



**PC Myanmar (Hong Kong) Limited (PCML)**

**Environmental Impact Assessment (EIA)  
for infill drilling within the  
Yetagun Gas Field**

**EIA Report**

26 March 2019

Prepared by: Environmental Resources Management

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# Environmental Impact Assessment (EIA) for infill drilling within the Yetagun Gas Field

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## EIA Report

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Client: PC Myanmar (Hong Kong) Limited		Project No: 0444295			
Summary:  This document presents the EIA Report for infill drilling in Yetagun Gas Field.		Date: 26 March 2019			
		Approved by:   Craig A. Reid Partner			
2	Update in response to ECD comments	Var.	RS	CAR	26/03/2019
1	Final Draft To MOGE & ECD	Var.	RS	CAR	10/10/2018
Revision	Description	By	Checked	Approved	Date
<p>This report has been prepared by ERM with all reasonable skill, care and diligence within the terms of the Contract with the client, incorporating our General Terms and Conditions of Business and taking account of the resources devoted to it by agreement with the client.</p> <p>We disclaim any responsibility to the client and others in respect of any matters outside the scope of the above.</p> <p>This report is confidential to the client and we accept no responsibility of whatsoever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies on the report at their own risk.</p>		<p>Distribution</p> <p><input type="checkbox"/> Internal</p> <p><input checked="" type="checkbox"/> Public</p> <p><input type="checkbox"/> Confidential</p> <div style="text-align: right;">     </div>			

**Comments and Findings of Environmental Impact Assessment Report for Infill drilling and Exploration Drilling within the Yetagun Gas Field, PC Myanmar (Hong Kong) Limited (PCML)**

No	Findings	Suggestions	PCML Response
	<b>Executive summary</b>		
a	<p>Page (1 -15), it was found that mitigation measures in Table (1.5); Impacts from Physical Presence of the MODU and Support Vessels on fishing and shipping activity discharge is stated as A 5 NM radius safety exclusion zone around the MODU.</p>	<ul style="list-style-type: none"> <li>• It is needed to state and check again the safety distance – exclusion zone distance.</li> <li>• According to the UNCLOS, exclusion zone should not be exceeded over 500 m for the safety of the offshore installation.</li> </ul>	<ul style="list-style-type: none"> <li>• The safety exclusion zone is approved by the MOGE and is specified to be <b>5 nautical miles (NM)</b> around the existing Yetagun Platform.</li> <li>• The UNCLOS states that the exclusion zone should be at least 500 m to avoid collisions. In this instance, the exclusion zone is 5 NM as this was agreed with MOGE and to ensure safe operation of the Platform. Given the distance from the coastline, there is limited overlap with fishing activities. This is the exclusion zone currently in place around the Yetagun Platform. This information is updated in Section 4.2.</li> </ul>
b	<p>Page ( 1 -15), it was found that mitigation measures in Table (1.5), Impacts of Drilling Cuttings and drilling Fluids Discharge is stated as maximum residual Non Aqueous Phase Drilling Fluid will be 6.9 % on wet cuttings.</p> <p>In EQEG Guideline and IFC EHS Guidelines for Offshore Oil and Gas Development (2015), it is stated as Dry Cuttings.</p>	<ul style="list-style-type: none"> <li>• To change Dry Cuttings instead of Wet Cuttings.</li> </ul>	<p>As in Page 28 of IFC EHS Guidelines (2015):</p> <ul style="list-style-type: none"> <li>- NADF 6.9% on <b>wet</b> cutting for existing facilities.</li> </ul> <p>The EQEG are based on IFC EHS Guidelines (2007). The MOGE have approved the use of the 2015 Guidelines for offshore Oil and Gas Operators with existing facilities (such as the Yetagun Platform and drilling rigs). As such, no change has been made. The MOGE letter to operators is provided in <b>Appendix A</b>.</p>
c	<p>Page (1-21), it is needed to state the monitoring plans related with the Marine Biodiversity and Discharge Monitoring (Table 1.7 – Environmental Monitoring Recording)</p>	<ul style="list-style-type: none"> <li>• To add the monitoring plans related with the Marine Biodiversity and Discharge Monitoring</li> </ul>	<p>The monitoring plan related to the Marine Biodiversity and Discharge Monitoring has been included in In <b>Table 1.7, page 1-22</b> and throughout the EIA Report. This includes monitoring for water quality, marine sediments, marine benthic organisms, and monitoring of drilling fluid discharges.</p>

No	Findings	Suggestions	PCML Response
	<b>Policy, Legal and Institutional Framework</b>		
a	<p>Although the project related laws were described, it was found that as follows.</p> <ul style="list-style-type: none"> <li>- In some laws ,the objectives of the laws were stated and there is no explanation how these laws are related with the proposed project</li> <li>- Some laws in this report is not related with this project (eg, Explosive Act (1887), Explosive Substances Act (1908) )</li> <li>- Although some are amendment laws, the appeal laws are included in this report</li> <li>- It is needed to include more laws</li> </ul>	<p>To include the following law.</p> <ol style="list-style-type: none"> <li>1. Environmental Conservation Law, 2012 ( Clause 7 (o), 14,15,29)</li> <li>2. Environmental Conservation Rules, 2015 (Rule 69)</li> <li>3. Environmental Impact Assessment procedure , 2015 ( Clause 87, 102 – 110, 113, 115)</li> <li>4. Public Health law , 1972</li> <li>5. National Environmental Quality (Emission) Guidelines</li> <li>6. The protection of rights of national Races law, 2015 (Section 5)</li> <li>7. The Prevention and Control of Communicable Diseases Law, 1995</li> <li>8. The Control of Smoking and Consumption of Tobacco Product Law, 2006</li> <li>9. The Myanmar fire Force law, 2015 (section 25)</li> <li>10. The protection and Preservation of Antique Objects law (2015)</li> <li>11. The Protection and Preservation of Ancient Monuments Law (2015)</li> <li>12. Myanmar Investment law, 2016 – 51 (a) (b) (c) (d) , 65 (g) (i) (j) (k) (l) (m) (n) (o) (p) (q)</li> <li>13. The Development of Employees and Expertise (Skill) , 2013 (Section 5,14,30)</li> <li>14. The Factories Act, 1951 (Before notification that this project is oilfield issued by MOEE).</li> </ol>	<p>In <b>Table 3.1, page 3-6 to 3-26</b>, the Laws and Clauses mentioned have been included.</p>

No	Findings	Suggestions	PCML Response
		<p>15. The Warfare of labors of Oilfield Act,1951 (After notification)</p> <p>16. The Workmen Compensation Act, 1951</p> <p>17. Labor Organization Law, 2012</p> <p>18. The Settlement of labor Dispute Law, 2012</p> <p>19. Minimum Wages law, 2013</p> <p>20. Payment of Wages law, 2016 (3, 4, 8, 7 (ii),9, 10 (a) to (e) )</p> <p>21. Social Security Law, 2012 – 11, 16 (a), 48 (a), 51 (a) (b) , 54)</p> <p>22. Leaves and Holidays Act, 1951</p> <p>23. The Import and Export law, 2012 (Section 7)</p> <p>24. The Myanmar Port Authority law, 2015 (Clause 19 (a,b) , 80 (a), 23 (b,c).</p> <p>25. The Myanmar marine Fisheries law, 1990 (clause 39)</p> <ul style="list-style-type: none"> <li>- Not to include the amendment laws</li> <li>- To state the update name and year of the laws</li> <li>- To include the legal commitments by referring the clauses</li> <li>- To study the project well and to include the related laws</li> </ul>	
b	<p>In Table 3.2 International Conventions relevant to the project, To include the facts that the project will follow the specifications according to the Ramsar Convention as the gulf of Mottama has already stated as the Ramsar Site.</p>	<ul style="list-style-type: none"> <li>• To include the facts that the project will follow the specifications according to the Ramsar Convention</li> </ul>	<p>This Project is not within the RAMSAR Site. The nearest RAMSAR site is over 200 km from the Project. Information on RAMSAR sites is included in <b>Section 5.6.2, page 5-34</b>, and the RAMSAR sites in relation to the Project are shown in <b>Figure 5.8</b>.</p>
3	<b>Project Description and Alternatives</b>		

No	Findings	Suggestions	PCML Response
a	It was found that even though it is stated the project background as the title, there is no paragraph included, Page 4-1, Section 4.1.	<ul style="list-style-type: none"> <li>To add the necessary information</li> </ul>	<ul style="list-style-type: none"> <li>PETRONAS Carigali Myanmar (Hong Kong) Limited (PCML) is involved in the oil and gas exploration activities in offshore Myanmar. PCML are the operator of the existing Yetagun Platform targeting the Yetagun Field in Blocks M12, M13, and M14. PCML wish to drill three additional wells within the field. This information is provided in <b>Section 4.1 (page 4-1)</b>.</li> </ul>
b	It was found that there is no statement about MODU Design, efficient pollution control systems although there is statement about semi-submersible Rig related with MODU	<ul style="list-style-type: none"> <li>To present the verification audit (or) third party compliance certificate to confirm that proposed MODU is conformable with EQEG emission Guideline and/or IFC 2015 Guidelines, MARPOL requirement, other Good International Industrial Practice</li> <li>To state the MODU Design, efficient pollution control system</li> </ul>	<ul style="list-style-type: none"> <li>The drilling rig (MODU) for the Project is likely to be the West Vencedor. An inspection report for this rig is provided in <b>Appendix C</b>.</li> <li>PCML commit to effluent discharge monitoring (i.e., monitoring drilling fluid discharges) to ensure the discharge is in compliance with the EQEG. The monitoring to be conducted for the Project is included in <b>Table 1.7, page 1-21 &amp; 22</b> and throughout the EIA and includes drill fluids/cuttings monitoring. Any non-compliances with the commitments / mitigation in the EIA will be reported in the Environmental Monitoring Report. The mitigation in the EIA Report is aligned to the IFC EHS and EQEG.</li> <li>There are various systems to control pollution on the MODU including wastewater discharges in line with MARPOL, drilling fluids discharges in lie with EQEG and IFC EHS (2015) Standards, and waste management measures. These are mentioned in more detail in <b>Section 4.4.6 (page 4-10 to 4-14)</b></li> </ul>
c	In 4.4.1, in drilling activities, non-aqueous drilling fluid (NADF) will be used in intermediate and bottom hole and will be	<ul style="list-style-type: none"> <li>In discharge process of the proposed project, it is needed to state detail</li> </ul>	<ul style="list-style-type: none"> <li>The discharge conditions from the EQEG and IFC EHS Guidelines for NADF discharges are provided in <b>Section 4.4.1, page 4-4 &amp; 4-5</b>.</li> </ul>

No	Findings	Suggestions	PCML Response
	discharged as Myanmar Environmental Emissions Guidelines for Offshore Oil and Gas Development (2015).	information according to the specific criteria and standards	
d	It was found that safety exclusion zone around the MODU will be A 5 NM radius in which other shipping or fishing vessels cannot enter.	<ul style="list-style-type: none"> <li>To check again and state the Safety Distance – Exclusion Zone</li> <li>According to the UNCLOS, exclusion zone should not be exceeded over 500 m for the safety of the offshore installation.</li> </ul>	<ul style="list-style-type: none"> <li>As per response to <b>Comment 1(b)</b></li> </ul>
e	<p>On Page (4-8), Section (4.4.5), it is stated that all chemicals that may be discharged to the marine environment during the infill drilling activity are required to be selected and approved in line with National laws and regulations. Chemicals considered for use are assessed in terms of their application, discharge and potential risk to the marine environment.</p> <p>It is needed to include types of chemicals and their amount, their toxicity status, impacts of water quality, sediment, marine biodiversity and habitats due to the usage and discharge of these chemicals.</p> <p>It is also needed to include if there any additional mix usage of chemical.</p>	<ul style="list-style-type: none"> <li>To include types of chemicals and their amount, their toxicity status, ways of chemicals storage, safety methods for the selection of chemicals and usage of these.</li> <li>To include the impacts and mitigation measures for the water quality, sediment, marine biodiversity and habitats due to the usage and discharge of chemicals.</li> </ul>	<ul style="list-style-type: none"> <li>The chemicals used during the Project are split between cementing and drilling chemicals and the full list including MSDS is provided in <b>Appendix B and Appendix D</b>, respectively. The MSDS include information on toxicity and storage. Chemicals are selected based on their required use taking into consideration the toxicity rating on the MSDS. Low toxicity drilling chemicals are selected where possible.</li> <li>The assessment of impacts from drilling fluid / cuttings discharge is included in Section 6.3.2 in relation to Sediment Quality, Marine Water Quality, Benthic Communities, and Fish &amp; Pelagic Communities (<b>Table 6.8 to 6.11</b>). This assessment has taken into consideration the types of chemicals used and discharged.</li> </ul>
f	It is found that there is no information about cementing chemicals which will be used during casing.	<ul style="list-style-type: none"> <li>To include the information about cementing chemicals</li> </ul>	<ul style="list-style-type: none"> <li>The cementing chemicals are listed in <b>Appendix B</b> which includes their MSDS sheets.</li> </ul>

No	Findings	Suggestions	PCML Response
g	<p>On Page (4-9), it is stated that hazardous wastes such as lubricants, filters, chemical containers, used equipment or batteries will be stored and consolidated for onshore disposal.</p>	<ul style="list-style-type: none"> <li>To include the types of waste from the project, amount of hazardous waste, location and ways of waste disposal for onshore, waste management and transportation methods</li> </ul>	<ul style="list-style-type: none"> <li>The types of wastes are provided in <b>Table 4.7</b>.</li> <li>For hazardous waste, the type, containers, storage and disposal of wastes are described in <b>Table 4.8</b>.</li> <li>Typical waste streams from offshore drilling are presented in <b>Appendix E</b>.</li> </ul>
h	<p>It is found that there is no statement about Mud Pits types.</p> <p>There is no statement how to refine and discharge the oil which will be attached on Mid Pits and how many percentage of oil will be refined.</p>	<ul style="list-style-type: none"> <li>To include the mud pits types which will be used in the proposed project</li> <li>To describe how much percentage of the oil mixed (attached) with Mud pits will be treated and discharged.</li> </ul>	<ul style="list-style-type: none"> <li>Information on the mud pit and cuttings dryer system is provided in <b>Section 4.4.6 (page 4-13 &amp; 4-14)</b>. The mud pits and cuttings systems is shown in <b>Figure 4.5</b>.</li> <li>The discharge is managed to 6.9%. This information is included in <b>Section 4.4.6 (page 4-13)</b>.</li> </ul>
i	<p>It is found that the wastewater generated by the MODU and support vessels includes domestic and sanitary wastewater, deck drainage and bilge water. Wastes will be treated and monitored abroad before discharge into the surrounding environment. These wastewater releases will comply with International Convention for the Prevention of Pollution from ships (MARPOL) 73/78 Annex I requirements and EQEQ Guidelines. Ballast water will be discharged to comply with IMO guidelines. Hazardous wastes will be stored and consolidated for onshore disposal.</p>	<ul style="list-style-type: none"> <li>To state the refining methods for the domestic and sanitary wastewater, deck drainage and bilge water, location for the drainage of wastes on the onshore and the transportation methods of wastes</li> </ul>	<ul style="list-style-type: none"> <li>Information on the waste water treatment system on board the rig is provide in <b>Section 4.4.6 (page 4-10)</b>. This is standard equipment for offshore oil and gas and is designed to meet the applicable IFC EHS standards.</li> </ul>
4	<b>Description of the Surrounding Environment</b>		

No	Findings	Suggestions	PCML Response
a	<p>In section (5.6.5) and (5.6.6), it is included the general information about the marine mammals, marine turtles and seabirds that usually found in Myanmar waters.</p>	<ul style="list-style-type: none"> <li>To include the marine mammals, marine turtles and seabirds which usually found on Block M-12, 13, 14.</li> </ul>	<ul style="list-style-type: none"> <li>Sandy shore habitat along Moscos Island and the adjacent Tanintharyi coastline are nesting sites for species including green turtles, hawksbill, Olive Ridley and Leatherback (UNEP, 2017). Given the location of the Project Area in relation to known nesting beaches, there is a potential for marine turtles to be present within these blocks when traversing open waters to and from seasonal nesting areas and adjacent mating areas.</li> <li>Given that marine mammals in Myanmar waters have wide ranges, it is assumed that all 25 recorded species of marine mammal in Myanmar waters could be present in Blocks M12, M13 and M14.</li> <li>Although detailed data on distribution, abundance, habitat utilisation and seasonality of seabirds specific to the Project Area are limited at present, noting the above it can be conservatively assumed that seabirds mentioned in <b>Section 5.6.7</b> may be expected to occasionally pass within or close by to the Project Area.</li> <li>Information on the marine mammals, marine turtles and seabirds has been included in <b>Section 5.6.5, 5.6.6, and 5.6.7.</b></li> </ul>
b	<p>There is no information if there are Ecotourism Sites and beach resorts near the proposed project coastal area or not</p>	<ul style="list-style-type: none"> <li>To include whether there are Ecotourism Sites and beach resorts near the proposed project coastal area or not</li> </ul>	<ul style="list-style-type: none"> <li>Information on tourism has been included in <b>Section 5.12</b>. There are no tourism activities in the Area of Influence as the wells will be drilled over 100 km from the nearest coastline.</li> </ul>
6	<p><b>Public consultation and Disclosure</b></p>		

No	Findings	Suggestions	PCML Response
a	Although there is statement about the advertisement disclosing information on the project in the Global New Light of Myanmar (English) and the Mirror (Burmese), there is no information about the publication dates.	<ul style="list-style-type: none"> <li>To include the publication dates, page and column of the newspaper (the Mirror and the Global New Light of Myanmar)</li> </ul>	<ul style="list-style-type: none"> <li>The publication dates, column, and page of the newspaper adverts has been included in <b>Section 9.6, page 9-30.</b></li> </ul>
b	It is needed to include the plans distributing the project information up to village level for letting local fishermen to know and understand	<ul style="list-style-type: none"> <li>It is needed to include the plans distributing the project information up to village level for letting local fishermen to know and understand</li> </ul>	<ul style="list-style-type: none"> <li>PCML will disclose the final EIA Report in the same newspapers. The EIA Report will also be made available online at PCML's website, <a href="https://www.petronas.com">https://www.petronas.com</a>. Hard copies of the Myanmar language executive summary will also be sent to the DOF and GAD in Dawei and Myeik.</li> <li>The public disclosure plan for distributing project information up to a village level is provided in <b>Section 9.6, page 9-16.</b></li> </ul>
c	It is found that there is no information about the CSR programs and CSR Budget.	<ul style="list-style-type: none"> <li>To include the CSR programs and CSR budgets upon the need of the local communities</li> </ul>	<ul style="list-style-type: none"> <li>The updated CSR Program and Proposed budget for 2019 is described in <b>Appendix O</b> (in Myanmar language).</li> </ul>
d	It is found that there is statement for the community grievance mechanism (page 9-17, Section 9.6). But it is very general.	<ul style="list-style-type: none"> <li>To include about detailed community grievance mechanism, responsible person, organization flow charts, clarification of the steps of working plan and contact information.</li> </ul>	<ul style="list-style-type: none"> <li>The contact persons are provided in <b>Section 9.7 (page 9-20)</b> and the organisation flow chart, and steps of the Grievance Mechanism are included in <b>Figure 9.9</b> and <b>Figure 9.10.</b></li> </ul>
7	<b>Environmental Management Plan</b>		
a	Page (8-2), Table (8.1), it is stated that oil concentration lower than 6.9 % by weight on dry cuttings (as per IFC EHS Guideline for Oil and Gas Development (2015) ) for drilling cuttings and drilling fluids parameter.	<ul style="list-style-type: none"> <li>To change Dry Cuttings instead of wet Cuttings</li> </ul>	<ul style="list-style-type: none"> <li>As per response to the <b>Comment 1(b)</b></li> </ul>

No	Findings	Suggestions	PCML Response
	<p>However, in Table (8.2), In the statement of oil on cutting percentage, it is found that maximum residual non aqueous phase drilling fluid will be 6.9 % on wet cuttings.</p>		
b	<p>Waste management Plan (Page 8-14, Section 8.5.1), it is shown that a waste management plan will be prepared to outline the methods and practices to meet the requirements of this EIA and applicable regulations. But, there is no statement about the detailed waste management plan.</p>	<ul style="list-style-type: none"> <li>To include the detailed waste management plan for hazardous waste and non-hazardous waste</li> </ul>	<ul style="list-style-type: none"> <li>The full Management Plans are prepared after the EIA Report is approved, as the EIA Report final Commitments are used to update the details in the Management Plans. In Addition, companies contracted to PCML may produce some of the Management Plans suggested to be required in the EIA Report.</li> <li>More information on management actions is provided in <b>Section 8.5.1 (page 8-14)</b> and an overview of the MARPOL requirements for waste discharges is provided in <b>Appendix G</b>.</li> <li>The Waste Management Plan will be finalised after selection of the contractors and will be provided to ECD prior to drilling. This commitment is included in <b>Table 8.3 (page 8-9)</b>.</li> </ul>
c	<p>It is found that there is no information about the chemical management plan, operational discharge management plan, drilling cutting and fluid disposal plan, waste management plan and blowout contingency plan.</p>	<ul style="list-style-type: none"> <li>To include the detail management plan about the chemical management plan, operation discharge management plan, drilling cutting and fluid disposal plan, waste management plan and blowout contingency plan.</li> </ul>	<ul style="list-style-type: none"> <li>The chemical management plan, operational discharge management plan, drilling cutting and fluid plan are included under one plan – Sediment and Drilling Cuttings Plan (<b>Section 8.5.2</b>) and will be finalised after selection of the contractors and EIA commitment approval. More information on the management actions is provided in <b>Section 8.5.2 (page 8-17 &amp; 8-18)</b> and the Non Aqueous Drilling Fluid Management Guideline is provided in <b>Appendix H</b>.</li> <li>The Waste Management Plan is mentioned above (Comment 8b).</li> </ul>

No	Findings	Suggestions	PCML Response
			<ul style="list-style-type: none"> <li>The Oil Spill Response Plan is provided in <b>Appendix M</b> and summarised in <b>Section 8.5.5 (page 8-24 to 8-27)</b>.</li> </ul>
d	<p>In Section 8.5.4, Emergency Response Plan, it is stated that ERP should contain the following facts but there is no detail information related them.</p> <ul style="list-style-type: none"> <li>Vessel emergency procedures an oil spill contingency plan implemented in the event of a hydrocarbon spill requiring response beyond the capacity of the SOPEP</li> <li>Medical emergencies including medevac procedures</li> <li>Search and rescue – includes man-overboard procedure and helicopter ditching</li> <li>Heavy weather/ cyclone plan</li> <li>Hazardous material spill response plans</li> <li>Any other emergency response plan required by the Republic of the Union of Myanmar authorities</li> </ul>	<ul style="list-style-type: none"> <li>To include the detail plans for these facts in this EIA report.</li> </ul>	<ul style="list-style-type: none"> <li>The Emergency Response Procedures for the rig is provided in <b>Appendix I</b> and summarised in <b>Section 8.5.4 (page 8-20 to 8-23)</b>.</li> <li>The Medical Emergency Response Plan is included in <b>Appendix J</b> and summarised in <b>Section 8.5.4 (page 8-21 to 8-23)</b>.</li> <li>The Oil Spill Response Plan is provided in <b>Appendix M</b> and summarised in <b>Section 8.5.5 (page 8-24 to 8-27)</b>.</li> <li>The Cyclone and Adverse Weather Management Plan is provided in <b>Appendix K</b> and <b>Appendix L</b>, respectively and summarised in <b>Section 8.5.4 (page 8-21)</b>.</li> </ul>
e	<p>In oil spill contingency plan, it is needed to include the following facts:</p> <ul style="list-style-type: none"> <li>Potential impact of Overflow amount and types due to the experimental drillings and diesel usage of Vessel</li> <li>Potential procedures</li> <li>Spreading time and spreading area to the ocean.</li> </ul>	<ul style="list-style-type: none"> <li>To include the following facts: <ul style="list-style-type: none"> <li>Potential impact of Overflow amount and types due to the experimental drillings and diesel usage of Vessel</li> <li>Potential procedures</li> <li>Spreading time and spreading area to the ocean.</li> <li>Engagement with the government departments including sending information to DMA.</li> </ul> </li> </ul>	<p>The Oil Spill Response Plan (OSRP) is provided in <b>Appendix M</b> and summarised in <b>Section 8.5.5 (page 8-24 to 8-27)</b>.</p> <ul style="list-style-type: none"> <li>The potential impacts from diesel and hydrocarbon release are considered in the OSRP.</li> </ul>

No	Findings	Suggestions	PCML Response
	<ul style="list-style-type: none"> <li>- Engagement with the government departments including sending information to DMA</li> </ul>		<ul style="list-style-type: none"> <li>• The procedures for spill response are included in the OSRP.</li> <li>• The Oil Spill Modelling results are shown in <b>Section 6.3.4 (page 6-34 to 6-37)</b>. This demonstrates results of a worst case spill (left for two weeks). This is considered in the OSRP.</li> <li>• Engagement with local government departments will be conducted as per legal requirements of Myanmar in the event of a spill.</li> </ul>
f	Page (8-14), Section (8.5.3), Table 8.7 of the Biodiversity Management Plan, it is stated only monitoring plans for marine sediments and communities but there is no statement about monitoring plans for the marine biodiversity.	<ul style="list-style-type: none"> <li>• To include the monitoring plan for the marine biodiversity</li> </ul>	<ul style="list-style-type: none"> <li>• The marine biodiversity monitoring plan is mentioned in <b>Table 8-7</b> and throughout the EIA. Monitoring will be conducted for benthic organisms as well as visual observations for marine mammals and turtles.</li> </ul>
8	<b>Public Consultation and Disclosure</b>		
a	<ul style="list-style-type: none"> <li>• To engage with the local communities (stakeholders) and to conduct according to their comments and suggestions.</li> </ul>		<ul style="list-style-type: none"> <li>• Noted. Locals communities have been consulted (as per <b>Table 9.1</b> and <b>9.2</b>) and the comments have been considered in the EIA (as per <b>Table 9.3</b>).</li> </ul>

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Appendix B - Material Safety Data Sheets for Cementing Chemicals

Appendix C - Drilling Rig Inspection Report

Appendix D- Material Safety Data Sheets for Drilling Chemicals

Appendix E - Summary of Waste Streams

Appendix F - Drill Cuttings Dispersion and Oil Spill Modelling Report

Appendix G - Summary of MARPOL Discharge Requirements

Appendix H - NADF Management Guideline

Appendix I - Emergency Response

Appendix J - Medical Emergency Response Plan

Appendix K - Cyclone Emergency Response Plan

Appendix L - Adverse Weather Emergency Response Plan

Appendix M - Oil Spill Response Plan

Appendix N - Public Consultation Results

Appendix O - CSR Program and Proposed Budget for 2019

## Acronyms and Abbreviations

Acronym	Definition
ASEAN	Association of South-East Asia Nations
BANCA	Biodiversity and Nature Conservation Association
dB	Decibels
DoF	Department of Fisheries
ECC	Environmental Compliance Certificate
ECD	Environmental Conservation Department
EHS	Environmental Health and Safety
EIA	Environmental Impact Assessment
ERM	Environmental Resources Management
EMP	Environmental Management Plan
ft.	Feet
HSE	Health, Safety and Environment
Hz	Hertz
IEE	Initial Environmental Examination
IFC	International Finance Corporation
IMO	International Maritime Organisation
IOGP	International Association of Oil and Gas Producers
IPIECA	International Petroleum Industry Environmental Conservation Association
IUCN	International Union for the Conservation of Nature
KCL	Potassium Chloride
km	Kilometres
km <sup>2</sup>	Square kilometres
LTOBM	Low Toxicity Oil Based Mud
m	Metres
m <sup>3</sup>	Cubic metres
MARPOL	International Convention for the Prevention of Pollution from Ships
MIC	Myanmar Investment Commission
MODU	Mobile Offshore Drilling Unit
MOEE	Ministry of Electricity and Energy
MOGE	Myanma Oil and Gas Enterprise
MONREC	Ministry of Natural Resources and Environmental Conservation
NADF	Non-Aqueous Drilling Fluid
Pa	Pascal
PHPA	Partially Hydrolysed Poly Acrylamide
PSC	Production Sharing Contract
SEP	Stakeholder Engagement Plan

Acronym	Definition
UNEP	United Nations Environment Programme
WBDF	Water Based Drilling Fluid

# **1 EXECUTIVE SUMMARY**

## **1.1 INTRODUCTION**

PC Myanmar (Hong Kong) Limited (PCML) is the operator of Yetagun Gas Field in offshore Myanmar Blocks M-12, M-13, and M-14. In May 1990, PCML signed the Petroleum Production Sharing Contract (PSC) with Myanma Oil & Gas Enterprise (MOGE), NIPPON and PTTEPI for Blocks M12, M13 and M14; located to the southwest of Dawei in the Andaman Sea.

This Report is the Environmental Impact Assessment for the infill drilling conducted in the Yetagun Field, offshore Tanintharyi Region by PCML.

The Project will cover the drilling of three infill wells within the Project Area of Block M-12, M-13 and M-14, which will be drilled in waters depths of about 110 m deep and at least 140 km from the mainland coastline and over 100 km from the nearest islands (Kyunsu) of the Myeik Archipelago.

As per the Myanmar EIA Procedure, this Project requires an EIA to be conducted and submitted to the Environmental Conservation Department (ECD) of the Ministry of Natural Resources and Environmental Conservation (MONREC).

Environmental Resources Management (ERM) – Hong Kong Limited are the environmental and social consultants that conducted this EIA Study. ERM will be supported by local environmental consultants, Resource and Environment, Myanmar (REM) and Environmental Quality Management (EQM), both of which are registered under the Ministry of Natural Resources and Environmental Conservation (MONREC) Consultant Registration Scheme.

## **1.2 POLICY AND REGULATORY FRAMEWORK**

The Project will be undertaken in line with a number of national and local standards and laws. Local laws relating to EIA including but not limited to:

- Environmental Conservation Law (2012);
- Environmental Conservation Rules (2014);
- National Environmental Quality (Emission) Guidelines (2015); and
- Environmental Impact Assessment Procedure (2015).

## **1.3 PROJECT DESCRIPTION AND ALTERNATIVES**

### **1.3.1 Proposed Project**

The wells will be drilled using a mobile offshore drilling unit (MODU) which will have an exclusion area of 5 nautical miles (NM) radius in which other

shipping or fishing vessels cannot enter. Given the wells will be drilled at the existing Yetagun production platform, this exclusion area will overlap the existing exclusion area that surrounds the Yetagun Complex.

The coordinates for the three wells are provided in *Table 1.1* and shown in *Figure 4.1*.

**Table 1.1** *Well Locations*

No	Name	Coordinates
1	YA-01	Lat: 13° 4'17.09"N/ Long: 96°52'5.31"E
2	YA-05	Lat: 13° 4'17.09"N/ Long: 96°52'5.31"E
3	YA-12TS1	Lat: 13° 4'17.09"N/ Long: 96°52'5.31"E

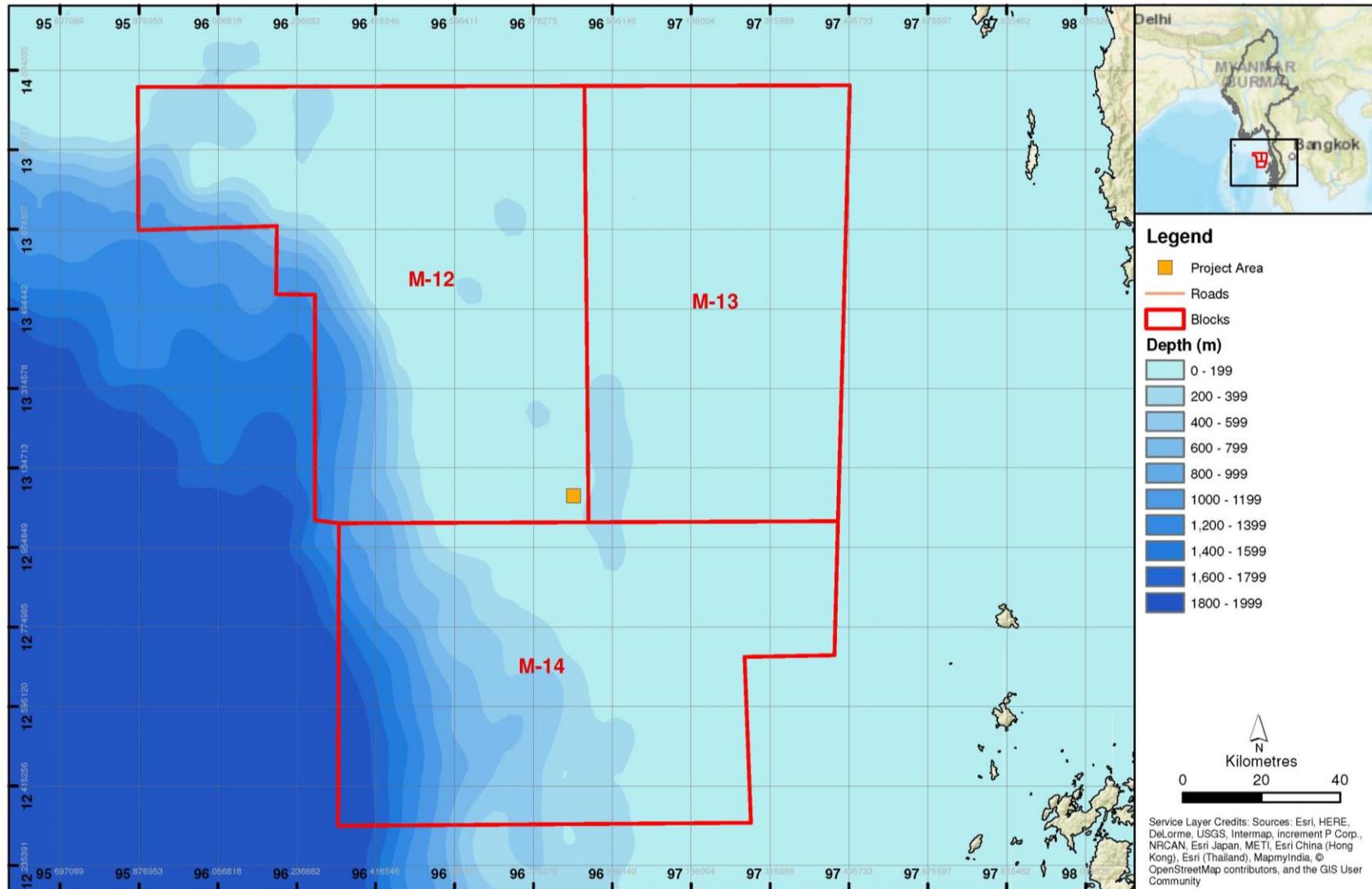
The proposed infill drilling is scheduled to take place in Q4 2018. Each well will take approximately 65 days to complete; therefore drilling will take around 7-8 months. As this Project is only exploration activity, there is only one Phase, namely the Operation Phase. There is no permanent infrastructure and no pre-construction, construction, or decommissioning phases.

A typical offshore well is drilled to a depth of 2,000 m to 3,000 m (total vertical depth in metres below sea bed). A generic well schematic for the three wells is provided in *Figure 1.2* and a summary of the well information is provided in *Table 1.2*.

Top-hole section(s) of the wells will typically be drilled riser-less using seawater and/or WBDF to circulate drill cuttings from the wellbore, which are released to the seabed. After drilling, a conductor (i.e. steel tubular casing) is run and cemented in place which provides structural support for the well. After completion of the top-hole section a blowout preventer (BOP) and marine riser is installed on the wellhead. The BOP is required for well control and a marine riser acts as a conduit between the wellhead and MODU.

Once the riser is in place the bottom-hole sections will be drilled using WBDF. The drill cuttings will be re-injected where possible however the majority of WBDF cuttings will be discharged to sea.

Figure 1.1 Location of Project Area

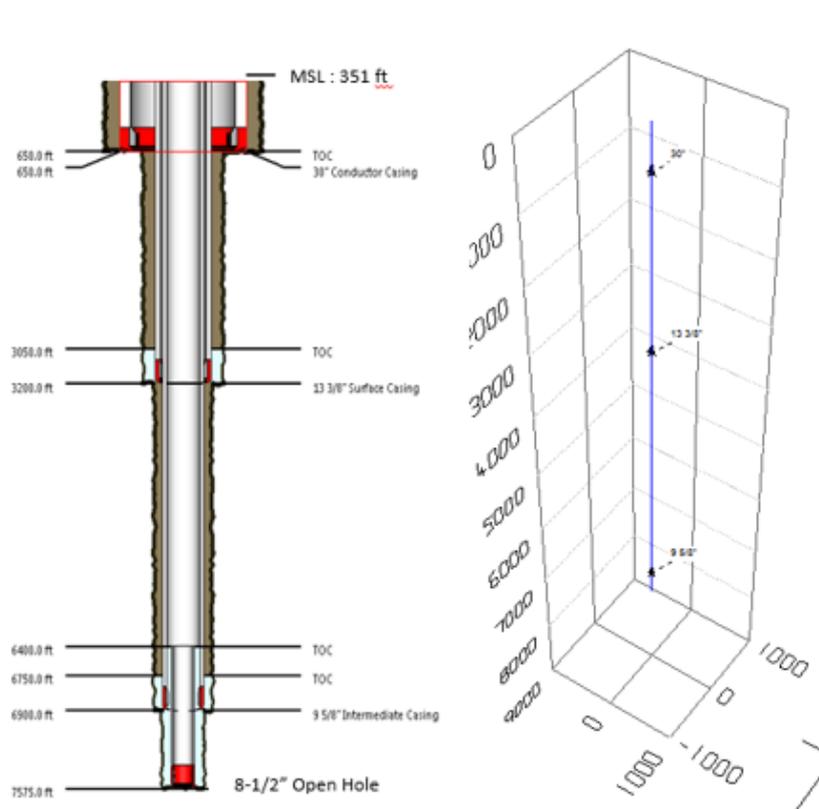


Non-aqueous drilling fluid (NADF) will be used on the intermediate and bottom hole sections. Where NADF are used, cuttings will be processed on board the MODU prior to discharge in line with Myanmar Environmental Emissions Guidelines and IFC EHS Guidelines for Offshore Oil and Gas Developments (2015).

**Table 1.2** *Indicative Well Information Summary*

Well Interval	Hole Diameter (inches)	Discharge Method	Cuttings Discharge (m <sup>3</sup> )	Muds		Discharge duration (days)
				Type	Volume of solids discharged (m <sup>3</sup> )	
Surface hole	23"	Near seabed (riser-less)	400	Bentonite / seawater	2,500	2
Intermediate hole	17.5"	Near seabed (riser-less)	500	WBDF (KCl/PHP A)	1,500	6
Intermediate hole	12.25"	Surface (riser)	700	NADF	0	21
Production hole	8.5"	Surface (riser)	30	NADF	0	12
Production hole	6"	Surface (riser)	10	NADF	0	3
<b>Total discharge volume of sediments</b>			<b>1,640</b>		<b>4,000</b>	<b>44</b>

Figure 1.2 Indicative Infill Drilling Well Schematic



### 1.3.2 Alternatives

Consideration of Project options and alternatives is a fundamental requirement in the planning of any project as a means of avoiding or reducing adverse environmental and social impacts and maximising or enhancing project benefits. Several options that have been considered for the Project include the following:

- **No Project Alternative.** The 'No Project' alternative would result in no further field development activity in Blocks M-12, M-13 and M-14 and, in turn, no further oil and gas development and a reduction in production. The production of gas resources stimulates the Myanmar economy and 'No Project' would result in fewer opportunities for gas supply to the domestic market and could lead to fewer employment opportunities and less economic growth.
- **Drill Cutting Disposal.** Disposal options for the drill cuttings comprise (1) onshore disposal, (2) offshore re-injection, and (3) offshore discharge. Offshore re-injection is not possible and offshore disposal is the selected alternative for the project as is considered to be industry standard. Drill cuttings dispersion modelling have been conducted in order to address the potential environmental impacts.
- **Types of Drilling Fluid.** The wells can be drilled with either non aqueous drilling fluid (NADF) or water based drilling fluid (WBDF). For this

Project, the well will be drilled using WBDF for top hole sections and NADF for deep more technically challenging bottom hole sections, where required. NADF have been specifically developed by the industry as a low toxicity, faster biodegrading replacement to the traditionally-used oil based fluids while maintaining drilling performance.

- **Well Locations.** Wells will be drilled from the Yetagun-A platform. The selection of the well locations is driven by factors related to gas reservoir location and geology and position of the Yetagun platform, where the drilling activities will occur. All the potential well locations are located in waters approximately 110 m deep. The potential well locations are over 140 km from the mainland and over 100 km from the nearest outlying islands of the Myeik Archipelago.

## 1.4

### *DESCRIPTION OF THE SURROUNDING ENVIRONMENT*

The **Project Area** is the MODU and the 5 nautical mile exclusion zone. The following section describes the physical, biological, and social environment within the **Study Area**, which is defined as the waters of Project Area as well as the surrounding waters offshore Tanintharyi Region. As the potential well will be located 140 km from the mainland and 100 km from the nearest coast (nearest island of the Myeik Archipelago), the focus of the baseline information is on open water habitats.

The **Area of Influence** varies depending on the receptor and activity. For environmental receptors, the Area of Influence is limited to the waters of the Project Area and the surrounding offshore waters of Tanintharyi Region. For the social assessment, the closest receptors are located in the Tanintharyi Region; about 140 km from the Project. Given the Area of Influence is offshore open waters the environmental impact assessment will focus on habitats and species in this area. Information on coastal areas and protected areas is included to provide a general baseline description.

The information provided in this Section is based on a desktop review of published information, supplemented with information provided by PCML, and through review of available ERM in house literature. As this Project is an EIA, primary environmental baseline data were collected in April 2018. Primary social data collected during public consultations have been used to supplement the desk-top review. Secondary data sources were also referred to, such as; reports by the Wildlife Conservation Society (WCS), scientific journals, fisheries cruise data (2015), and local study reports available at the marine science department of Mawlamyine and Patheingyi Universities.

### 1.4.1

#### *Primary Baseline Data*

In April 2018, primary data collection was conducted for water quality, plankton, sediments and macrobenthos. The data was collected by experienced marine scientists from ERM, supported by our local subcontractor REM. Sampling and analysis was conducted at laboratories and universities in Myanmar, Hong Kong and China.

The survey recorded a total of 31 individual organisms, with a total biomass of 0.283 g in four sediment grab samples. The specimens belong to seven (7) Phyla (Annelida, Arthropoda, Chordata, Cnidaria, Echinodermata, Mollusca, and Nemertinea), from a total of 15 Families in seven Classes. The April 2018 survey also observed that the majority (54.84%) of the number of macrobenthic organisms (i.e. abundance) recorded at Yetagun field were from the Class Polychaeta (Phylum Annelida (marine worms), followed by Class Crustacea (Phylum Arthropoda, 22.58 of the total). Samples were dominated by polychaete worms or crustaceans (Phylum Arthropoda), which was the same finding as reported from surveys in 1998.

Overall, the benthic grab sampling at the Yetagun field in April 2018 have revealed a sparse abundance, high variability, and low diversity of infauna. Bristleworms (polychaetes/worms) were most common with other fauna including crustaceans, ribbonworms, anemones, gastropods, fish and brittlestars. The benthic habitat within the Surveyed Area near the Platform spanning the outer continental shelf was found to consist of bare, unconsolidated sandy and muddy sediments supporting a sparse assemblage of benthic organisms.

The survey in April 2018 also recorded a total of between 46,810 to 149,856 algal cells/L in four water column-integrated samples. The specimens belong to two Divisions (Cyanophyta, Chromophyta), three Classes (Cyanophyceae, Bacillariophyceae, Dinophyceae ), 20 Families and 23 Species.

Primary marine baseline surveys in April 2018 established that seabed areas in the Yetagun field were found to mostly consist of clayey sediment. The organic content of marine sediments was found to be similar at all sampling stations ranging from 0.16 to 0.21% and was considered typical of unpolluted offshore marine environments.

For water quality, the oil and grease concentration in all seawater samples was <2 mg/l or Non Detectable and were considered to be negligible. Overall, the Marine Baseline Survey was taken as indicating no evidence of hydrocarbon contamination at levels of environmental concern.

#### **1.4.2 *Environmental Baseline***

A total of 43 designated or proposed protected areas with IUCN categories existing in Myanmar (Istituto Oikos and BANCA, 2011) however some are proposed as protected area without authorized designation (i.e. “soft” designation). None of these protected or environmentally sensitive areas lie within the Project Area. The closest is a designated Shark Protection Area located 138 km from the Project Area. The area was established in 2004 as a national Marine Protected Area (MPA) and covers an area of 11,836 km<sup>2</sup> where there are restrictions on fishing activities.

In 2012, the Wildlife Conservation Society (WCS) identified 132 Key Biodiversity Areas (KBAs) alongside Myanmar environmental experts (Holmes et al, 2013). These KBAs are regarded as areas holding significant populations of species of high conservation concern but are not legally recognized nor

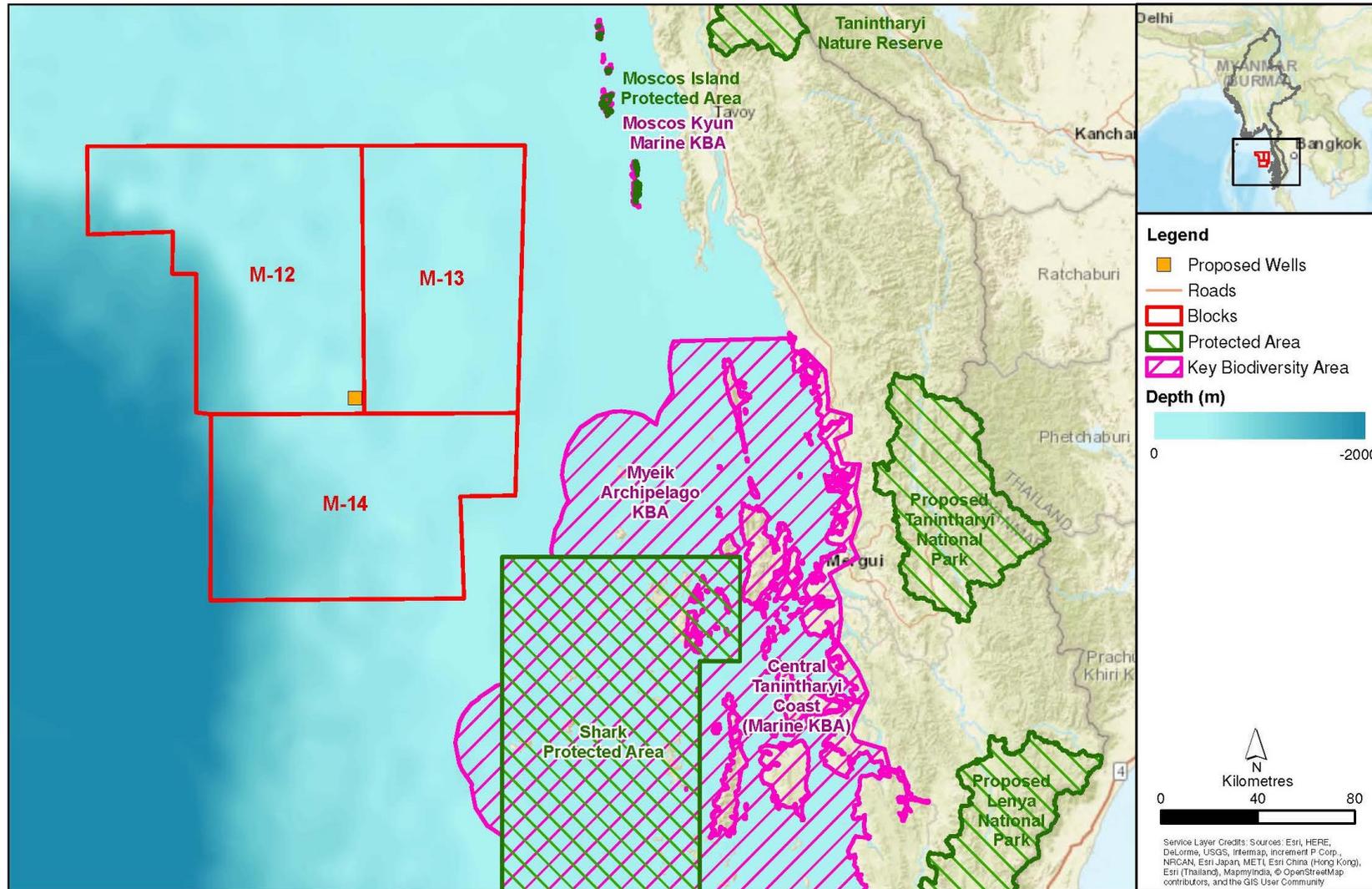
designated as protected areas in Myanmar. The closest KBA is the Myeik Archipelago KBA which is located around 88 km from the Project Area. This KBA was identified due to four key species of sea turtles potentially nesting on the islands.

The KBA's within the Study Area are provided in *Table 1.3* and *Figure 1.3*.

**Table 1.3** *Key Biodiversity Areas (KBAs) in the Study Area*

Name	Area (km <sup>2</sup> )	Key species
Myeik Archipelago	43,963	Leatherback turtle, green turtle, hawksbill turtle
Moscós Kyun	57	Leatherback turtle, green turtle, hawksbill turtle, olive ridley turtle
Lampi Island MPA	225	Hornbill, numerous shark species, turtle species

Figure 1.3 Protected Areas in the Study Area



Source: Homles et al, 2014

Climate data is available from Dawei, which is located 140 km from the Project Area and is the closest District. Within Myanmar, Dawei is affected first by the southwest monsoon and is reported to experience an average of 142 rainy days and 17.9 ft. of precipitation per year (FAO, 2014).

Average monthly wind speeds in the Andaman Sea in the vicinity of the Project Area are reported to range from 3.5 m/s to 7.5 m/s (Steedman Science & Engineering 1994). The most common wind direction is from the north-northeast from November to April and southwest from May to October (worldweatheronline).

Data on temperature, salinity, oxygen, and fluorescence were recorded during a survey of the waters of Tanintharyi Region was conducted in 2015 as part of the 'Dr. Fridtjof Nansen' survey (Myanmar Ecosystem Survey, 2015). In the east of the survey area (where the Project Area is located) the near-surface temperatures (5 m depth) were around 32°C and salinity at 5 m ranged from 31 to 34. Oxygen levels in surface waters were generally high (~4 - 5 ml/l), and showed relatively high variability.

In terms of nearshore habitats, Fauna and Flora International (FFI) have conducted research in the Myeik Archipelago into the presence of coral reefs and their health. Within the three reef types, substrates varied across sites and hard coral cover ranged from under 10% to over 90% in some locations. On the inner reefs hard coral cover varied from 1.5 to 95% (n= 227); on fringing from 0 to 80% (n= 21); and Rock Reefs 8.1 to 30% (n=14) (Howard, 2018). Given the deeper water depths at the Project Area Yetagun field (>100 m), insufficient light reaches the seabed to allow the growth of primary producers such as seagrass, macroalgae or zooxanthellate scleractinian (reef building) corals and these groups are absent from the seabed. Coral habitats would not be expected to be present in the Project's Area of Influence.

FFI also conducted a study on mangroves in Myeik Archipelago (not including near the Project Area) (San Tha Tun et al, 2014). This survey identified 46 species belonging to 32 genera from 20 families. The most abundant family was the *Rhizophoraceae* with eight species followed by *Avicenniaceae* with three species.

Based on data from U. Soe-Htun and Tint Swe (2013), Myanmar has 10 species of seagrass belonging to 5 genera from 2 families. These are *Cymodocea rotundata*, *C. serrulata*, *Halodule pinifolia*, *H.uninervis*, *Syringodium isoetofolium*, *Enhalus acoroides*, *Halophila beccarii*, *H.decipiens*, *H. ovalis*, and *Thalassia hemprichii*. Of these, *Cymodocea rotundata*, *C.serrulata* and *Enhalus acoroides* are dominant in the seagrass beds. Most of these seagrass species are found in Rakhine and Tanintharyi coastal areas and at its closest over 125 km to the south of the Project Area.

A fish survey was conducted by FFI in 2014 of 28 sites in the Myeik Archipelago (Russel, 2015). Surveys were conducted using high definition underwater video. A total of 409 species belonging to 55 families were recorded. The majority of fish species recorded were typical coral and rocky reef-associated species. The most abundant families included wrasses (Labridae), damselfishes (Pomacentridae), gobies (Gobiidae), cardinalfishes (Apogonidae), groupers (Serranidae), butterflyfishes (Chaetodontidae), snappers (Lutjanidae), surgeonfishes (Acanthuridae), parrotfishes (Scaridae), and Scorpionfishes (Scorpaenidae). These 10 families accounted for 263 species or ~ 64% of the total fish species recorded.

A total of 25 cetacean (whale and dolphin) species have been recorded as either Confirmed or Probable in Myanmar waters (Holmes et al. 2014; IUCN, 2017). One sirenian (dugong; Dugong dugon) also has a confirmed presence in the coastal waters of Myanmar (Tun and Ilangakoon, 2006). Of the whale and dolphin species potentially present in Myanmar waters, most are far-ranging migratory oceanic species while several others are coastal species with closer affinities to shallow water habitat areas and estuarine areas. IUCN-listed threatened cetacean species in Myanmar waters are oceanic species that typically inhabit deep offshore open waters, namely the blue whale (*Balaenoptera musculus*) (Endangered), fin whale (*Balaenoptera physalus*) (Endangered) and sperm whale (*Physeter macrocephalus*) (Vulnerable). The blue whale and the fin whale are also listed as endangered species recognized as of prime importance to the Region and deserving special attention under the ASEAN Agreement on the Conservation of Nature and Natural Resources (ASEAN, 1985). Other common deeper water species such as humpback whale (*Megaptera novaeangliae*) and Bryde's whale (*Balaenoptera edeni*) are known to occur in offshore waters in Myanmar; however these are listed as Least Concern and Data Deficient on IUCN Red List, respectively.

Five (5) of the world's seven (7) marine turtle species are regularly seen nesting and foraging in the coast of Myanmar. These include the Hawksbill (*Eretmochelys imbricata*), Green (*Chelonia mydas*), Loggerhead (*Caretta caretta*), Olive Ridley (*Lepidochelys olivacea*), and Leatherback (*Dermochelys coriacea*). UNEP data suggest sandy shore habitat along Moscos Island and the adjacent Tanintharyi coastline are nesting sites for species including green turtles, hawksbill, Olive Ridley and Leatherback (UNEP, 2017). Annual turtle nesting activity in Myanmar waters is reported to occur between September and March with the peak period of activity occurring from December to January. Given the location of Block M-12, M-13 and M-14 in relation to known nesting beaches, there is a potential for marine turtles to be present within these blocks when traversing open waters to and from seasonal nesting areas and adjacent mating areas. All known nesting beaches are outside the Project Area; located at least 100 km away.

Outlying islands of the Myeik Archipelago and Moscos Island which are located over 100 km from the Project Area are expected to be potential suitable

nesting site for individuals of these species, though this is not confirmed by observation. Lampi Island located over 100 km from the Project Area, is classified as an Important Bird Area which has been identified for the presence of resident species of plain-pouched hornbills (*Rhyticeros subruficollis*) that are Vulnerable on the IUCN Red List.

### 1.4.3 Social Baseline

The Project is located 140 km from the mainland in the offshore waters of Tanintharyi Region. The closest Township is Laungdon, Dawei District, in Tanintharyi Region.

There are no specific regional plans or strategies for the Project Area. The demography of Dawei District is provided in *Table 1.4*.

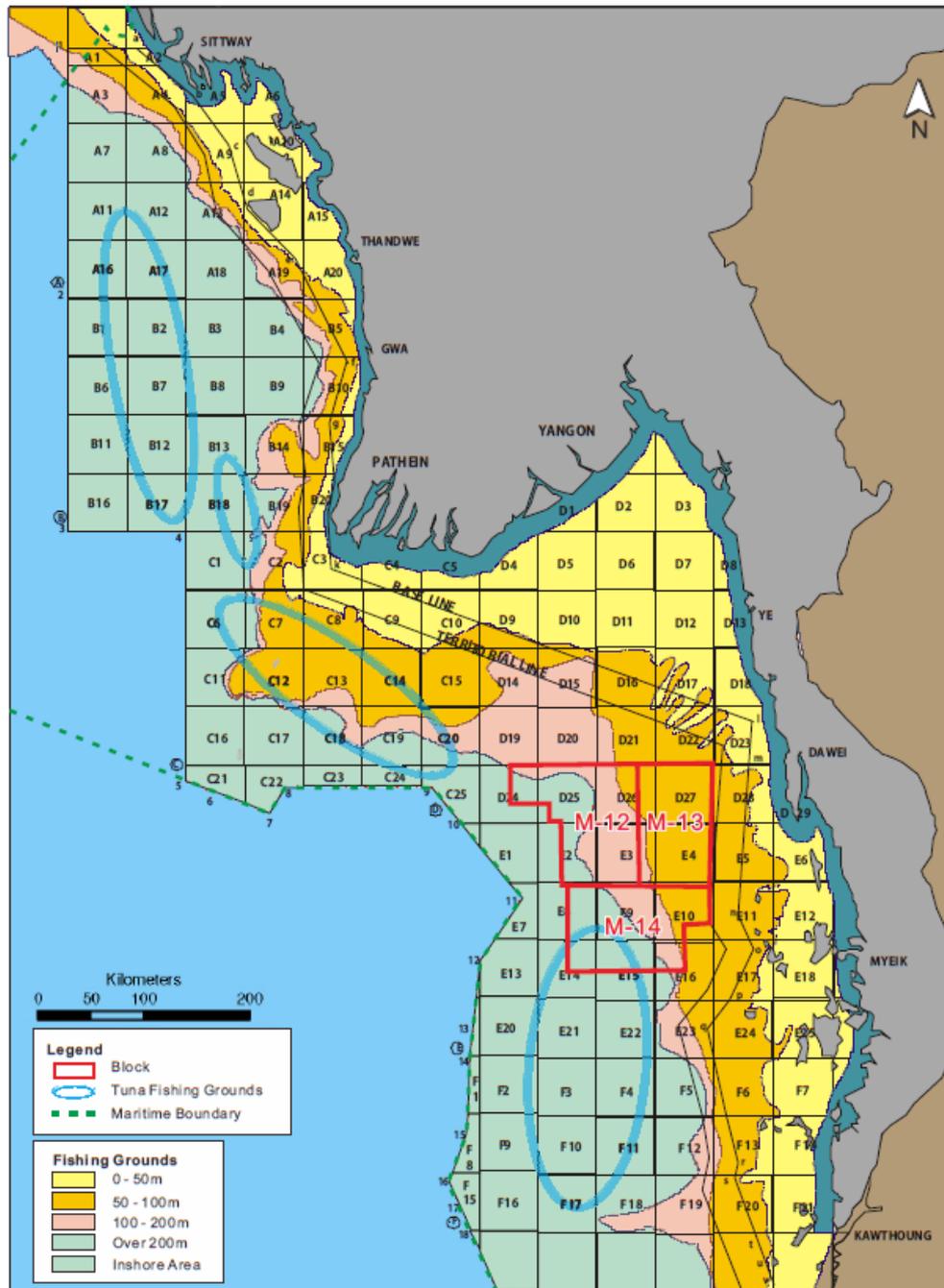
**Table 1.4 Demographic data in Study Area**

Township	Households	Population	Male	Female
Dawei	24,943	125,605	60,044	65,561
LaungLon	25,735	118,317	55,558	62,759
ThayetCahung	22,874	105,662	50,421	55,241
Yebyu	22,073	100,768	50,782	49,986

Source: Myanmar Population Census Data (2014)

The Department of Fisheries (DoF) has instituted two fishing zones which provide a restriction on fishing activities and a degree of protection to fisheries resources. Fishing Zone 1, for traditional coastal fisheries, extends from the shoreline to 10 nautical miles from the shore. Fishing Zone 2 extends from the outer limit of Fishing Zone 1 to the 200 nautical mile Exclusive Economic Zone (EEZ) limit (*Figure 1.4*). The peak fishing season is usually November to April as the sea conditions are calmer and vessels may fish further offshore. During the rainy season (i.e. generally May to October), fishing is often constrained to the Fishing Zone 1 (inshore) by adverse sea conditions.

Figure 1.4 Fishing Blocks in Tanintharyi Waters



Source: Department of Fisheries (2003), modified by ERM (2018)

Focus group discussions with fishers, fishing associations, and the DoF were conducted in July 2018. From the data collected, the townships with potential overlap of fishing activity and the Project Area includes boats over 40 ft. long from Maung Ma Kan, KyaukSan, and Pan Tin Inn. Boats over 60 ft. long from San Hlan, Tha Bawt Seik, and Pyin Gyi also may fishing in the Project Area. The best fishing grounds were roecorded as those around the islands; such as Bote Island and Heinze (Moscos) Islands. KyaukSin noted that the Project Area and offshore is their best fishing ground.

There are no known offshore sites of culture heritage are identified as within the Project Area.

Given that the Project is located over 140 km from the nearest habited land and over 100 km) from the nearest outlying islands of the Myeik Archipelago, there will not be any visual impacts from the Project.

## 1.5

### *IMPACT AND RISK ASSESSMENT AND MITIGATION MEASURES*

The wells are located at least 140 km from the nearest social receptors in Dawei Township, Tanintharyi and 100 km from anyone in the closest outlying islands of the Myeik Archipelago. The planned impacts are not expected to be large enough in spatial extent to reach the shore.

For interactions where possible significant effects could occur, these interactions will be assessed in more detail within the EIA. Those interactions include:

- Potential short-term disturbance to offshore fishing activities and shipping within the Project Area;
- Potential impacts from anchoring and the discharge of drill cuttings with residual drilling mud on water quality, sediment quality and marine ecology;
- Increases in ambient underwater sound from the MODU, vessels and exploration drilling operations including from VSP (short-term). These activities have the potential to impact ecologically sensitive receivers, e.g. marine mammals, marine turtles and fish that may be present within the Project Area;
- Potential impacts from vessel operational discharges on marine water quality;
- Potential impacts on marine biodiversity and secondary impacts on fisheries from the accidental release of invasive species; and
- Potential water contamination and secondary impacts to biodiversity, fishing activity, and public health from accidental spills or leaks (e.g. during offshore re-fueling).

The potential impacts and mitigation measures are provided in *Table 1.5*.

**Table 1.5 Summary of the Key Impacts and Control/Mitigation Measures for the Project**

Potential Impact/Issue	Control / Mitigation Measures	Significance of Residual Impact
<b>Drilling Phase</b>		
Impacts from Physical Presence of the MODU and Support Vessels on Fishing and Shipping Activity	<ul style="list-style-type: none"> <li>• A 5 NM radius safety exclusion zone around the MODU.</li> <li>• MODU and support vessels will comply with international regulations for collision avoidance, navigation and maintenance.</li> <li>• Myanmar speaking (crew members) available on board the MODU.</li> <li>• Timely sharing of information (in the form of a Notice to Mariners).</li> <li>• Disclosure and implementation of the feedback grievance mechanism.</li> </ul>	<b>Minor</b>
		<b>Minor (sediment quality)</b>
Impacts from Drill Cuttings and Drilling Fluid Discharges to Sediment Quality, Marine Water Quality, Benthic Communities, and Fish & Pelagic Communities	<ul style="list-style-type: none"> <li>• Maximum residual Non Aqueous Phase Drilling Fluid will be 6.9% on wet cuttings.</li> <li>• Where cuttings are discharged overboard, they will be discharged 15m below the water line.</li> <li>• All chemicals selected for low toxicity where possible and subject to internal justification.</li> <li>• NADF shall only be used where seawater and sweeps or WBDF cannot provide the required technical specifications.</li> <li>• All residual NADF returned to a shore for reconditioning, re-use or disposal. No bulk discharge of NADF drilling fluids will take place.</li> </ul>	<b>Negligible (benthic quality)</b>
		<b>Minor (water quality)</b>
		<b>Negligible (fish and pelagic species)</b>
Impacts from Underwater Sound from Drilling, VSP, and Vessel Movements on Marine Fauna (Fish, Mammals, and Turtles)	<ul style="list-style-type: none"> <li>• Visual check for marine fauna within 1 km (observation zone) of the MODU or vessel for 20 minutes prior to commencing VSP operations.</li> <li>• Soft start - build up power for VSP slowly to give adequate time for marine fauna to leave the area (20 minutes at minimum).</li> <li>• Soft start procedures should only resume when fauna have moved outside the shutdown zone (500 m) or when 30 minutes have lapsed since the last sighting.</li> <li>• Visual observations of the observation zone (1 km) must be maintained continuously to identify if there are any mammals or turtles present.</li> <li>• During the pre-start meeting, alert all crews to immediately report to the trained observer when they observe any marine mammals or turtles during and prior to the activity.</li> <li>• An observer will be utilised during VSP operations to monitor and record marine mammals and marine turtles observations and all records will be reported to MONREC following completion of the activity.</li> </ul>	<b>Minor (fish)</b>
		<b>Moderate (marine mammals and turtles)</b>

Potential Impact/Issue	Control / Mitigation Measures	Significance of Residual Impact
Impacts from unplanned spills on marine fauna	<ul style="list-style-type: none"> <li>• Preparation and implementation of vessel standard operating procedures.</li> <li>• Adherence to MARPOL 73/78 Annex I.</li> <li>• Chemicals and/or hydrocarbons will be handled and stored in compliance with the Material Safety Data Sheet (MSDS).</li> <li>• Spill response kits will be available and kept stocked.</li> <li>• Standard maritime safety/navigation procedures will be implemented</li> <li>• Establishment of a 5 NM radius safety exclusion zone around the MODU.</li> <li>• In the event of a vessel collision, the SOPEP will be implemented, if required.</li> </ul>	Negligible
Impacts from Unplanned Collisions on Fishing and Shipping Activity	<ul style="list-style-type: none"> <li>• A 5 NM radius safety exclusion zone around the MODU.</li> <li>• MODU and support vessels will comply with international regulations for collision avoidance, navigation and maintenance.</li> <li>• Myanmar speaking (crew members) available on board the MODU.</li> <li>• Timely sharing of information (in the form of a Notice to Mariners).</li> <li>• Disclosure and implementation of the Feedback grievance mechanism.</li> </ul>	Negligible

## 1.6

### *CUMULATIVE IMPACT ASSESSMENT*

The Project Area is surrounded by oil and gas blocks operated by other Companies however, at the time of writing there are no other oil and gas activities in these Blocks that are likely to overlap with the timing of the Project activities.

Near the Project Area is the existing Yetagun Platform and PCML are also planning on drilling some exploration wells and conducting a 3D seismic survey. There could be overlap with these activities.

The main impacts arise from the temporary disturbance of fishing activity, specifically fishermen that fish near the continental shelf area where the Project Area overlaps with potential fishing grounds. The mitigation measures listed in the above sections are standard international best practise and will be adopted during all drilling activities.

With the standard mitigation measures in place, any impacts are unlikely to marine species will be of **Minor** significance.

The potential for cumulative spills of fuel from the vessels is extremely unlikely to occur, and as both vessels use light fuels which are readily diluted and dispersed and implement standard mitigation measures, impacts would be expected to be **Minor**.

In terms of social impacts, although the Project Area is large the exclusion zone will be limited to a safety zone around the vessel and a stationary zone around the drilling rig. As such, the area from which fishermen will be temporarily displaced is relatively small. It is expected that the social impacts from the Project, if properly mitigated, will be localised to the area where fishing occurs and temporary in nature (a few days). Therefore, the impact will be of **Minor** significance to fishing activities but this is expected to be a **Negligible** impact on livelihoods.

## 1.7

### *ENVIRONMENTAL MANAGEMENT PLAN*

The Project is being conducted in line with PCML HSE Management Policy, the requirements of the Production Sharing Contract (PSC), Myanmar regulatory requirements, and international conventions, standards and guidelines.

A summary of the Project environmental and social standards are shown in *Table 1.6*.

**Table 1.6 Project Environmental and Social Standards**

Parameter	Standard	Requirement
Drilling fluids and cuttings (non-aqueous drilling fluid)	NEQ and IFC EHS Guidelines (2015)	<ul style="list-style-type: none"> <li>• Non-aqueous drilling fluid, re-inject or ship-to-shore; no discharge to sea</li> <li>• Drilled cuttings, re-inject or ship-to-shore; no discharge except:</li> <li>• Oil concentration lower than 6.9% by weight on dry cuttings (as per IFC 2015 EHS Guidelines)</li> <li>• Mercury maximum 1 mg/kg dry weight in stock barite</li> <li>• Cadmium maximum 3 mg/kg dry weight in stock barite</li> <li>• Discharge via a caisson at least 15 metres below sea surface</li> </ul> <p><i>(Note: ECD allows an exemption to the above guidelines for exploration drilling with the limits presented in IFC EHS Guidelines for Offshore Oil and Gas (2015) permitted.)</i></p>
Drilling fluids and cuttings (water-based drilling fluid)	NEQ and IFC EHS Guidelines (2015)	<ul style="list-style-type: none"> <li>• Water-based drilling fluid, re-inject or ship-to-shore; no discharge to sea</li> <li>• Water-based drilling fluids and cuttings, re-inject or ship-to-shore; no discharge to sea except:</li> <li>• Mercury 1 mg/kg dry weight in stock barite</li> <li>• Cadmium 3 mg/kg dry weight in stock barite</li> <li>• Maximum chloride concentration must be less than four times ambient concentration of fresh or brackish receiving water</li> <li>• Discharge via a caisson at least 15 meters below sea surface</li> </ul>

Parameter	Standard	Requirement
Completion and well work-over fluids	NEQ and IFC EHS Guidelines (2015)	<ul style="list-style-type: none"> <li>• Ship-to-shore or re-inject, no discharge to sea except:</li> <li>• Maximum one day oil and grease discharge</li> <li>• should not exceed 42 mg/l; 30 day average should not exceed 29 mg/l</li> <li>• Neutralize to attain a pH of 5 f or more</li> </ul>
Air Emissions	MAPROL Annex VI	<ul style="list-style-type: none"> <li>• Vessels will be in compliance with applicable MARPOL 73/78 Regulations for the prevention of air pollution from ships (Annex VI).</li> <li>• Use of low sulphur fuel (sulphur content not to exceed 3.5% m/m) when it is available</li> <li>• An International Air Pollution Prevention (IAPP) certification for the Project vessels, as applicable or required by vessel class.</li> </ul>
Sewage	MARPOL Annex IV / NEQ Guidelines	<ul style="list-style-type: none"> <li>• The Project vessels will comply with applicable MARPOL requirements, including: discharge of untreated sewage into the sea is prohibited, except when the ship has in operation an approved sewage treatment plant or when the ship is discharging comminuted and disinfected sewage using an approved system at a distance of more than 3 nm from the nearest land.</li> <li>• Sewage which is not comminuted or disinfected has to be discharged at a distance of more than 12 nm from the nearest land.</li> <li>• The discharge of sewage can only occur when the vessel is en route and travelling at no less than 4 knots.</li> <li>• An International Sewage Pollution Prevention (ISPP) certificate and International Oil Pollution Prevention (IOPP) certificate will be required, as appropriate to vessel class.</li> </ul>

Parameter	Standard	Requirement
Waste Discharges (including food waste)	MARPOL Annex I & V	<ul style="list-style-type: none"> <li>Vessels will operate in compliance with MARPOL Annexes I: any oil-in-water content of discharges should not exceed 15 ppm.</li> <li>General waste (excluding food) will not be disposed of to sea in line with MARPOL Annex V Requirements.</li> <li>Combustible wastes will be segregated and disposed by incinerator on-board, should an incinerator be available on the selected vessel (in line with MARPOL Annex V requirements). No discharge of food waste is permitted less than 3 nm from the coast. Maceration is required at greater than 3 nm and less than 12 nm from the coast. Hazardous wastes will be stored on the vessels in appropriate containers with labels.</li> <li>Hazardous waste storage will be designated in accordance with their Materials Data Sheet (MSDS) (in line with MARPOL Annex V requirements). Hazardous wastes will be returned to the vessels' selected shore base and sent to a licensed disposal facility by a licensed waste contractor (in line with MARPOL Annex V requirements).</li> </ul>
Spills	MARPOL Annex I	Support vessels standard operating procedures to be prepared and implemented including (if appropriate) an offshore bunkering procedure. Shipboard Oil Pollution Emergency Plans (SOPEPs) will be prepared and implemented.

It is estimated that the overall budget for implementing the EMP for the infill drilling is \$800k USD. Many of the management and mitigation measures are embedded controls as part of the standard operational costs of the drilling program.

Given that there are no significant impacts from the Project (under *Chapter 6* of this EIA Report); no separate management plans are required for the following:

- Air: the emissions to air are not likely to cause any significant impact;
- Noise: the noise emissions will not cause any significant impact;
- Water Quality: there are no significant impacts from drilling cuttings disposal;
- Biodiversity: there are no Major impacts to biodiversity given the distance from sensitive receptors (over 100 km);
- Sediment & Drill Cuttings: there is no Major impacts from drilling cuttings; discharges of drill cuttings will be monitored as per NEQ and MARPOL requirements; and
- Community: the Project is located 140 km from the nearest human receptor and communities and therefore will not have an impact.

Management Plans are, however, prepared for **Emergency Response** and **Waste** as per industry standard procedures.

For this short duration drilling program, no specific management plans are required for pre-construction, construction, operation and decommissioning phases as this activity only has the Operational Phase.

PCML will submit an Environmental Monitoring Report, to MOGE and MONREC after completion of the drilling program. The Environmental Monitoring Report will include the items listed in *Table 1.7*. Given the limited duration of the drilling program (7-8 months) and lack of significant impacts, no additional monitoring is considered to be required for the Project.

**Table 1.7** *Environmental Monitoring Recording*

Project Environmental Aspect	Activity/ Monitoring Measures	Reporting
Air Emissions	Routine atmospheric emissions will be monitored with emphasis on greenhouse gases (CO <sub>2</sub> /SO <sub>x</sub> ).	Monthly emissions record
Waste Management	Amounts and types of waste produced and how it is discharged / disposed of.	Month waste inventory

Project Environmental Aspect	Activity/	Monitoring Measures	Reporting
Water Quality		Water quality will be measured as per the same parameters mentioned in Section 5.2.1 including hydrocarbon content, metals, and nutrients. Four locations around the platform will be monitored no more than two months after drilling activities. If the discharges are in compliance with baseline conditions and EQEG standards; the frequency of monitoring will be reduced.	Post drilling environmental monitoring report
Marine Sediments		Marine sediments quality will be monitored for particle size, hydrocarbon content, metals, and nutrients as per the same parameters mentioned in Section 5.2.1. Four locations around the platform will be monitored no more than two months after drilling activities. If the discharges are in compliance with baseline conditions and EQEG standards; the frequency of monitoring will be reduced.	Post drilling environmental monitoring report
Marine (Seabed) and Organisms	Benthic Communities	Marine macrobenthos will be sampled for species and families in sediment samples as per the same methodology mentioned in Section 5.2.1.	Post drilling environmental monitoring report
Incident Reporting		Details of any environment or social incidents	Incident report forms
Accidental and Leaks	Releases	Safety record	Safety record
Non-Compliance Reporting		Non-Compliance with EMP	Inspection check sheets
Effluent Monitoring	Discharge	The amount and type of drilling fluid discharged will be tested to ensure compliance with the EQEG Standards for NADF and WBDF discharges.	Post drilling environmental monitoring report
Marine mammal and fauna observers		Any marine mammals or turtles observed during the activity will be recorded.	Post drilling environmental monitoring report

The EIA consultation meetings were held with various relevant stakeholders at the Regional Level in Tanintharyi. The consultation helped the Project to gather information on potentially affected people, on potential data gaps, and how these will be closed out in the EIA Report. The EIA consultation involved face-to-face meetings with a range of stakeholders including villagers, the Department of Fisheries (DoF), the Tanintharyi Chief Minister, the Regional Environmental Conservation Department (ECD), and the General Administrative Department (GAD), ward administrators, planning department as well as local community and fishing representatives. The date, time, location, stakeholder and purpose of each meeting is provided in *Table 1.8*.

**Table 1.8** *Consultation Activities Undertaken*

Date, time, location	Stakeholder
30 March, 2018, Tanintharyi Regional Government Office	Meeting with Minister of Electricity and Energy; Ministry of Agriculture, Livelihood and Irrigation
2 April, 2018, Hotel Zayar Htet San, Dawei	Meeting with GAD, ECD, DOF, NGOs, media, political parties,
3 April, 2018, Grand Jade Hotel, Myeik	Meeting with GAD, ECD, DOF, DOA, INGOs and NGOs, Media, Political Parties
23 August, 2018, ThaYetChaung GAD Office	Meeting with GAD, DOF, Village Leaders, Villagers
24 August, 2018, LaungLon GAD Office	Meeting with GAD, Village Leaders, Fishermen, Villagers
24 August, 2018, Zayyar Htet San Hotel, Dawei	Meeting with ECD, DOF, Concerned Departments, Media, CSOs, Village Leaders
26 August, 2018, Grand Jade Hotel, Myeik	Meeting with ECD, DoF, Concerned Departments, MFF, Media, CSOs, Village Leaders and Fishermen

The following section summarises the key issues raised in public consultation meetings and *Table 1.9* presents the responses concerned with these issues.

**Table 1.9 Key Questions Raised During EIA Public Consultation**

Comments Received	Response to Comment in Meeting	EIA Study Considerations
<p><u>Impacts on the Marine Environment</u></p> <p>Queries relating to wastes discharge from drilling activities</p>	<p>PCML will conduct all project activities in compliance with National Emission Quality Guideline. Different kinds of wastes must be categorized and treated prior to any discharge. If the drilling cuttings cannot be discharged on the board, they are carried to the disposable land.</p>	<p>The EIA report will assess the potential impacts of planned wastes generation from the Project activities and their discharges / disposal on water quality and secondary impacts to biodiversity, fishing activity, and socio-economic factors.</p>
<p><u>Impacts on the Marine Environment</u></p> <p>Queries relating to accidental wastes discharge, the monitoring program and how local communities can be involved in the monitoring process.</p>	<p>PCML will conduct all project activities in compliance with Myanmar, International Finance Corporation (IFC) guidelines, and international standards. A detailed record for discharge will be made and will be submit to ECD.</p>	<p>Monitoring requirements and details on the respective parties' responsibilities for compliance and demonstrating compliance have been included in the EIA Report.</p>
<p><u>Impacts on the Fishermen and Fisheries</u></p> <p>Fishing community expressed their concern on impacts to fishing. Myeik fishing community expressed that they do not want the project to commence.</p>	<p>In terms of monitoring, the EIA report which will be submitted to ECD, will include an Environmental Management Plan and discuss monitoring.</p> <p>ERM will prepare the EIA in compliance with Myanmar Environmental Impact Assessment law and procedures and international standards and then submit to ECD.</p> <p>Prior to start of the infill drilling activity, a Notice to Mariners will be announced in the newspaper. In this notice, the location of the wells in the Project Area will be described. However, fishing will only be restricted within the 5 NM safety zone around the vessel.</p>	<p>Impacts to fishing have been assessed in the EIA Report.</p>
<p><u>Corporate Social Responsibility (CSR) and Social Benefits</u></p> <p>One of the most common issues raised was accessible to electricity and charge per unit</p>	<p>To get access to electricity, the region needs transmission line that connects with National Grid. The electricity charge per unit will also be lower.</p> <p>The Department of Electricity are planning to implement Mawlamyaing-Yae-Dawei transmission line and Dawei-Myeik-Bokepyin transmission line.</p>	<p>CSR is not part of the environmental and social impact assessment and as such is not discussed in this Report. However, for information, details of PCML's current CSR activities are provided in Section 9.</p>

Comments Received	Response to Comment in Meeting	EIA Study Considerations
	For the CSR programs, PCML have to negotiate with the Regional Government not to overlap with their planned project before starting the project activities.	
<p><u>Benefits to Regional Level from Natural Resources</u></p> <p>As the resources come from Tanintharyi, the local community from the region should get the benefits too.</p>	<p>The profits from this project are under the management of Union Government. The revenue sharing between the Union and State Government is not something that PCML can comment on.</p> <p>The Union Government will share the profits equally for the development of States and Regions.</p>	This is not part of the EIA Study but PCML are aware that this is important for local communities.
<p><u>Disclosure of Information</u></p> <p>One stakeholder mentioned that the operations and schedule for the Project must be disclosed to the public particularly in newspapers.</p>	Information will be disclosed as per the EIA Procedure and a Notice to Mariners will be issued to the DOF before Project activities commence.	The EMP is presented in <i>Section 8</i> .
<p><u>Impacts on the Tourism Industry</u></p> <p>One concern raised about the impacts on the marine flora and tourism.</p>	<p>As the drilling activities operate in the water depth of about 300 ft., there may not have coral reefs and scuba-diving.</p> <p>Concerning sea water, sediment, benthos and sea-bed organisms, samplings are conducted in four directions (East, West, South, and North) of the Project Area.</p>	Impacts to the coast have been scoped out of the EIA as the Project is over 100 km away and will not cause impacts.
<p><u>Contract between MOGE and PCML</u></p> <p>Queries raised about the contract and timeline.</p>	The contract is not a new one and it's "Production Sharing Contract" between MOGE and PCML. The project timeline is 30-yr and started in 2000.	It's not part of the EIA Study.
<p><u>Grievance Mechanism and Compensation</u></p>	PCML has a grievance mechanism and the community can contact the phone number mentioned in the brochure for complaints.	The EMP is presented in <i>Section 9</i> .

Comments Received	Response to Comment in Meeting	EIA Study Considerations
<p>One stakeholder’s concern is about the grievance process if the fishing vessels/nets collapse with the drilling vessels.</p>	<p>For compensation process, if there are laws and regulations for projects located in the sea, PCML will comply with the government instruction.</p>	
<hr/>		
<p><u>Earthquakes or landslides</u></p> <p>Some stakeholders were concerned about if the Project could cause a landslide or earthquake that can impact the shore.</p>	<p>When the gas is taken, the reservoir is naturally filled with oil and water. Drilling does not trigger earthquakes either which can cause landslides, this is caused they the movement of “plates” under the seabed.</p>	<p>This is not considered in the impact assessment as drilling does not cause earthquakes or landslides.</p>

Stakeholder consultation undertaken to date confirmed that potential impacts as a result of Project activities will be small in scale and of limited extent.

Future engagement activities will consist of the following:

- Further disclosure of Project information and EIA Report, including opportunities to provide feedback;
- Engagement with relevant regional officials/authorities and government organisations on the outcomes of the EIA; and
- Ongoing communications with interested and potentially affected stakeholders during the operation. While impacts on local communities, ongoing project information will be provided to local areas.

PCML will provide an activity update in the notice to mariners prior to the start of the Project. A grievance mechanism will be in place during operation, in line with the steps required under the EIA Procedure, as well as international good practice.

The EIA Report will be made available online at PCML's website, <https://www.petronas.com>. There will also be adverts in one English and one Myanmar newspaper and hard copies of the report will be made available in Yangon, Dawei, and Myeik.

နှိမ်နင်း

PC Myanmar (Hong Kong) Limited (PCML) သည် မြန်မာနိုင်ငံ ကမ်းလွန် လုပ်ကွက်အမှတ် M-12၊ M-13 နှင့် M-14 တို့ရှိ ရဲတံခွန် ဓာတ်ငွေ့ထုတ်လုပ်မှုကွင်း၏ လုပ်ငန်းဆောင်ရွက်သူ (operator) ဖြစ်ပါသည်။ ၁၉၉၀ ပြည့်နှစ် မေလတွင် PCML သည် ကပ္ပလီပင်လယ်ရှိ ထားဝယ် နေရာ၏ အနောက်တောင်ဘက်၌ ရှိနေသော လုပ်ကွက်အမှတ် M12၊ M13 နှင့် M14 တို့အတွက် မြန်မာ့ရေနံနှင့် သဘာဝဓာတ်ငွေ့လုပ်ငန်း (MOGE)၊ NIPPON နှင့် PTTEPI တို့နှင့် ထုတ်ဝေမှု အပေါ်ခွဲဝေခံစားရေးစာချုပ် (PSC) ကို လက်မှတ်ထိုးချုပ်ဆိုခဲ့ကြပါသည်။

ယခုအစီရင်ခံစာသည် PCML က ရဲတံခွန်ကမ်းလွန်ပြင်၊ တနင်္သာရီတိုင်းဒေသကြီး တွင် ဆောင်ရွက်မည့် ကြားဖြည့်တူးဖော်ရေးတို့အတွက် ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း ဖြစ်ပါသည်။

စီမံကိန်းတွင် စီမံကိန်းနယ်မြေဧရိယာ လုပ်ကွက် M-12 M-13 နှင့် M-14 တို့အတွင်း ကြားဖြည့်ရေနံ တွင်းသုံးတွင်းတူးဖော်မှုတို့ ပါဝင်သွားမည် ဖြစ်ပြီး၊ ၎င်းတို့ကို ရေအနက် မီတာ ၁၁၀ နှင့် ပင်မနယ်မြေ ကမ်းရိုးတန်းမှ အနည်းဆုံး ကီလိုမီတာ ၁၄၀ အကွာ နှင့် မြိတ်ကျွန်းစု၏ အနီးဆုံးကျွန်းများမှ ကီလိုမီတာ ၁၀၀ ကျော်အကွာရှိ နေရာများ၌ တူးဖော်သွားမည် ဖြစ်ပါသည်။

မြန်မာနိုင်ငံ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း (EIA) ဆိုင်ရာ လုပ်ထုံးလုပ်နည်းအရ၊ စီမံကိန်းသည် IEE တစ်ရပ်ကို ဆောင်ရွက်ပြီး၊ သယံဇာတ နှင့် သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာန (MONREC) ၏ ပတ်ဝန်းကျင် ထိန်းသိမ်းရေးဦးစီးဌာန (ECD) ထံသို့ တင်သွင်းသွားရန် လိုအပ်ပါသည်။

ဤပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းကိုလုပ်ဆောင်ခဲ့သူများမှာ Environmental Resources Management (ERM) – Hong Kong Limited မှ သဘာဝပတ်ဝန်းကျင်နှင့် လူမှုရေးရာ အကြံပေးပညာရှင်များဖြစ်ပါသည်။ ERM အား ပြည်တွင်း သဘာဝပတ်ဝန်းကျင်ဆိုင်ရာ အကြံပေးပညာရှင်အဖွဲ့များဖြစ်ကြသော Resource and Environment, Myanmar (REM) နှင့် Environmental Quality Management (EQM) အဖွဲ့များမှ ကူညီလုပ်ကိုင်ကြမည်ဖြစ်ပြီး အဆိုပါအဖွဲ့အစည်း ၂ခုလုံးသည် သယံဇာတနှင့် သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာန (MONREC) ၏ မှတ်ပုံတင်ပြီး အကြံပေးပညာရှင်အဖွဲ့စာရင်းတွင် ပါဝင်ပါသည်။

၁.၂ မူဝါဒ နှင့် ကြီးကြပ်ရေးဆိုင်ရာ မူဘောင်

စီမံကိန်းကို အမျိုးသားအဆင့်နှင့် ဒေသအဆင့်စံနှုန်းများ နှင့် ဥပဒေများနှင့်အညီ ဆောင်ရွက်သွားမည် ဖြစ်ပါသည်။ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းနှင့် သက်ဆိုင်ရာ ဒေသဥပဒေများတွင် အောက်ပါ တို့ပါဝင်ပါသည် -

- ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဥပဒေ (၂၀၁၂)၊
- ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးနည်းဥပဒေ (၂၀၁၄)၊
- အမျိုးသား ပတ်ဝန်းကျင်အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်များ (၂၀၁၅)၊ နှင့်
- ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းလုပ်ထုံးလုပ်နည်း (၂၀၁၅)။

၁.၃ စီမံကိန်းအကြောင်းအရာဖော်ပြချက် နှင့် အခြားဆောင်ရွက်နိုင်သော နည်းလမ်းများ

၁.၃.၁ အဆိုပြုစီမံကိန်း

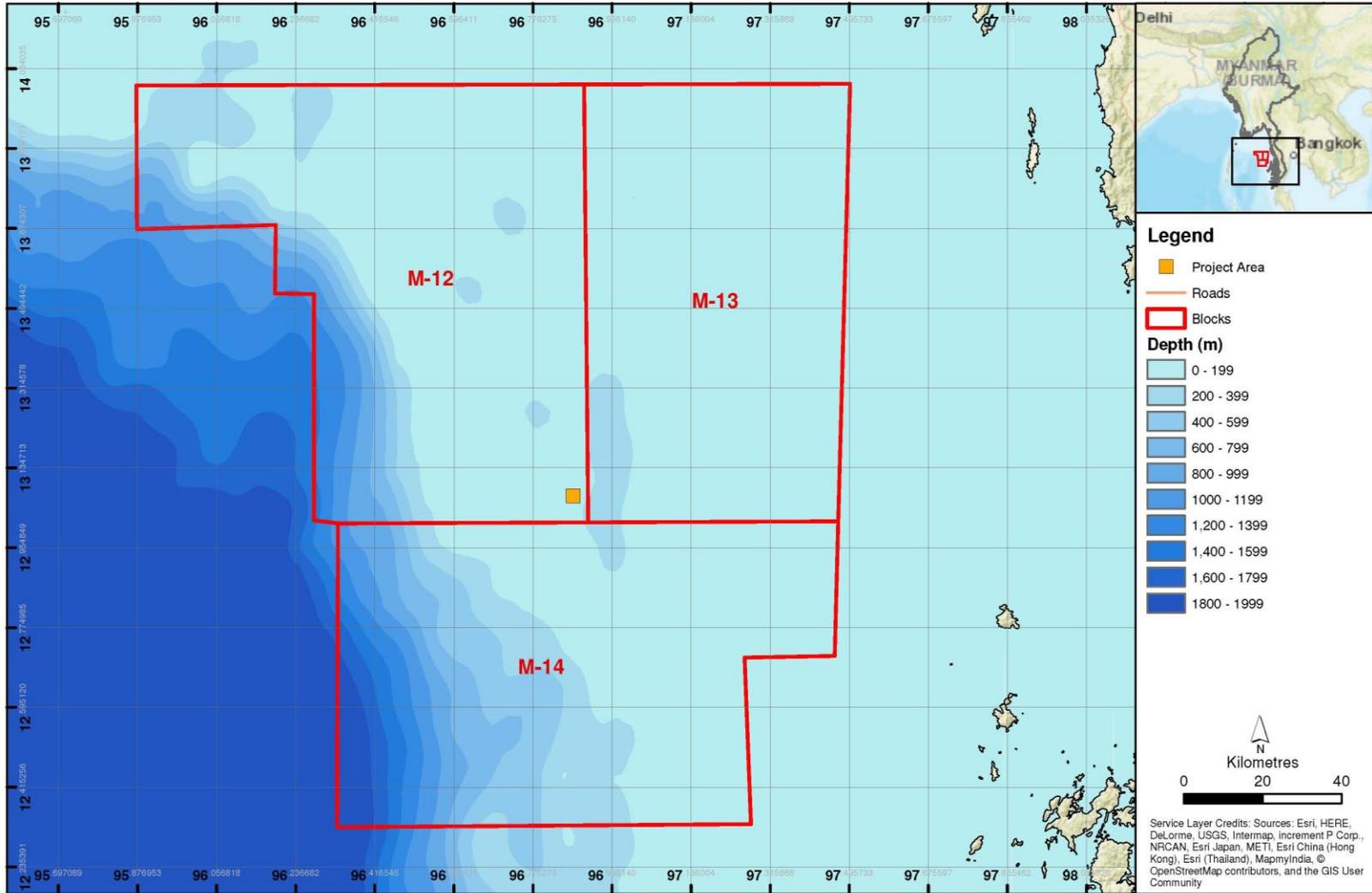
ရေနံတွင်းများအတွက် ရွေ့လျားရေနံတွင်းတူးစင် (MODU) ကို အသုံးပြုလျက် တူးဖော်သွားမည် ဖြစ်ပြီး၊ ၎င်းတွင် အခြားသင်္ဘောများ သို့မဟုတ် ငါးဖမ်းရေယာဉ်များ မဝင်ရောက်နိုင်သည့် ရေမိုင် ၅ မိုင်အချင်းဝက်ရှိ ကန့်သတ်ရေးဇုန်ကို ထားရှိမည် ဖြစ်ပါသည်။ ရေနံတွင်းများကို ရှိနေပြီးသော ရဲတံခွန်ထုတ်လုပ်ရေးပလက်ဖောင်း၌ တူးဖော်သွားမည် ဖြစ်သဖြင့်၊ ၎င်းကန့်သတ်ရေးနယ်မြေဧရိယာမှာ ရဲတံခွန်ပေါင်းစပ်လုပ်ငန်းကို ဝိုင်းပတ်ထားသည့် ရှိနေပြီးသော ကန့်သတ်ရေးနယ်မြေဧရိယာနှင့် ထပ်တူကျသွားမည် ဖြစ်ပါသည်။

ရေနံတွင်း သုံးတွင်းအတွက် ကိုဩဒိနိတ်များကို ဇယား ၁.၁ နှင့် ပုံ ၄.၁ တို့တွင် ဖော်ပြထားပါသည်။

ဇယား ၁.၁ ရေနံတွင်း တည်နေရာများ

စဉ်	အမည်	ကော်ဩဒိနိတ်
၁	YA-01	လတ္တီတွဒ် - ၁၃° ၄'၁၇.၀၉"N/ လောင်ဂျီတွဒ် - ၉၆°၅၂'၅.၃၁"E
၂	YA-05	လတ္တီတွဒ် - ၁၃° ၄'၁၇.၀၉"N/ လောင်ဂျီတွဒ် - ၉၆°၅၂'၅.၃၁"E
၃	YA-12TS1	လတ္တီတွဒ် - ၁၃° ၄'၁၇.၀၉"N/ လောင်ဂျီတွဒ် - ၉၆°၅၂'၅.၃၁"E

ပုံ ၁.၁ စီမံကိန်းနယ်မြေစရိယာတည်နေရာပြပုံ



အဆိုပြု ကြားဖြည့်တူးဖော်မှုကို ၂၀၁၈ နောက်ဆုံးသုံးလပတ် အတွင်း ဆောင်ရွက်သွားရန် အချိန်ဇယားပြုလုပ်ထားပါသည်။ တွင်းတစ်ခုချင်းစီသည် ပြီးမြောက်ရန် ၆၅ ရက်ခန့် ကြာမြင့်နိုင်သောကြောင့်၊ တူးဖော်ရေးသည် ၇-၈ လခန့်အထိ ကြာမြင့်သွားနိုင်မည် ဖြစ်ပါသည်။ ယခုစီမံကိန်းသည် ရှာဖွေရေးလုပ်ငန်းသာဖြစ်သဖြင့်၊ လုပ်ငန်းလည်ပတ်ရေးအဆင့် ဟုခေါ်သည့် အဆင့်တစ်ရပ်သာ ရှိမည် ဖြစ်ပါသည်။ အမြဲတမ်းအခြေခံအဆောက်အအုံများ နှင့် အကြို တည်ဆောက်ခြင်း၊ တည်ဆောက်ခြင်း၊ သို့မဟုတ် ရပ်စဲခြင်းဆိုင်ရာ အဆင့်များ ပါဝင်မည် မဟုတ်ပါ။

ပုံမှန်ကမ်းလွန်ရေနံ့တွင်းကို အနက် မီတာ ၂၀၀၀ မှ မီတာ ၃၀၀၀ အထိ (ပင်လယ်ကြမ်းပြင်အောက် စုစုပေါင်း မီတာ ဒေါင်လိုက်အနက်) တူးဖော်ကြပါသည်။ ရေတွင်း (၃) တွင်းအတွက် ယေဘုယျရေနံ့တွင်းပုံကို ပုံ ၁.၂ တွင် ဖော်ပြထားပြီး၊ ရေနံ့တွင်းဆိုင်ရာ အချက်အလက်များကို ဇယား ၁.၂ တွင် အကျဉ်းဖော်ပြထားပါသည်။

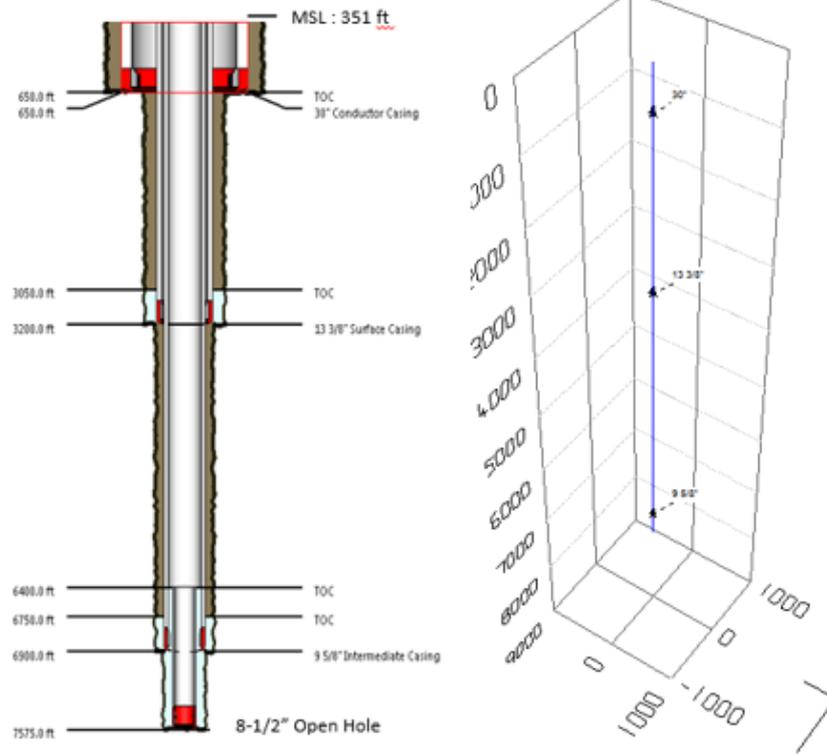
ရေနံ့တွင်း၏ ရေတွင်းအပေါ်ပိုင်းအဆင့်(များ) ကို ပုံမှန်အားဖြင့် ပင်လယ်ရေအသုံးပြုလျက် တူးဖော်ပြီး၊ သို့မဟုတ် ပင်လယ်ကြမ်းပြင်ပေါ်စွန့်ထုတ်သည့် တွင်းနက်မှ တူးဖော်မှုကျစ်စာများကို လှည့်ပတ်သွား စေရန် WBDF ကို အသုံးပြုပါသည်။ တူးဖော်ပြီးနောက်၊ ပြွန်ချောင်း (စတီးလ်ပြွန်ချောင်းအဖုံး) ကို လည်ပတ်စေပြီး၊ ရေနံ့တွင်းအတွက် ဖွဲ့စည်းပုံအထောက်အပံ့ကို ဖြစ်ပေါ်စေမည့် အင်္ဂတေဖြင့် နေရာ တကျဆောင်ရွက်ပါသည်။ ရေနံ့တွင်းအပေါ်ပိုင်းအဆင့်ကိုဆောင်ရွက်ပြီးနောက်၊ တွင်းအပေါ်ပိုင်း၌ ပွင်းထွက်မှုကိုကာကွယ်သည့်ကိရိယာ (BOP) နှင့် အကူဝါသွယ်ယူရေးပြွန်ကို တပ်ဆင်ပါသည်။ ရေနံ့တွင်းထိန်းချုပ်မှုအတွက် BOP ကိုလိုအပ်ပြီး၊ အကူဝါသွယ်ယူရေးပြွန်သည် တွင်းအပေါ်ပိုင်း နှင့် MODU တို့အကြား သွယ်ယူရေးပြွန်အနေဖြင့် ဆောင်ရွက်ပါသည်။

သွယ်ယူရေးပြွန်ကို နေရာတကျဆောင်ရွက်ပြီးသည်နှင့်တစ်ပြိုင်နက် WBDF ကို အသုံးပြုလျက် ရေနံ့ တွင်း အောက်ပိုင်းအဆင့်ကို တူးဖော်သွားမည် ဖြစ်ပါသည်။ တူးဖော်မှုကျစ်စာများကို ဖြစ်နိုင်သော အခြေအနေ၌ ပြန်လည်လောင်းဖြည့်သွားမည်ဖြစ်သော်လည်း WBDF ကျစ်စာအများစုကို ပင်လယ် သို့ စွန့်ထုတ်သွားမည် ဖြစ်ပါသည်။

ရေတွင်းမပျော်ဝင်သောတူးဖော်ရေးအရည် (NADF) တို့ကို တွင်း၏အလယ်အလတ်ပိုင်း နှင့် အောက် ပိုင်းအဆင့်များတွင် အသုံးပြုသွားမည် ဖြစ်ပါသည်။ NADF အသုံးပြုသောအခြေအနေများ တွင်း၊ မြန်မာနိုင်ငံ ပတ်ဝန်းကျင်ထုတ်လွှတ်မှုလမ်းညွှန်ချက်များ နှင့် ကမ်းလွန် ရေနံ့နှင့် သဘာဝဓာတ်ငွေ့ လုပ်ငန်းများအတွက် IFC ESH လမ်းညွှန်ချက်များနှင့်အညီ မစွန့်ထုတ်မီကြိုတင်၍ MODU ပေါ်တွင် ကျစ်စာများကို စီမံပြုပြင်သွားမည် ဖြစ်ပါသည်။

ဇယား ၁.၂ ရေနံတွင်း အချက်အလက်များအကျဉ်းပြဆိုချက်

ရေနံတွင်း အဆင့်များ	တွင်းခေါင်း အရင်း (လက်မ)	စွန့်ထုတ်ရေး နည်းလမ်း	ကျစ်စများ စွန့်ထုတ်ခြင်း (ကုဗမီတာ)	ရွှံ့များ		ဆောင်ရွက်မှု ကာလ (ရက်)
				အမျိုးအစား	အစဉ်အခဲများ စွန့်ထုတ်သည့် ပမာဏ (ကုဗမီတာ)	
တွင်းအပေါ်ပိုင်း အဆင့်	၂၃"	ပင်လယ်ကြမ်း ပြင် အနီး	၄၀၀	ပင်လယ်ရေ	၂၅၀၀	၂
တွင်း အလယ် အလတ် အဆင့်	၁၇.၅"	ပင်လယ်ကြမ်း ပြင် အနီး	၅၀၀	WBDF (KCI/PHP A)	၁၅၀၀	၆
တွင်း အလယ် အလတ် အဆင့်	၁၂.၂၅"	မျက်နှာပြင် (သွယ် ယူရေးဖြန့်)	၇၀၀	NADF	၀	၂၀
တွင်း ထုတ်လုပ် ရေး အဆင့်	၈.၅"	မျက်နှာပြင် (သွယ် ယူရေးဖြန့်)	၃၀	NADF	၀	၁၂
တွင်း ထုတ်လုပ် ရေး အဆင့်	၆"	မျက်နှာပြင် (သွယ် ယူရေးဖြန့်)	၁၀	NADF	၀	၃
<b>နန်းပမာဏ စုစုပေါင်း စွန့်ထုတ်မှု</b>			<b>၁၆၄၀</b>		<b>၄၀၀၀</b>	<b>၄၄</b>



**အခြားဆောင်ရွက်နိုင်သော နည်းလမ်းများ**

စီမံကိန်းနှင့်ပတ်သက်သည့် အခြားရွေးချယ်စရာများကိုထည့်သွင်းစဉ်းစားခြင်းသည် ပတ်ဝန်းကျင် နှင့် လူမှုဆိုးကျိုးများကို ရှောင်ကြဉ်ရန် သို့မဟုတ် လျော့ချရန် နှင့် စီမံကိန်းအကျိုးအမြတ်များကို တိုးမြှင့်သွားရန် သို့မဟုတ် မြှင့်တင်သွားရန် စီမံကိန်းများကိုစီစဉ်ရေးဆွဲရာတွင် အခြေခံသတ်မှတ်ချက်တစ်ရပ် ဖြစ်ပါသည်။ စီမံကိန်းအတွက် ထည့်သွင်းစဉ်းစားခဲ့သော အခြားရွေးချယ်စရာများမှာ အောက်ပါအတိုင်းဖြစ်ပါသည် -

- **စီမံကိန်းမဆောင်ရွက်သည့် အခြားနည်းလမ်းရွေးချယ်မှု။** 'စီမံကိန်းမဆောင်ရွက်တော့ခြင်း' ရွေးချယ်မှုသည် လုပ်ကွက် M-12 M-13 နှင့် M-14 တို့တွင် နောက်ထပ် လုပ်ကွင်းဖွံ့ဖြိုးရေး လုပ်ငန်းမဆောင်ရွက်တော့ခြင်းဖြစ်ပြီး၊ ရလဒ်အားဖြင့် နောက်ထပ် ရေနံ နှင့် သဘာဝဓာတ်ငွေ့ဖွံ့ဖြိုးရေးလုပ်ငန်းမရှိတော့ခြင်း နှင့် ထုတ်လုပ်မှုလျော့ချခြင်း ဖြစ်ပါသည်။ သဘာဝဓာတ်ငွေ့ထုတ်လုပ်မှုသည် မြန်မာနိုင်ငံစီးပွားရေးကို တက်ကြွလာစေပြီး၊ 'စီမံကိန်း မဆောင်ရွက်တော့ခြင်း'သည် ပြည်တွင်းဈေးကွက်သို့ ဓာတ်ငွေ့ရောင်းလိုအားအတွက် အခွင့်အလမ်းများ လျော့နည်းသွားနိုင်ခြင်း၊ အလုပ်အကိုင်အခွင့်အလမ်းများနည်းပါးသွားနိုင်ခြင်း နှင့် စီးပွားရေး ဖွံ့ဖြိုးမှု နည်းပါးသွားနိုင်ခြင်း တို့ကို ဖြစ်ပေါ်စေနိုင်ပါသည်။
- တူးဖော်မှုကျစ်စာစွန့်ပစ်မှု။ တူးဖော်မှုကျစ်စာများအတွက် စွန့်ပစ်မှုရွေးချယ်စရာများတွင် (၁) ကုန်းပေါ်စွန့်ပစ်မှု၊ (၂) ကမ်းလွန်တွင် ပြည်လည်ဖြည့်သွင်းခြင်း၊ နှင့် (၃) ကမ်းလွန်တွင် စွန့်ပစ်မှုတို့ ပေါင်းစပ်ပါဝင်ပါသည်။ ကမ်းလွန်တွင် ပြည်လည်ဖြည့်သွင်းခြင်းသည် မဖြစ်နိုင်သော အခြေအနေတွင်ရှိပြီး၊ ကမ်းလွန်တွင် စွန့်ပစ်မှုသည် လုပ်ငန်းစံနှုန်းများထည့်သွင်းစဉ်းစားလျက်

စီမံကိန်းအတွက် ရွေးချယ်ထားသောနည်းလမ်း ဖြစ်ပါသည်။ ဖြစ်ပေါ်လာနိုင်သည့် ပတ်ဝန်းကျင်ဆိုင်ရာ သက်ရောက်မှုများကို ထည့်သွင်းဆောင်ရွက်ရန် တူးဖော်မှုကျစ်စာများ ပျံ့နှံ့လွှင့်ပြယ်မှုနမူနာကို ဆောင်ရွက်ခဲ့ပါသည်။

- တူးဖော်မှုအရည်အချိုးအစားများ။ ရေနံတွင်းများကို ရေတွင်မပျော်ဝင်နိုင်သော တူးဖော်မှုအရည် (NADF) သို့မဟုတ် ရေအခြေပြုတူးဖော်မှုအရည် (WBDF) တစ်ခုမဟုတ် တစ်ခုကို အသုံးပြု၍ တူးဖော်နိုင်ပါသည်။ ယခုစီမံကိန်းအတွက် တွင်းတူးရာတွင် တွင်းအပေါ်ပိုင်းအဆင့်များအတွက် WBDF ကို အသုံးပြုသွားမည် ဖြစ်ပြီး၊ လိုအပ်နေရာများဖြစ်သည့် နည်းပညာအရ ပိုမိုစိန်ခေါ်မှုများသည့် တွင်းအောက်ပိုင်းအဆင့်များအတွက် NADF ကို အသုံးပြုသွားမည် ဖြစ်ပါသည်။ NADF ကို အဆိပ်အတောက်ပါဝင်မှုနည်းသည့် လုပ်ငန်းဖြင့် အသေးစိတ်ဆောင်ရွက်ပြီးဖြစ်ပါသည်။ တူးဖော်ဆောင်ရွက်မှုကိုထိန်းသိမ်းထားနိုင်သည့်အပြင်၊ မိရိုးဖလာအသုံးပြုသည့် ဆီအခြေပြုအရည်များကို ပိုမိုမြန်ဆန်ပြီးဆွေးမြေ့ပျက်စီးစေနိုင်သော အစားထိုးမှုဖြင့် ဆောင်ရွက်ခြင်း ဖြစ်ပါသည်။
- **ရေနံတွင်း နေရာများ။** ရဲတံခွန်-အေ ပလက်ဖောင်းမှ ရေနံတွင်းသုံးတွင်းကို တူးဖော်ဆောင်ရွက်ရန်ရှိပါသည်။ ရေနံတွင်းနေရာများရွေးချယ်မှုကို တူးဖော်မှုလုပ်ငန်းများဖြစ်ပေါ်မည့် ရဲတံခွန် ပလက်ဖောင်း၏ ဓာတ်ငွေ့ကန်တည်နေရာ နှင့် ဘူမိဗေဒ နှင့် တည်ရှိနေသောနေရာနှင့် စပ်လျဉ်းသည့် အကြောင်းတရားများမှ တွန်းပို့ဖြစ်ပေါ်စေပါသည်။ ဖြစ်ပေါ်လာနိုင်သည့် ရေနံတွင်းနေရာများသည် ရေအနက် မီတာ ၁၁၀ ခန့်ရှိ ရေပြင်များ၌ တည်ရှိပါသည်။ ဖြစ်ပေါ် လာနိုင်သည့် ရေနံတွင်းနေရာများသည် ပင်မနယ်မြေမှ ကီလိုမီတာ ၁၄၀ ကျော်အကွာ နှင့် မြိတ်ကျွန်းစု၏ အနီးဆုံး အစွန်အဖျားကျွန်းများမှ ကီလိုမီတာ ၁၀၀ ကျော်အကွာတွင် ရှိပါသည်။

**၁.၄ အနီးပတ်ဝန်းကျင်ဖော်ပြချက်**

စီမံကိန်းနယ်မြေဧရိယာသည် MODU နှင့် ရေမိုင် ၅ မိုင်ရှိ သေးကင်းလုံခြုံရေးဇုန်တို့ဖြစ်ပါသည်။ အောက်ပါအခန်းတွင် တနင်္သာရီတိုင်းဒေသကြီးကမ်းလွန် ရေပြင်များအနီးတစ်ဝိုက်အပြင် စီမံကိန်း နယ်မြေဧရိယာ၏ ရေပြင်များအဖြစ် သတ်မှတ်ထားသည့် လေ့လာမှုနယ်မြေဧရိယာအတွင်းရှိ ရှုပ၊ ဇီဝ နှင့် လူမှုပတ်ဝန်းကျင်များကို ဖော်ပြထားပါသည်။ ဖြစ်ပေါ်လာနိုင်သည့် ရေနံတွင်းသည် ပင်မနယ်မြေမှ ကီလိုမီတာ ၁၄၀ နှင့် အနီးဆုံးကျွန်းများ (မြိတ်ကျွန်းစု၏အနီးဆုံးကျွန်း)မှ ကီလိုမီတာ ၁၀၀ အကွာ၌ တည်ရှိသောကြောင့်၊ အခြေခံအချက်အလက်များ၏ အလေးပေးမှုမှာ ဟင်းလင်းဖြစ်နေသောရေပြင်နေရာများဖြစ်ပါသည်။

သက်ရောက်မှုရှိစေမည့် နယ်မြေဧရိယာသည် ပတ်ဝန်းကျင်နေရာ နှင့် လုပ်ငန်းဆောင်ရွက်မှုအပေါ် မူတည်လျက် ကွဲပြားပါသည်။ သဘာဝပတ်ဝန်းကျင်နေရာများအတွက်၊ သက်ရောက်မှုရှိစေမည့် နယ်မြေဧရိယာမှာ စီမံကိန်းနယ်မြေဧရိယာ၏ ရေပြင်များနှင့် တနင်္သာရီတိုင်းဒေသကြီး၏ အနီးကမ်းလွန်ရေပြင်များ အထိ ကန့်သတ်သေးငယ်သွားစေပါသည်။ လူမှုရေးဆန်းစစ်ခြင်းအတွက်၊ အနီးဆုံးနေရာများသည် စီမံကိန်းမှ ကီလိုမီတာ ၁၄၀ အကွာခန့်တွင်ရှိသည့် တနင်္သာရီတိုင်း ဒေသကြီးတွင် တည်ရှိပါသည်။ သက်ရောက်မှုရှိစေမည့် နယ်မြေဧရိယာသည် ကမ်းလွန်ဟင်းလင်း ရေပြင်များတွင် ရှိနေသဖြင့်၊ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းကို ဤနယ်မြေဧရိယာရှိ နေရင်း ဒေသများ နှင့် မျိုးစိတ်များအပေါ် အလေးပေးပြုလုပ်သွားမည်

ဖြစ်ပါသည်။ ယေဘုယျ အခြေခံ ဖော်ပြချက်ကိုထောက်ပံ့ပေးနိုင်ရန် ကမ်းရိုးတန်းနယ်မြေဧရိယာများ နှင့် ထိန်းသိမ်းကာကွယ် ထားသော နယ်မြေဧရိယာများနှင့် ပတ် သက်သည့် သတင်းအချက်အလက်များကို ထည့်သွင်းထား ပါသည်။

ယခု အခန်း ပါသတင်းအချက်အလက်များသည် PCML က ထောက်ပံ့ပေးသည့် သတင်းအချက် အလက်များနှင့်ဖြည့်စွက်၍ ပုံနှိပ်ထုတ်ဝေထားသော သတင်းအချက်အလက်များကို ပြန်လည်သုံး သပ်ခြင်း နှင့် ERM ရုံးတွင်းရှိ ရရှိနိုင်သော စာရွက်စာတမ်းများကို သုံးသပ်မှုတို့အပေါ် အခြေခံထား ခြင်း ဖြစ်ပါသည်။ ယခုစီမံကိန်းမှာ EIA ဖြစ်သောကြောင့်၊ သဘာဝပတ်ဝန်းကျင်ဆိုင်ရာ မူလအချက်အလက်များကို ၂၀၁၈ ခုနှစ် ဧပြီလတိုင် ကောက်ယူခဲ့ပါသည်။ ရှေးကပင်ရှိနေသောပြန်လည်သုံးသပ်မှုများကို ထောက်ပံ့မှုပြုနိုင် ရန် အများပြည်သူနှင့်တိုင်ပင် ဆွေးနွေးမှုများ ကာလအတွင်း ကောက်ယူခဲ့သော မူလလူမှုရေး ဆိုင်ရာ အချက်အလက်များကို အသုံးပြုပါသည်။ တစ်ဆင့်ခံအချက်အလက် အရင်းအမြစ်များအဖြစ် သားငှက်ထိန်းသိမ်းရေးအဖွဲ့ (WCS)၊ သိပ္ပံဂျာနယ် များ၊ ငါးဖမ်းလုပ်ငန်းသွားရောက်လေ့လာမှု အချက်အလက် (၂၀၁၅)၊ နှင့် မော်လမြိုင် နှင့် ပုသိမ် တက္ကသိုလ်တို့၏ အဏ္ဏဝါသိပ္ပံဌာနရှိ ရရှိသော ဒေသလေ့လာမှုဆိုင်ရာ အစီရင်ခံစာများကို ကိုးကားခဲ့ ပါသည်။

**၁.၄.၁ မူလအခြေခံအချက်အလက်များ**

၂၀၁၈ ခုနှစ်၊ ဧပြီလတွင်၊ ရေအရည်အသွေး၊ မျောလှေး၊ နန်းများ နှင့် ကြမ်းပြင်နေသက်ရှိများ အတွက် မူလအချက်အလက်ကောက်ယူမှုကို ဆောင်ရွက်ခဲ့ပါသည်။ အဆိုပါအချက်အ လက်ကောက်ယူမှုကို ERM မှအန္တရာယ်ပေးတွင် အတွေ့အကြုံရှိထားသော သိပ္ပံပညာရှင်မှ ပြည်တွင်း subcontractor REM အဖွဲ့၏အားဖြည့်ကူညီမှုဖြင့် ကောက်ယူထားပါသည်။ နမူနာစစ်ဆေးလေ့လာခြင်းများကိုလည်း မြန်မာ၊ ဟောင်ကောင် နှင့် တရုတ်နိုင်ငံတို့ရှိ ဓာတ်ခွဲစမ်းသပ်ခန်းနှင့် တက္ကသိုလ်များတွင်လုပ်ဆောင်ခဲ့ပါသည်။

စစ်တမ်းတွင် နန်းနေရာ နမူနာလေးနေရာရှိ စုစုပေါင်း အလေးချိန် ၀.၂၈၃ ဂရမ် အပါအဝင်၊ စုစုပေါင်း ၃၁ သက်ရှိ မျိုးကို မှတ်တမ်းတင်နိုင်ခဲ့ပါသည်။ ခုနစ်မျိုးထဲတွင်မျိုးရိုးစုစုပေါင်း ၁၅ မျိုးမှာ နမူနာ မျိုးပေါင်းစု(၇)မျိုး (Annelida၊ Arthropoda၊ Chordata၊ Cnidaria၊ Echinodermata၊ Mollusca၊ နှင့် Nemertinea) တို့ ပါဝင်ကြပါသည်။ ၂၀၁၈ ခုနှစ်ဧပြီလတွင် ရဲတံခွန်လုပ်ကွင်း၌ မှတ်တမ်းယူခဲ့သည့်ရေအောက်ကြမ်းပြင်နေသက်ရှိ သတ္တဝါများ၏ အများစု (၅၄.၈၄%) သည် Class Polychaeta (Phylum Annelida (marine worms)) မှဖြစ်ပြီး၊ ဒုတိယလိုက်သည်မှာ Class Crustacea (Phylum Arthropoda ဖြစ်ပြီး၊ စုစုပေါင်း၏ ၂၂.၅၈) ဖြစ်ပါသည်။ နမူနာများသည် ၁၉၉၈ ခုနှစ်က စစ်တမ်းများမှ တင်ပြသည့် တွေ့ရှိချက်များနှင့် အတူတူဖြစ်နေသော polychaete worms သို့မဟုတ် crustaceans (Phylum Arthropoda) တို့ဖြင့် အဓိကလွှမ်းမိုးနေပါသည်။

ခြုံငုံကြည့်လျှင်၊ ၂၀၁၈ ခုနှစ် ဧပြီလတွင် ရဲတံခွန်လုပ်ကွင်း၌ ရယူဆောင်ရွက်ခဲ့သည့် ရေအောက် နမူနာသည် သက်ရှိများကျိုးတိုးကျဲတဲဖြစ်မှု၊ ပြောင်းလဲမှုမြင့်ခြင်း၊ နှင့် ရေအောက်နန်းပေါ်နေသတ္တဝါ များ မျိုးစုံမှု နည်းပါးခြင်းတို့ကို တွေ့ရှိရပါသည်။ Crustaceans၊ ribbonworms၊ anemones၊ gastropods၊ ငါးများ နှင့် brittlestars တို့အပါအဝင် အခြားဒေသရင်းသတ္တဝါများနှင့် Bristleworms (polychaetes/worms) တို့မှာ အတွေ့ရအများဆုံးဖြစ်ပါသည်။ အပြင်ဘက် ကမ်းလွန်ရေတိမ်ပိုင်း နှင့်ဆက်နေသောပလက်ဖောင်းအနီး စစ်တမ်းဆောင်ရွက်ခဲ့သည့်နယ်မြေဧရိယာအတွင်းရေအောက် ကြမ်းပြင် နေရင်းဒေသများကို ရေအောက်ကြမ်းပြင်နေ

သက်ရှိများကျိုးတိုးကျဲတဲအစုအဝေးကို ထောက် ပံ့နေသော ခိုင်မာမှုမဲ့သော သဲများ နှင့် ရွှံ့များရှိနေခြင်းများပါဝင်ကြောင့် တွေ့ရှိပါသည်။

၂၀၁၈ ဧပြီလတွင် စုစုပေါင်း ၄၆၈၁၀ မှ ၁၄၉၈၅၆ algal cell/L တို့ကို ကော်လန်လေးမျိုးပေါင်းစပ် ထားသည့် နမူနာများဖြင့် စစ်တမ်းကောက်ယူခဲ့ပါသည်။ နမူနာများသည် မျိုးစိတ် ၂၃ မျိုး၊ မျိုးရိုး ၂၀ မျိုး၊ မျိုးစု ၃ စု (Cyanophyceae၊ Bacillariophyceae၊ Dinophyceae) နှင့် မျိုးကွဲ နှစ်မျိုး (Cyanophyta၊ Chromophyta) နှင့် အကျုံးဝင်ပါသည်။

၂၀၁၈ ဧပြီလတွင် မူလ အက္ခရာအခြေခံစစ်တမ်းများကို ဆောင်ရွက်ခဲ့ပြီး၊ ရဲတံခွန်ကွင်းရှိ ပင်လယ် ကြမ်းပြင်နယ်မြေဧရိယာများ၌ clayey နန်းအများဆုံးပါဝင်နေမှုကို တွေ့ရှိရပါသည်။ အက္ခရာနန်း အော်ဂဲနစ်ပါဝင်မှုသည် ၀.၁၆ မှ ၀.၂၁% အထိရှိ နမူနာယူသည့်စခန်းများ၌ တူညီကြပြီး၊ ၎င်းကို ညစ်ညမ်းမှုမရှိသည့် ပုံမှန် ကမ်းလွန် အက္ခရာပတ်ဝန်းကျင်များဟု ထည့်သွင်းစဉ်းစားပါသည်။

ရေအရည်အသွေးနှင့်ပတ်သက်၍၊ ပင်လယ်ရေနမူနာများအားလုံးရှိ ဆီ နှင့် ချောဆီများပါဝင်မှုသည် <၂ mg/l သို့မဟုတ် မမြင်သာသည့်အခြေအနေဖြစ်ပြီး၊ ၎င်းတို့ကို မပြောပလောက်သည့် အဆင့် ဟုတ် ထည့်သွင်းစဉ်းစားပါသည်။ ခြုံကြည့်လျှင်၊ ပတ်ဝန်းကျင်ဆိုင်ရာ စိုးရိမ်မှုအဆင့်များရှိသည့် ဟိုက်ဒရိုကာဗွန်ညစ်ညမ်းမှုရှိသည့် သက်သေများကို ညွှန်ပြမနေသည့် အက္ခရာအခြေခံစစ်တမ်းကို ဆောင်ရွက်ခဲ့ပါသည်။

**၁.၄.၂ ပတ်ဝန်းကျင်ဆိုင်ရာ အခြေခံအချက်အလက်များ**

မြန်မာနိုင်ငံတွင် IUCN အမျိုးအစားများအဖြစ် ပညတ်ထားသော သို့မဟုတ် အဆိုပြုထားသော ထိန်း သိမ်းကာကွယ်ထားသည့် စုစုပေါင်းနယ်မြေဧရိယာမှာ ၄၃ နေရာရှိပါသည် (Istituto Oikos နှင့် BANCA (2011))။ သို့ရာတွင် အချို့နေရာများမှာ တရားဝင်သတ်မှတ်ထားခြင်းမျိုး မဟုတ်ဘဲ ထိန်း သိမ်းကာကွယ်ထားသည်နယ်မြေဧရိယာအဖြစ် အဆိုပြုထားခြင်း ဖြစ်ပါသည်။ စီမံကိန်းနယ်မြေ ဧရိယာအတွင်း၌ ၎င်း ထိန်းသိမ်းကာကွယ်ထားသော သို့မဟုတ် ပတ်ဝန်းကျင်အရ ထိခိုက်လွယ် သော နေရာများရှိမနေပါ။ အနီးဆုံး အဆိုပြုပညတ်ထားသည့် ငါးမန်းထိန်းသိမ်းရေး နယ်မြေဧရိယာ သည် စီမံကိန်းနယ်မြေဧရိယာမှ ၃၃ ကီလိုမီတာအကွာ၌ တည်ရှိပါသည်။ ၎င်းဧရိယာနယ်မြေကို ၂၀၀၄ ခုနှစ်တွင် အမျိုးသား အက္ခရာထိန်းသိမ်းကာကွယ်ရေးနယ်မြေဧရိယာ (MPA) အဖြစ် တည်ထောင်ခဲ့ပြီး၊ ယင်းနယ်မြေဧရိယာသည် ၁၁၈၃၆ စတုရန်းကီလိုမီတာအထိ လွှမ်းမိုးပါဝင်ကာ ငါးဖမ်းလုပ်ငန်းများကို ကန့်သတ်ထားပါသည်။

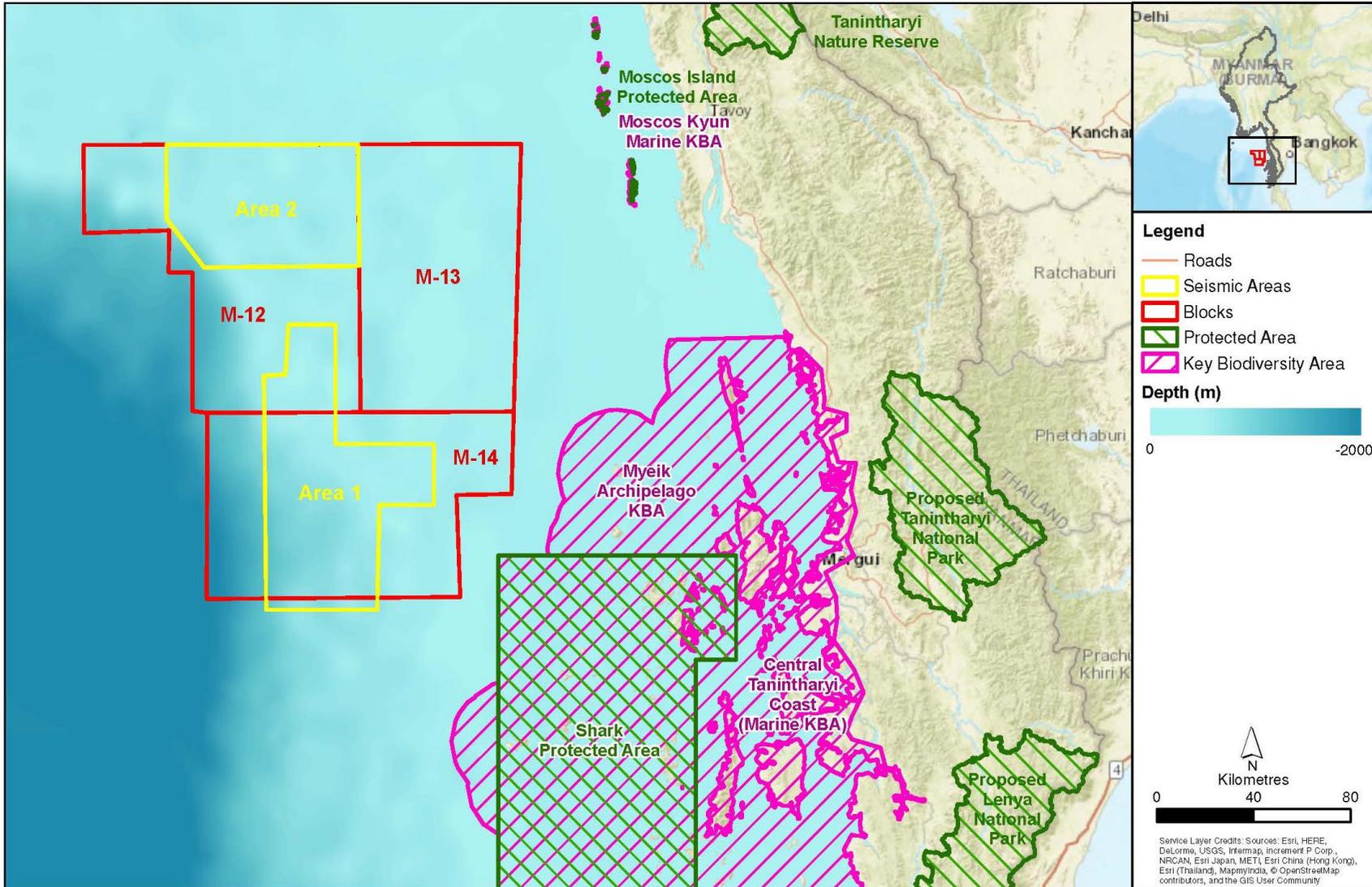
၂၀၁၂ ခုနှစ်တွင်၊ သားငှက်ထိန်းသိမ်းရေးအဖွဲ့ (WCS) သည် မြန်မာနိုင်ငံ ပတ်ဝန်းကျင်ပညာရှင်များ နှင့် အဓိကအရေးပါသောဇီဝမျိုးစုံမျိုးကွဲနယ်မြေဧရိယာများ (KBAs) အဖြစ် ၁၃၂ နေရာ ကို ဖော် ထုတ်သတ်မှတ်ခဲ့ပါသည် (Holmes et al၊ ၂၀၁၃)။ ၎င်း KBAs နေရာများကို ထိန်းသိမ်းရန်လိုအပ် သည့် မျိုးစိတ်များ သိသာထင်ရှားစွာ ရှိနေသည့်နေရာများအဖြစ် သတ်မှတ်ပါသည်။ သို့ရာတွင်၊ မြန်မာနိုင်ငံတွင် ထိန်းသိမ်းကာကွယ်ရေးနယ်မြေဧရိယာများအဖြစ် တရားဝင်အသိအမှတ်ပြုထား သည်တော့မဟုတ်ပါ။ အနီးဆုံး KBA သည် မြိတ်ကျွန်းစု KBA ဖြစ်ပြီး၊ ၎င်းသည် စီမံကိန်း နယ်မြေ ဧရိယာမှ ၈၈ ကီလိုမီတာခန့်အကွာတွင် တည်ရှိပါသည်။ ၎င်း KBA ကို ကျွန်းများပေါ်တွင် အသိုက် ပြုလုပ်နိုင်ခြေရှိသည် လိပ်မျိုးစိတ် လေးမျိုးရှိနေသော ကြောင့် သတ်မှတ်ခဲ့ခြင်း ဖြစ်ပါသည်။

လေ့လာမှုနယ်မြေဧရိယာအတွင်းရှိ KBA ကို ဇယား ၁.၃ နှင့် ပုံ ၁.၄ တို့တွင် ဖော်ပြပေးထားပါသည်

ဇယား ၁.၃ လှေလာမှုနယ်မြေဧရိယာရှိ အရေးပါသောဇီဝမျိုးစုံမျိုးကွဲနယ်မြေဧရိယာများ (KBAs)

အမည်	ဧရိယာ (စတုရန်းကီလိုမီတာ)	အဓိက မျိုးစိတ်များ
မြစ်ကွန်းစု	၄၃၉၆၃	Leatherback turtle မျိုးစိတ်၊ green turtle မျိုးစိတ်၊ hawksbill turtle မျိုးစိတ်
မိုစကိုကွန်း	၅၇	Leatherback turtle မျိုးစိတ်၊ green turtle မျိုးစိတ်၊ hawksbill turtle မျိုးစိတ်၊ olive ridley turtle မျိုးစိတ်
လမ်းပိ နှင့် MPA	၂၂၅	အောင်လောင်ငှက်မျိုးစိတ်၊ ငါးမန်း မျိုးစိတ်များ၊ နှင့် လိပ် မျိုးစိတ်များ

ပုံ ၁.၄ လှေလာမှုနယ်မြေစရိယာရှိ ထိန်းသိမ်းကာကွယ်ထားသော နယ်မြေစရိယာများ



တိုးကား - Homles et al, 2014

ဥတုရာတီအချက်အလက်များကို စီမံကိန်းနယ်မြေဧရိယာမှ ၁၄၈ ကီလိုမီတာကွာဝေးပြီး အနီးဆုံး ခရိုင်ဖြစ်သည့် ထားဝယ်မှ ရရှိပါသည်။ မြန်မာနိုင်ငံအတွင်း၊ ထားဝယ်သည် အနောက်တောင်ပိုင်းသို့ ၏ ပထမဆုံး သက်ရောက်မှုကိုခံရပြီး၊ တစ်နှစ်လျှင် ပုံမှန် မိုးရွာသည့် ရက်ပေါင်း ၁၄၂ ရက်ရှိကာ၊ မိုးရေချိန် ၁၇.၉ ပေအထိရှိပါသည် (FAO၊ ၂၀၁၄)။

စီမံကိန်းနယ်မြေဧရိယာ၏ အနီးဝန်းကျင်ရှိ ကပ္ပလီပင်လယ်တွင် လစဉ်ပုံမှန် လေတိုက်ခတ်မှုနှုန်းမှာ တစ်စက္ကန့်လျှင် ၃.၅ မီ မှ တစ်စက္ကန့်လျှင် ၇.၅ မီတာအထိအရှိကြောင်း သိရှိရပါသည် (Steedman Science & Engineering၊ ၁၉၉၄)။ နိုဝင်ဘာလ မှ ဧပြီလအထိ အများဆုံးတွေ့ရသော လေဦးတည် ရာမှာ မြောက်မှ အရှေ့မြောက်ဖြစ်ပြီး၊ မေလ မှ အောက်တိုဘာလအထိ မှာ အနောက်တောင် ဖြစ်ပါ သည် (worldweatheronline)။

အပူချိန်၊ ဆားဓာတ်ပါဝင်မှု၊ အောက်ဆီဂျင်၊ နှင့် ဖလော်ရစ်စ်တို့နှင့်ပတ်သက်သည့် အချက်အလက် များကို 'Dr. Fridtjof Nansen' စစ်တမ်း၏အစိတ်အပိုင်းတစ်ရပ်အနေဖြင့် ၂၀၁၅ ခုနှစ်တွင် ဆောင် ရွက်ခဲ့သည့် တနင်္သာရီတိုင်းဒေသကြီးရေပြင်စစ်တမ်းကာလအတွင်း မှတ်တမ်းယူခဲ့ပါသည် (မြန်မာ နိုင်ငံဧကစနစ်စစ်တမ်း - ၂၀၁၅)။ စစ်တမ်းအရှေ့ဘက် (စီမံကိန်းနယ်မြေဧရိယာတည်ရှိသည့် နေရာ) ရှိ အနီးမျက်နှာပြင်အပူချိန်မှာ (၅ မီတာ အနက်) ၃၂ °C ခန့် နှင့် ၅ မီတာအနက်ရှိ ဆားဓာတ်ပါဝင်မှုများ ၃၁ မှ ၃၄ အထိ ရှိပါသည်။ မျက်နှာပြင်ရေပြင်များရှိ အောက်ဆီဂျင်အဆင့်များ မှာ ယေဘုယျအားဖြင့် မြင့် (~၄ - ၅ ml/l) ပြီး၊ ပြောင်းလဲနိုင်မှုမှာလည်း မြင့်လျက် ရှိပါသည်။

ကမ်းနီးနေရင်းဒေသများကိုကြည့်လျှင်၊ Fauna and Flora International (FFI) သည် မြိတ်ကျွန်းစု ရှိ သတ္တကျောက်တန်းများ နှင့် ၎င်းတို့၏ အခြေအနေနှင့်ပတ်သက်၍ သုတေသနဆောင်ရွက်ခဲ့ပါ သည်။ ကျောက်တန်းနေရာသုံးမျိုးအတွင်း၊ အောက်ခံလွှာများသည် နေရာများတစ်လျှောက်ကွဲပြား ပြီး၊ အချို့နေရာများ၌ ကျောက်မာများသည် ၁၀% မှ ၉၀ % ကျော်ထိရှိပါသည်။ အတွင်းပိုင်း ကျောက်မာမှာ ၁.၅ မှ ၉၅% (n= 227) ကွဲပြားကြပါသည်။ အမြိတ်အတွင်းမှာ ၀ မှ ၀% (n= 21) နှင့် သတ္တကျောက်တန်းများမှာ ၈.၁ မှ ၃၀ % (n=14) အထိ ရှိပါသည် (Howard၊ ၂၀၁၈)။ စီမံကိန်းနယ်မြေဧရိယာရေတံခွန်လုပ်ကွင်းရှိ ရေမှာ (>၁၀၀ မီတာ) နက် သောကြောင့် ပင်လယ် မြက်များ၊ macroalgae သို့မဟုတ် zooxanthellate scleractinian (ကျောက်တန်းဖွဲ့စည်းမှု) ကျောက်တန်းများ ကဲ့သို့သော မူလအတိုင်းဖွံ့ဖြိုးကြီးမားနိုင်စေမည့် ရေအောက်အထိ အလင်းရောင် လုံလုံလောက်လောက်မရရှိနိုင်သောကြောင့် ၎င်းအုပ်စုများမှာ ပင်လယ်ကြမ်းပြင်တွင် ရှိမနေနိုင်ပါ။ သတ္တကျောက်တန်းနေရင်းဒေသများသည် စီမံကိန်း၏ သက်ရောက်မှုရှိစေမည့် နယ်မြေဧရိယာတွင် ရှိနေနိုင်သည်ဟု တွက်ချက်ပါသည်။

မြိတ်ကျွန်းစုတွင် ဒီရေတောများနှင့်ပတ်သက်၍ (စီမံကိန်းနယ်မြေဧရိယာအနီးမပါဝင်ပါ) လေ့လာမှု တစ်ရပ်ကို FFI ကလည်း ဆောင်ရွက်ခဲ့ပါသည် (San Tha Tun et al၊ ၂၀၁၄)။ ဤစစ်တမ်းတွင် မျိုးရိုး (၂၀) မှ မျိုးစု (၃၂) မျိုးနှင့် အကျုံးဝင်သည့် မျိုးစိတ် ၄၆ မျိုးကို ဖော်ထုတ်သတ်မှတ်ခဲ့ပါသည်။ အများဆုံးတွေ့ရသည်မှာ *Rhizophoraceae* ဖြစ်ပြီး မျိုးစိတ် ရှစ်မျိုးရှိပြီး၊ နောက်တစ်မျိုးမှာ *Avicenniaceae* ဖြစ်ပြီး မျိုးစိတ်သုံးမျိုးဖြစ်ပါသည်။

ဦးစိုးထွန် နှင့် တင့်ဆွေ (၂၀၁၃) မှ အချက်အလက်များအရ မြန်မာနိုင်ငံတွင် ပင်လယ်မြက် မျိုးစိတ် (၁၀) မျိုးရှိပြီး၊ မျိုးရိုး (၂) မှ မျိုးစု (၅) တွင် အကျုံးဝင်ပါသည်။ ၎င်းတို့မှာ *Cymodocea rotundata*၊ *C. serrulata*၊ *Halodule pinifolia*၊ *H.uninervis*၊ *Syringodium isoetofolium*၊ *Enhalus acoroides*၊ *Halophila beccarii*၊ *H.decipiens*၊ *H. ovalis* နှင့် *Thalassia hemprichii* တို့ဖြစ်ကြပါသည်။ ယင်းတို့အထဲမှ *Cymodocea rotundata*၊ *C.serrulata* နှင့် *Enhalus acoroides* တို့မှာ ပြင်လယ်မြက်ကြမ်းပြင်တွင် အဓိကလွှမ်းမိုးထားပါသည်။ ယင်းမျိုးစိတ်အများစုကို ရခိုင် နှင့် တနင်္သာရီ ကမ်းရိုးတန်းနယ်မြေဧရိယာများနှင့် ၎င်းတို့နှင့်အနီးစပ်ဆုံးဖြစ်သော စီမံကိန်းနယ်မြေဧရိယာ တောင်ဘက်သို့ ၁၂၅ ကီလိုမီတာကျော်တွင် အများဆုံးတွေ့ရပါသည်။

မြိတ်ကျွန်းစုရှိ နေရာ (၂၈) နေရာကို ၂၀၁၄ ခုနှစ်တွင် FFI က ငါးစစ်တမ်းကို ကောက်ယူခဲ့ပါသည် (Russell၊ ၂၀၁၅)။ စစ်တမ်းကို ရေအောက် အမြင်ကြည့်ဖွဲ့ဒီယိုအသုံးပြုလျက် ဆောင်ရွက်ခဲ့ပါသည်။ စုစုပေါင်း (၄၀၉) မျိုးစိတ်တို့သည် မျိုးရိုး (၅၅) မျိုးကို အကျုံးဝင်ကြောင်း မှတ်တမ်းတင်ခဲ့ပါသည်။ မှတ်တမ်းထားသည့် အဓိကငါးမျိုးစိတ်များသည် သတ္တာကျောက်တန်း နှင့် ကျောက်ပေါသောနေရာများနှင့် ဆက်နွယ်မှုရှိသောမျိုးစိတ်များ ဖြစ်ပါသည်။ အများဆုံးတွေ့ရသည့် မျိုးရိုးတို့တွင် wrasses (Labridae)၊ damselfishes (Pomacentridae)၊ gobies (Gobiidae)၊ cardinalfishes (Apogonidae)၊ ကျောက်ငါးမျိုး (Serranidae)၊ butterflyfishes (Chaetodontidae)၊ snappers (Lutjanidae)၊ surgeonfishes (Acanthuridae)၊ parrotfishes (Scaridae) နှင့် Scorpionfishes (Scorpaenidae) တို့ပါဝင်ပါသည်။ ဤမျိုးရင်း (၁၀) မျိုးသည် ၂၆၃ မျိုးစိတ် သို့မဟုတ် မှတ်တမ်းယူတင်ထားသည့် စုစုပေါင်းငါးမျိုးစိတ်များ၏ ~ ၆၄ % ကို အကျုံးဝင်ပါသည်။

မြန်မာ့ရေပြင်တွင် စုစုပေါင်း cetaceans (ဝေလ နှင့် လင်းပိုင်) မျိုးစိတ် ၂၅ မျိုး ရှိကြောင်း မှတ်တမ်းတင်ထားပါသည် သို့မဟုတ် ရှိနိုင်ခြေရှိပါသည် (Holmes et al၊ ၂၀၁၄၊ IUCN၊ ၂၀၁၇)။ မြန်မာ့ ကမ်းရိုးတန်းရေပြင်များတွင် sirenian (ရေဝက်; *Dugong dugon*) မျိုးစိတ် တစ်မျိုး ရှိကြောင်း လည်းအတည်ပြုထားပါသည် (Tun and Ilangakoon၊ ၂၀၀၆)။ မြန်မာ့ရေပြင်များတွင် ဝေလငါးများ နှင့် လင်းပိုင်မျိုးစိတ်များ ရှိနေနိုင်ပြီး၊ အချို့မှာကမ်းရိုးတန်းမျိုးစိတ်များဖြစ်သော်လည်း အများစုမှာ ပြောင်းရွှေ့သွားလာကျက်စားတတ်သော ပင်လယ်မျိုးစိတ်များ မှ ရေတိမ်နေရင်းဒေသများ နှင့် မြစ်ဝဒေသဧရိယာများအထိ ပါဝင်ကြပါသည်။ IUCN က မြန်မာနိုင်ငံရေပြင်များရှိ ထိန်းသိမ်းကာ ကွယ်ရန်လိုအပ်သည့် cetacean မျိုးစိတ်များစာရင်းတွင် ပုံမှန်အားဖြင့် ကမ်းလွန်ရေနက်နေရာ များတွင် နေထိုင်ကျက်စားတတ်သော blue whale (*Balaenoptera musculus*) (မျိုးသုဉ်း ခါနီးမျိုးစိတ်)၊ fin whale (*Balaenoptera physalus*) (မျိုးသုဉ်းခါနီးမျိုးစိတ်) နှင့် sperm whale (*Physeter macrocephalus*) (ထိခိုက်လွယ် မျိုးစိတ်) ကဲ့သို့သော အဏ္ဏဝါမျိုးစိတ်များပါဝင်ကြပါသည်။ Blue whale နှင့် fin whale မျိုးစိတ်တို့သည်လည်း ဒေသအတွင်း အဓိကအရေးပါသော မျိုးသုဉ်းခါနီးမျိုးစိတ်များအဖြစ် အသိအမှတ်ပြုထားပြီး၊ သဘာဝသယံဇာတ နှင့် အရင်းအမြစ်များ ထိန်းသိမ်းရေးဆိုင်ရာ အာဆီယံ သဘောတူညီချက် အရ အထူးအလေးထားမှုကို ရရှိပါသည် (ASEAN၊ ၁၉၈၅)။ Humpback whale (*Megaptera novaeangliae*) နှင့် Bryde's whale (*Balaenoptera edeni*) ကဲ့သို့သော အခြားတွေ့မြင်နေကျ ရေနက်ပိုင်းနေမျိုးစိတ်များသည် မြန်မာနိုင်ငံ ကမ်းလွန်ရေပြင်များတွင် တွေ့ရှိရကြောင်း သိရှိပါသည်။ သို့ရာတွင် IUCN အနီရောင် စာရင်းတွင် စိုးရိမ်မှုအနိမ့်ဆုံး နှင့် အချက်အလက်များလိုနေသည်ဟု စာရင်းဝင်ပါသည်။

ကမ္ဘာ့ ပင်လယ်လိပ်မျိုးစိတ် (၇) မျိုးထဲမှ (၅)မျိုးမှာ မြန်မာနိုင်ငံ ကမ်းခြေတို့၌ အသိုက်ပြုလုပ်ခြင်း နှင့် ကျက်စားခြင်းတို့ကို တွေ့ရှိပါသည်။ ၎င်းတို့တွင် Hawksbill မျိုးစိတ် (*Eretmochelys imbricata*)၊ Green မျိုးစိတ် (*Chelonia mydas*)၊ Loggerhead မျိုးစိတ် (*Caretta caretta*)၊ Olive Ridley မျိုးစိတ် (*Lepidochelys aolivacea*) နှင့် Leatherback မျိုးစိတ် (*Dermochelys coriacea*) တို့ပါဝင်ပါသည်။ UNEP အချက်အလက်များအရ မိုစကိုကျွန်းတစ်လျှောက် သဲရှိသောကမ်းနေရာ နှင့် တနင်္သာရီကမ်းရိုးတန်းနှင့်ကပ်လျက်နေရာများသည် green turtles မျိုးစိတ်၊ hawksbill မျိုးစိတ်၊ Olive Ridley မျိုးစိတ် နှင့် Leatherback မျိုးစိတ် တို့အပါအဝင် မျိုးစိတ်များအတွက် အသိုက်လုပ်သော နေရာများဖြစ်ပါသည် (UNEP၊ ၂၀၁၇)။ မြန်မာ့ရေပြင်များရှိ နှစ်စဉ် လိပ်အသိုက် ပြုလုပ်သည့်အချိန်အခါမှာ စက်တင်ဘာလမှ မတ်လဖြစ်ပြီး အများဆုံးဆောင်ရွက် သည့်ကာလမှာ ဒီဇင်ဘာလ မှ ဇန်နဝါရီလအတွင်း ဖြစ်ပါသည်။ အသိုက်များ ရှိနေနိုင်သော ကမ်းခြေများနှင့်ဆက်စပ်လျက် လုပ်ကွက်အမှတ် M-12၊ M-13 နှင့် M14 တို့၏ တည်နေရာအကွာအဝေးအထူးကြောင့်၊ ရာသီလိုက်အသိုက်ပြုလုပ်မှုနှင့် မိတ်လိုက်သည့် နေရာများနှင့် ကပ်လျက်ရှိသောရေပြင်များကို ဖြတ်သွားသောအခါ ၎င်းလုပ်ကွက်များအတွက် ပင်လယ်လိပ်များ ရောက်ရှိနိုင်ခြေရှိပါသည်။ သိရှိရသော အသိုက်ပြုလုပ်သည့် ကမ်းခြေနေရာများ အားလုံးမှာ စီမံကိန်းနယ်မြေဧရိယာအပြင်ဘက် တွင်ရှိပြီး၊ အနည်းဆုံး ကီလိုမီတာ ၁၀၀ အကွာတွင် ရှိပါသည်။

စီမံကိန်းနယ်မြေဧရိယာမှ ကီလိုမီတာ ၁၀၀ ကျော်အကွာအဝေးတွင် ရှိသည့် မြိတ်ကျွန်းစု၏ အစွန် အဖျားကျွန်းများ နှင့် မိုစကိုကျွန်းတို့သည် အကဲခတ်လေ့လာမှုဖြင့် အတည်အပြုနိုင်သော်လည်း၊ အချို့မျိုးစိတ်များအတွက် အသိုက်ပြုလုပ်ရန်သင့်လျော်သောအထူးရှိကြောင်း တွက်ချက်ပါသည်။ လန်ပိကျွန်းသည် စီမံကိန်းနယ်မြေဧရိယာမှ ကီလိုမီတာ ၁၀၀ ကျော်ကွာဝေးပြီး၊ IUCN အနီရောင် စာရင်း တွင် ထိခိုက်လွယ်သောအဆင့်ရှိသည့် အောင်လောင်ငှက်ခေါ် (*Rhyticeros subruficollis*) မျိုးစိတ်များ နေထိုင်ကျက်စားမှုရှိကြောင်း သတ်မှတ်ဖော်ထုတ်ထားသည့် အရေးပါသောငှက်နယ်မြေ ဧရိယာအဖြစ် အမျိုးအစားသတ်မှတ်ထားပါသည်။

**၁.၄.၃ လူမှုဆိုင်ရာအခြေခံအချက်အလက်များ**

စီမံကိန်းသည် တနင်္သာရီတိုင်းဒေသကြီးကမ်းလွန်ရေပြင်ရှိ ပင်မနယ်မြေမှ ၁၄၀ ကီလိုမီတာ အကွာ၌ တည်ရှိပါသည်။ အနီးဆုံးမြို့နယ်မှာတနင်္သာရီတိုင်းဒေသကြီး၊ ထားဝယ်ခရိုင်၊ လောင်းလုံဖြစ်ပါသည်။

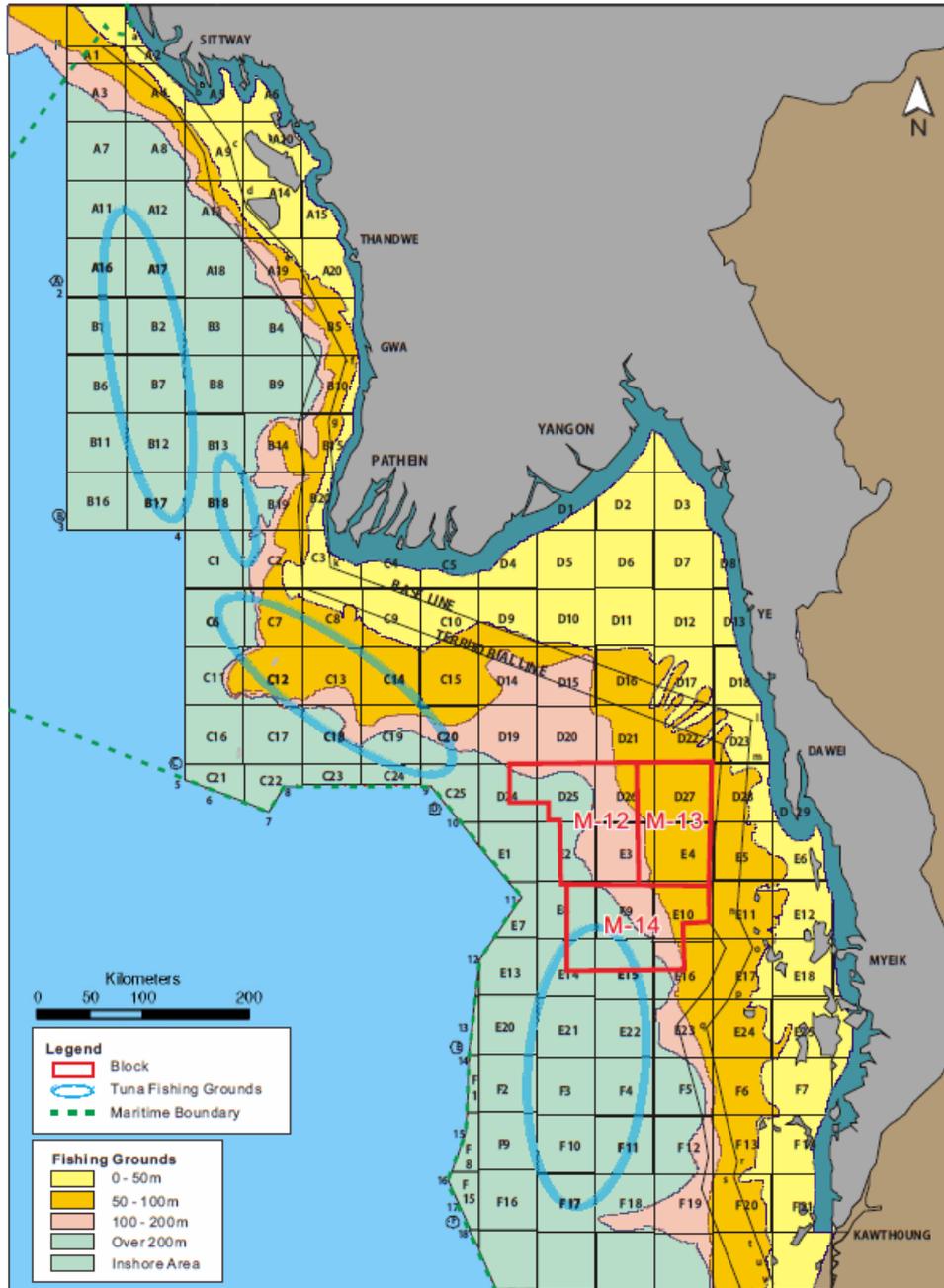
စီမံကိန်းနယ်မြေဧရိယာအတွက် အသေးစိတ် ဒေသအစီအစဉ်များ သို့မဟုတ် မဟာဗျူဟာများ ရှိ မနေပါ။ ထားဝယ်ခရိုင်၏ လူဦးရေဆိုင်ရာအချက်အလက်များကို ဇယား ၁.၄ တွင် တင်ပြထား ပါသည်။

ဇယား ၁.၄ လေ့လာမှုနယ်မြေစရိယာရှိ လူဦးရေဆိုင်ရာအချက်အလက်များ

မြို့နယ်	အိမ်ထောင်စု	လူဦးရေ	ကျား	မ
ထားဝယ်	၂၄၉၄၃	၁၂၅၆၀၅	၆၀၀၄၄	၆၅၅၆၁
လောင်းလုံ	၂၅၇၃၅	၁၁၈၃၁၇	၅၅၅၅၈	၆၂၇၅၉
သရက်ချောင်း	၂၂၈၇၄	၁၀၅၆၆၂	၅၀၄၂၁	၅၅၂၄၁
ရေဖြူ	၂၂၀၇၃	၁၀၀၇၆၈	၅၀၇၈၂	၄၉၉၈၆

ကိုးကား - မြန်မာနိုင်ငံ လူဦးရေသန်းခေါင်စာရင်းအချက်အလက် (၂၀၁၄)

ငါးလုပ်ငန်းဦးစီးဌာန (DOF) သည် ငါးဖမ်းလုပ်ငန်းစနစ်ကို စုစည်းခဲ့ပြီး၊ ၎င်းနေရာတို့၌ ငါးဖမ်းလုပ်ငန်းကန့်သတ်မှုများ နှင့် ငါးအရင်းအမြစ်များကို အတိုင်းအတာတစ်ရပ်ထိ ထိန်းသိမ်းကာကွယ်မှုကို ဆောင်ရွက်ပါသည်။ ငါးဖမ်းလုပ်ငန်းစနစ် (၁) သည် ရိုးရာကမ်းရိုးတန်းငါးဖမ်းလုပ်ငန်းများ အတွက် ဖြစ်ပြီး၊ ကမ်းမှ ရေမိုင် ၁၀ မိုင် အကွာထိရှိပါသည်။ ငါးဖမ်းလုပ်ငန်းစနစ် (၂) သည် ငါးဖမ်းလုပ်ငန်းစနစ် (၁) ၏ အပြင်ဘက်သို့ ရေမိုင် ၁ မိုင် မှ ၂၀၀ မိုင်အထိရှိ သီးသန့်စီးပွားရေးဇုန် (EEZ) ကန့်သတ်နေရာထိ ရှိပါသည် (ပုံ ၁.၅)။ ငါးဖမ်းအများဆုံးရာသီမှာ ပုံမှန်အားဖြင့် နိုဝင်ဘာလ မှ ဧပြီလအထိဖြစ်ပါသည်။ ၎င်းမှာ ရာသီဥတုအခြေအနေများသည် ပိုမိုတည်ငြိမ်ပြီး၊ ပိုမိုဝေးကွာသော ကမ်းလွန်နေရာများထိ သွားဖမ်းနိုင်သောကြောင့် ဖြစ်နိုင်ပါသည်။ မိုးရာသီကာလအတွင်း (ဥပမာ - ပုံမှန်အားဖြင့် မေလ မှ အောက်တိုဘာလအထိ)၊ ဆိုးရွားသောပင်လယ်ရာသီဥတုအခြေအနေများကြောင့် ငါးဖမ်းလုပ်ငန်းစနစ် (၁) (ကမ်းနီး) ရှိ ငါးဖမ်းလုပ်ငန်းကို အကြာခဏဆိုသလို ကန့်သတ်ထားပါသည်။



Source: Department of Fisheries (2003), modified by ERM (2018)

အုပ်စုလိုက်ဆွေးနွေးမှုများကို ငါးဖမ်းလုပ်ကိုင်သူများ၊ ငါးဖမ်းလုပ်ငန်းအသင်းအဖွဲ့များ၊ နှင့် DoF တို့နှင့် ၂၀၁၈ ဇူလိုင်လတွင် ဆောင်ရွက်ခဲ့ပါသည်။ စုဆောင်းခဲ့သည့် အချက်အလက်များအရ ငါးဖမ်းလုပ်ငန်းနှင့်စီမံကိန်းနယ်မြေဧရိယာတို့အတွင်း ဖြစ်ပေါ်လာနိုင်သည့် အပြန်အလှန်ထပ်ကျန် မည့် ပေ ၄၀ ရှည် စက်လှေများရှိသည့်မြို့နယ်များမှာ မောင်းမကန်၊ ကျောက်စံ နှင့် ပန်းတင်အင်းတို့ ဖြစ်ကြပါသည်။ စံလှန်၊ သဘော့ဆိပ် နှင့် ပြင်ကြီး တို့မှ ပေ ၆၀ ကျော်ရှည်သည့် စက်လှေများသည် စီမံကိန်းနယ်မြေဧရိယာအတွင်း ငါးဖမ်းဆောင်ရွက်နိုင်ပါသည်။ ငါးဖမ်းအကောင်းဆုံးနေရာများသည် ဘုတ်ကျွန်း နှင့် ဟိန်းဇေ (မိုစကို)ကျွန်းများကဲ့သို့သော ကျွန်းများပတ်ပတ်လည်နေရာများဖြစ်

ကြောင်း မှတ်တမ်းတင်ရရှိပါသည်။ ကျောက်ဆင်၌ဆွေးနွေးကြသည်မှာ စီမံကိန်းနယ်မြေဧရိယာ နှင့် ကမ်းလွန်နေရာတို့သည် သူတို့၏ ငါးဖမ်းအကောင်းဆုံးနေရာများဖြစ်ကြောင်း မှတ်သားရပါသည်။

စီမံကိန်းနယ်မြေဧရိယာအတွင်း ယဉ်ကျေးမှုအမွေအနှစ်ဆိုင်ရာ ကမ်းလွန်နေရာများ ရှိမနေပါ။

စီမံကိန်းလုပ်ငန်းသည် အနီးဆုံး ဒေသရင်းနေရာများမှ ၁၄၀ ကီလိုမီတာကျော် နှင့် မြိတ်ကျွန်းစု၏ အနီးဆုံးအစွန်အဖျားကျွန်းနေရာများမှ ကီလိုမီတာ ၁၀၀ ကျော် အကွာအဝေးတွင် တည်ရှိသော ကြောင့် စီမံကိန်းမှ မြင်သာသော သက်ရောက်မှုများ ရှိလာနိုင်မည် မဟုတ်ပါ။

**၁.၅ ထိခိုက်မှု နှင့် အန္တရာယ် ဆန်းစစ်ခြင်း၊ နှင့် လျော့ချရေး အစီအမံများ**

ရေနံတွင်းတို့သည် တနင်္သာရီ၊ ထားဝယ် မြို့နယ်ရှိ အနီးဆုံး လူမှုပတ်ဝန်းကျင် နေရာများမှ အနည်း ဆုံး ကီလိုမီတာ ၁၄၀ အကွာနှင့်၊ မြိတ်ကျွန်းစု၏ အနီးဆုံး အစွန်အဖျားကျွန်းများမှ ကီလိုမီတာ ၁၀၀ အကွာတွင် တည်ရှိပါသည်။ စီမံထားသော သက်ရောက်မှုများသည် ကမ်းသို့ရောက်ရှိရန် အထိ ကြီးမားသောအတိုင်းအတာမရှိဟု တွက်ချက်ပါသည်။

သိသာထင်ရှားသည့် သက်ရောက်မှုများဖြစ်ပေါ်လာနိုင်သည့် အပြန်အလှန်ချိတ်ဆက်မှုများကို EIA ၌ ပိုမိုအသေးစိတ် ဆန်းစစ်သွားမည် ဖြစ်ပါသည်။ ၎င်းအပြန်အလှန်ချိတ်ဆက်မှုများမှာ အောက်ပါတို့ ပါဝင်ပါသည် -

- စီမံကိန်းနယ်မြေဧရိယာအတွင်း ကမ်းလွန်ငါးဖမ်းလုပ်ငန်းများ နှင့် သင်္ဘောသွားလာရေးတို့ အပေါ် ယာယီ အနှောင့်အယှက်ဖြစ်နိုင်ခြင်း၊
- ကျောက်ချရပ်နားမှု နှင့် တူးဖော်မှုကျစ်စာများစွန့်ထုတ်မှုတို့မှ ကြွင်းကျန်တူးဖော်ရေးရွှံ့များ ကြောင့် ရေအရည်အသွေး၊ နန်းအရည်အသွေး နှင့် ပင်လယ်ဂေဟစနစ်တို့အပေါ် သက်ရောက် နိုင်မှုများ၊
- MODU၊ ရေယာဉ်များ နှင့် VSP (ယာယီ) အပါအဝင် ရှာဖွေတူးဖော်ရေးလုပ်ငန်းတို့မှ အနီး ရေအောက်အသံများမြင့်တက်လာခြင်း။ ၎င်းလုပ်ငန်းများသည် ဂေဟစနစ်အရ ထိခိုက်လွယ် သောဇီဝပတ်ဝန်းကျင်များ ဥပမာ - စီမံကိန်းနယ်မြေဧရိယာအတွင်း ရှိနေနိုင်သည့် ပင်လယ်နို့တိုက်သတ္တဝါများ၊ ပင်လယ်လိပ်များ နှင့် ငါးများအပေါ် သက်ရောက်နိုင်မှုများ၊
- ယာဉ်လည်ပတ်ရေးဆိုင်ရာ စွန့်ထုတ်မှုများမှ ပင်လယ်ရေအရည်အသွေးအပေါ် သက်ရောက် နိုင်မှုများ၊
- မတော်တဆ ပြင်ပ ပင်လယ်မျိုးစိတ်များထိုးဖောက်ပျံ့နှံ့ဝင်ရောက်လာခြင်းကြောင့် ပင်လယ် ဇီဝမျိုးစုံမျိုးကွဲအပေါ် သက်ရောက်နိုင်မှုများ နှင့် ငါးဖမ်းလုပ်ငန်းများအပေါ် တစ်ဆင့်ခံ သက်ရောက်နိုင်မှုများ၊ နှင့်

- မတော်တဆ ယိုဖိတ်မှုများ သို့မဟုတ် ယိုစိမ့်မှုများ (ဥပမာ - ကမ်းလွန်၌ လောင်စာ ပြန်လည် ဖြည့်စဉ်) ကြောင့် ရေထုညစ်ညမ်းနိုင်မှု နှင့် ဇီဝမျိုးစုံမျိုးကွဲ၊ ငါးဖမ်းလုပ်ငန်း နှင့် အများပြည်သူ ကျန်းမာရေးတို့အပေါ် တစ်ဆင့်ခံ သက်ရောက်နိုင်မှုများ။

ဖြစ်ပေါ်လာနိုင်သော သက်ရောက်မှုများ နှင့် လျှော့ချရေးအစီအမံများကို ဇယား ၁.၅ တွင် ဖော်ပြ ထားပါသည်။

ဇယား ၁.၅ စီမံကိန်းအတွက် အဓိက သက်ရောက်မှုများနှင့် ထိန်းချုပ်ရေး/လျှော့ချရေး အစီအမံများ အကျဉ်းဖော်ပြချက်

ဖြစ်ပေါ်လာနိုင်သည့် သက်ရောက်မှု / ထိခိုက်မှု	ထိန်းချုပ်ရေး / လျှော့ချရေး အစီအမံများ	ကြိုင်းကျန်သက်ရောက်မှု၏ အရေးပါမှု
<b>တူးဖော်မှုအဆင့်</b>		
<p>MODU နှင့် ထောက်ပံ့ရေးရေယာဉ်များ ရောက်ရှိနေမှုများ၊ ငါးဖမ်းလုပ်ငန်းနှင့် သင်္ဘောသွားလာရေးလုပ်ငန်းတို့အပေါ် သက်ရောက်မှုများ</p>	<ul style="list-style-type: none"> <li>• MODU ပတ်ပတ်လည်တွင် အချင်းဝက် ရေမိုင် ၅ မိုင်ရှိ ဘေးကင်းရေးဇုန်ကို ထားရှိခြင်း။</li> <li>• တိုက်မိခြင်းကိုရှောင်ခြင်း၊ ရေကြောင်းသွား လာခြင်း နှင့် ထိန်းသိမ်းခြင်းတို့အတွက် နိုင်ငံတကာ စည်းကမ်းများနှင့်အညီ MODU နှင့် ထောက်ပံ့ရေးရေယာဉ်များကို ဆောင်ရွက်သွားမည် ဖြစ်ပါသည်။</li> <li>• MODU ပေါ်တွင် မြန်မာစကားပြောသော သင်္ဘောအမှုထမ်းတို့ ရှိနေမည် ဖြစ်ပါသည်။</li> <li>• ပင်လယ်ရေကြောင်းသတိပေးမှု နည်းလမ်းဖြင့် အချက်အလက်များကို အချိန်နှင့်တစ်ပြေးညီ ထုတ်ပြန်ပေးမည်။</li> <li>• အကြံပြုတိုင်ကြားရေးယန္တရားကို ထုတ်ဖော် အကောင်အထည်ဖော်ဆောင်ရွက်ခြင်း။</li> </ul>	သာမည
<p>တူးဖော်မှုကျစ်စာများ နှင့် တူးဖော်မှု အရည် စွန့်ပစ်မှု များကြောင့် နန်းအရည်သွေး၊ ပင်လယ်ရေ အရည်အသွေး၊ ကြမ်းပြင်နေသက်ရှိများ၊ ငါးများ နှင့် ရေပေါ်ရေလွှာနေ ငါးများအပေါ် သက်ရောက်မှုများ</p>	<ul style="list-style-type: none"> <li>• ကြိုင်းကျန် ရေတွင်မပျော်ဝင်သည့်အဆင့်တူးဖော်မှု အရည်အများဆုံးသည် ကျစ်စာများစိုစွပ်နေသည့်အခြေအနေ တွင် ၆.၉% ဖြစ်မည် ဖြစ်ပါသည်။</li> <li>• ကျစ်စားများကို ယာဉ်ပေါ်မှ စွန့်ပစ်သည့်အနေအထားတွင်၊ ၎င်းတို့ကို ရေလိုင်းအောက် ၁၅ မီတာတွင် စွန့်ပစ် သွားမည် ဖြစ်ပါသည်။</li> <li>• ဖြစ်နိုင်သောအခြေအနေနှင့် ရုံးတွင်းပိုင်းသတ်မှတ်အကြောင်းပြချက်များအရ ရွေးချယ်ထားသည့် ဓာတုပစ္စည်းများ အားလုံးသည် အဆိပ်အတောက်နည်းပါသည်။</li> <li>• ပင်လယ်ရေ သို့မဟုတ် WBDF သည် လိုအပ်သည့် နည်းပညာဆိုင်ရာများကို မထောက်ပံ့နိုင်သောအနေအထားတွင် သာ NADF ကိုအသုံးပြုရမည် ဖြစ်ပါသည်။</li> <li>• ကြိုင်းကျန် NADF အားလုံးကို ပြန်လည်ပြုပြင်ရန်၊ ပြန်လည်အသုံးပြုရန် သို့မဟုတ် စွန့်ပစ်ရန်အတွက် ကန့်သတ်မှု ပြန်လည်ပို့ဆောင်မည် ဖြစ်ပါသည်။ NADF တူးဖော်မှုအရည်အမြောက်အမြားစွန့်ပစ်မှု ဖြစ်ပေါ်မည် မဟုတ်ပါ။</li> <li>• ရွှံ့တွင်းသန့်ရှင်းရေးလျှို့ဝှက်မှုများအတွက် ပုံမှန်ဆီပါဝင်မှုကို ပမာဏအားဖြင့် ၁% သို့ကန့်သတ်သွားမည် ဖြစ်ပါသည်။</li> </ul>	<p>သာမည (နန်းအရည်အသွေး)</p> <p>မပြောပလောက် (ကြမ်းပြင်အရည်အသွေး)</p> <p>သာမည (ရေအရည်အသွေး)</p> <p>မပြောပလောက် (ငါးများ နှင့် ရေပေါ်ရေလွှာနေ မျိုးစိတ်များ)</p>
<p>တူးဖော်မှု၊ VSP၊ နှင့် ရေယာဉ်များရွေ့လျားမှုတို့ ကြောင့် ရေအောက်အသံများမှ ပင်လယ်သတ္တဝါများ (ငါးများ၊ နို့တိုက်သတ္တဝါများ၊ နှင့် လိပ်များ) အပေါ် သက်ရောက်မှုများ</p>	<ul style="list-style-type: none"> <li>• ဆစ်စမစ်စူးစမ်းလေ့လာမှု (VSP) လုပ်ငန်းများ မစတင်မီ MODU မှ ၁ ကီလိုမီတာ အကွာ(စောင့်ကြည့်ရေးဇုန်) အတွင်း ပင်လယ်သတ္တဝါများရှိ မရှိ မိနစ် ၂၀ ခန့် စစ်ဆေးခြင်း။</li> <li>• ဖြေးညှင်းစွာ စတင်ခြင်း - ပင်လယ်သတ္တဝါများ ဖမ်းယူမှု ထွက်ခွာနိုင်ရန် (အနည်းဆုံးမိနစ် ၂၀ ခန့်) အချိန်လုံလောက်စွာပေးရန် VSP ကို ဖြေးညှင်းစွာ စတင်ဆောင်ရွက်ခြင်း။</li> </ul>	သာမည (ငါးများ)

ဖြစ်ပေါ်လာနိုင်သည့် သက်ရောက်မှု / ထိခိုက်မှု	ထိန်းချုပ်ရေး / လျှော့ချရေး အစီအမံများ	ကြိုင်းကျန်သက်ရောက်မှု၏ အရေးပါမှု
	<ul style="list-style-type: none"> <li>• သတ္တဝါများသည် မမြင်တွေ့ရသောရန် (မီတာ ၅၀၀) အကွာ အပြင်ဖက် သို့ ရောက်ရှိသွား တော့မှ သို့မဟုတ် နောက်ဆုံးတွေ့မြင်ခဲ့သည့် အချိန်မှ မိနစ် ၃၀ ကြာမှ ဖြေးညှင်းစွာစတင်ခြင်း ဆောင်ရွက်မှုများကို ပြန်လည်စတင် ဆောင်ရွက်ခြင်း။</li> <li>• နို့တိုက်သတ္တဝါများ သို့မဟုတ် လိပ်များရှိ မရှိကို သတ်မှတ်နိုင်ရန် စောင့်ကြည့်ရေးရန် (၁ ကီလိုမီတာအကွာ) ကို အစဉ်မပြတ် ထိန်းသိမ်းဆောင်ရွက်နေရမည် ဖြစ်ပါသည်။</li> <li>• ပင်လယ် နို့တိုက်သတ္တဝါများ သို့မဟုတ် လိပ်များကို ဆောင်ရွက်နေစဉ်အတွင်း သို့မဟုတ် လုပ်ငန်းမဆောင်ရွက်မီ တွေ့မြင်ရလျှင်၊ သင်္ဘောအဖွဲ့ များမှ ချက်ချင်းအစီရင်ခံရန် စတင်ခြင်းမဆောင်ရွက်မီ အကြိုအစည်းအဝေးအတွင်း သူတို့အား နှိုးဆော်ထားမည် ဖြစ်ပါသည်။</li> <li>• ပင်လယ်နို့တိုက်သတ္တဝါ နှင့် လိပ်တို့ကို လေ့လာမှုများအတွက် စောင့်ကြည့်ရန် နှင့် မှတ်တမ်းယူရန် VSP ဆောင်ရွက်မှုကာလအတွင်း လေ့လာသူ တစ်ဦးကို တာဝန်ပေးဆောင်ရွက်သွားမည် ဖြစ်ပါသည်။</li> </ul>	<p><b>အတော်အတန်</b> (ပင်လယ်နို့တိုက်သတ္တဝါများ နှင့် လိပ်များ)</p>
<p>မမျှော်လင့်ထားသည့် ယိုဖိတ်မှုများမှ ပင်လယ်သတ္တဝါများအပေါ် သက်ရောက်မှုများ</p>	<ul style="list-style-type: none"> <li>• ရေယာဉ်လည်ပတ်ရေးစံနှုန်းလုပ်ထုံးလုပ်နည်းများကို ပြင်ဆင်အကောင်အထည်ဖော်ဆောင်ရွက်ခြင်း။</li> <li>• MARPOL 73/78 Annex I ကို လိုက်နာဆောင်ရွက်ခြင်း။</li> <li>• ဓာတုပစ္စည်းများ နှင့်/သို့မဟုတ် ဟိုက်ဒရို ကာဗွန်များကို ပစ္စည်းများဘေးကင်းရေး အချက်အလက်စာရွက် (MSDS) ပါ အချက်အလက်များနှင့်အညီ ကိုင်တွယ်သိုလှောင်ဆောင် ရွက်သွားမည် ဖြစ်ပါသည်။</li> <li>• ယိုဖိတ်မှုထိန်းချုပ်ရေးအသင့်ဆောင်ကိရိယာများကို အသင့်ထားရှိသွားမည် ဖြစ်ပါသည်။</li> <li>• စံနှုန်းမီရေကြောင်း ဘေးကင်းရေး /မောင်းနှင်သွားလာရေးလုပ်ထုံးလုပ်နည်းများကို အကောင်အထည်ဖော် ဆောင်ရွက်သွားမည် ဖြစ်ပါသည်။</li> <li>• MODU ပတ်ပတ်လည်တွင် အချင်းဝက် ရေမိုင် ၅ မိုင်ရှိ ဘေးကင်းရေးရန်ကို ထားရှိခြင်း။</li> <li>• ယာဉ်များတိုက်မိခြင်းများအတွက် လိုအပ်လျှင် SOPEP ကို အကောင်အထည်ဖော်ဆောင်ရွက်သွားမည် ဖြစ်ပါသည်။</li> </ul>	<p><b>မပြောပလောက်</b></p>
<p>မမျှော်လင့်ထားသည့် ထိခိုက်မှုများမှ ငါးဖမ်းလုပ်ငန်း နှင့် သင်္ဘောသွားလာရေး လုပ်ငန်းတို့အပေါ် သက်ရောက်မှုများ</p>	<ul style="list-style-type: none"> <li>• MODU ပတ်ပတ်လည်တွင် အချင်းဝက် ရေမိုင် ၅ မိုင်ရှိ ဘေးကင်းရေးရန်ကို ထားရှိခြင်း။</li> <li>• တိုက်မိခြင်းကိုရှောင်ခြင်း၊ ရေကြောင်းသွားလာခြင်း နှင့် ထိန်းသိမ်းခြင်းတို့အတွက် နိုင်ငံတကာ စည်းကမ်းများနှင့်အညီ MODU နှင့် ထောက်ပံ့ရေးရေယာဉ်များကို ဆောင်ရွက်သွားမည် ဖြစ်ပါသည်။</li> <li>• MODU ပေါ်တွင် မြန်မာစကားပြောသော သင်္ဘောအမှုထမ်းတို့ ရှိနေမည် ဖြစ်ပါသည်။</li> <li>• ပင်လယ်ရေကြောင်းသတ်ပေးမှု နည်းလမ်းဖြင့် အချက်အလက်များကို အချိန်နှင့်တစ်ပြေးညီ ထုတ်ပြန်ပေးမှုခြင်း။</li> <li>• အကြံပြုတိုင်ကြားရေးယန္တရားကို ထုတ်ဖော် အကောင်အထည်ဖော်ဆောင်ရွက်ခြင်း။</li> </ul>	<p><b>မပြောပလောက်</b></p>

**ဆက်စပ်ထိခိုက်မှုဆန်းစစ်ခြင်း**

စီမံကိန်းနယ်မြေဧရိယာကို အခြားကုမ္ပဏီများမှ ဆောင်ရွက်နေသည့် ရေနံ နှင့် သဘာဝဓာတ်ငွေ့ လုပ်ကွက်များဖြင့် ဝန်းရံထားပါသည်။ သို့ရာတွင် ယခုအစီရင်ခံစာရေးသားနေသောကာလအထိ ဤလုပ်ကွက်များအတွင်း စီမံကိန်းလုပ်ငန်းများ၏ အချိန်နှင့် ထပ်တူကျနိုင်ခြေရှိသော အခြားရေနံ နှင့် သဘာဝဓာတ်ငွေ့လုပ်ငန်းဆောင်ရွက်မှုများ ရှိမနေပါ။

စီမံကိန်းနယ်မြေဧရိယာအနီးတွင် တည်ရှိနေပြီးသောရဲတံခွန်ပလက်ဖောင်းရှိပြီး၊ PCML သည် ရေနံ ရှာဖွေတူးဖော်မှုအချို့ နှင့် 3D ဆိုက်စမစ်တိုင်းတာမှုများကိုလည်း စီစဉ်လျက် ရှိပါသည်။ ၎င်းလုပ်ငန်းများနှင့် ထပ်တူကျနိုင်ခြေရှိပါသည်။

ဖြစ်ပေါ်လာနိုင်သည့် အဓိကသက်ရောက်မှုများမှာ ငါးဖမ်းလုပ်ငန်းအပေါ်ယာယီအနှောင့်အယှက် ဖြစ်ပေါ်ခြင်းဖြစ်ပြီး၊ အထူးသဖြင့် စီမံကိန်းနယ်မြေဧရိယာရှိ ကမ်းလွန်ရေတိမ်ပိုင်းအနီး ရှိနေနိုင်သော ငါးဖမ်းနေရာများအတွင်း ငါးဖမ်းဆောင်ရွက်သူများအပေါ် ဖြစ်ပါသည်။ အထက်ပါအပိုင်းများ၌ ဖော်ပြထားသည့် လျှော့ချရေးအစီအမံများသည် နိုင်ငံတကာ အလေ့အကျင့်ကောင်းစံနှုန်းများဖြစ်ပြီး၊ တူးဖော်ရေး လုပ်ငန်းများအားလုံးဆောင်ရွက်ရာ ကာလအတွင်း ကျင့်သုံးသွားမည် ဖြစ်ပါသည်။

လျှော့ချရေးအစီအမံ စံနှုန်းများနေရာတကျရှိနေခြင်းဖြင့်၊ အဏ္ဏဝါမျိုးစိတ်များအပေါ် သက်ရောက်နိုင် ခြေမှာ သာမည အဆင့်သာ ဖြစ်ပေါ်မည် ဖြစ်ပါသည်။

ယာဉ်များမှ ရေနံများ၏ ဆက်စပ်ယိုဖိတ်မှုများအတွက် အလားအလာမှာ ဖြစ်ပေါ်နိုင်ခြေနည်းပြီး၊ ရေယာဉ်နှစ်စင်းလုံးမှာ သန့်စင်သောလောင်စာများကို အသုံးပြုပြီး ၎င်းမှာ ရေရောလွယ်ပြီး ပျံ့နှံ လွယ်ပါသည်။ ထို့ပြင်၊ လျှော့ချရေးအစီအမံများအကောင်အထည်ဖော်ဆောင်ရွက်ခြင်းဖြင့်၊ သက် ရောက်မှုများသည် သာမည အဆင့်သာ သတ်မှတ်ထားပါသည်။

လူမှုသက်ရောက်မှုများအကြည့်လျှင်၊ စီမံကိန်းနယ်မြေဧရိယာသည် ရေယာဉ်ပတ်ပတ်လည်တွင် ဘေးကင်းရေးဇုန်အဖြစ် ကန့်သတ်သွားမည်ဖြစ်ပြီး၊ တူးဖော်ရေးစင်ပတ်ပတ်လည်တွင် ပုံသေဇုန်တစ်ခုရှိသွားမည် ဖြစ်ပါသည်။ ထို့ကြောင့် ငါးဖမ်းဆောင်ရွက်သူများကို ၎င်းဧရိယာမှ ယာယီ ရွှေ့ဆိုင်းသွားမည့် နေရာမှာ သေးငယ်မည် ဖြစ်ပါသည်။ လျှော့ချရေးအစီအမံများကို စနစ်တကျ ဆောင်ရွက်ခြင်းဖြင့်၊ ဆိုက်စမစ်တိုင်းတာမှုများမှ လူမှုသက်ရောက်မှုများသည် ငါးဖမ်းဆောင်ရွက် သောနေရာတွင်သာ ကွက်၍ဖြစ်ပေါ်နိုင်ပြီး၊ သဘာဝအရ ယာယီ (ရက်အနည်းငယ်) သာ ဖြစ်ပါ သည်။ ထို့ကြောင့်၊ ငါးဖမ်းလုပ်ငန်းများအပေါ် သက်ရောက်မှုမှာ သာမည အဆင့်ဖြစ်ပြီး၊ အသက် မွေးဝမ်းကျောင်းများအပေါ် သက်ရောက်မှုမှာ မပြောပလောက်သော အဆင့်သာ ဖြစ်ပေါ်မည် ဖြစ်ပါ သည်။

**ပတ်ဝန်းကျင်ဆိုင်ရာ စီမံခန့်ခွဲမှုအစီအစဉ်**

စီမံကိန်းကို PCML HSE စီမံခန့်ခွဲမှုမူဝါဒ၊ ထုတ်လုပ်မှုအပေါ်ခွဲဝေခံစားရေးစာချုပ် (PSC)၊ မြန်မာနိုင်ငံ ကြီးကြပ်ရေးဆိုင်ရာ သတ်မှတ်ချက်များ၊ နှင့် နိုင်ငံတကာ ကွန်ဗင်းရှင်းများ၊ စံနှုန်းများ နှင့် လမ်းညွှန် ချက်များနှင့်အညီ ဆောင်ရွက်လျက်ရှိပါသည်။

စီမံကိန်း၏ ပတ်ဝန်းကျင် နှင့် လူမှု စံနှုန်းသတ်မှတ်ချက်များဆိုင်ရာ အကျဉ်းကို ဇယား ၁.၆ တွင် တင်ပြထားပါသည်။

ဇယား ၁.၆ စီမံကိန်းဆိုင်ရာ ပတ်ဝန်းကျင် နှင့် လူမှု စံနှုန်းများ

ပါရာမီတာ	စံနှုန်း	သတ်မှတ်ချက်
တူးဖော်မှု အရည်များ နှင့် ကျစ်စာများ (ရေတွင်မပျော်ဝင်သော တူးဖော်မှုအရည်)	NEQ နှင့် IFC EHS လမ်းညွှန်စံနှုန်းများ (၂၀၁၅)	<ul style="list-style-type: none"> <li>ရေတွင်မပျော်ဝင်သောတူးဖော်မှုအရည်၊ ပြန်လည်ဖြည့်သွင်းခြင်း သို့မဟုတ် သင်္ဘောမှကုန်းမြေသို့၊ ပင်လယ်သို့ မစွန့်ထုတ်ခြင်း</li> <li>ဆီပါဝင်မှုသည် ခြောက်နေသောကျစ်စာများမှ ၆.၉% ထက် လျော့နည်းရမည် (IFC ၂၀၁၅ EHS လမ်းညွှန်ချက်များ အရ)</li> <li>Stock barite တွင် ပြဒါး ၁ mg/kg အလေးချိန်ရှိခြင်း၊</li> <li>Stock barite တွင် ကက်ဒမီယမ် ၃ mg/kg အလေးချိန်ရှိခြင်း၊</li> <li>ပင်လယ်ရေမျက်နှာပြင်အောက် အနည်းဆုံး ၁၅ မီတာရှိ ရေလုံသောအခန်းမှတစ်ဆင့် စွန့်ပစ်ခြင်း။</li> </ul> <p>(မှတ်ချက် - ECD သည် ခွင့်ပြုထားသော ကမ်းလွန်ရှိ ရေနံနှင့် သဘာဝဓာတ်ငွေ့ အတွက် IFC EHS လမ်းညွှန်ချက်များ (၂၀၁၅) တွင် တင်ပြထားသည့် ကန့်သတ်ချက်များနှင့် ရှာဖွေတူးဖော်မှုအတွက် လမ်းညွှန်ချက်ထက် ကျော်လွန်မှုကို လွတ်ငြိမ်းခွင့် ပေးပါသည်။)</p>
တူးဖော်မှု အရည်များ နှင့် ကျစ်စာများ (ရေအခြေပြု တူးဖော်မှု အရည်)	NEQ နှင့် IFC EHS လမ်းညွှန်စံနှုန်းများ (၂၀၁၅)	<ul style="list-style-type: none"> <li>ရေအခြေပြုတူးဖော်မှုအရည်၊ ပြန်လည်ဖြည့်သွင်းခြင်း သို့မဟုတ် သင်္ဘောမှကုန်းမြေသို့၊ ပင်လယ်သို့ မစွန့်ထုတ်ခြင်း</li> <li>ရေအခြေပြုတူးဖော်မှုအရည်များ နှင့် ကျစ်စာများ ပြန်လည်ဖြည့်သွင်းခြင်း သို့မဟုတ် သင်္ဘောမှကုန်းမြေသို့ ။ အောက်ပါတို့မှလွဲ၍ ပင်လယ်သို့ မစွန့်ထုတ်ခြင်း -</li> <li>Stock barite တွင် ပြဒါး ၁ mg/kg အလေးချိန်ရှိခြင်း၊</li> <li>Stock barite တွင် ကက်ဒမီယမ် ၃ mg/kg အလေးချိန်ရှိခြင်း၊</li> <li>ကလိုရိုက်ပါဝင်မှု အများဆုံးသည် အနီးဝန်းကျင်ရှိ ရေချို သို့မဟုတ် ငန်ရိရိရေ ပါဝင်မှု လေးဆထက် နိမ့်ရမည် ဖြစ်ပါသည်။</li> <li>ပင်လယ်ရေမျက်နှာပြင်အောက် အနည်းဆုံး ၁၅ မီတာရှိ ရေလုံသောအခန်းမှတစ်ဆင့် စွန့်ပစ်ခြင်း။</li> </ul>

ပါရာမီတာ	စံနှုန်း	သတ်မှတ်ချက်
<p>ပြီးမြောက်ခြင်း နှင့် ရေနံတွင် ဆိုင်ရာ အရည်များနှင့်ပတ်သက်သည့်လုပ်ငန်း</p>	<p>NEQ နှင့် IFC EHS လမ်းညွှန်ခံ ဖြစ်မှုများ (၂၀၁၅)</p>	<ul style="list-style-type: none"> <li>• သဘောမကုန်းမြေသို့ သို့မဟုတ် ပြန်လည်ဖြည့်သွင်းခြင်း။ အောက်ပါတို့မှလွဲ၍ ပင်လယ်သို့ မစွန့်ထုတ်ခြင်း -</li> <li>• ဆီနှင့် ချောဆီများစွန့်ထုတ်ရန် အများဆုံး တစ်ရက်၊</li> <li>• ၄၂mg/l ထက် မကျော်လွန်သင့်၊ ပုံမှန် ရက်ပေါင်း ၃၀ သည် ၂၉ mg/l ထက်မကျော်လွန်သင့်</li> <li>• ၅ f ၏ pH နှင့် အထက် ရရှိရန် အာနိသင်ပျက်ပြယ်ခြင်း</li> </ul>
<p>ထုတ်လွှတ်အခိုးအငွေ့</p>	<p>MAPROL နေ ဘက်ဆက်တွဲ-၆</p>	<ul style="list-style-type: none"> <li>• သဘောများမှ လေထုညစ်ညမ်းမှုကာကွယ် (နောက်ဆက်တွဲ-၆) ရန် ရေယာဉ်များသည် သက်ဆိုင်ရာ MARPOL ၇၃ / ၇၈ ကြီးကြပ် ရေးလုပ်ထုံးများနှင့် အညီ ဖြစ်မည် ဖြစ်ပါသည်။</li> <li>• ဆာလဖာပါဝင်မှုနည်းသည့်လောင်စာ (၃.၅% m/m ထက်မ ကျော် လွန်သည့် ဆာလဖာပါဝင်မှု) ကို ရရှိလျှင်၊ အသုံးပြုမည် ဖြစ်ပါသည်။</li> <li>• ဆိုက်စမစ်ရေယာဉ်၊ ထောက်ပံ့ရေးရေယာဉ် နှင့် ကင်းထောက် ရေယာဉ် တို့သည် ရေယာဉ်အမျိုးအစားအပေါ် မူတည်၍ အပြည်ပြည်ဆိုင်ရာလေထု ညစ်ညမ်းမှုကာကွယ်ရေး (IAPP) သက်သေခံ လက်မှတ်ကို လိုက်နာဆောင်ရွက်မည် ဖြစ်ပါ သည်။</li> </ul>
<p>မိလ္လာ အညစ်အကြေး ထုတ်လွှတ်မှု</p>	<p>MARPOL နေ ဘက်ဆက်တွဲ-၄ / NEQ လမ်းညွှန်ခံ ဖြစ်မှုများ</p>	<ul style="list-style-type: none"> <li>• စီမံကိန်းရေယာဉ်များသည် သက်ဆိုင်ရာ MARPOL သတ်မှတ် ချက်များနှင့်အညီ ဖြစ်မည် ဖြစ်ပါသည်။ ၎င်းတွင် အနီးဆုံး မြေပြင်မှ ရေမိုင် ၃ မိုင်ထက် ကွာဝေးသည့် အကွာနေ ရာတွင် ခွင့်ပြုထား သောစနစ်တစ်ရပ် အသုံးပြုလျက် ပိုးသတ်ထား သော မိလ္လာ ရေဆိုးများ ကို သဘောမှ စွန့်ထုတ်သောအခါ သို့မဟုတ် လည်ပတ်ရေးအတွက် ခွင့်ပြုထားသော မိလ္လာရေဆိုး ပြုပြင်မှု စက်ရုံတစ်ခု သဘောပေါ်တွင် ရှိနေသောအခါတို့မှ လွဲ၍၊ မြေပြင် ထားသည့် မိလ္လာရေဆိုးများကို ပင်လယ် သို့စွန့်ထုတ်မှုကို တားမြစ်ခြင်း၊</li> <li>• ပိုးသတ်မထားသော မိလ္လာရေဆိုးများကို အနီးဆုံးကမ်းမှ ရေမိုင် ၁၂ မိုင်ထက် ကွာဝေးသည့် အကွာနေရာတွင် စွန့်ထုတ် ရမည် ဖြစ်ပါ သည်။</li> <li>• ရေယာဉ်မှ ရေမိုင် ၄ မိုင်ထက်ဝေးသည့်နေရာတွင် သွားလာ ရောက် ရှိနေမှသာ မိလ္လာ ရေဆိုးစွန့်ထုတ်မှုကို ဆောင်ရွက်မည် ဖြစ်ပါသည်။</li> <li>• ရေယာဉ်အမျိုးအစားနှင့် သင့်လျော်မှုအပေါ် မူတည်၍ အပြည် ပြည်ဆိုင်ရာမိလ္လာညစ်ညမ်းမှုကာကွယ်ခြင်း (ISPP) လက်မှတ် နှင့် အပြည်ပြည်ဆိုင်ရာ ရေနံဆီညစ်ညမ်းမှု ကာကွယ်ခြင်း (IOPP) လက်မှတ်တို့ကို လိုအပ်သွားမည် ဖြစ်ပါသည်။</li> </ul>

ပါရာမီတာ	စံနှုန်း	သတ်မှတ်ချက်
<p>စွန့်ပစ်ပစ္စည်း စွန့်ပစ်မှု (အစားအစာ စွန့်ပစ်ပစ္စည်းအပူအဝင်)</p>	<p>MARPOL နေဘက်ဆက်တွဲ-၁ နှင့် ၅</p>	<ul style="list-style-type: none"> <li>• ရေယာဉ်များသည် MARPOL နောက်ဆက်တွဲ ၁ ကို လေးစားလိုက်နာ ဆောင်ရွက်သွားမည် ဖြစ်ပါသည်။ စွန့်ပစ်ရေဆီပါဝင်မှုသည် ၁၅ ppm ကို မကျော်လွန်သင့်ပါ။</li> <li>• MARPOL နောက်ဆက်တွဲ ၅ သတ်မှတ်ချက်များအရ ယေဘုယျ စွန့်ပစ်ပစ္စည်း များ (အစားအစာများမပါဝင်) ကို ပင်လယ် ထဲသို့ စွန့်ပစ်သွားမည် မဟုတ်ပါ။</li> <li>• မီးလောင်လွယ်သော စွန့်ပစ်ပစ္စည်းများကို သီးသန့်ခွဲ ထားပြီး ရေယာဉ်ပေါ် ပါရှိသော မီးရှို့စက်ဖြင့် ရှင်းထုတ်မည် ဖြစ်ပါသည် (MARPOL နောက်ဆက်တွဲ-၅ ပါသတ်မှတ်ချက် များနှင့်အညီ)။ ကမ်းမှ ၃ nm အကွာအဝေးထက်နီးသည့် နေရာများတွင် အစား အသောက် စွန့်ပစ်ပစ္စည်းများကို စွန့်ပစ်ရန် ခွင့်ပြုမည် မဟုတ်ပါ။ ကမ်းမှ ၃ nm အထက် နှင့် ၁၂ nm အောက်ကွာဝေးသော နေရာများတွင် နူးအောင်ပြုလုပ်ရန် လိုအပ် ပါသည်။</li> <li>• အန္တရာယ်ရှိသော စွန့်ပစ်ပစ္စည်းများကို ရေယာဉ်ပေါ်ရှိ အမည် တပ်ထားသည့် သင့်လျော်သော ကွန်တိန်နာများတွင် သိုလှောင် သွားမည် ဖြစ်ပါသည်။</li> <li>• အန္တရာယ်ရှိသော စွန့်ပစ်ပစ္စည်းများသိုလှောင်မှုကို ၎င်းတို့၏ ပစ္စည်းအချက်အလက် စာရွက် (MSDS) နှင့်အညီ ရှေးချယ် သတ်မှတ်သွားမည် ဖြစ်ပါသည် (MARPOL နောက်ဆက်တွဲ-၅ ပါသတ်မှတ်ချက်များနှင့်အညီ)။ အန္တရာယ်ရှိသော စွန့်ပစ်ပစ္စည်း များကို ရေယာဉ်ဖြင့် သင့်လျော်သောကမ်းရှိ အခြေစိုက်နေရာသို့ ပြန်လည် ပို့ဆောင်မည် ဖြစ်ပြီး၊ လိုင်စင်ရ စွန့်ပစ်ပစ္စည်း ကန်ထရိုက် တာမှ လိုင်စင်ရစွန့်ပစ်ရေး အဆောက်အအုံနေရာသို့ ပို့ဆောင်မည် ဖြစ်ပါသည် (MARPOL နောက်ဆက်တွဲ-၅ ပါသတ်မှတ်ချက်များနှင့်အညီ)။</li> </ul>
<p>ယိုဖိတ်မှုများ</p>	<p>MARPOL နေဘက်ဆက်တွဲ-၁</p>	<p>(သင့်လျော်သော) ကမ်းလွန်ရေယာဉ် လောင်စာဖြည့်ခြင်း ဆိုင်ရာ လုပ်ထုံးစနစ်များအပါအဝင်၊ ထောက်ပံ့ရေး ရေယာဉ်များ လည်ပတ်မှု စံနှုန်းများ လုပ်နည်းစနစ်များကို ပြင်ဆင် ရေးဆွဲပြီး၊ အကောင်အထည်ဖော် ဆောင်ရွက်သွားမည် ဖြစ်ပါသည်။ သင်္ဘော ပေါ်ရှိ ဆီညစ်ညမ်းမှုအရေးပေါ် အစီအစဉ်များ (SOPEPs) ကို ပြင်ဆင်အကောင်အထည်ဖော် ဆောင်ရွက် သွားမည် ဖြစ်ပါသည်။</p>

အဏ္ဏပါဆိုက်စမစ်တိုင်းတာမှုအတွက် EMP အကောင်အထည်ဖော်ဆောင်ရွက်မှုအတွက် ခြုံငုံအသုံးစရိတ်မှာ အမေရိကန်ဒေါ်လာ ၅ သောင်းခန့်ရှိမည်ဟု ခန့်မှန်းထားပါသည်။ စီမံခန့်ခွဲမှုနှင့် လျှော့ချရေးအစီအမံအမြောက်အများမှာ တူးဖော်ရေးအစီအစဉ်များ၏ လည်ပတ်ရေးကုန်ကျစရိတ်များ၏ အစိတ်အပိုင်းအဖြစ် စွဲကိုင်ထားသော ထိန်းချုပ်ရေးတို့ ဖြစ်ပါသည်။

စီမံကိန်းမှ သိသာထင်ရှားသော ထိခိုက်မှုများမရှိနိုင်သဖြင့် (EIA အစီရင်ခံစာ၏ အခန်း ၆ အရ)၊ အောက်ပါတို့အတွက် သီးသန့်စီမံခန့်ခွဲမှုအစီအစဉ်များ မလိုအပ်တော့ပါ -

- လေထု - လေထုသို့ထုတ်လွှတ်မှုများသည် သိသာထင်ရှားသည့်သက်ရောက်မှုကိုဖြစ်ပေါ်မည် မဟုတ်ပါ။
- ဆူညံသံ - ဆူညံသံထုတ်လွှတ်မှုများသည် သိသာထင်ရှားသည့်သက်ရောက်မှုကို ဖြစ်ပေါ်မည် မဟုတ်ပါ။
- ရေအရည်အသွေး - တူးဖော်မှုကျစ်စာများစွန့်ထုတ်ခြင်းသည် သိသာထင်ရှားသည့် သက်ရောက်မှုကို ဖြစ်ပေါ်မည် မဟုတ်ပါ။
- ဇီဝမျိုးစုံမျိုးကွဲ - ထိခိုက်လွယ်နေရာများမှ (ကီလိုမီတာ ၁၀၀ ကျော်) ဝေးကွာ သဖြင့်၊ ဇီဝမျိုးစုံမျိုးကွဲသို့ အရေးပါသည့်သက်ရောက်မှုများရှိမည် မဟုတ်ပါ။
- နန်း နှင့် တူးဖော်မှုကျစ်စာများ - တူးဖော်မှုကျစ်စာများမှ အရေးပါသည့်သက်ရောက်မှုများ ရှိမည် မဟုတ်ပါ။ တူးဖော်မှုကျစ်စာများစွန့်ပစ်မှုတို့ကို NEQ နှင့် MARPOL သတ်မှတ်ချက် များနှင့်အညီ စောင့်ကြပ်ကြည့်ရှုစစ်ဆေးသွားမည်ဖြစ်ခြင်း၊ နှင့်
- ရပ်ရွာပြည်သူ - စီမံကိန်းသည် အနီးဆုံး လူနေထိုင်သည့်နေရာ နှင့် ရပ်ရွာများမှ ကီလိုမီတာ ၁၄၀ အကွာတွင် တည်ရှိသောကြောင့်၊ သက်ရောက်မှုရှိမည် မဟုတ်ပါ။

သို့ရာတွင် လုပ်ငန်းစံနှုန်းလုပ်ထုံးလုပ်နည်းများအရ၊ **အရေးပေါ်တုံ့ပြန်မှု နှင့် စွန့်ပစ်ပစ္စည်း** အတွက် စီမံခန့်ခွဲမှုအစီအစဉ်များကို ပြင်ဆင်ထားပါသည်။

ယခုလုပ်ငန်းတွင် လည်ပတ်ရေးကာလအဆင့်သာဖြစ်သဖြင့်၊ ယခုကဲ့သို့တိုတောင်းသော တူးဖော်ရေးအစီအစဉ်အတွက်၊ အကြိုတည်ဆောက်ရေး၊ တည်ဆောက်ရေး၊ လည်ပတ်ရေး နှင့် ရပ်စဲရေးကာလ အဆင့်များအတွက် သီးသန့်စီမံခန့်ခွဲမှုအစီအစဉ်များမလိုအပ်သွားမည် မဟုတ်ပါ။

PCML သည် တူးဖော်ရေးအစီအစဉ် ပြီးမြောက်ပြီးနောက်၊ စောင့်ကြပ်ကြည့်ရှုစစ်ဆေးမှု အစီရင်ခံစာကို MOGE နှင့် MONREC တို့ထံသို့ တင်သွင်းသွားမည် ဖြစ်ပါသည်။ ပတ်ဝန်းကျင် စောင့်ကြပ်ကြည့်ရှုစစ်ဆေးမှုအစီရင်ခံစာ၌ ဇယား ၁.၇ တွင် စာရင်းပြုစုထားသည့် အကြောင်းအရာများ ပါဝင်သွားမည် ဖြစ်ပါသည်။ တူးဖော်ရေးအစီအစဉ်၏ ကာလမှာ အကန့်အသတ် (၇ လ မှ ၈ လ) ဖြစ်ပြီး သိသာထင်ရှားသော အကျိုးသက်ရောက်မှုနည်းပါးလှသည် ဖြစ်သဖြင့်၊ စီမံကိန်း အတွက် နောက်ထပ် စောင့်ကြပ်ကြည့်ရှုစစ်ဆေးမှုတို့ လိုအပ်သွားမည် မဟုတ်ပါ။

စီမံကိန်းလုပ်ငန်း / ပတ်ဝန်းကျင်ဆိုင်ရာ ကဏ္ဍ	စောင့်ကြပ်ကြည့်ရှုစစ်ဆေးရေး အစီအမံများ	အစီရင်ခံခြင်း
ထုတ်လွှတ်အခိုးအငွေ့များ	ပုံမှန် လေထုထုတ်လွှတ်မှုများကို ဖန်လုံအိမ် ဓာတ်ငွေ့ (CO2/SOx) အပေါ် အလေး ပေးလျက် စောင့်ကြည့်သွားမည် ဖြစ်ပါသည်။	လစဉ် ထုတ်လွှတ်မှုများ မှတ်တမ်း
စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှု	ထွက်ရှိသည့် စွန့်ပစ်ပစ္စည်းအမျိုးအစားများ နှင့် ၎င်းကိုမည်သို့ စွန့်ပစ်သည် / စွန့်ထုတ်သည် စသည်အကြောင်း။	လစဉ် စွန့်ပစ်ပစ္စည်းများ စာရင်း
ရေ အရည်အသွေး	ဟိုက်ဒရိုကာဗွန်ပါဝင်မှု၊ သတ္တုများ နှင့် ဩဇာဓာတ်တို့ အပါအဝင်၊ ရေ အရည်အသွေးကို အခန်း (၅.၂) တွင်ဖော်ပြထားသည့် တူညီသောပါရာမီတာများ အရ တိုင်းတာသွားမည် ဖြစ်ပါသည်။ တွင်းတူးလုပ်ငန်း စတင်ပြီး၊ ၂-လထက် မကျော်လွန်သော ကာလ အတွင်း၊ တွင်းစင်အနီး ၄-နေရာတွင် စောင့်ကြပ်ကြည့်ရှုစစ်ဆေးသွားမည်။ စွန့်ထုတ်မှုများသည် မူလအခြေခံ အချက်အလက်များနှင့် EQEG စံနှုန်း အတွင်း လိုက်နာ မှုရှိခဲ့ပါက၊ စောင့်ကြပ်ကြည့်ရှုမည် အကြိမ် အရေအတွက် ကိုလျော့ချသွားမည်။	တူးဖော်မှုအလွန် ပတ်ဝန်းကျင်စောင့်ကြည့် ရေး အစီရင်ခံစာ
အဏ္ဏဝါ နုန်း	အမှုန်အရွယ်အစား၊ ဟိုက်ဒရိုကာဗွန်ပါဝင်မှု၊ သတ္တုများ နှင့် ဩဇာဓာတ်တို့အပါအဝင်၊ အဏ္ဏဝါ နုန်း နှင့် ကြမ်းပြင်နေသက်ရှိများ အရည်အသွေးတို့က အခန်း (၅.၂.၁) တွင်ဖော်ပြထားသည့် တူညီသောပါရာမီတာများ အရ တိုင်းတာသွားမည် ဖြစ်ပါသည်။ တွင်းတူးလုပ်ငန်း စတင်ပြီး၊ ၂-လထက် မကျော်လွန်သော ကာလ အတွင်း၊ တွင်းစင်အနီး ၄-နေရာတွင် စောင့်ကြပ်ကြည့်ရှုစစ်ဆေးသွားမည်။ စွန့်ထုတ်မှုများသည် မူလအခြေခံ အချက်အလက်များနှင့် EQEG စံနှုန်း အတွင်း လိုက်နာ မှုရှိခဲ့ပါက၊ စောင့်ကြပ်ကြည့်ရှုမည် အကြိမ် အရေအတွက် ကိုလျော့ချသွားမည်။	တူးဖော်မှုအလွန် ပတ်ဝန်းကျင်စောင့်ကြည့် ရေး အစီရင်ခံစာ
အဏ္ဏဝါကြမ်းပြင်နေ သက်ရှိများ	အခန်း(၅.၂.၁) တွင် ဖော်ပြထားသော တူညီသည့် နည်းစဉ်အတိုင်း နုန်းနမူနာအတွင်း မျိုးစိတ်များ၊ မျိုးစိတ်ဝင်များ အတွက် အဏ္ဏဝါကြမ်းပြင်နေ လှေးများ ကို နမူနာ ကောက်ယူသွားမည်	တူးဖော်မှုအလွန် ပတ်ဝန်းကျင်စောင့်ကြည့် ရေး အစီရင်ခံစာ

ဖြစ်ရပ်များအစီရင်ခံခြင်း	ပတ်ဝန်းကျင် နှင့် လူမှုဆိုင်ရာ အသေးစိတ်အချက်များ ဖြစ်ရပ်များ	ဖြစ်ရပ်များအစီရင်ခံစာ ပုံစံဖောင်များ
မတော်တဆ ယိုဖိတ်မှုများ နှင့် ယိုစိမ့်မှုများ	ဘေးကင်းလုံခြုံရေးဆိုင်ရာ မှတ်တမ်း	ဘေးကင်းလုံခြုံရေးဆိုင်ရာ မှတ်တမ်း
လိုက်နာမှုမရှိသည်များ အစီရင်ခံခြင်း	EMP နှင့် ကိုက်ညီမှုမရှိသည်များ အစီရင်ခံခြင်း	စစ်ဆေးခြင်းဆိုင်ရာ စာရွက်မှတ်တမ်းများ
စွန့်ထုတ်အရည် စောင့်ကြပ် ကြည့်ရှုခြင်း	NADF နှင့် WBDF စွန့်ထုတ်မှု ကို EQEG စံနှုန်း အတွင်း လိုက်နာစေရန် တွင်းတူး အရည်စွန့် ထုတ်သည့် ပမာဏနှင့် အမျိုးအစားကို စမ်းသပ်စစ်ဆေးသွားမည်။	တူးဖော်မှုအလွန် ပတ်ဝန်းကျင်စောင့်ကြည့် ရေး အစီရင်ခံစာ
အဏ္ဏဝါသက်ရှိနှင့် မန် (မွှားကောင်) တွေ့ ရှိမှု	လုပ်ငန်းဆောင်ရွက်နေစဉ်အတွင်း အဏ္ဏဝါနို့တိုက် သတ္တဝါများနှင့် လိပ်များ တွေ့ ရှိပါက မှတ်သားထားမည်	တူးဖော်မှုအလွန် ပတ်ဝန်းကျင်စောင့်ကြည့် ရေး အစီရင်ခံစာ

**၁.၈ အများပြည်သူနှင့် တိုင်ပင်ဆွေးနွေးမှု နှင့် ထုတ်ဖော်တင်ပြချက်**

EIA တိုင်ပင်ဆွေးနွေးမှုဆိုင်ရာအစည်းအဝေးများကို တနင်္သာရီတိုင်းဒေသကြီးအဆင့် အမျိုးမျိုးသော သက်ဆိုင်ရာ သက်ဆိုင်သူများနှင့် ကျင်းပခဲ့ပါသည်။ ဆွေးနွေးတိုင်ပင်မှုတို့သည် ထိခိုက်ခံစားရနိုင် သည့် လူပုဂ္ဂိုလ်များ၊ ဖြစ်ပေါ်နိုင်သည့် အချက်အလက်ကွာဟချက်များ နှင့် EIA အစီရင်ခံစာ၌ မည် သို့ထည့်သွင်းဆောင်ရွက်သွားရမည်နှင့်ပတ်သက်သော အချက်အလက်များကို ရရှိစေရန် စီမံကိန်း အတွက် အထောက်အကူဖြစ်စေခဲ့ပါသည်။ EIA တိုင်ပင်ဆွေးနွေးမှုတွင် ကျေးရွာသူ/ သားများ အပါအဝင်၊ ငါးလုပ်ငန်းဦးစီးဌာန (DOF)၊ တနင်္သာရီတိုင်းဒေသကြီး ဝန်ကြီးချုပ်၊ တိုင်းဒေသ ကြီးအ ဆင့် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာန (ECD)၊ နှင့် အထွေထွေအုပ်ချုပ်ရေးဦးစီးဌာန (GAD)၊ ရပ်ရွက်အုပ်ချုပ်ရေးမှူးများ၊ စီမံကိန်းဦးစီးဌာန၊ ဒေသခံရပ်ရွာ နှင့် ငါးဖမ်းလုပ်ငန်း ကိုယ်စား လှယ်တို့ နှင့် မျက်နှာချင်းဆိုင်အစည်းအဝေးများပါဝင်ခဲ့ပါသည်။ အစည်းအဝေးတစ်ခုချင်းစီ၏ နေ့စွဲ၊ အချိန်၊ နေရာ၊ သက်ဆိုင်သူများ နှင့် ရည်ရွယ်ချက်များကို ဇယား ၁.၈ တွင် ဖော်ပြထားပါသည်။

**ဇယား ၁.၈ ဆောင်ရွက်ခဲ့သည့် တိုင်ပင်ဆွေးနွေးမှုလုပ်ငန်းများ**

နေ့စွဲ၊ အချိန်၊ နေရာ	သက်ဆိုင်သူများ
၂၀၁၈ မတ်လ ၃၀၊ တနင်္သာရီတိုင်းဒေသကြီး အစိုးရအဖွဲ့ရုံး	လျှပ်စစ် နှင့် စွမ်းအင် ဝန်ကြီး၊ စိုက်ပျိုးရေး၊ မွေးမြူရေး နှင့် ဆည်မြောင်းဝန်ကြီးဌာနနှင့် တွေ့ဆုံခြင်း
၂၀၁၈ ဧပြီလ ၂၊ ဇေယျာထက်စံဟိုတယ်၊ ထားဝယ်	GAD၊ ECD၊ DOF၊ NGOs၊ မီဒီယာ၊ နိုင်ငံရေးပါတီများ နှင့် တွေ့ဆုံခြင်း
၂၀၁၈ ဧပြီလ ၃၊ ဂရမ်းဂျိတ်ဟိုတယ်၊ မြိတ်	GAD၊ ECD၊ DOF၊ DOA၊ INGOs နှင့် NGOs၊ မီဒီယာ နှင့် နိုင်ငံရေးပါတီများ နှင့် တွေ့ဆုံခြင်း
၂၀၁၈ ဩဂုတ်လ ၂၃၊ သရက်ချောင်း GAD ရုံး	GAD၊ DOF၊ ကျေးရွာခေါင်းဆောင်များ၊ ကျေးရွာသူ/သားများနှင့် တွေ့ဆုံခြင်း

နေ့စွဲ၊ အချိန်၊ နေရာ	သက်ဆိုင်သူများ
၂၀၁၈ ဩဂုတ်လ ၂၄၊ လောင်းလုံ GAD ရုံး	GAD၊ ကျေးရွာခေါင်းဆောင်များ၊ ငါးဖမ်းဆောင်ရွက်သူများ၊ ကျေးရွာသူ/သားများနှင့်တွေ့ဆုံခြင်း
၂၀၁၈ ဩဂုတ်လ ၂၄၊ ဇေယျာထက်စံဟိုတယ်၊ ထားဝယ်	ECD၊ DoF၊ သက်ဆိုင်ရာ ဌာနများ၊ မီဒီယာ၊ CSOs၊ ကျေးရွာခေါင်းဆောင်များနှင့် တွေ့ဆုံခြင်း
၂၀၁၈ ဩဂုတ်လ ၂၆၊ ဂရမ်းဂျိတ်ဟိုတယ်၊ မြိတ်	ECD၊ DoF၊ သက်ဆိုင်ရာ ဌာနများ၊ MFF၊ မီဒီယာ၊ CSOs၊ ကျေးရွာခေါင်းဆောင်များ နှင့် ငါးဖမ်းဆောင်ရွက်သူများနှင့် တွေ့ဆုံခြင်း

အောက်ပါအပိုင်း၌ အများပြည်သူနှင့်တိုင်ပင်ဆွေးနွေးမှုအစည်းအဝေးများအတွင်း မေးမြန်းခဲ့သည့် အဓိကကိစ္စရပ်များကို အကျဉ်းဖော်ပြထားပြီး၊ ဇယား ၁.၉ တွင် ၎င်းကိစ္စရပ်များနှင့်စပ်လျဉ်းသည့် တုံ့ပြန်ဖြေကြားချက်များကို တင်ပြထားပါသည်။

ဇယား ၁.၉ EIA အတွက် အများပြည်သူနှင့် တိုင်ပင်ဆွေးနွေးမှုကာလအတွင်း မေးမြန်းခဲ့သည့် အဓိကမေးခွန်းများ

လက်ခံရရှိသည့် မှတ်ချက်များ	အစည်းအဝေးတွင် မှတ်ချက်များအပေါ် တုံ့ပြန်မှုများ	EIA လေ့လာချက် အတွက် ထည့်သွင်းစဉ်းစားမှု
<p><u>အလှူဝါပတ်ဝန်းကျင်အပေါ် သက်ရောက်မှုများ</u></p> <p>တူးဖော်ရေးလုပ်ငန်းများမှ စွန့်ပစ်ပစ္စည်းများစွန့်ထုတ်ခြင်းနှင့် ပတ်သက်သည့် မေးခွန်းများ</p>	<p>PCML သည် စီမံကိန်းလုပ်ငန်းများအားလုံးကို မြန်မာနိုင်ငံ အမျိုးသား ထုတ်လွှတ်မှု အရည်အသွေး လမ်းညွှန်ချက်နှင့် အညီ ဆောင်ရွက်သွားမည် ဖြစ်ပါသည်။</p> <p>စွန့်ထုတ်မှုများမပြုလုပ်မီ မတူညီသော စွန့်ပစ်ပစ္စည်းများကို အမျိုးအစားခွဲပြီး ပြုပြင်ရမည် ဖြစ်ပါသည်။ တူးဖော်မှုကျစ်စာများကို ယာဉ်ပေါ်တွင် မစွန့်ပစ်နိုင်လျှင်၊ ၎င်းတို့ကို စွန့်ပစ်နိုင်သောကုန်းမြေသို့ သယ်ယူသွားမည် ဖြစ်ပါသည်။</p>	<p>EIA အစီရင်ခံစာသည် စီမံကိန်းလုပ်ငန်းများကြောင့် စီစဉ် ထားသည့် စွန့်ပစ်ပစ္စည်းများထွက်ရှိမှု၏ ဖြစ်ပေါ်လာနိုင်သော သက်ရောက်မှုများ၊ နှင့် ၎င်းတို့၏ စွန့်ပစ်မှုများ / စွန့်ထုတ်မှု များမှ ရေအရည်အသွေးအပေါ် သက်ရောက်မှုများ၊ နှင့် ဇီဝမျိုးစုံမျိုးကွဲ၊ ဝါးဖမ်းလုပ်ငန်း နှင့် လူမှု-စီးပွား အကြောင်း အရင်းများအပေါ် တစ်ဆင့်ခံ သက်ရောက်မှုများ ကို ဆန်းစစ်သွားမည် ဖြစ်ပါသည်။</p>
<p><u>အလှူဝါပတ်ဝန်းကျင်အပေါ် သက်ရောက်မှုများ</u></p> <p>မတော်တဆစွန့်ပစ်ပစ္စည်းများစွန့်ပစ်မှု၊ စောင့်ကြည့်မှုအစီအစဉ် နှင့် ဒေသခံများက စောင့်ကြည့်မှုလုပ်ငန်းစဉ်တွင် မည်သို့ပါဝင် သွားနိုင်ကြောင်းနှင့်စပ်လျဉ်း၍ မေးမြန်းကြသည်များ ရှိပါသည်။</p>	<p>PCML သည် စီမံကိန်းလုပ်ငန်းများကို မြန်မာနိုင်ငံ၊ အပြည်ပြည်ဆိုင်ရာ ဘဏ္ဍာရေး ကော်ပိုရေးရှင်း (IFC) လမ်းညွှန်ချက်များ၊ နှင့် နိုင်ငံတကာ စံနှုန်းများနှင့် အညီ ဆောင်ရွက်သွားမည် ဖြစ်ပါသည်။ စွန့်ပစ်မှုအတွက် အသေးစိတ်မှတ်တမ်းကို ပြုလုပ်ဆောင်ရွက်သွားမည် ဖြစ်ပြီး၊ ECD သို့ တင်သွင်းသွားမည် ဖြစ်ပါသည်။</p> <p>စောင့်ကြည့်မှုနှင့်ပတ်သက်၍ ECD သို့ တင်သွင်းသွားမည့် EIA အစီရင်ခံစာတွင် ပတ်ဝန်းကျင်ဆိုင်ရာစီမံခန့်ခွဲမှုအစီအစဉ်ပါဝင်သွားမည် ဖြစ်ပြီး၊ စောင့်ကြည့်မှုများကို ဆွေးနွေးသွားမည် ဖြစ်ပါသည်။</p>	<p>စောင့်ကြည့်မှုသတ်မှတ်ချက်များ နှင့် လိုက်နာဆောင်ရွက်မှု အတွက် သက်ဆိုင်ရာ ပါတီအုပ်စုများ၏ တာဝန်များ နှင့် လိုက်နာဆောင်ရွက်မှုသရုပ်ပြဆောင်ရွက်မှုတို့ကို EIA အစီရင်ခံစာတွင် ထည့်သွင်းပြီးဖြစ်ပါသည်။</p>
<p><u>ဝါးဖမ်းဆောင်ရွက်သူများ နှင့် ဝါးဖမ်းလုပ်ငန်းများအပေါ် သက်ရောက်မှုများ</u></p> <p>ဝါးဖမ်းလုပ်ငန်းဆောင်ရွက်သည့်ရပ်ရွာတို့သည် ဝါးဖမ်းလုပ်ငန်းအပေါ် သက်ရောက်မှုရှိ မရှိစပ်လျဉ်း၍ သူတို့၏ စိုးရိမ်မှုကို ဖော်ထုတ်ကြပါသည်။ မြိတ်မှ ဝါးဖမ်းလုပ်ငန်းဆောင်ရွက်သည့်ရပ်ရွာတို့သည်၊ စီမံကိန်းကို စတင်ဆောင်ရွက်ရန် မလိုလားကြောင်း သူတို့ ဖော်ပြကြပါသည်။</p>	<p>ERM သည် EIA ကို မြန်မာနိုင်ငံ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း နှင့် လုပ်ထုံးလုပ်နည်းများ နှင့် နိုင်ငံတကာ စံနှုန်းများနှင့်အညီ ပြုစုသွားမည်ဖြစ်ပြီး၊ ယင်းနောက် ECD သို့ တင်သွင်းသွားမည် ဖြစ်ပါသည်။</p> <p>ဆိုက်စမစ်တိုင်းတာမှုမစတင်မီ၊ ရေကြောင်းသတိပေးချက်များကို သတင်းစာတွင် ကြေညာပေးသွားမည် ဖြစ်ပါ သည်။ ၎င်းသတိပေးချက်တွင်၊ စီမံကိန်းနယ်မြေဧရိယာ၏ တည်နေရာများကို ဖော်ပြပေးသွားမည် ဖြစ်ပါသည်။ သို့ရာတွင်၊ ဝါးဖမ်းရေယာဉ်များကို ဆိုက်စမစ်ရေယာဉ်ပတ်ပတ်လည်တွင် ရေမိုင် ၅ မိုင်ရှိ ဘေးကင်းလုံခြုံရေးဇုန် အတွင်းသာ ကန့်သတ်သွားမည် ဖြစ်ပါသည်။</p>	<p>ဝါးဖမ်းဆောင်ရွက်မှုအပေါ် သက်ရောက်မှုများကို EIA တွင် ဆန်းစစ်ခဲ့ပါသည်။</p>

**လက်ခံရရှိသည့် မှတ်ချက်များ**

**အစည်းအဝေးတွင် မှတ်ချက်များအပေါ် တုံ့ပြန်မှုများ**

**EIA လေ့လာချက် အတွက် ထည့်သွင်းစဉ်းစားမှု**

<p>လူမှုရေးဆိုင်ရာတာဝန်ယူဆောင်ရွက်မှု (CSR) နှင့် လူမှုအကျိုးအမြတ်များ</p> <p>အများဆုံးမေးမြန်းကြသည့် ကိစ္စရပ်များထဲမှ တစ်ခုမှာ လျှပ်စစ်မီးရရှိနိုင်ခြေနှင့် တစ်ယူနစ် ကုန်ကျစရိတ်နှင့် ဆက်စပ်ပါသည်။</p>	<p>လျှပ်စစ်မီးရရှိရန်၊ တိုင်းဒေသကြီးသည် အမျိုးသား ဓာတ်အားလိုင်းနှင့် ချိတ်ဆက်နိုင်မည့် သွယ်ယူရေးလိုင်းကို လိုအပ်ပြီး၊ လျှပ်စစ်တစ်ယူနစ်ခမှာလည်း လျော့နည်းသွားမည် ဖြစ်ပါသည်။</p> <p>လျှပ်စစ်ဦးစီးဌာနသည် မော်လမြိုင်-ရဲ-ထားဝယ် ဓာတ်အားသွယ်ယူရေးလိုင်း နှင့် ထားဝယ်-မြိတ်-ဘုတ်ပြင်း ဓာတ်အားသွယ်ယူရေးလိုင်းတို့ကို အကောင်အထည်ဖော်ဆောင်ရွက်ရန် စီစဉ်လျက် ရှိပါသည်။</p> <p>CSR အစီအစဉ်များနှင့်စပ်လျဉ်း၍ PCML သည် CSR အစီအစဉ်များမစတင်မီ PCML စီမံကိန်းနှင့် ထပ်တူကျမသွားစေရန် တိုင်းဒေသကြီးအစိုးရ နှင့် ညှိနှိုင်းဆောင်ရွက်သွားရမည် ဖြစ်ပါသည်။</p>	<p>CSR မှာ ပတ်ဝန်းကျင် နှင့် လူမှုထိခိုက်မှုဆန်းစစ်ခြင်း ၏ အစိတ်အပိုင်းတစ်ရပ်မဟုတ်သောကြောင့်၊ ယခု အစီရင်ခံစာတွင် ဆွေးနွေးထားခြင်း မရှိပါ။ သို့ရာတွင်၊ အချက်အလက်များနှင့်စပ်လျဉ်း၍ PCML ၏ လက်ရှိ ဆောင်ရွက်နေသော CSR လုပ်ငန်းများအသေးစိတ်ကို အခန်း (၉) တွင် တင်ပြထားပါသည်။</p>
<p>သဘာဝသယံဇာတများမှ တိုင်းဒေသကြီးအဆင့်သို့ အကျိုးအမြတ်များ</p> <p>သယံဇာတများသည် တနင်္သာရီတိုင်းဒေသကြီးမှ ဖြစ်သောကြောင့်၊ တိုင်းဒေသကြီးမှ ဒေသခံရပ်ရွာများသည် အကျိုးအမြတ်ရသင့်ကြောင်း မေးမြန်းခြင်း။</p>	<p>ယခုစီမံကိန်းမှ အကျိုးအမြတ်များသည် ပြည်ထောင်စုအစိုးရအဖွဲ့၏ စီမံခန့်ခွဲမှု အောက်တွင် ရှိပါသည်။ ပြည်ထောင်စုအဆင့် နှင့် ပြည်နယ်အစိုးရအဆင့်အကြားရှိ ဝင်ငွေခွန်များဝေမျှရေး ကိစ္စမှာ PCML အနေဖြင့် မှတ်ချက်ပေးနိုင်သည် မဟုတ်ပါ။</p> <p>ပြည်ထောင်စုအစိုးရသည် ပြည်နယ်များ နှင့် တိုင်းဒေသကြီးများ၏ ငွေကြေးတိုက်ရင်း အတွက် အကျိုးအမြတ်များကို ညီမျှစွာ ဝေမျှသွားမည် ဖြစ်ပါသည်။</p>	<p>၎င်းမှာ EIA လေ့လာမှု၏ အစိတ်အပိုင်းတစ်ရပ်မဟုတ်ပါ။ သို့ရာတွင် ၎င်းမှာ ဒေသခံရပ်ရွာများအတွက် အရေးပါကြောင်း PCML မှ ဂရုပြုပါသည်။</p>
<p>သတင်းအချက်အလက်များထုတ်ဖော်တင်ပြခြင်း</p> <p>စီမံကိန်းအတွက် လည်ပတ်မှုများ နှင့် အချိန်ဇယားကို သတင်းစာများ၌ ထုတ်ဖော်တင်ပြရမည်ဟု သက်ဆိုင်သူများက တင်ပြကြပါသည်။</p>	<p>IEE လုပ်ထုံးလုပ်နည်းအရာ သတင်းအချက်အလက်များကို ထုတ်ဖော်တင်ပြသွားမည် ဖြစ်ပြီး၊ စီမံကိန်းလုပ်ငန်းများ မစတင်မီ သတင်းစာများ၌ ရေးကြောင်း သတိပေးချက် များကို ထုတ်ပြန်သွားမည် ဖြစ်ပါသည်။</p>	<p>EMP ကို အခန်း (၈) တွင် တင်ပြထားပါသည်။</p>
<p>ခရီးသွားလာရေးလုပ်ငန်းများအပေါ် သက်ရောက်မှုများ</p> <p>အက္ကဝါ ဒေသရင်းပင်များ နှင့် ခရီးသွားလုပ်ငန်းများပေါ် သက်ရောက်မှုရှိ မရှိ နှင့်ပတ်သက်၍ စိုးရိမ်ကြပါသည်။</p>	<p>တူးဖော်မှုလုပ်ငန်းများသည် ရေအနက် ပေ ၃၀၀ ခန့်တွင် လည်ပတ်ဆောင်ရွက်မည် ဖြစ်သဖြင့်၊ သတ္တာကျောက်တန်းများ နှင့် စက္ကဘာခိုင်စင်များ ရှိမည် မဟုတ်ပါ။</p>	<p>စီမံကိန်းသည် ကမ်းမှ ကီလိုမီတာ ၁၀၀ ကျော် ကွာဝေးပြီး သက်ရောက်မှုမရှိနိုင်သောကြောင့်၊ ကမ်းများအပေါ် သက်ရောက်မှုများကို EIA တွင် ချုပ်လှန်ခဲ့ပါသည်။</p>

ပင်လယ်ရေ၊ နန်း၊ ကြမ်းပြင်နေသက်ရှိများ နှင့် ပင်လယ်ကြမ်းပြင်ရှိ သတ္တဝါများနှင့် ပတ်သက်၍၊ နမူနာများကို စီမံကိန်း၏ ဦးတည်ရာနေရာ လေးခု (အရှေ့၊ အနောက်၊ တောင် နှင့် မြောက်) တို့ ၌ ဆောင်ရွက်ခဲ့ပါသည်။

MOGE နှင့် PCML အကြားရှိ စာချုပ်

စာချုပ် နှင့် အချိန်ဇယားအကြောင်းကို မေးမြန်းခြင်း

စာချုပ်မှာ အသစ်ချုပ်ဆိုခြင်းမဟုတ်ပါ။ ၎င်းမှာ MOGE နှင့် PCML တို့အကြားရှိ "ထုတ်လုပ်မှုအပေါ် ခွဲဝေခံစားရေးစာချုပ်" ဖြစ်ပါသည်။ စီမံကိန်းအချိန်ကာလမှာ နှစ် ၃၀ ဖြစ်ပြီး၊ ၂၀၀၀ ပြည့်နှစ်တွင် စတင်ခဲ့ခြင်း ဖြစ်ပါသည်။

၎င်းမှာ EIA လေ့လာမှု၏ တစ်စိတ်တစ်ဒေသမဟုတ်ပါ။

အကြံပြုတိုင်ကြားရေးဆိုင်ရာ ယန္တရား နှင့် လျော်ကြေးပေးဆောင်ရွက်ခြင်း

သက်ဆိုင်သူတစ်ဦး၏ စိုးရိမ်မှုမှာ အကယ်၍ ၎င်း၏ ငါးဖမ်းယာဉ်များ/ပိုက်များသည် တူးဖော်ရေး ရေယာဉ်များနှင့် တိုက်မိခိုက်မိမှုများ နှင့် စပ်လျဉ်းသည့် အကြံပြုတိုင်ကြားရေးလုပ်ငန်းစဉ်နှင့်ပတ်သက် ပါသည်။

PCML တွင် အကြံပြုတိုင်ကြားရေးယန္တရားတစ်ရပ်ရှိပြီး၊ ရပ်ရွာမှ လက်ကမ်း စာစောင်တွင် တိုင်ကြားရန်အတွက် ဖော်ပြထားသည့် ဖုန်းနံပါတ်မှ တစ်ဆင့် ဆက်သွယ်နိုင်ပါသည်။

EMP ကို အခန်း (၉) တွင် တင်ပြထားပါသည်။

လျော်ကြေးပေးရေး လုပ်ငန်းစဉ်အတွက်၊ PCML သည် အစိုးရ၏ ညွှန်ကြားချက်နှင့် အညီ ဆောင်ရွက်သွားမည် ဖြစ်ပါသည်။

ငလျင်များ နှင့် မြေပြိုကျမှုများ

အချို့ သက်ဆိုင်သူများသည် စီမံကိန်းကြောင့် မြေပြိုကျမှုများ သို့မဟုတ် ငလျင်များ ဖြစ်ပေါ်ပြီး ကမ်းပေါ် သက်ရောက်မှုများရှိ မရှိ စိုးရိမ်ကြပါသည်။

ဓာတ်ငွေ့ကိုထုတ်ယူပြီးသည်နှင့်တစ်ပြိုင်နက်၊ လှောင်ကန်မှာ ဆီများ နှင့် ရေများဖြင့် သဘာဝအလျောက် ပြည့်သွားပါသည်။ တူးဖော်မှုကြောင့် ငလျင်များမဖြစ်ပေါ်နိုင်ခြင်း မရှိသလို၊ မြေပြိုကျမှုများလည်း မဖြစ်နိုင်ပါ။ ငလျင်ဖြစ်ပေါ်မှုမှာ ပင်လယ်ကြမ်းပြင်ရှိ "ကျောက်ထုလွှာများ" ရွေ့လျားမှုကြောင့် ဖြစ်ပေါ်နိုင်ပါသည်။

တူးဖော်မှုမှ ငလျင်များ သို့မဟုတ် မြေပြိုကျမှုများ မဖြစ်ပေါ်သောကြောင့်၊ ၎င်းကို ထိခိုက်မှုဆန်းစစ်ခြင်းတွင် ထည့်သွင်းမစဉ်းစားပါ။

စီမံကိန်းလုပ်ငန်းများ၏ ရလဒ်များအဖြစ် ဖြစ်ပေါ်လာနိုင်သည့် သက်ရောက်မှုများသည် အရွယ်အစား အားဖြင့် သေးငယ်ပြီး၊ အကန့်အသတ်ဖြင့်သာ ဖြစ်ပေါ်မည်ဖြစ်ကြောင်း ယခုအချိန်ထိဆောင်ရွက်ခဲ့ သော သက်ဆိုင်သူများနှင့် တိုင်ပင်ဆွေးနွေးမှုများက အတည်ပြုပါသည်။

နောက်ထပ်တိုင်ပင်ဆွေးနွေးမှုလုပ်ငန်းများတွင် အောက်ပါတို့ ပါဝင်သွားမည် ဖြစ်ပါသည် -

- အကြံပြုမှတ်ချက်များထောက်ပံ့ပေးနိုင်ရန် အခွင့်အလမ်းများအပါအဝင်၊ စီမံကိန်းအချက် အလက်များ နှင့် EIA အစီရင်ခံစာကို နောက်ထပ် ထုတ်ဖော်တင်ပြခြင်း၊
- EIA ၏ ရလဒ်များနှင့် စပ်လျဉ်း၍ သက်ဆိုင်ရာ ဒေသ အစိုးရအရာရှိများ/အာဏာပိုင်များ နှင့် အစိုးရအဖွဲ့အစည်းများနှင့် တိုင်ပင်ဆွေးနွေးခြင်း၊ နှင့်
- စိတ်ဝင်စားပြီး ခံစားထိခိုက်ခံရနိုင်သည့် သက်ဆိုင်သူများနှင့် ရှိနေဆဲဆက်သွယ်မှုများ ဆက် လက်ဆောင်ရွက်နေခြင်းများဆောင်ရွက်မည် ဖြစ်ပြီး၊ ဒေသခံရပ်ရွာများအပေါ်သက်ရောက်မှု များနှင့် စပ်လျဉ်း၍၊ ဒေသခံနယ်မြေဧရိယာများသို့ ဆောင်ရွက်နေသည့်စီမံကိန်းသတင်း အချက်အလက်များကို တင်ပြသွားမည် ဖြစ်ပါသည်။

PCML သည် စီမံကိန်းမစတင်မီ လုပ်ငန်းနောက်ဆုံးဆောင်ရွက်ထားရှိမှုအခြေအနေများနှင့် စပ်လျဉ်း သည့် သတိပေးချက်များကို ရေလုပ်ငန်းလုပ်ကိုင်သူများထံသို့ ထုတ်ပြန်ပေးသွားမည် ဖြစ်ပါသည်။ EIA လုပ်ထုံးလုပ်နည်း နှင့် နိုင်ငံတကာအလေ့အကျင့်ကောင်းများအရ၊ လိုအပ်သည့် အဆင့်များနှင့် အညီ၊ လည်ပတ်ရေးကာလအတွင်း အကြံပြုတိုင်ကြားရေးဆိုင်ရာယန္တရားတစ်ရပ်ကို ထားရှိသွားမည် ဖြစ်ပါသည်။

EIA အစီရင်ခံစာကို PCML ဝက်ဘ်ဆိုက်ဖြစ်သည့် <https://www.petronas.com> တွင် ဝင်ရောက် ကြည့်ရှု နိုင်အောင် ဆောင်ရွက်သွားမည် ဖြစ်ပါသည်။ အင်္ဂလိပ်ဘာသာဖြင့်ရေးသားသည့် သတင်း စာတစ်စောင်နှင့် မြန်မာဘာသာဖြင့်ရေးသားသည့် သတင်းစာတစ်စောင်တို့၌ ကြော်ငြာများ ပါရှိ သွားမည်ဖြစ်ပြီး၊ အစီရင်ခံစာ၏ ကော်ပီစာမူများကို ရန်ကုန်၊ ထားဝယ် နှင့် မြိတ်တို့တွင် ထားရှိသွား မည် ဖြစ်ပါသည်။

This Report is the Environmental Impact Assessment for the infilling drilling within the Yetagun Field by PC Myanmar (Hong Kong) Limited.

### 2.1 **PRESENTATION OF THE PROJECT PROPONENT**

PC Myanmar (Hong Kong) Limited (PCML) has signed 13 Production Sharing Contracts (PSCs) for Blocks M12/13/14, IOR5, and one Improved Petroleum Recovery Contract (IPR) for block IOR7 and farmed into four blocks (Block D, AD9, AD11, EP1). PCML's portfolio in Myanmar includes a total of six blocks. PCML are the operator of three offshore blocks (M12, M13 and M14: Yetagun Gas Project in Tanintharyi Region) and two onshore blocks (IOR5 and IOR7 in Ayeyarwaddy Region). The contact details for PCML are provided below:

**Name:** Than Naing Myint/ Zaw Zaw Aung  
**Address:** Main Office  
 Myanmar Centre Business Suites, 10<sup>th</sup>, 11<sup>th</sup>, 12<sup>th</sup> Connecting Floor, Myanmar Centre Tower 2, 192, Kaba Aye Pagoda Road, Bahan 11201, Yangon, Myanmar  
**Phone:** +(951)515011/526411, 9345065/66/67/68  
**Fax:** +(951)525698/525684

Annex Office:  
**Address:** 1(E), Kaba Aye Pagoda Road, Bahan, Yangon, Myanmar  
**Phone:** +(951)515011/526411  
**Fax:** +(951)525698/525684  
**Email:** [than\\_naingmyint@petronas.com](mailto:than_naingmyint@petronas.com) / [zzaung@petronas.com](mailto:zzaung@petronas.com)

### 2.2 **PRESENTATION OF ENVIRONMENTAL AND SOCIAL EXPERTS**

Environmental Resources Management (ERM) - Hong Kong Limited are the environmental and social consultants that conducted this EIA Study. ERM will be supported by local environmental consultants, Resource and Environment Myanmar (REM) and Environmental Quality Management (EQM), all of which are registered under the Ministry of Natural Resources and Environmental Conservation (MONREC) Consultant Registration Scheme. Information on the experts is presented in *Table 2.1*.

### 2.3 **PRESENTATION OF HEALTH EXPERT**

As this Project is located 140 km from the nearest inhabited land, no health experts are required as there will be no impact to public health. Occupational Health and Safety is, however, considered in this EIA Report under accidental events.

**Table 2.1** *Environmental and Social Consultants for the Project*

Name	Organisation	Academic Experience	Years' Experience	Area of Expertise	Registration Status
Craig A. Reid	ERM	BSc (honours) Marine Biology	20	Ecology and Biodiversity	Registered Under ERM Hong Kong (Certificate No. 0016) and Individually (Certificate No. 0053)
Rebecca Summons	ERM	MSc Marine Environmental Protection	9	Ecology and Biodiversity	Registered Under ERM Hong Kong (Certificate No. 0016) and Individually (Certificate No. 0053)
Khin Su Su Naing	ERM	M.A (International and Community Development) Management	>10	Socio-economic Facilitation of Meeting	Registration Application submitted to ECD under ERM Hong Kong
Aye Mya Thinzar	ERM	B.Sc (Forestry)	4	Socio-economic Facilitation of Meeting	Registration Application submitted to ECD under ERM Hong Kong
Tom Glenwright	ERM	PhD Marine Ecology	16	Water Pollution Control, Modelling for Water Quality, Ground water and Hydrology	Registered Under ERM Hong Kong (Certificate No. 0016)
Stuart Mackenzie	ERM	BSc Environmental Geography	10	Waste Management	Registered Under ERM Hong Kong (Certificate No. 0016)
Piers Touzel	ERM	MBA	15	Facilitation of meeting, Socio-Economy, Land use	Registered Under ERM Hong Kong (Certificate No. 0016)
Edmund Taylor	ERM	MSc Environmental Dynamics and Climate Change	5	Air Pollution Control, Modelling for Air Quality	Registered Under ERM Hong Kong (Certificate No. 0016)

Name	Organisation	Academic Experience	Years' Experience	Area of Expertise	Registration Status
Man Ping To (Mandy To)	ERM	MSc Environmental Management	20	Noise and Vibration	Registered Under ERM Hong Kong (Certificate No. 0016)
Herve Bonnel	ERM	M.Eng Mechanical Engineering	19	Risk Assessment and Hazard Management	Registered Under ERM Hong Kong (Certificate No. 0016)
Laurence Geene	ERM	MSc Environmental Science	20	Risk Assessment and Hazard Management, Legal Analysis	Registered Under ERM Hong Kong (Certificate No. 0016)
Chi Hung Wan (Frank Wan)	ERM	MSc Waste Management	30	Geology and Soil, Archaeology	Registered Under ERM Hong Kong (Certificate No. 0016)
Dr Ohnmar May Tin Hlaing	EQM	PhD	>20	Air Quality	Registered Under EQM (Certificate No. 0009)

### ***POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK***

This section provides the relevant legal and policy context in Myanmar including the following:

- PCML policies relating to health, safety and the environment.
- Policy and Legal Framework; including:
  - Myanmar EIA legislation, other relevant Myanmar legislation; and
  - International conventions, standards and guidelines relevant to the Project.
- Institutional Framework of Myanmar; and
- Environmental, Social and/or Health standards related to the Project.

#### **3.1**

##### ***CORPORATE ENVIRONMENTAL AND SOCIAL POLICIES***

PCML have a Health, Safety, and Environment (HSE) System which includes a HSE Policy which provides the direction on how issues relating to HSE are to be managed and integrated into the overall business process throughout the company. This is provided in *Figure 3.1*.

Figure 3.1 PCML HSE Management Policy

	<b>PETRONAS CARIGALI HSE MANAGEMENT SYSTEM (HSE MS)</b>	WW ALL S 08 003 I Rev. 4
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**2.0 POLICY AND STRATEGIC OBJECTIVES**

**2.1 HSE POLICY**

(1) Purpose

- i. PETRONAS Carigali HSE Policy provides the direction on how issues relating to HSE are to be managed and integrated into the overall business process throughout the Company.
- ii. PETRONAS Carigali HSE associated policies (also referred to as daughter policies) on the other hand are developed for specific HSE associated subjects to complement PETRONAS Carigali HSE Policy. These HSE associated policies shall be in line with PETRONAS Carigali HSE Policy.

(2) Expectations

- i. PETRONAS Carigali HSE Policy and its associated policies are in line with Group HSE Policy, which can be referred to in Appendix 1.
- ii. The HSE Policy and its associated policies shall be reviewed at least once a year or as and when required, taking into account the relevancy and adequacy as part of Management Review.
- iii. Contractor HSE policies shall be consistent with the Company policies.
- iv. The HSE Policy and its associated policies shall be communicated and explained to all employees and key stakeholders e.g. contractor, visitor, supplier etc. Records of communication shall be maintained.
- v. The HSE policy and its associated policies shall be readily available and displayed at prominent location in a language and format that is easily understood.

(3) Verifications

- i. Compliance to the above expectations may be demonstrated by the following:
  - a. Availability of PETRONAS Carigali HSE Policy and its associated policies in English and country-specific national language;
  - b. Display of PETRONAS Carigali HSE Policy and its associated policies at strategic locations throughout workplaces;
  - c. Records of PETRONAS Carigali HSE Policy and its associated policies revisions including stakeholders review; and

	<b>PETRONAS CARIGALI HSE MANAGEMENT SYSTEM (HSE MS)</b>	WW ALL S 08 003 I Rev. 4
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- d. Records of dissemination and communication of the PETRONAS Carigali HSE Policy and its associated policies to all employees and Contractors.

## 2.2 HSE MANAGEMENT OF JOINT VENTURES

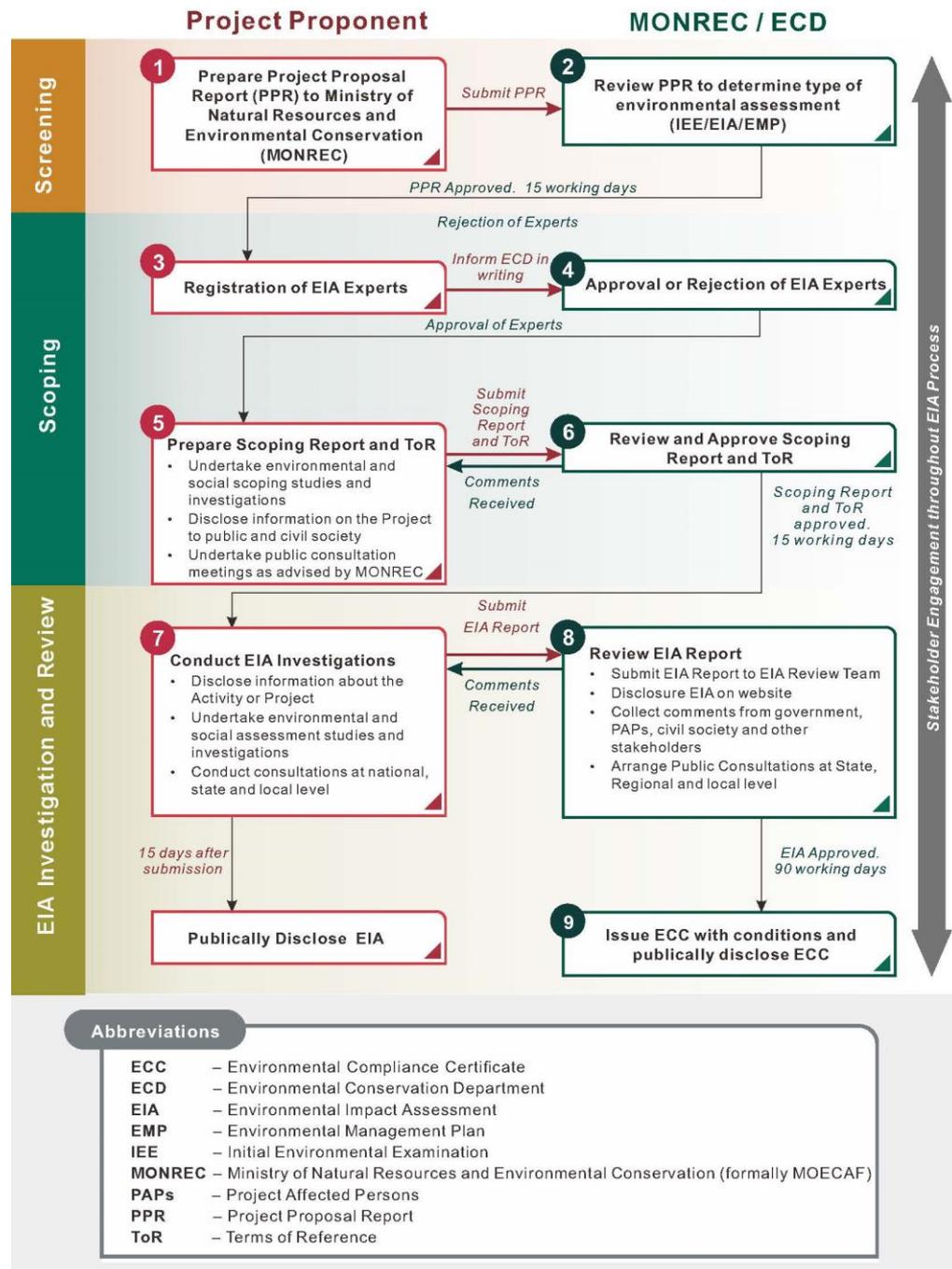
- (1) Purpose
  - i. This Sub-Element defines PETRONAS Carigali HSE Policy in respect to the HSE management of Joint Ventures.
- (2) Scope
  - i. The requirement on HSE management of Joint Ventures shall apply for Joint-Operated Ventures and Joint Ventures Operated by Others, throughout PETRONAS Carigali global operations.
- (3) Expectations
  - i. For Joint-Operated Ventures, PETRONAS Carigali representatives assigned to work in the ventures shall steer the implementation of an effective HSE MS that is in line with International Standards and/or Industry Standards.
  - ii. For Joint Ventures Operated by Others, PETRONAS Carigali Joint Ventures Division shall influence the implementation of an effective HSE MS that is in line with International Standards and/or Industry Standards.
  - iii. Formal mechanism shall be in place to enable the Management Committee of the Joint Ventures to monitor the implementation of the HSE MS, including monitoring of HSE performance.
  - iv. HSE MS assurance shall be carried out to verify the effective implementation of HSE MS of the Joint Ventures.
- (4) Verifications
  - i. Compliance to the above expectations may be demonstrated by the following documentations:
    - a. Availability of Joint Ventures HSE MS, including associated HSE governance documents;
    - b. Records of minutes of Management HSE Committee Meeting, or equivalent;
    - c. Records of related report on HSE MS assurance; and
    - d. Records of HSE Performance.

3.2 POLICY AND LEGAL FRAMEWORK

3.2.1 Myanmar EIA Procedure

The Myanmar EIA Procedure (dated 29 December 2015) sets out the EIA Process undertaken for the Project and is shown in Figure 3.2.

Figure 3.2 EIA Process in Myanmar



PCML undertook a systematic assessment of the proposed activities. Screening was conducted as part of the assessment to identify all potential environmental risks. A summary of the screening and the preliminary identified environmental and social impacts was submitted to MONREC and MOGE in the form of a Project Proposal Report. MONREC used this document to decide whether the Project required an IEE or an EIA Study would be required. For this Project, an EIA Study was required in line with Annex I of the EIA Procedure.

The subsequent EIA Report (this Report) has been prepared to address all potential adverse environmental and social impacts and propose appropriate mitigation measures. The report includes the results of public consultations and addresses public concerns when assessing impacts, designing mitigation measures and selecting monitoring parameters. The EIA report will be submitted to MONREC and MOGE for approval.

### **3.2.2** *Myanmar Legislation Relevant to the Project*

Laws relating to environmental and social issues within the Oil and Gas Sector and hence their relevance to the EIA Study are included in *Table 3.1*.

### **3.2.3** *International Agreements and Conventions*

Relevant international conventions to which Myanmar is a signatory include those related to waste management, biodiversity conservation and labour conventions. The key international conventions of relevance to the Project are included in *Table 3.2*.

**Table 3.1 Myanmar Legislation Relating to the Oil and Gas Sector and Relevance to Project**

Sources of Related Laws, Rules and Regulations	Relevant Articles	Commitments
<b>The Constitution of the Republic of the Union of Myanmar, 2008</b>	Article 37 (a)(b) , 42, 390	<p>The Constitution of the Union of Myanmar is the supreme law of the country and has provisions regarding the protection of the environment in Myanmar.</p> <p>Project Proponent commits to comply as these three Articles in the Constitution provide a basis for legalizing and institutionalizing environmental health impact assessment and social impact assessment. There stipulates that</p> <ul style="list-style-type: none"> <li>• The Union is the ultimate owner of all lands and all natural resources above and below the ground, above and beneath the water and in the atmosphere in the Union; The Union shall enact necessary law to supervise extraction and utilization of State owned natural resources by economics forces;</li> <li>• The Union shall protect and conserve natural environment.</li> <li>• Every citizen has the duty to assist the Union in carrying out the following matters:               <ul style="list-style-type: none"> <li>(a) preservation and safeguarding of cultural heritage;</li> <li>(b) environmental conservation;</li> <li>(c) striving for development of human resources;</li> <li>(d) protection and preservation of public property.</li> </ul> </li> </ul>
<b>Environmental Conservation Law (Pyidaungsu Hluttaw Law No.9/2012)</b>	Clause 7(o), 14,15, 29	<p>Project Proponent commits to comply as there prescribes</p> <ul style="list-style-type: none"> <li>• That the Ministry (MONREC) has the right to manage a proponent to provide compensation for environmental impact and contribute funds and need for prior permission from the Ministry for the business that have been categorized for causing impact on the environmental quality and right to issuing permit with terms and conditions relating to environmental conservation after scrutinizing.</li> <li>• To treat, emit, discharge and deposit the substances which cause pollution in the environment in accord with stipulated environmental quality standards for causing a point source of pollution.</li> <li>• That the owner or occupier of any business, material or place which causes a point source of pollution have to install or use an on-site facility or controlling equipment in order to monitor, control, manage, reduce or eliminate environmental pollution. If it is impracticable, it has to be arranged to dispose the wastes in accord with environmentally sound methods.</li> <li>• For not to violate any prohibition contained in the rules, notifications, orders, directives and procedures under the Environmental Conservation Law.</li> </ul>
<b>Environmental Conservation Rules (notification no 50/2014)</b>	Rule 69(a) (b)	<p>Project Proponent commits:</p> <ul style="list-style-type: none"> <li>• Not to emit, cause to emit, dispose, cause to dispose, pile and cause to pile, by any means, the pollutants and the hazardous waste or hazardous material stipulated by notification under the Law and any of these rules at any place which may affect the public directly or indirectly.</li> <li>• Not to carry out to damage the ecosystem and the natural environment which is changing due to such system, except for carrying out with the permission of the Ministry for the interest of the people.</li> </ul>

Sources of Related Laws, Rules and Regulations	Relevant Articles	Commitments
<b>Environmental Impact Assessment Procedure, 2015</b>	Clause 87, 102(a)(b), 103, 104, 105, 106, 107, 108, 110, 113, 115, 117	<p>The EIA Procedure sets out the procedures for completing an IEE, EIA and/or EMP in Myanmar. This includes information on project categorization, responsibilities of project developers and ministries, EIA review, monitoring and auditing, among other issues.</p> <p>Project Proponent commits to bear full legal and financial responsibility:</p> <ul style="list-style-type: none"> <li>• For his actions and omissions and those of its contractors, subcontractors, officers, employees, agents, representatives, and consultants employed, hired, or authorized by the Project acting for or on behalf of the Project, in carrying out work on the Project; and</li> <li>• To support programs for livelihood restoration and resettlement in consultation with the PAPs, related government agencies, and organizations and other concerned persons for all Adverse Impacts until PAPs have achieved socio-economic stability at a level not lower than that in effect prior to the commencement of the Project</li> </ul> <p><i>For EMP</i>, Project Proponent commits to comply</p> <ul style="list-style-type: none"> <li>• to implement the EMP, all Project commitments, and conditions, and</li> <li>• for liability to ensure that all contractors and subcontractors of the Project comply fully with all applicable Laws, the Rules, this Procedure, the EMP, Project commitments and conditions when providing services to the Project.</li> <li>• For his responsibility, and to fully and effectively implement the requirements set forth in ECC, applicable Laws, Rules, EIA Procedure and standards.</li> <li>• Project commitments and conditions when providing services to the Project and inform the Ministry with detailed information as to the propose project’s potential adverse impacts.</li> </ul> <p><i>For monitoring and reporting</i>, Project Proponent commits to comply:</p> <ul style="list-style-type: none"> <li>• To notify and identify in writing to the Ministry, providing detailed information as to the proposed Project's potential Adverse Impacts.</li> <li>• To engage in continuous, proactive and comprehensive self-monitoring of the Project and activities related thereto, all Adverse Impacts, and compliance with applicable laws, the Rules, this EIA Procedure, standards, the ECC, and the EMP during all phases of the Project (pre-construction, construction, operation, decommissioning, closure and post-closure).</li> <li>• to notify and identify in writing to the Ministry for any breaches of his obligations or other performance failures or violations of the ECC and EMP as soon as reasonably possible and in any event, in respect of any breach which would have a serious impact or where the urgent attention of the Ministry is or may be required, to undertake within not later than twenty-four (24) hours, and in all other cases within seven (7) days of the Project Proponent becoming aware of such incident.</li> <li>• to submit monitoring reports to the Ministry not less frequently than every six (6) months, as provided in a schedule in the EMP, or periodically as prescribed by the Ministry.</li> <li>• to submit the monitoring report within ten (10) days of completing a monitoring report and the information to be included.</li> </ul>

Sources of Related Laws, Rules and Regulations	Relevant Articles	Commitments
<b>National Environmental Quality (Emissions) Guidelines (2015)</b> <b>Myanmar Investment Law, 2016</b>	Clause (50)(d), (51), (65),	<ul style="list-style-type: none"> <li>• To make a monitoring report as contemplated in Article 108 and Article 109 in accordance with the EMP schedule, (except as may relate to National Security concerns) publicly available on the Project’s website, at public meeting places (e.g. libraries, community halls) and at the Project offices within ten (10) days of completing</li> <li>• To submit a digital copy of a monitoring report within ten (10) days of receiving such request via email or as may otherwise be agreed upon with the requestor for the request of any organization or person.</li> </ul> <p><i>For the purposes of monitoring and inspection, the event of emergency,</i> Project Proponent commits to</p> <ul style="list-style-type: none"> <li>• grant the ministry and/or its representatives, at any time during normal working hours, access to the Project’s offices and to the Project site and any other location at which the Project activities or activities related to the Project are performed;</li> <li>• grant, from time to time as and when the Ministry may reasonably require, the Ministry access to the Project’s offices and to the Project site and any other location at which the Project activities or activities related to the Project are performed.</li> <li>• grant full and immediate access to the Ministry at any time as may be required by the Ministry in the event of an emergency, or where, in the opinion of the Ministry, there is or may exist a violation or risk of violation of the compliance by the Project with all applicable environmental and social requirements.</li> <li>• Ensure that the Ministry’s rights of access can extend to access by the Ministry to the Project’s contractors and subcontractors.</li> </ul> <p><i>For the Conditions and Revisions to Conditions prescribed in Environmental Compliance Certificate,</i> The Project Proponent commits to commence the implementation of the Project strictly in accordance with the conditions attached to the ECC and including the EMP, within such time as may be prescribed by the Ministry upon receipt of the written approval from the relevant authority.</p> <p>Project Proponent commits to comply the NEQ guidelines and its setting out for emission standards for air, noise and effluent discharges for oil and gas operations. Project Proponent considers this emissions standards in its environment impact assessment and environmental management plan.</p> <p>Project Proponent commits to comply</p> <ul style="list-style-type: none"> <li>• The stipulation to register the land lease contract at the office of Registry of Deeds in accordance with the Registration Act.</li> <li>• The mentioning for appointment, replacement, providing for the employment of staff and workers, ensuring to comply the entitlements and rights in the labor laws and rules, settling dispute regarding HR issues.</li> <li>• The stipulation:             <ul style="list-style-type: none"> <li>(a). To respect and comply with the customs, traditions and traditional culture of the ethnic groups in the Union;</li> <li>(e). To inform to the Commission if it is found that natural mineral resources or antique objects and treasure trove are not related to the investment permitted;</li> </ul> </li> </ul>

Sources of Related Laws, Rules and Regulations	Relevant Articles	Commitments
		<ul style="list-style-type: none"> <li>(f). Not to make any significant alteration of topography or elevation of the land on which is entitled to lease or to use, without the approval of the Commission;</li> <li>(g). To abide by applicable laws, rules, procedures and best standards practiced internationally for this investment so as not to cause damage, pollution, and loss to the natural and social environment and not to cause damage to cultural heritage;</li> <li>(h). To list and keep proper records of books of account and financial statement and necessary financial matters relating to the investments performed by permit or endorsement in accordance with internationally and locally recognized accounting standards;</li> <li>(i). To close and discontinue the investment only after the payment of compensation to employees in accordance with applicable laws for any breach of employment contracts, closure of investment, sale and transfer of investment, discontinuation of investment, or reduction of workforce;</li> <li>(j). To pay wages and salaries to employees in accordance with applicable laws, rules, procedures, directive and so forth during the period of suspension of investment for a credible reason;</li> <li>(k). To pay compensation and indemnification in accordance with applicable laws to the relevant employee or his successor for injury, disability, disease or death due to the work;</li> <li>(l). To supervise foreign experts, supervisors and their families, who employ in their investment, to abide by the applicable laws, rules, orders and directives, and the culture and traditions of Myanmar;</li> <li>(m). To respect and comply with the labor laws;</li> <li>(n). To have the right to sue and to be sued in accordance with the laws;</li> <li>(o). To pay effective compensation for loss incurred to the victim, if there are damage to the natural environment and socioeconomic losses caused by logging or extraction of natural resources which are not related to the scope of the permissible investment, except from carrying out the activities required to conduct investment in a permit or an endorsement;</li> <li>(p). To allow the Commission to inspect in any places, when the Commission informs the prior notice to inspect the investment;</li> <li>(q). To take in advance permit or endorsement of the Commission for the investments which need to obtain prior approval under the Environmental Conservation Law and the procedures of environmental impact assessment, before undertaking the assessment, and shall submit the situation of environmental and social impact assessment to the Commission along the period of activities of the investments which obtained permit or endorsement of the Commission.</li> </ul>
<b>Myanmar Investment Rules, 2017</b>	Clause 202, 203, 206, 212,	Project Proponent commits: <ul style="list-style-type: none"> <li>• To comply with all terms and conditions in the permit and other applicable laws when the investment is carried out.</li> <li>• To fully assist while negotiating with the Authority for settling the grievances of the local community that have been effected due to Investments.</li> <li>• To appoint expert foreigner as senior manager, technical and operational expert or advisor according to subsection (a) of the section 51 of the Law.</li> </ul>

Sources of Related Laws, Rules and Regulations	Relevant Articles	Commitments
<b>The Import and Export Law, 2012</b> <b>Conservation of Water Resources and Rivers Law (2006)</b>	Clause 7  Clause 10, 11(a), 19,	<ul style="list-style-type: none"> <li>To obtain the permit or tax exemption or relief to insure the relevant insurance out of the following types of the insurance at any insurance business entitled to carry out insurance business within the Union based on the nature of the business: Property and Business Interruption Insurance; Engineering Insurance; Professional Liability Insurance; Bodily Injury Insurance; Marine Insurance; or Workmen Compensation Insurance; Life Insurance; Fire Insurance.</li> </ul> <p>Project Proponent, as a license holder, commits to comply not to violate the conditions contained in the license.</p> <p>Project Proponent commits to comply prohibitions for the following activities:</p> <ul style="list-style-type: none"> <li>“No person shall anchor the vessels where vessels are prohibited from anchoring in the rivers and creeks.</li> <li>No person shall dispose of engine oil, chemical, poisonous material and other materials which may cause environmental damage, or dispose of explosives from the bank or from a vessel which is plying, vessel which has berthed, anchored, stranded or sunk.</li> <li>No one shall dispose of any substance into the river creek that may cause damage to waterway or change of watercourse from the bank or vessel.”</li> </ul>
<b>The Protection of Biodiversity and Conservation Areas Law 2018</b>	Clause 39 (d) (e),	<p>The empowerment of this Law is provided to the Ministry of Transport for controlling navigation of vessels in the rivers and creeks as well as communicating with local and foreign government and organizations for conservation of water resources, rivers and creeks. Also, to carry out conservation works for water resources, rivers and creeks, in accordance with the relevant international conventions, regional agreements and bilateral agreements for environmental conservation.</p> <p>Project Proponent commits to comply the stipulation that there may be charge with fine or imprisonment or both if finds guilty of</p> <ul style="list-style-type: none"> <li>using dynamite or explosive chemicals, electrolyzing, destroying water flow or poisoning water, intentionally pollutes the soil, water, air in the conservation area;</li> <li>Disposing or handling chemical waste and poisoning materials in the conservation area.</li> </ul>
<b>The Protection and Preservation of Cultural Heritage Regions Law, 1998</b>	Clause 13, 15, 22	<p>The State Peace and Development Council Law enacted this law by Law No. 9/ 98 on the date of 10 September, 1998. The Ministry of Culture may, with the approval of the Government issue notification for the protection of cultural heritage areas are categorized as following kinds of zones / region:</p> <p>a) Ancient monumental zone;  b) Ancient site zone.</p> <p>Project Proponent commits:</p> <ul style="list-style-type: none"> <li>To apply for prior permission and must abide by provisions of existing laws for certain land-based construction works.</li> <li>To comply the stipulation for the person desirous of carrying out construction works to abide by the provisions of other existing laws and also apply in accordance with the stipulations to the Department to obtain prior permission under this law.</li> <li>To conform to conditions prescribed by the Ministry of Culture for Buildings in cultural heritage region.</li> </ul>

Sources of Related Laws, Rules and Regulations	Relevant Articles	Commitments
<b>The Protection and Preservation of Antique Objects Law (2015)</b>	Clause 12, 13	Project Proponent commits to comply the stipulation: <ul style="list-style-type: none"> <li>For person who finds any object which has no owner or custodian, needs to inform the relevant Ward or village-tract administrator if he knows or it seems reasonable to assume that the said object is an antique object.</li> <li>For a procedure to inform and the responsibility to inspect whether it is a real ancient monument or not and keep or cause to protect as may be necessary in accordance with the stipulation</li> </ul>
<b>The Protection and Preservation of Ancient Monuments Law (2015)</b>	Clause 12, 13, 15, 20	Project Proponent commits to comply the stipulations: <ul style="list-style-type: none"> <li>For a person who finds an ancient monument over one hundred years old under the water or above ground to promptly inform the relevant Ward or Village-Tract Administrative Office.</li> <li>For procedure to inform and the responsibility to inspect whether it is a real ancient monument or not and keep or cause to protect as may be necessary in accordance with the stipulation.</li> <li>To apply prior permission from the Department before searching for and extracting oil and gas or constructing pipelines</li> <li>For prohibitions not to damage ancient monuments including using machinery which causes vibration and discharging chemical substance.</li> </ul>
<b>Myanmar Fire Force Law, 2015</b>	Clause 25	Project Proponent commits: <ul style="list-style-type: none"> <li>to obtain the opinion of the Fire Services Department for the purpose of fire precaution and prevention, when laying down plans for construction for town, village and downtown or village development plans.</li> <li>To comply the stipulations for the factory, workshop, highway bus, airport, jetty, hotel, motel, guest house, collective-owned building, market, work-site or business exposed to fire hazard of the owner or manager; <ol style="list-style-type: none"> <li>Not fail to form the reserve fire brigade</li> <li>Not fail to provide materials and apparatuses for fire safety; in conformity with the directive of the Fire Services Department.</li> </ol> </li> </ul>
<b>Prevention from Danger of Hazardous Chemical and Associated Material Law (Pyidaungsu Hluttaw Law No 28/2013)</b>	Clause 7,8, 13, 20, 22, 15, 16, 17, 23, 27	Project Proponent commits to comply the stipulations: <ul style="list-style-type: none"> <li>For Any person, who wants to do the business of chemical and associated materials, to apply to the central body for the acquisition of the license, attached with the management plan for the environmental conservation in accord with the stipulations".</li> <li>For License holder to apply to the central supervising body in accord with the stipulation for the relevant chemicals and associated materials using for his chemicals and associated materials business" for a certificate.</li> <li>For the registered certificate holder to abide by the regulations contained in the registered certificate and follow the order and directives issued from time to time by the central supervising body".</li> <li>For the duties and powers of the central supervising board.</li> <li>For the requirements: <ol style="list-style-type: none"> <li>before works, license holder to be inspected by the relevant supervising and inspection team for safety and machinery/equipment check and</li> <li>The persons who are discharging the duty to be asked to attend foreign training or preventative trainings conducted by government departments and organizations.</li> </ol> </li> <li>For license holders to</li> </ul>

Sources of Related Laws, Rules and Regulations	Relevant Articles	Commitments
<p><b>Prevention from Danger of Hazardous Chemical and Associated Material Rule (notification No 85/2015-2016)</b></p>	<p>Clause 61 (a)</p>	<ul style="list-style-type: none"> <li>(a). follow the license regulations,</li> <li>(b). follow directives on safe handling and shall ask workers to strictly follow</li> <li>(c). shall provide necessary safety equipment and issue free personal protective equipment to workers,</li> <li>(d). provide training in occupational safety</li> <li>(e). determine the hazard to the environment, people and animals</li> <li>(f). provide fit for work medical check-up and keep records</li> <li>(g). send permission letter to Department of Township Administration if the chemicals and associated material are permitted to store</li> <li>(h). acquire in advance guidance and agreement from fire service department if using inflammable materials or explosives</li> <li>(i). transport only the permitted amount of chemicals in accordance with prescriptive stipulations</li> <li>(j). obtain approval of central supervising body if transporting chemical and associated material from the permitted region to any other region</li> <li>(k). abide and operate in accordance with related environmental laws to avoid impacts and damage to the environment.</li> </ul> <ul style="list-style-type: none"> <li>• For the license holder to have insurance in accordance with stipulations in case of compensation is required for losses related to people, animals and environment.</li> <li>• For the registered certificate holder to apply for using chemical which are not in the registered list.</li> <li>• For the license holder: <ul style="list-style-type: none"> <li>(a). To classify the hazard level of chemicals and related substances in advance</li> <li>(b). To show Material Safety Data Sheet and warning signage</li> <li>(c). To provide safety equipment, personal protective equipment and training on their use</li> <li>(d). To possess, transport, store, use and discharge chemicals and related materials in accordance with stipulations,</li> <li>(e). Not to import or export chemicals and related materials banned by the central supervising board.</li> </ul> </li> </ul> <p>Project Proponent commits to comply the stipulations:</p> <ul style="list-style-type: none"> <li>• For organizations and license holders who store the chemical and related substances to abide by the following facts for safety: <ul style="list-style-type: none"> <li>(a). installing the fire protection system in building to be stored in accordance with prescribed provisions of the Department of Fire Brigade and being the building which is constructed to correspond for storing the chemical and related substances;</li> <li>(b). sticking the warning sign according to hazard class, and keeping the safety equipment at the stored places;</li> <li>(c). storing only after checking certainly to the chemical and related substances which are kept completely with the pictogram, and packing system by the importers and possessors;</li> </ul> </li> <li>• To be safe, for the user of chemical and related substances: <ul style="list-style-type: none"> <li>(a). To use only the registered restricted or conditional chemical and related substances;</li> <li>(b). Not to use the unregistered, without labeled, unknown, damaged or expired chemical and related substances;</li> </ul> </li> </ul>

Sources of Related Laws, Rules and Regulations	Relevant Articles	Commitments
<b>Underground Water Act, 1930</b>		<p>The underground water act is enacted on the date of 21st June in 1930 whereas it is expedient to conserve and protect underground sources of water supply in the Union of Myanmar.</p> <p>Project Proponent commits to comply the stipulations:</p> <ul style="list-style-type: none"> <li>• for prohibition from sinking of a tube for the purpose of obtaining underground water except under and in accordance with the terms of a license granted by the water officer.</li> <li>• For the powers of Township Officer or sub-divisional officer to close a license tube after exercising jurisdiction over the local area concerned and the expense of such closure shall be recoverable from the owner of the tube as if it were an arrear of land-revenue.</li> </ul>
<b>Myanmar Insurance Law (1993)</b>	Clause 15, 16	<p>Myanmar Insurance is established under this Law as a legal entity having perpetual succession, capable of suing and being sued in its own name.</p> <p>Project Proponent commits to comply the stipulations:</p> <ul style="list-style-type: none"> <li>• For compulsory requirement for owners of motor vehicles to have Third Party Liability Insurance with Myanma Insurance</li> <li>• For compulsory requirement for organizations operating as an enterprise which may cause damage to life and property of the public or may pollute the environment to have General Liability Insurance with the Myanma Insurance.</li> </ul>
<b>Third-Party Liability insurance Rules (notification no.64/2003)</b>	Clause 3(a) (b)	<p>Project Proponent commits to comply the stipulations for the motor vehicles using in project:</p> <ul style="list-style-type: none"> <li>• To compulsorily insured with the Myanma Insurance against third-party liability for having his vehicle.</li> <li>• To pay the premium charged by the Myanma Insurance to it or the organization authorized thereby on registration of his motor vehicle or renewal of the registration.</li> </ul>
<b>The Law On Standardization (2014)</b>	Clause 3, 5	<p>Project Proponent commits to comply the stipulations:</p> <ul style="list-style-type: none"> <li>• For the smoothness of technology transfer and invention, utilizes the standardization to reduce the technological barriers for the trade and supportive for the development international free trade zone and for the development of Myanmar economy and social,</li> <li>• For empowering Ministry to organize the council for setting up the policy, guideline and to implement to practice the national standard in respective production and service.</li> </ul>
<b>Territorial Sea and Maritime Zone Law (Pyidaungsu Hluttaw Law No 14/2017)</b>	Clause 10 (a), 12(c), 30, 31 (b)	<p>Project Proponent commits to comply the stipulations:</p> <ul style="list-style-type: none"> <li>• For the restriction of routes for tanker carrying petroleum, ship using nuclear power, ship carrying material that means as nuclear as per its nature and hazardous or poisonous material.</li> <li>• For the right of the Government to temporarily block the innocent passage of foreign shipping for the purpose of state security.</li> <li>• For not altering or shifting the cultural heritage object and historic object situated under the contiguous zone without the Prior Approval of the Government.</li> </ul>

Sources of Related Laws, Rules and Regulations	Relevant Articles	Commitments
<b>Myanmar Port Authority Law 2015</b>	Clause 19 (a)(b), 23 (a) to (c), 19, 59, 66 (f), 72 (a) to (c), 73, 80(a), 80 (b), 80 (d), The Law Amending the Ports Act promulgated (2008), Clause 11 (substituting for Sub-Clause 21 of the Ports Act), 53	<ul style="list-style-type: none"> <li>• For the restriction for the exploration, production, catching natural resources in exclusive economic zone without prior permission.</li> </ul> <p>Project Proponent commits to comply the stipulations:</p> <ul style="list-style-type: none"> <li>• That the Myanmar Port Authority can claim damages from the relevant organization and person if the pollution arises and losses to environmental resources occur within the port limit and right to retain the relevant vessels, from above and under water natural resource exploration rigs and structures before obtaining the compensations.</li> <li>• That the Myanmar Port Authority, relating to environmental conservation, to carry out             <ol style="list-style-type: none"> <li>1. protection and prevention for non-existence of wastes;</li> <li>2. Distribution of information and technology, taking precautionary measures not cause oil spills from oil pipelines or from collision and grounding of vessels.</li> <li>3. For clearing and sanitation, not causing water pollution if oil and chemical spill occurs, charging the cost occurred from the responsible person.</li> </ol> </li> <li>• That the Myanmar Port Authority may claim damages from the relevant organization if damage and losses to environmental resources occur within the port limit due to oil spill.</li> <li>• For functions and duties to be carried out by the Myanmar Port Authority relating to the prevention of the infectious diseases and health of the sick within a port limit where sea-going vessels berth by itself or by delegating to the health officer appointed and assigned duty.</li> <li>• That the port conservator can remove sewage of a vessel disposed or dumped not in conformity with the discipline so as not to affect the navigation channel and claim the expenses from the relevant master of a vessel and take action against the master of a vessel who disposed or dumped the sewage;</li> <li>• For the requirement to apply a license from the Myanmar Port Authority for the building any kinds of wharf, shipyard, dry dock, slip way and require to pay license pay.</li> <li>• That the Myanmar Port Authority can charge a fine to the person who has obtained an operation license and violates the prohibitions.</li> <li>• Prohibition from causing oil spill or discharging of sludge from tankers navigated in port limit or from oil test wells, oil wells and oil pipelines and grounding of vessels</li> <li>• Prohibition from discharging, disposing or causing to fall dangerous materials, toxic materials, garbage, sludge and waste from vessels and above or below water from exploration rigs and structures within a port limit.</li> <li>• Prohibition from disposing or dropping materials that may slide into the port because of tide, storm or flood on land.</li> <li>• Prohibition from removing or shifting rocks, stones, gravels, sand or materials protecting the bank from slide from the foreshore and shore area of any bank without permission of the port conservator.</li> <li>• To comply with any order or directive by the assigned person on duty of the Myanmar Port Authority.</li> <li>• For Any person who by himself or another so casts or throws any ballast or rubbish or any such other thing or so discharges any oil or water mixed with oil, or the master of any vessel from which the same is so cast, thrown or discharged, to be punishable with fine not exceeding fifty thousand kyats, and to pay any reasonable expenses which may be incurred in removing the same.</li> </ul>

Sources of Related Laws, Rules and Regulations	Relevant Articles	Commitments
<b>Motor Vehicle Law (2015)</b>	Chapter 1, 2(v)	<ul style="list-style-type: none"> <li>For any pilot in charge of a vessel who disobeys, or abets disobedience to, any of the provisions of this Chapter, be punishable with fine not exceeding fifty thousand kyats for each instance of such disobedience or abetment, and, in addition, be liable to have his authority to act as a pilot withdrawn.</li> </ul> <p>Project Proponent commits to comply the stipulations:</p> <ul style="list-style-type: none"> <li>for reducing environmental pollution caused by motor vehicles</li> <li>for the right of the Department to issue directives, the standards, guidelines for the purposes of importing, manufacturing, assembling, maintaining to be safe in accident and environment conservation.</li> <li>For taking actions to conserve the green environment and the reduction in pollution of air, water, land and noises caused by motor vehicles.</li> </ul>
<b>Union of Myanmar Marine Fisheries law (25 April 1990, amended 1993)</b>	Clause 39, 40	<p>Project Proponent commits to comply the stipulations:</p> <ul style="list-style-type: none"> <li>For prohibition from disposing of living aquatic creatures or any material into the Myanmar Marine Fisheries Waters to cause pollution of water or to harass fishes and other marine organisms.</li> <li>For prohibition for searching and collecting marine products without a license.</li> </ul>
<b>Freshwater Fisheries Law, 1991,</b>	Clause 36, 40, 41	<p>Project Proponent commits:</p> <ul style="list-style-type: none"> <li>Not to erect, construct place, maintain or arrange any obstruction such as a dam, bank or weir in a freshwater fisheries waters without the permission of the Department.</li> <li>Not to cause harassment of fish and other aquatic organisms or pollution of the water in a freshwater fisheries water.</li> <li>Not to alter the quality of water, volume of water or the water -course in a leasable fishery, reserved fishery and creeks contiguous thereto or in water-courses.</li> </ul>
<b>The Law Relating to Aquaculture, 1989</b>	Clause 29(b)	<p>Project Proponent commits to comply the stipulation:</p> <ul style="list-style-type: none"> <li>For deterring transport by water and flow or pollution or mean to happen that at the territory of fishing area.</li> </ul>
<b>Public Health Law, 1972</b>	Clause 3, 5	<p>Project Proponent commits to cooperate with the authorized person or organization in line with the stipulations</p> <ul style="list-style-type: none"> <li>To abide by any instruction or stipulation for public health.</li> <li>To accept any inspection, anytime, anywhere if it is needed.</li> </ul>
<b>The Protection and Prevention of Communicable Disease Law, 1995</b>	Clause 3(a), 9, 11	<p>Project Proponent commits to comply the stipulations:</p> <ul style="list-style-type: none"> <li>For the Department of Health to carry out immunizations and health education activities related to communicable diseases</li> <li>For all responsible persons to prepare report for an outbreak of a communicable disease to the nearest Health Officer.</li> <li>For Health Officer to undertake investigations and medical examinations to prevent the control the spread of Principal Epidemic Disease.</li> </ul>
<b>The Control of Smoking and Consumption of Tobacco Product Law, 2006</b>	Clause 9(a-d),	<p>Project Proponent commits to comply the stipulation:</p> <ul style="list-style-type: none"> <li>For the person-in-charge <ul style="list-style-type: none"> <li>(a) To keep the caption and mark referring that it is a non-smoking area,</li> <li>(b) To arrange the specific place</li> <li>(c) To supervise and carry out measures so that no one shall smoke at the non-smoking area</li> <li>(d) To accept the inspection when the supervisory body comes to the place for which he is responsible.</li> </ul> </li> </ul>

Sources of Related Laws, Rules and Regulations	Relevant Articles	Commitments
<b>The Petroleum Rules (1937)</b>	Clause 3, 4	<p>Project Proponent commits to comply the stipulations for</p> <ul style="list-style-type: none"> <li>• The import, transport or store of any petroleum that cannot be made save in accordance to the rules.</li> <li>• The needs and exemptions from licenses and authorizes for the testing of petroleum by the President of the Union and rules that might issue rules on that regard.</li> </ul>
<b>The Petroleum and Petroleum Product Law, 2017</b>	Clause 7, 9, 10, 11	<p>Project Proponent commits to comply the stipulations for empowering:</p> <p>(a). To the Ministry of Commerce to function relating to:</p> <ul style="list-style-type: none"> <li>(e) issuing licenses relating to import and export (c) determining procedures and conditions related to import and export</li> <li>(f) prohibition not to import or export from the other places except from the places stipulated for import or export;</li> <li>(g) determining procedures, and conditions relating to import or export;</li> </ul> <p>(b). To the Ministry of Transport and Communications to carry out the following functions relating to any petroleum and petroleum product</p> <ul style="list-style-type: none"> <li>(a) issuing licenses relating to refining, transit, transport by pipeline, sale and distribution, inspection, and testing; issuing joint license or compound license for carrying out more than a type of business activities;</li> <li>(d) taking action, as necessary, in accordance with the existing laws if it occurs spill or accident in carrying out import, export, transport, and sale and distribution of petroleum and petroleum product by water;</li> <li>(e) determining standard and quality of receptacles for transport, and procedures and conditions for the pipelines;</li> </ul> <p>(c). To the Ministry of Transport and Communications to carry out the following functions relating to any petroleum and petroleum product</p> <ul style="list-style-type: none"> <li>(a) issuing license for the right to store for the storage tanks and warehouses;</li> <li>(b) issuing transport permit for the vehicles, vessels and barges that shall carry any petroleum and petroleum product;</li> <li>(d) if it occurs environmental impacts in carrying out petroleum and petroleum product business activities, taking action, as necessary , in accordance with the existing laws of on-site inspection</li> </ul> <p>(d). For stating warning sign of danger or if not possible writing to be displayed on all receptacles containing any dangerous petroleum and petroleum product.</p>
<b>The Oilfields Act (1918) (amended in 1919, 2010)</b>		<p>This act provides clarification on activities within the oil and gas industry, and provides the Government with the power to define and alter limits of any notified oilfield. In addition, the Government may make rules for regulating all matters connected with many operations related to the extraction of oil and/or gas.</p>
<b>Oilfields (Labor &amp; Welfare) Act (1951) (amended in 1953)</b>		<p>Project Proponent commits to comply guidance and issues prescribed such as for preventing oil and gas wastes, reporting of fires, accidents and other occurrences and regulating the collection and disposal of both oil and gas.</p> <p>The act provide for the prevention of waste of oil or gas and also the prevention of environmental pollution by petroleum operations. There mentions wide range of protection measures for O&amp;G workers, covering health, safety and worker welfare issues. It also covers working hours, holidays and extensive prescriptions on employing children as well as setting up an inspection.</p>

Sources of Related Laws, Rules and Regulations	Relevant Articles	Commitments
		<p>Project Proponent commits to comply the stipulations</p> <ul style="list-style-type: none"> <li>For the labors' working hours: Higher physical danger risk establishment (e.g. an oil rig): 8 hours/day or 40 hours/week, Medium physical danger risk establishment (e.g. factory, oilfield, open mine): 8 hours/day or 44 hours/week. If factory work is part of a continuous process (i.e. technical reasons): admissible 48 hours/week, 10 hours a day Max. 6 days/week (i.e. Sunday = weekly holiday). For Overtime: 2x normal pay rate. Work on weekly holiday = alternative day off within a period of 2 months. In Practice: No specific rules for offshore workers except in old law – oilfields act. Workers in industrial zones work around 11 hours a day, 6 days a week. Many in oilfields the same, but more dangerous jobs, 40/ week.</li> </ul>
<p><b>Explosives Substances Act (1908)</b></p>		<p>Project Proponent commits to comply the stipulations</p> <ul style="list-style-type: none"> <li>For any person who unlawfully and maliciously causes, by any explosive substance, an explosion of a nature likely to endanger life or to cause serious injury to property, whether any injury to person or property has been actually caused or not, to be punished with transportation for life or any shorter term, to which a fine may be added, or with imprisonment for a term which may extend ten years, to which a fine may be added.</li> </ul>
<p><b>Industrial Use Explosive Substance Law (Law no.17/2018)</b></p>	<p>Clause 19 (a)</p>	<p>Project Proponent commits to comply the prohibition</p> <ul style="list-style-type: none"> <li>Not to import, transport, store, make, use, hold, transfer the industrial explosive substances without any approval in accordance with this law.</li> </ul>
<p><b>Employment and Skill Development Law, 2013</b></p>	<p>Clause 5, 14, 15, 30</p>	<p>Project Proponent commits to comply the stipulation</p> <p>(a). For the agreement, training and probation period as prescribed in:</p> <ol style="list-style-type: none"> <li>If the employer has appointed the employee to work for an employment, the employment agreement shall be made within 30 days. But it shall not be related with government department and organization for a permanent employment.</li> <li>If pre training period and probation period are stipulated before the appointment the said trainee shall not be related with the stipulation of sub-section (1).</li> </ol> <p>(b). For particulars to be included in the employment agreement:</p> <ol style="list-style-type: none"> <li>the type of employment;</li> <li>the probation period;</li> <li>wage, salary;</li> <li>location of the employment;</li> <li>the term of the agreement;</li> <li>working hour;</li> <li>day off, holiday and leave;</li> <li>overtime;</li> <li>meal arrangement during the work hour;</li> <li>accommodation;</li> <li>medical treatment;</li> </ol>

Sources of Related Laws, Rules and Regulations	Relevant Articles	Commitments
		<ul style="list-style-type: none"> <li>12. ferry arrangement to worksite and travelling;</li> <li>13. regulations to be followed by the employees;</li> <li>14. if the employee is sent to attend the training, the limited time agreed by the employee to continue to work after attending the training;</li> <li>15. resigning and termination of service;</li> <li>16. termination of agreement;</li> <li>17. the obligations in accord with the stipulation of the agreement;</li> <li>18. the cancellation of employment agreement mutually made between employer and employee;</li> <li>19. other matters;</li> <li>20. specifying the regulation of the agreement, amending and supplementing;</li> <li>21. Miscellaneous.</li> </ul> <p>(c). For the worksite regulations contained in the employment agreement to be in compliance with any existing law and the benefits of the employee not to be less than those of the any existing law.</p> <p>(d). For the employment agreement, the Ministry can issue the notification for paying the stipulated compensation to the employee by the employer, if the work is completed earlier than the stipulated period or the whole work or any part of it have to be terminated due to unexpected condition or the work has to be terminated due to various conditions.</p> <p>(e). For the employment agreement made under sub-section (a) to be related with daily wage workers, piece rate workers who are appointed temporarily in the government department and organization.</p> <p>(f). For the worksite regulations and benefits contained in the employment agreement mutually made between the employer and employee or among the employees to be amended as necessary, in accord with the existing law.</p> <p>(g). For the employer to send a copy of the employment agreement made between the employer and employee, to the relevant employment and labor exchange office within the stipulated period and to get the approval of it.</p> <p>(h). For the employment agreement made before the enforcement of this law has to be confirmed up to the end of the term of the original agreement.</p> <ul style="list-style-type: none"> <li>• To carry out the training program in accord with the work requirement in line with the policy of the skill development team to develop the skill relating to the employment for the workers who are proposed to appoint and working at present. to carry out the training for each work or compounding the work individually or group-wise by opening on-job training, training systematically at worksite, sending outside training and training by using information technology system, for arranging the training program to enhance the employment skill of the workers;</li> <li>• For appointing the youths of 16 years as apprentice, to arrange the training for technology relating to the employment systematically in accord with the regulations prescribed by the skill development team.</li> <li>• For the employer of the industry and service business to put in to the fund monthly as put in fees without fail for the total wages of the subordinates and the supervisors' salary for not less than 0.5%;</li> </ul> <p>(b) To put in money paid under sub-section (a) not to be deducted from the wage and salary of the employees.</p>

Sources of Related Laws, Rules and Regulations	Relevant Articles	Commitments
<b>The Factories Act , 1951 (Amended in 1953, 1954, 1962, 2016)</b>		<p>Project Proponent commits to comply the provisions for the requirement</p> <ul style="list-style-type: none"> <li>• For permits for some chemicals.</li> <li>• For all factories to have proper pollution control measures such as air pollution, sewage and wastewater treatment system.</li> </ul>
<b>The Settlement of Labor Dispute Law, 2012</b>	Clause 38, 39, 40, 51	<p>The Pyidaungsu Hluttaw hereby had enacted this Law for safeguarding the right of workers or having good relationship between employer and workers and making peaceful workplace or obtaining the rights fairly, rightfully and quickly by settling the dispute of employer and worker justly.</p> <p>Project Proponent commits to comply:</p> <ul style="list-style-type: none"> <li>• Not to fail to negotiate and coordinate in respect of a complaint within the prescribed period without sufficient cause</li> <li>• Not to alter the conditions of service of workers involved in disputes prior to investigation by tribunals</li> <li>• For no party to strike or lock-out without negotiation, conciliation and arbitration by Arbitration Body.</li> <li>• For the employer if commits acts without sufficient cause, to be liable to pay full compensation to workers as determined by Arbitration Body or Tribunal.</li> </ul>
<b>The Workmen Compensation Act, 1923 (amended 2005)</b>		<p>The Workmen’s compensation act had been promulgated in 1923, amended in 2005,</p> <p>Project Proponent commits to comply the stipulations:</p> <ul style="list-style-type: none"> <li>• For the payment by certain classes of employers to their workmen of compensation for injury by accident.</li> <li>• For the liability for compensation of employer’s, amount of compensation, compensation to be paid when due and penalty for default, method of calculating wages, review, commutation of half-monthly payments, payment of a lump sum amount, distribution of compensation, compensation not to be assigned, attached or charged, notice and claim, power to require from employers statements regarding fatal accidents, reports of fatal accidents and serious bodily injuries, medical examination, contracting, remedies of employer against stranger, compensation to be first charge on assets transferred by employer, special provisions relating to masters and seamen.</li> <li>• For any updating for revising the monetary amount as per the amendment law.</li> </ul>
<b>Labor Organization Law (The Pyidaungsu Hluttaw Law No. 7/2011)</b>	Clause 17, 18, 19, 20, 21, 22	<p>This Law was enacted, to protect the rights of the workers, to have good relations among the workers or between the employer and the worker, and to enable to form and carry out the labor organizations systematically and independently.</p> <p>Project Proponent commits to comply the stipulations as there mentions:</p> <ul style="list-style-type: none"> <li>• That Labor Organizations are free to organise and negotiate workers rights if not meeting labour laws.</li> <li>• That Labour Organisations may demand re-appointment of worker if cause of dismissal is related to labour organisation membership or activities or not conform with labour laws..</li> <li>• That Labour Organisations have the right to send representatives to conciliation tribunals.</li> <li>• That Labour Organisations have the right to participate and discuss workers rights and interests with government and employers</li> <li>• That Labour Organisation have the right to participate in collective bargaining in accordance with labour laws.</li> <li>• That Labour Organisation may take collective actions in accordance with the relevant procedures, regulations and law.</li> </ul>

Sources of Related Laws, Rules and Regulations	Relevant Articles	Commitments
<b>Minimum Wages Law, 2013</b>	Clause 12 (a-e), 13 (a-g)	<p>This Law was enacted to meet with the essential needs of the workers, and their families, who are working at the commercial, production and service, agricultural and livestock breeding businesses and with the purpose of increasing the capacity of the workers and for the development of competitiveness.</p> <p>Project Proponent commits to comply the stipulations:</p> <ul style="list-style-type: none"> <li>For the employer not to pay wage less than the minimum wage stipulated, do not have the right to deduct any other wage;</li> <li>For the employer to inform rates of minimum wage relating to the business, allow the entry and inspection of the inspection officer, give the sick worker holiday for medical treatment in accord with stipulation and give holiday for the matter of funeral of the family of worker without deducting from the minimum wage.</li> </ul>
<b>Payment of Wages Law, 2016</b>	Clause 3, 4, 5, 7 (ii), 8, 9, 10, 14	<p>Project Proponent commits to comply the stipulations:</p> <ul style="list-style-type: none"> <li>That salaries are to be paid at the end of the month or, depending on the size of the employing enterprise, between 5-10 days before the end of the month. The employer is permitted and required to withhold income tax and social security payments. Other deductions, e.g. for absence, may only be withheld in accordance with the law.</li> <li>For the employer (a) to pay for salary either Myanmar Kyats or Foreign Cash permitted by National Bank of Myanmar. When delivery the salary (b) If the employer needs to pay the other opportunities or advantages, he can pay cash together with other materials according employee's attitude.</li> <li>For finishing the contract, employer need to pay the salary (not more than one month) to employees. For the permanent worker, need to pay per monthly. If more than 100 employees, need to pay within the 5 days from the end of month. If fire the employees, need to pay salary within two days after fire. When employee dies due to the accident, need to pay money as an insurance to employee's family within two days.</li> <li>For the employer to report to the Department with evidence of payment at later date agreed with the employee if the employer has difficulties to pay wages on time because of significant events (eg natural disaster),</li> <li>For the employer to deduct expense which are allowance for accommodation and ferry service arranged by the employer, meal allowance, electricity charges, water service charges and income taxes liable to be paid by workers and cash paid in excess under mistake, which are not included in the expression of wages under this Law and not to deduct from the wages of the worker except the deduction as per clause 7.</li> <li>For any deducting from the salary due to the employees' absence, the total cut salary not to be more than 50 % of his salary.</li> <li>For overtime work, to allow the presiding overtime rate as set by the Law.</li> </ul>
<b>Social Security Law, 2012</b>	Clause 11 (a)(b), 15(a), 16 (a), 18(b), 48(a), 49(a)(b), 51(a)(b), 53(a), 54(a)(b), 75	<p>Project Proponent commits to comply the stipulations:</p> <ul style="list-style-type: none"> <li>For compulsory registration for social security system and benefits, the following establishments can be applied if they employ minimum number of workers and above determined by the Ministry of Labor in co-ordination with the Social Security Board: <ul style="list-style-type: none"> <li>production industries doing business whether or not they utilize mechanical power or a certain kind of power, works of production, repairing or services, or engineering works, mills, warehouses, establishments;</li> </ul> </li> </ul>

Sources of Related Laws, Rules and Regulations	Relevant Articles	Commitments
		<ul style="list-style-type: none"> <li>ii. Government departments, Government organizations and regional administrative organizations doing business;</li> <li>iii. development organizations;</li> <li>iv. financial organizations,</li> <li>v. companies, associations, organizations and their subordinate departments and branch offices doing business;</li> <li>vi. shops, commercial establishments, public entertaining establishments;</li> <li>vii. Government departments and Government organizations doing business or transport businesses owned by regional administrative body, and transport businesses carried out with the permission of such department, body or in joint venture with such department or body;</li> <li>viii. construction works carried out for a period of one year and above under employment agreement;</li> <li>ix. works carried out with foreign investment or citizen investment or joint ventured businesses;</li> <li>x. works relating to mining and gemstone contained in any existing law;</li> <li>xi. works relating to petroleum and natural gas contained in any existing law;</li> <li>xii. ports and out-ports contained in any existing law;</li> <li>xiii. works and organizations carried out with freight handling workers;</li> <li>xiv. Ministry of Labor and its subordinate departments and organizations;</li> <li>xv. Establishments determined by the Ministry of Labor from time to time, in co-ordination with the Social Security Board and with the approval of the Union Government; that they shall be applied with the provisions of compulsory registration for Social Security System and benefits contained in this Law.</li> </ul> <ul style="list-style-type: none"> <li>• For provisions of compulsory registration under sub-section (a) to continue to be applied by this Law even though any of the following situations occurs if it continues to carry out such work: <ul style="list-style-type: none"> <li>i. carrying out work by employing under stipulated minimum number of workers but more than one worker;</li> <li>ii. changing the employer or changing the type of business.</li> </ul> </li> <li>• For the Social security fund, to include the funds for health and social care, family assistant, invalidity benefit, superannuation benefit and survivors' benefit, unemployment benefit, other social security fund for social security system of compulsory registration and contribution stipulated by the Ministry of labor, other social security fund and social security housing plan fund.</li> <li>• For arranging insurance for the workers to enable to enjoy social security benefits by contributing to the social security fund.</li> <li>• For the employer to deduct contributions to be paid by worker from his wages together with contribution to be paid by him and pay to the social security fund and in such case he can incur the expense.</li> <li>• For the employer to effect insurance by registering for employment injury benefit insurance system contained in section 45 at the relevant township social security office and pay contribution to employment injury benefit fund in accord with stipulations in order that workers applied to provisions of compulsory registration may obtain the employment injury benefits.</li> <li>• For the inapplicability to the Workmen's compensation act.</li> </ul>

Sources of Related Laws, Rules and Regulations	Relevant Articles	Commitments
<p><b>Law protecting Ethnic Right, 2015</b></p>	<p>Clause 5</p>	<ul style="list-style-type: none"> <li>• For the employer (a) to pay contribution monthly to Employment Injury Benefit Fund at the rates stipulated under section 50. Moreover he shall also bear the expenses for paying as such; (b) to pay defaulting fee stipulated under section 88, in addition to the contribution if fails to contribute after effecting insurance for employment injury benefit.</li> <li>• For the employers and workers (a) to co-ordinate with the Social Security Board or insurance agency in respect of keeping plans for safety and health in order to prevent employment injury, contracting disease and decease owing to occupation and in addition to safety and educational work of the workers and accident at the establishment;</li> <li>• For the employer (a) to report to the relevant township social security office immediately if a serious employment accident occurs to his insured worker. There shall not be any delay without sufficient cause to report as such. (b) A team of officers and other staff who inspect the establishments, if it is found out the employment injury, death, and contracting disease, shall report to the relevant township social security office in accord with the stipulations.</li> <li>• For keeping records of work and lists.</li> </ul> <p>Project Proponent commits to comply the stipulations</p> <p>For the Equal right between the Ethnic living in Myanmar. It enacted that if an ethnic loose the right, he can complain to the Regional or State Government to get the equal chance and find the equal right.</p> <p>That project matters shall be informed, coordinated and undertaken in consultation with ethnic groups if projects are in areas with ethnic groups.</p> <p>Project Proponent also commits to comply the Succeeding laws to protect the right of Myanmar national:</p> <p><b>Monogamy Law (2015):</b> Concerning all those who are living in Myanmar, Myanmar Citizens who live outside of Myanmar, and foreigners who marry Myanmar citizens while living in Myanmar for preventing misconducting marriages.</p> <p><b>Buddhist Women Special Marriage Law (2015):</b> Concerning the marriage between Buddhist Woman and other religious man. There prescribed the legal procedure, the conditions to be complied by non-Buddhist husband, the customs for dividing property when divorcing.</p> <p><b>Religious Conversion Law (2015):</b> This is enacted for the freedom to convert from one religion to another, or a person without a religion has the freedom to convert to a religion. There prohibited to apply for a religious conversion with an intent to insult, disrespect, destroy, or abuse a religion.</p> <p><b>Population Control Healthcare Law (2015);</b> This is for alleviate poverty, provide adequate quality healthcare, and ensure that family planning improves maternal and child health in the country. This Empowers region or state government that concerned with the special zone for healthcare to form region or state population control healthcare group to implementing the task as per the directives of the Ministry and region or state government and the Union Territory Governing body.</p>

Sources of Related Laws, Rules and Regulations	Relevant Articles	Commitments
<b>Leaves and Holidays Act, 1951</b>	Clause 4.	<p>Project Proponent commits to comply the stipulations:</p> <ul style="list-style-type: none"> <li>• For employee to be granted to pay public holidays as announced by the Government in the Myanmar Gazette. On average, Myanmar has 26 public holidays per year, depending on the date of the variable holidays.</li> <li>• For additional rules to apply in accordance with other laws, such as the Social Security Law (2012) for employees contributing to the Social Security Fund.</li> <li>• To grant earned leave with average wages or average pay for a period of ten consecutive days by his employer during the subsequent period of twelve months to every employee who has completed a period of twelve months continuous service.</li> </ul>

**Table 3.2 International Conventions relevant to the Project**

Legislation	Description	Relevance to the Project	Ratification Status in Myanmar
<b>Environmental</b>			
The International Convention for the Prevention of Pollution from Ships 1973, as modified by the Protocol of 1978 relating thereto and by the Protocol of 1997(MARPOL)	Regulates waste, emission and discharges from vessels. Contains the following Annexes:		
	Annex I: Regulations for the Prevention of Pollution by Oil (October 1983)		
	Annex II: Regulations for the Control of Pollution by Noxious Liquid Substances in Bulk (1986)	The Project vessels will comply with emissions and discharge standards. Annex I, IV, V and VI are of relevance to the Project.	Ratified Annexes I and II
	Annex III: Regulations for the Prevention of Pollution by Harmful Substances Carried by Sea in Packaged Form (1992)		
	Annex IV: Regulations for the Prevention of Pollution by Sewage from Ships (September 2003)		
	Annex V: Regulations for the Control of Pollution by Garbage from Ships (December 1998)		
Annex VI: Regulations for the Prevention of Air Pollution from Ships (1997)			
International Convention for the Control and Management of Ships' Ballast Water and Sediments (the Ballast Water Management Convention)	Aims to address the transfer of harmful aquatic organisms and pathogens in ships' ballast water.		

Legislation	Description	Relevance to the Project	Ratification Status in Myanmar
Vienna Convention for the Protection of the Ozone Layer 1988 and Montreal Protocol on Substances that Deplete the Ozone Layer 1989	Aims at the protection of the ozone layer, including requirements for limiting the production and use of ozone depleting substances.	Project vessels will comply where relevant.	Accession 16 Sep 1998 (Vienna) & Accession 24 Nov 1993 (Montreal)
Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention) (CMS)	CMS provides a global platform for the conservation and sustainable use of migratory animals and their habitats. Myanmar is currently a non-party but is a MOU Signatory for two CMS instruments: IOSEA Marine Turtles and dugongs.	The Project will be undertaken offshore where marine turtle species have been recorded. Dugongs are coastal and unlikely to be impacted by Project activities.	Marine Turtle (2001) & dugong (2007)
Convention on Biological Diversity 1992	Aims to promote national policies for the conservation of wild flora, fauna and habitat that needs to be included in planning policies. The three main goals are: (1) the conservation of the biological diversity; (2) the sustainable use of its components; (3) fair and equitable sharing of the benefits.	The Project will be undertaken in offshore habitats.	Ratified 25 Nov 1994
Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (1992)	The Convention regulates the transboundary movements of hazardous wastes and provides obligations to its Parties to ensure that such wastes are managed and disposed of in an environmentally sound manner.	The Project may generate hazardous wastes.	Entered into force 6 April 2015
United Nations Framework Convention on Climate Change 1992 (UNFCCC) and Kyoto Protocol 1997	Provide a framework for intergovernmental efforts to tackle climate change. Recognises that the climate system is a shared resource whose stability can be affected by industrial and other emissions of carbon dioxide and other GHGs.	The Project will form part of Myanmar's total emissions output.	Entered in force 23 Feb 1995 (UNFCCC) and 16 Feb 2005 (Kyoto Protocol)

Legislation	Description	Relevance to the Project	Ratification Status in Myanmar
Asia Least Cost Greenhouse Gas (GHG) Abatement Strategy (ALGAS) 1998	Develop national and regional capacity for preparation of GHG inventories. Assist in identifying GHG abatement options and preparation of a portfolio of abatement projects for each country.	The project will produce air emissions from the vessels.	1998
United Nations Agenda 21	Formed by the National Commission for Environmental Affairs in Myanmar. Provides a framework of programmes and actions for achieving sustainable development in the country. Building on the National Environment Policy of Myanmar, takes into account principles contained in the Global Agenda 21. Myanmar Agenda 21 also aims at strengthening and promoting systematic environmental management in the country.	Not relevant to Project. Relevant to government.	Since 1997
Social			
The International Convention for the Safety of Life at Sea (SOLAS) 1974	Ensures that ships flagged by signatory States comply with minimum safety standards in construction, equipment and operation.	The Project vessels will comply with safety standards (as applicable or required by vessel class).	Entered into Force 11 Feb 1988
Convention on the International Regulations for Preventing Collisions at Sea (COLREG) 1972	Sets out the navigation rules to be followed by ships and other vessels at sea to prevent collisions between two or more vessels.	The Project vessels will comply with navigation rules (as applicable or required by vessel class).	Entered into Force 11 Nov 1987
International Convention on Standards of Training, Certification and Watch-keeping for Seafarers 1978	Sets out requirements for marine environment awareness training and training in leadership and teamwork including new training guidance for personnel operating Dynamic Positioning Systems.	The project vessels will comply with training requirements (as applicable or required by vessel class).	Entered into Force 1988

### 3.2.4

#### *Good International Industry Practice Guidelines*

PCML has undertaken the EIA Study and will undertake offshore field development and production activities in a manner which is guided by good international industry practice.

Applicable guidelines which PCML will consider in preparing its approach include:

- IFC Performance Standards (IFC PS) (2012): The IFC PS's represent the 'policy framework' for the EIA and sustainable social and environmental management for the Project, whereas the World Bank Group's Environmental, Health, and Safety (EHS) Guidelines provide guidance on general and industry best practice as well as recommended numerical limits for emissions to the atmosphere, noise, liquid and solid wastes, hazardous wastes, health and safety, and other aspects of industrial facilities and other types of development projects.
- World Bank Group (WBG) EHS General Guidelines (2007): The EHS Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP). The EHS Guidelines contain the performance levels and measures that are generally considered to be achievable in new facilities by existing technology at reasonable costs.
- WBG EHS Guidelines for Offshore Oil and Gas Development (updated 2015): These latest guidelines for offshore oil and gas development (June 2015) consider industry-specific impacts and management relevant to the environment, occupational health and safety and community health and safety, as well as the development of performance indicators and monitoring programs. The applicability of the EHS Guidelines should be tailored to the hazards and risks established for each project on the basis of the results of the environmental assessment.

### 3.3

#### *CONTRACTUAL AND OTHER COMMITMENTS*

PCML commit to following all applicable local and international laws listed in this EIA Report.

The Production Sharing Agreement between MOGE and PCML notes that the Project shall be undertaken in accordance with the laws, regulations and directives of Myanmar:

*"Art. 17.2e States " Contractor shall be responsible for execution of work programmes which shall be implemented in a workmanlike manner and by appropriate scientific methods, and Contractor shall take such precautions for protection of navigation and fishing and the prevention of environmental pollution. It is also understood that the execution of the work programme shall be exercised so not to conflict with the Laws of the Union of Myanmar."*

### 3.4 INSTITUTIONAL FRAMEWORK

#### 3.4.1 Myanmar Regulatory Authorities

In Myanmar, matters pertaining to Health, Safety and Environment (HSE) requirements are generally under the jurisdiction of the ministries and state-owned enterprises. Key ministries, agencies and state-owned enterprises that have jurisdiction over HSE matters in oil and gas operations are included in Table 3.3.

**Table 3.3 Key Ministries, Agencies and State-Owned Enterprises Involved in HSE**

Ministry/Agency	Responsibility
Ministry of Natural Resources and Environmental Conservation (MONREC)	The Environmental Conservation Department (ECD) of MONREC has ultimate responsibility in the review and approval, or otherwise, of submissions under the IEE/EIA process.
Myanmar Oil and Gas Enterprise (MOGE)	MOGE is the state-owned enterprise responsible for working together with oil and gas companies (local and international) in Myanmar and oversees the PSCs in cooperation with foreign oil companies. MOGE is involved in direct communication and coordination with various levels of different government agencies for HSE related issues.
Ministry of Electricity and Energy (MOEE)	MOEE jointly works with MOGE in managing HSE issues of oil and gas operators in Myanmar, in which MOEE encourages operators to establish a HSE Management System and prepare their own EIA/SIA for their project.
Myanmar Investment Commission (MIC)	MIC is a government agency responsible for coordinating with ministries (such as the MOEE) and other state entities to facilitate foreign investment in Myanmar. The MIC is also responsible for granting MIC permits which enable foreign investors to carry out business activities under the Myanmar Investment Law (2016).
Ministry of Labour, Immigration and Population (MOL)	Factory and General Labour Laws Inspection Department of MOL encounter the safety and welfare issue of labours.

#### *Fisheries Organizations*

Given the offshore location of the Project, fisheries organisations are considered to be of relevance. The key organisations involved in the governance of the fisheries sector are discussed in the section below.

##### 1. Department of Fisheries

The Department of Fisheries (DoF), under the Ministry of Agriculture, Livestock and Irrigation, is the main institutional body which governs fishing grounds, methods and catches. The DoF is responsible for the development of the fisheries sector and management of commercial fisheries including exports. There are also fisheries administrations within the States and Divisions of Myanmar.

The DoF is responsible for:

- Issuing fisheries licenses for gear/vessels/sites and aquaculture sites/ventures.
- Advising the Ministry of Agriculture, Livestock and Irrigation and the Divisional and State Government on fisheries and aquaculture matters.
- Acting as regulatory body for the correct and proper conduct of fisheries and aquaculture.
- Facilitating the technical needs and equipment of the marine sector.
- Undertaking research and development activities.

## 2. Myanmar Fisheries Federation

The Myanmar Fisheries Federation (MFF) was formed in 1998 from the Myanmar Fishery Association, as part of the Association of South-East Asia Nations (ASEAN) Fisheries Federation. It is a non-governmental organisation (NGO) that deals with the fisheries industry.

The MFF operates at a local and national level and is governed by a Central Executive Committee. The Central Executive Committee plays a coordinating role and is supported by office holders. The role of the MFF is to:

- Support applications made by its members to DoF for the fisheries and aquaculture licenses.
- Support applications to the Livestock and Fisheries Bank for loans.
- Raise issues of importance to their members with the DoF.
- Assist in the negotiation of selling and harvesting.
- Assist in the transferring of technology to farmers.
- Assist in the communication and cooperation with trans-boundary organisations.

### 3.5

#### ***PROJECTS ENVIRONMENTAL AND SOCIAL STANDARDS***

With the release of the final EIA Procedure in December 2015, the National Environmental Quality (Emissions) Guidelines (NEQ) were also released. These Guidelines provide the basis for regulation and control of noise and air emissions and effluent discharges from projects in order to prevent pollution and protect the environment and public health. These standards are noted to be the same as that recommended by the IFC General EHS Guidelines (IFC 2007).

A summary of Myanmar national environmental standards that are relevant to the Project (offshore oil and gas) for effluent discharges is shown in *Table 3.4*.

**Table 3.4 National Environmental Quality (Emissions) Guidelines on Effluent Levels**

Parameter	National Environmental Quality guidelines
Drilling fluids and cuttings (non-aqueous drilling fluid)	<p>Non-aqueous drilling fluid, re-inject or ship-to-shore; no discharge to sea</p> <p>Drilled cuttings, re-inject or ship-to-shore; no discharge except:</p> <ul style="list-style-type: none"> <li>• Oil concentration lower than 6.9% by weight on wet cuttings (as per IFC 2015 EHS Guidelines)</li> <li>• Mercury maximum 1 mg/kg dry weight in stock barite</li> <li>• Cadmium maximum 3 mg/kg dry weight in stock barite</li> <li>• Discharge via a caisson at least 15 metres below sea surface</li> </ul> <p><i>(Note: ECD allows an exemption to the above guidelines for exploration drilling with the limits presented in IFC EHS Guidelines for Offshore Oil and Gas (2015) permitted). The approval letter from MOGE is provided in Appendix A.</i></p>
Drilling fluids and cuttings (water-based drilling fluid)	<p>Water-based drilling fluid, re-inject or ship-to-shore; no discharge to sea</p> <p>Water-based drilling fluids and cuttings, re-inject or ship-to-shore; no discharge to sea except:</p> <ul style="list-style-type: none"> <li>• Mercury 1 mg/kg dry weight in stock barite</li> <li>• Cadmium 3 mg/kg dry weight in stock barite</li> <li>• Maximum chloride concentration must be less than four times ambient concentration of fresh or brackish receiving water</li> <li>• Discharge via a caisson at least 15 meters below sea surface</li> </ul>
Sewage	Compliance with MARPOL 73/78 <sup>h</sup> (as per vessel class)
Food waste	Compliance with MARPOL 73/78 <sup>h</sup> (as per vessel class)
Storage displacement water	Compliance with MARPOL 73/78 <sup>h</sup> (as per vessel class)
Bilgewater	Compliance with MARPOL 73/78 <sup>h</sup> (as per vessel class)
Deck drainage	Compliance with MARPOL 73/78 <sup>h</sup> (as per vessel class)

This section provides a brief overview of the alternatives considered and details of the proposed Project activities to be conducted within the Project Area (i.e., the area in which the wells will be drilled).

#### **4.1 PROJECT BACKGROUND**

PC Myanmar (Hong Kong) Limited (PCML) is involved in the oil and gas exploration activities in offshore Myanmar. PCML are the operator of the existing Yetagun Platform targeting the Yetagun Field in Blocks M12, M13, and M14. PCML wish to drill three additional wells within the field.

#### **4.2 PROJECT LOCATION**

The Project will cover the drilling of three infill wells within the Project Area of Block M-12, M-13 and M-14, which will be drilled in waters depths of about 110 m deep and at least 140 km from the mainland coastline and over 100 km from the nearest islands (Kyunsu) of the Myeik Archipelago.

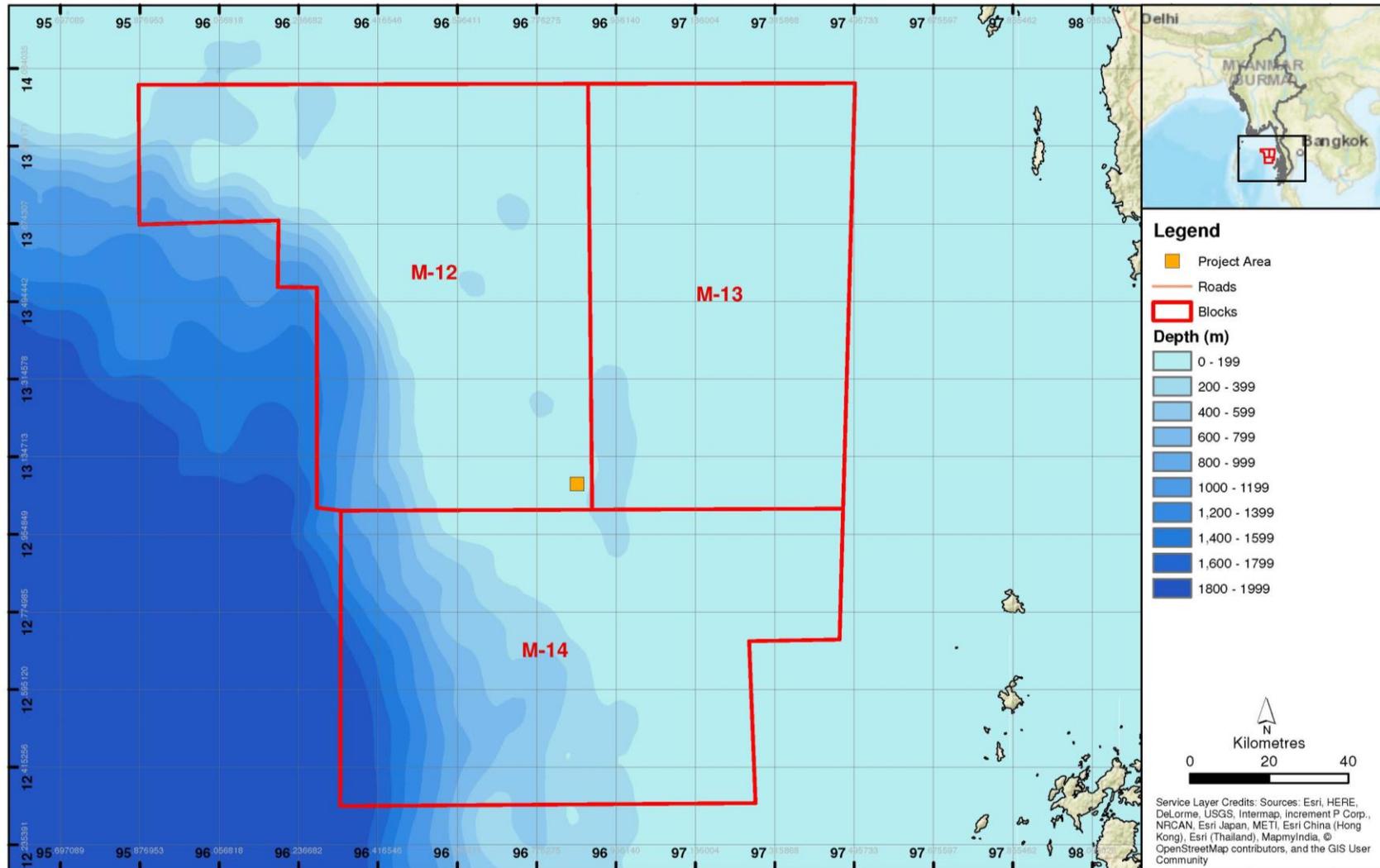
The wells will be drilled using a mobile offshore drilling unit (MODU) which will have an exclusion area of 5 NM radius in which other shipping or fishing vessels cannot enter. Given the wells will be drilled at the existing Yetagun production platform, this exclusion area will overlap the existing exclusion area that surrounds the Yetagun Complex. This exclusion safety zone is agreed with the MOGE.

The coordinates for the three wells are provided in *Table 4.1* and shown in *Figure 4.1*.

**Table 4.1 Well Locations**

No	Name	Coordinates
1	YA-01	Lat: 13° 4'17.09"N/ Long: 96°52'5.31"E
2	YA-05	Lat: 13° 4'17.09"N/ Long: 96°52'5.31"E
3	YA-12TS1	Lat: 13° 4'17.09"N/ Long: 96°52'5.31"E

Figure 4.1 Project Location



### 4.3

#### *PROJECT DEVELOPMENT AND IMPLEMENTATION TIME SCHEDULES*

The proposed infill drilling consisting of three (3) wells is scheduled to take place in Q4 2018. Each well will take approximately 65 days to complete; therefore drilling will take around 7-8 months.

### 4.4

#### *DESCRIPTION OF THE PROJECT*

#### 4.4.1

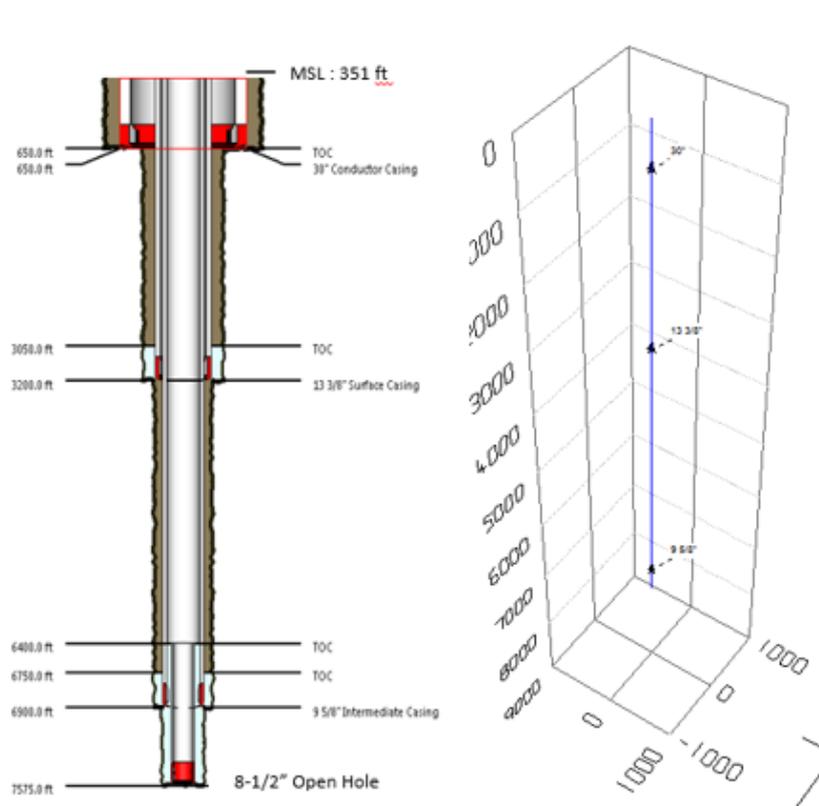
##### *Drilling Activities*

A typical offshore well is drilled to a depth of 2,000 m to 3,000 m (total vertical depth in metres below sea bed). A generic well schematic for M-12, M-13 and M-14 is provided in *Figure 4.2* and a summary of the well information is provided in *Table 4.2*.

**Table 4.2** *Indicative Well Information Summary*

Well Interval	Hole Diameter (inches)	Discharge Method	Cuttings Discharge (m <sup>3</sup> )	Muds		Discharge duration (days)
				Type	Volume of solids discharged (m <sup>3</sup> )	
Surface hole	23"	Near seabed (riser-less)	400	Bentonite / seawater	2,500	2
Intermediate hole	17.5"	Near seabed (riser-less)	500	WBDF (KCl/PHP A)	1,500	6
Intermediate hole	12.25"	Surface (riser)	700	NADF	0	21
Production hole	8.5"	Surface (riser)	30	NADF	0	12
Production hole	6"	Surface (riser)	10	NADF	0	3
<b>Total discharge volume of sediments</b>			<b>1,640</b>		<b>4,000</b>	<b>44</b>

Figure 4.2 Indicative Infill Drilling Well Schematic



Usually, the top-hole section(s) are drilled riser-less using seawater and/or WBDF to circulate drill cuttings from the wellbore, which are released to the seabed. After drilling, a conductor (i.e. steel tubular casing) is run and cemented in place which provides structural support for the well. Details of the cementing chemicals are provide in **Appendix B**.

After completion of the top-hole section a blowout preventer (BOP) and marine riser is installed on the wellhead. The BOP is required for well control and a marine riser acts as a conduit between the wellhead and MODU.

Once the riser is in place the bottom-hole sections will be drilled using WBDF. The drill cuttings will be re-injected where possible however the majority of WBDF cuttings will be discharged to sea. The discharge will be in line with Myanmar Environmental Emissions Guidelines and IFC EHS Guidelines for Offshore Oil and Gas Developments (2015), namely;

- Mercury 1 mg/kg dry weight in stock barite.
- Cadmium 3 mg/kg dry weight in stock barite.
- Maximum chloride concentration must be less than four time’s ambient concentration of fresh or brackish receiving water.
- Discharge via a caisson at least 15 meters below sea surface.

Non-aqueous drilling fluid (NADF) will be used on the intermediate and bottom hole sections. Where NADF are used, cuttings will be processed on board the MODU prior to discharge to the marine environment in line with Myanmar Environmental Emissions Guidelines and IFC EHS Guidelines for Offshore Oil and Gas Developments (2015); namely:

- Oil concentration lower than 6.9% by weight on wet cuttings (as per IFC 2015 EHS Guidelines).
- Mercury maximum 1 mg/kg dry weight in stock barite.
- Cadmium maximum 3 mg/kg dry weight in stock barite.
- Discharge via a caisson at least 15 metres below sea surface.

#### 4.4.2 *Vertical Seismic Profiling (VSP)*

Once the well had been constructed, cemented and logged, the target reservoir would be identified through logging activities. Once the required depth is reached, the formation (seabed and subsea structures) may be evaluated by taking a series of measurements from inside the wellbore. These measurements are used to provide further detail on the subsurface characteristics and to inform on hydrocarbon presence in the rock adjacent to the well. These measurements may include extracting small cores, wireline logging and vertical seismic profiling (VSP) as required.

VSP is an optional tool that is used to generate a high-resolution seismic image of the geology in the well's immediate vicinity. VSP uses a small airgun array, typically comprising either a system of three 250 inch<sup>3</sup> airguns with a total volume of 750 inch<sup>3</sup> of compressed nitrogen at approximately 2,000 pounds per square inch (psi). During VSP operations, four to five receivers are positioned in a section of the wellbore and the airgun array is discharged approximately five times at 20 second intervals. The generated sound pulses are reflected through the seabed and are recorded by the receivers to generate a profile along a section of the wellbore. This process is repeated as required for different stations in the wellbore and will involve approximately 18 hours of source release, within a 24 hour period.

#### 4.4.3 *Well Commissioning*

Once the wells are drilled and completed, well cleanup and production testing will be conducted by flowing well fluids via test equipment on the drilling rig. This requires separation of drilling fluids, produced water, gas and condensate. Water will be treated using the produced water treatment system for overboard disposal. Condensate will be sent to the condensate line or contained for onshore disposal and gas sent to export pipeline or flared. Well fluids will be processed on board the MODU or production platform prior to discharge in line with Myanmar Environmental Emissions Guidelines and IFC EHS Guidelines for Offshore Oil and Gas Developments (2015).

#### 4.4.4

#### *Vessel Requirements*

##### *Mobile Offshore Drilling Unit (MODU)*

A mobile offshore drilling unit (MODU) will be utilised for infill well drilling with a requirement that will be stationed adjacent to the Yetagun-A Well Head Platform. Due to PCML's operational experience in Myanmar waters, a semi-tender (i.e. semi-submersible) is identified as the preferred drilling rig type. The rig's drilling package would be transferred to the Yetagun-A platform and the rig will provide power and services to support the drilling operations. This floating rig, semi-submersible proposed is expected to require 8 anchors to maintain position during drilling activities. An example of a semi-tender rig is presented *Figure 4.3*.

**Figure 4.3** *Example of Semi-tender Rig*



In general, it can be expected that the drilling rig will have the following features:

- Accommodation including a hospital, mess, prayer room, offices, recreation, fluids lab, central control room, training room and helideck;
- Electrical power generating system;
- Cranes;
- Storage facilities – potable water, drill water, fuel, mud pits, cement bulk tanks, mud system bulk, clean fluid tanks, sack storage and store rooms;
- Drilling equipment – derrick, rotary table, draw-works, casing suspension system, mud pumps, mud pits and mixing equipment, solids control equipment, blowout preventers and choke manifold, and drilling accessories (e.g. drill pipe, drill collars, fishing tools, etc.);

- Well servicing equipment; and
- Safety equipment.

A 5 NM exclusion zone will be implemented around the MODU once on site for the duration of infill drilling in order to prevent any interactions with other marine users (i.e. shipping or fishing activities). This exclusion zone will overlap the existing exclusion zone in place at the existing Yetagun Complex. The safety exclusion zone is approved by the MOGE and is specified to be 5NM.

The MODU to be used for the Project is likely to be the West Vencedor. An inspection of this MODU was conducted for PCML in August 2018. The Inspection Report is provided in **Appendix C**.

The following data provided in *Table 4.3* is representative for the type of vessel that will be used. The MODU (and support vessels) would be mobilized from Singapore, or any country of origin, most likely a nearby country in South East Asia.

**Table 4.3** *Indicative MODU Details*

Component	Specification
Rig type/design/class	Floating , Semi-Submersible or Drill Ship
Accommodation	150 - 200
Station keeping	Anchors or DP
Max drill depth/water depth	+/- 6000m / +/- 1500m
Operating draft	11 -17m
Transit draft	9 - 12.8m
Bulk mud and cement storage capacity	30,000 cu.ft - 37,000 cu.ft
Liquid mud storage capacity	12,000bbls - 14,000bbls
Fuel oil storage capacity	25,000bbls - 35,000bbls
Drill water storage capacity	16,000 - 18,000bbls

#### *Support Vessels and Equipment*

Drilling operations will be supported by up to three support vessels used to tow the MODU to the drilling site, assist MODU anchoring, transport equipment, fuel, materials and waste between the MODU and the supply base (potentially located in Myanmar and/or Thailand). Support vessels will not anchor within the Project Area. Fuel will be transported to the MODU from the support vessels whilst at sea (i.e. offshore bunkering). The support vessels will also transfer drilling fluids, cements, and drill water as required and collect waste materials, and waste oil from the MODU for appropriate reuse, recycling or disposal via a suitable port and handling facility. The port used will be confirmed within the EIA Report

At this stage, the supply vessels that will be utilized are not yet confirmed. However, the following data provided in *Table 4.4* are representative for the type of vessel that will be used. An example of a support vessel is presented *Figure 4.4*.

**Table 4.4** *Indicative Support Vessel Details*

Phase	Drilling
Activity	Support
No. of vessels	3
Positioning system	Dynamic positioning/anchor
Overall length	70-90m
Personnel	Average 20 Max 24
Engine Power	10,000 bhp
Bollard Pull Capability	120-200 tons
Vessel movements to Supply Base	Thaketa Myanmar / Ranong Thailand

**Figure 4.4** *10,000 bhp Anchor Handling Tug Supply (AHTS) Vessel*



#### **4.4.5** *Drilling Fluids and Chemicals*

The function of the drilling mud is to provide circulation to remove cuttings from the hole, to cool the drill bit and to provide a hydrostatic head exerting a greater pressure than that expected from any formation which may be encountered in order to maintain well control. WBDF will be used for the exploration drilling. WBDF generally consists of approximately 92-98% fresh or saline water, with the remaining percentage comprising of drilling fluid additives that are generally inert or readily biodegradable organic polymers. A synthetic organic base fluid (40 to 65% by volume) is used in NADF. NADF have been specifically developed by the industry as a low toxicity, faster biodegrading replacement to traditionally-used oil based fluid. NADF will be recycled and bulk quantities will ultimately be transferred back onshore and returned to suppliers.

All chemicals that may be discharged to the marine environment during the infill drilling activity are required to be selected and approved in line with National laws and regulations. Chemicals considered for use are assessed in terms of their application, discharge and potential risk to the marine environment. The material safety data sheets (MSDSs) for all cementing and drilling chemicals are provided in **Appendix B** and **Appendix D**, respectively. Each MSDS contains the following:

- Identification of the substance and composition/information on ingredients;
- Hazards identification, including: first aid measures, firefighting measures, and accidental release measures;
- Handling and storage;
- Exposure controls/personal protection;
- Physical and chemical properties;
- Stability and reactivity,
- Toxicological and ecological information,
- Disposal considerations and transport information; and
- Regulatory information-international compliance.

Chemicals are selected based on their required use taking into consideration the toxicity rating on the MSDS. Low toxicity drilling chemicals are selected where possible.

#### **4.4.6 Emissions, Discharges & Wastes**

##### *Air Emissions*

Atmospheric emissions will arise from internal combustion engines on the MODU, PSVs and machinery engines resulting in the release of sulphur dioxide (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>), greenhouse gases (GHG), carbon dioxide (CO<sub>2</sub>), particulates and Volatile Organic Compounds (VOCs). An extensive analysis of the GHG emission of shipping is presented in the Third IMO Greenhouse Gas Study 2014<sup>(1)</sup> where a number of factors were developed for the emission of GHGs based on the mass of fuel consumed. It should be noted that both Nitrogen dioxide (NO<sub>2</sub>) and methane (CH<sub>4</sub>) are GHGs emitted in relatively trace amounts by ships. For the purposes of this project they can be considered to make a negligible contribution. The principal GHG emitted by internal combustion engines is CO<sub>2</sub>. Factors for the generation of CO<sub>2</sub> from various fuels are presented in *Table 4.5*.

(1) Third IMO Greenhouse Gas Study 2014.

**Table 4.5 Specific Emission Rates of CO<sub>2</sub> for Various Shipping Fuels**

Fuel Type	CO <sub>2</sub> Emissions (g/g fuel)
Residual fuel oil (RFO)	3.114
Low sulphur fuel oil (LSFO)	3.114
Marine gas oil (a distillate product) (MGO)	3.206
Liquid natural gas (LNG)	2.750

Estimated GHG emissions in tons of CO<sub>2</sub> equivalent for the Project are set out in Table 4.6.

**Table 4.6 Greenhouse Gas Calculation**

Vessel	Fuel* Consumed (tonnes)	CO <sub>2</sub> Emission (Tonnes)
MODU	1,600	5,130

\*fuel estimated as Marine gas oil

#### Wastewater and Wastes

The wastewater generated by the MODU and support vessels includes domestic and sanitary wastewater, deck drainage and bilge water. Wastes will be treated and monitored aboard before discharge into the surrounding environment. These wastewater releases will be tested to ensure compliance with International Convention for the Prevention of Pollution from Ships (MARPOL) 73/78 Annex I requirements and the National Environmental Quality (Emissions) Guidelines; which are identical. The treatment system consists of the following which is designed to meet the above standards;

- Mixing and Draining Pump
- Macerator
- Dosing Pump
- Chlorine Deficiency Switch
- Dry running Protection
- Hamman Discharge/Sludge Pump

Ballast water will be discharged to comply with International Marine Organization (IMO) guidelines.

A variety of non-hazardous solid wastes will be generated during the infill drilling activity such as glass, paper, plastic and wood. No solid wastes will be disposed of into the marine environment and must be collected and shipped to shore. Vessels shall be operated in compliance with MARPOL regulations (and Myanmar Guidelines) whereby the discharge of comminuted and disinfected sewage and food waste ground to particle size <25 millimetre (mm) is permitted >3 nautical mile (nm) from the nearest land. Hazardous wastes

such as lubricants, filters, chemical containers, used equipment or batteries will be stored and consolidated for onshore disposal.

The types of solid waste generated by the Project are shown in *Table 4.7*.

**Table 4.7** *Types of Waste*

Hazardous recyclable	Non-hazardous recyclable	Hazardous non-recyclable	Non-hazardous non-recyclable
Aerosol cans, batteries (non-alkaline), drums, fluorescent tubes, waste oil (engine, hydraulic).	Aluminium cans, paper, cardboard, newspapers, plastic bottles, cooking oil, metal, glass, batteries (alkaline), printer toner cartridges, wood/ timber.	Oily rags, dry oily absorbents, PPE, oil filters, empty chemical/ paint/ solvent/ thinner containers/ gaskets, insulation.	Food waste, general rubbish, rubber.

For hazardous waste, the type, containers, storage and disposal of wastes are described in *Table 4.8*. **Appendix E** summarises the main waste streams from offshore drilling and includes disposal routes.

**Table 4.8** *Types of Hazardous Waste and Generation*

No	Name of Waste	Waste Source	Type (Solid/ Liquid/ Powder)	Type of Container of the waste to be disposed	Characteristics (Toxic/ Flammable/ etc.)	Monthly Quantity Generated (Weight/ Volume/ Dimension/ etc.)	Storage Location	Disposal Location
1	Waste Oil	Engine	Liquid	Waste oil Transport tank	Flammable	500 litres	Pipe deck	Onshore - licensed facility
2	Waste Paint	Paint jobs	Liquid	Sealed drums	Flammable	200 litres	Paint locker	
3	Oil Filter	Engine	Solid	Transport drums	Flammable	50 kg's	Outside oil purifier room	
4	Oily Rags	Various	Solid	Transport drums	Flammable	200 kg's	Outside oil purifier room	
5	Contaminated metal drums	Various	Solid	Transport drums	-	1,000 drums	-	

### Drilling Cuttings / Mud Pits Discharge

The system for cuttings drying is to be confirmed but it is likely that a centrifugal cuttings dryers, augers and centrifuges system will be used. These systems are already in place or can be easily retrofitted on all the MODUs proposed for this Project. Figure 4.5 shows a schematic of the typical equipment involved. This processing limits the oil content of cuttings (OOC) to 6.9% by weight of wet cuttings.

The mud pits layout is provided in Figure 4.6.

Figure 4.5 Typical Schematic of Centrifugal Cuttings Dryers

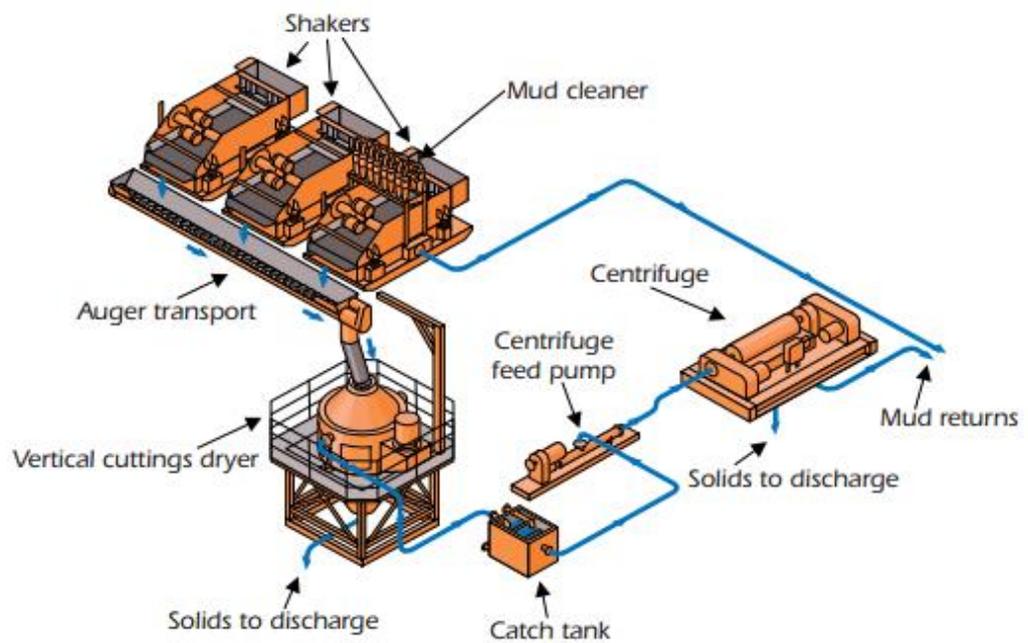
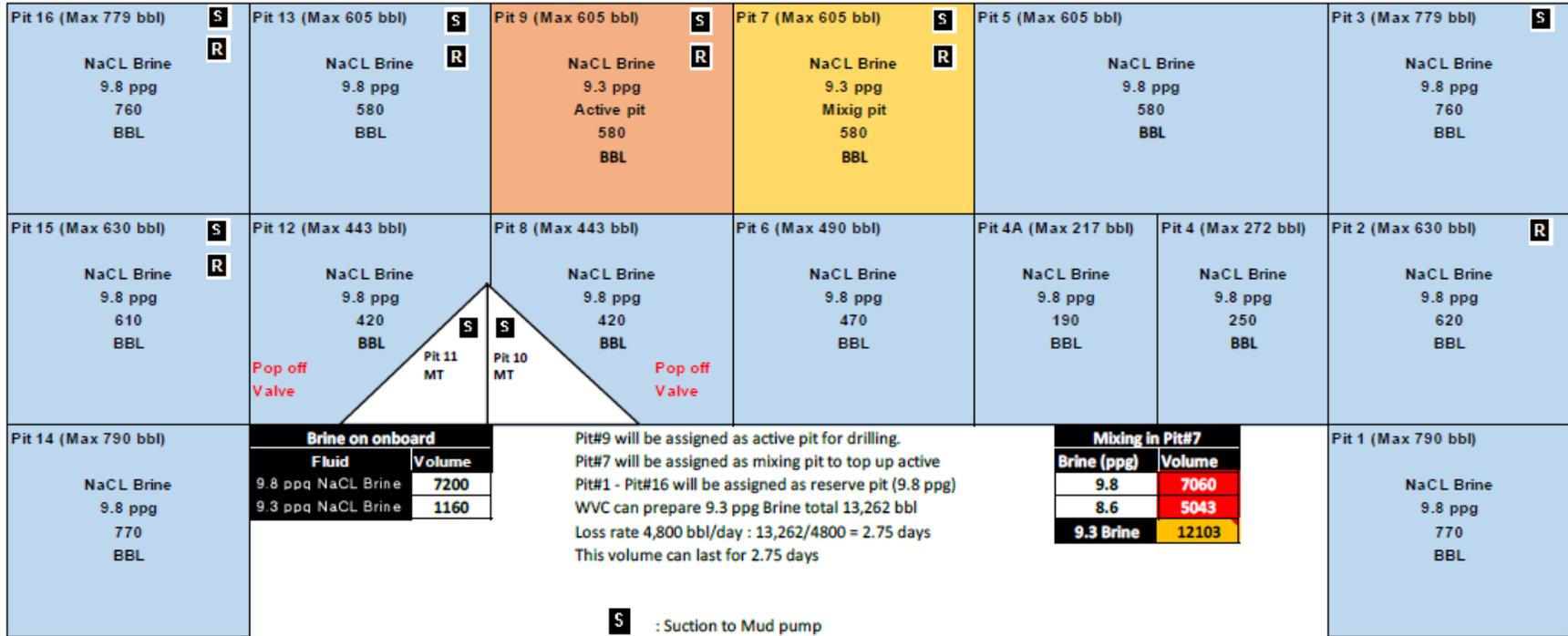


Figure 4.6 Layout of Mud Pits on MODU

8-1/2" Drilling



Discharge is controlled using cutting dryer to <6.9% OOC.

## 4.5

### *COMPARISON AND SELECTION OF PROJECT ALTERNATIVES*

Alternatives to the proposed Project were considered in the early stages of Project design which included different options available that may avoid or reduce any adverse environmental and/or social impacts. Different options are considered for this Phase 6 development that may avoid or reduce any adverse environmental and/or social impacts. The different options considered are presented in the following sections. The final option proposed for the Project is outlined in *Section 4.2*.

#### 4.5.1

##### *No Project Alternative*

The 'No Project' alternative would result in no further field development activity in Blocks M-12, M-13 and M-14 and, in turn, no further oil and gas development and a reduction in production. The production of gas resources stimulates the Myanmar economy and 'No Project' (i.e. no Phase 6) would result in fewer opportunities for gas supply to the domestic market and could lead to fewer employment opportunities and less economic growth. Furthermore, the domestic gas is being used for power generation and industrial heating. Without the gas supply, power generation and industrial heating will need to revert to fossil fuels which are potentially more damaging to the environment. In addition, given the operators obligations regarding Blocks M-12, M-13 and M-14, the 'No Project' alternative would cause a loss of potential revenue to the Myanmar economy, and accelerate the need to replace with other sources of energy.

#### 4.5.2

##### *Drill Cutting Disposal*

Disposal options for the drill cuttings comprise (1) onshore disposal, (2) offshore re-injection, and (3) offshore discharge. These options are discussed in more detail below.

###### *Onshore Disposal*

This option involves shipping all the cuttings generated from the well to shore for subsequent onshore processing followed by disposal in a land fill. This option will entail additional emissions to atmosphere from the additional use of vessels to ship the waste and land transport. Some operations currently use a supply base in Myanmar. This option presents complex logistics requirements and significant additional costs. This alternative is least preferred. Due to the usage of Best Available Technology (BAT) Cutting Dryers, there would not be any need to do onshore disposal. The onshore disposal method would make the project unsustainable, as this option would increase the project cost by an estimated 30%.

###### *Offshore Cutting Injection*

This option involves the injection of cuttings into a dedicated cuttings injection well which has already been drilled in the field. Due to all the wells are still

producing, this option is not feasible. Cutting reinjection can be considered if there is a non-producing well, or a dedicated well slot for this. Injecting slurry into the formation can also compromise the integrity of the platform as it weakens the formation below it. The platform was not designed to cater to this method of cuttings disposal.

#### *Offshore Discharge*

Offshore discharge means that the cuttings and fluids are discharged overboard from the drilling rig. The discharge of Water Based Drilling Fluids (WBDF) and Non-Aqueous Drilling Fluid (NADF) for the Project will be in line with good international industry practise and Myanmar Guidelines. There will be no discharges of bulk quantities of NADF into the sea. This option is the selected alternative for the project as is considered to be industry standard. Drill cuttings dispersion modelling will be conducted in order to address the potential environmental impacts.

#### **4.5.3** *Types of Drilling Fluid*

The wells can be drilled with either NADF or WBDF. For this Project, the well will be drilled using WBDF for top hole sections and NADF for deep more technically challenging bottom hole sections, where required. The use of WBDF does not result in any oil discharged on cuttings. In addition, WBDF generally consists of approximately 92-98% fresh or saline water, with the remaining percentage comprising of drilling fluid additives that are generally inert or readily biodegradable organic polymers. A synthetic organic base fluid (40 to 65% by volume) is used in NADF. NADF have been specifically developed by the industry as a low toxicity, faster biodegrading replacement to the traditionally-used oil based fluids while maintaining drilling performance.

#### **4.5.4** *Well Locations*

Within Blocks M-12, M-13 and M-14, PCML is currently considering to drill three infill wells from the Yetagun-A platform. The selection of the well locations is driven by factors related to gas reservoir location and geology and position of the Yetagun platform, where the drilling activities will occur. All the potential well locations are located in waters approximately 110 m deep. The potential well locations are over 140 km from the mainland and over 100 km from the nearest outlying islands of the Myeik Archipelago.

### 5.1 SETTING THE STUDY LIMITS

The **Project Area** is the MODU and the 5 NM exclusion zone. The following section describes the physical, biological, and social environment within the **Study Area**, which is defined as the waters of Project Area as well as the surrounding waters offshore Tanintharyi Region. As the potential well will be located 140 km from the mainland and 100 km from the nearest coast (nearest island of the Myeik Archipelago), the focus of the baseline information is on open water habitats.

The **Area of Influence** varies depending on the receptor and activity. For environmental receptors, the Area of Influence is limited to the waters of the Project Area and the surrounding offshore waters of Tanintharyi Region. For the social assessment, the closest receptors are located in the Tanintharyi Region; about 140 km from the Project.

Baseline information will be presented on shallow water and coastal habitats and species to support a general baseline description only; the focus of the baseline information is on open water habitats. For the social baseline, information will focus on users of the marine environment including offshore fishing, shipping and other exploration activities that could overlap with the Project activities.

The following provides information on the potential Area of Influence per activity / receptor:

- Impacts to fisheries and fishing activity either through unplanned collision or from physical displacement of vessels will be limited to within the Project Area;
- Impacts to marine species could arise from drilling fluids and cuttings discharge, presence of the vessel, routing discharges of waste, and vessel noise. The Area of Influence for these impacts is limited to within the Project Area;
- Impacts from spills or leaks will on the marine environment will also be limited to the Project Area. The only spills possible would be small volume spills of fuel which would not impact local coastal areas.

Given the Area of Influence is offshore open waters the environmental impact assessment will focus on habitats and species in this area. Information on coastal areas and protected areas is included to provide a general baseline description.

The information provided in this Section is based on a desktop review of published information, supplemented with information provided by PCML, and through review of available ERM in house literature. This Project is an EIA and therefore primary baseline data is required (refer to *Section 5.2.1*).

Primary social data collected during public consultations have been used to supplement the desk-top review.

Secondary data sources were also referred to, such as; reports by the Wildlife Conservation Society (WCS), scientific journals, fisheries cruise data, conducted in Myanmar waters in 2015, and local study reports available at the marine science department of Mawlamyine and Patheingyi Universities. This EIA Report contains a full list of references used to inform the baseline conditions.

The purpose of reviewing the baseline conditions is to present an understanding of the potential environmental and social sensitivities of the surrounding environment that could be impacted by the Project activities. Reviewing the baseline conditions allows PCML and its advisors to make an informed judgement on the appropriate level of impact assessment for the Project.

### 5.2.1

#### ***Primary Marine Baseline Survey***

##### *Survey Locations and Parameters*

In order to provide an up-to-date characterisation of marine environmental conditions in the surrounds of the proposed infill well locations, four sampling locations were surveyed at the Yetagun Field in April 2018. Sampling locations were positioned to the north, east, south and west of the proposed wells, which will be drilled at the Yetagun-A production platform.

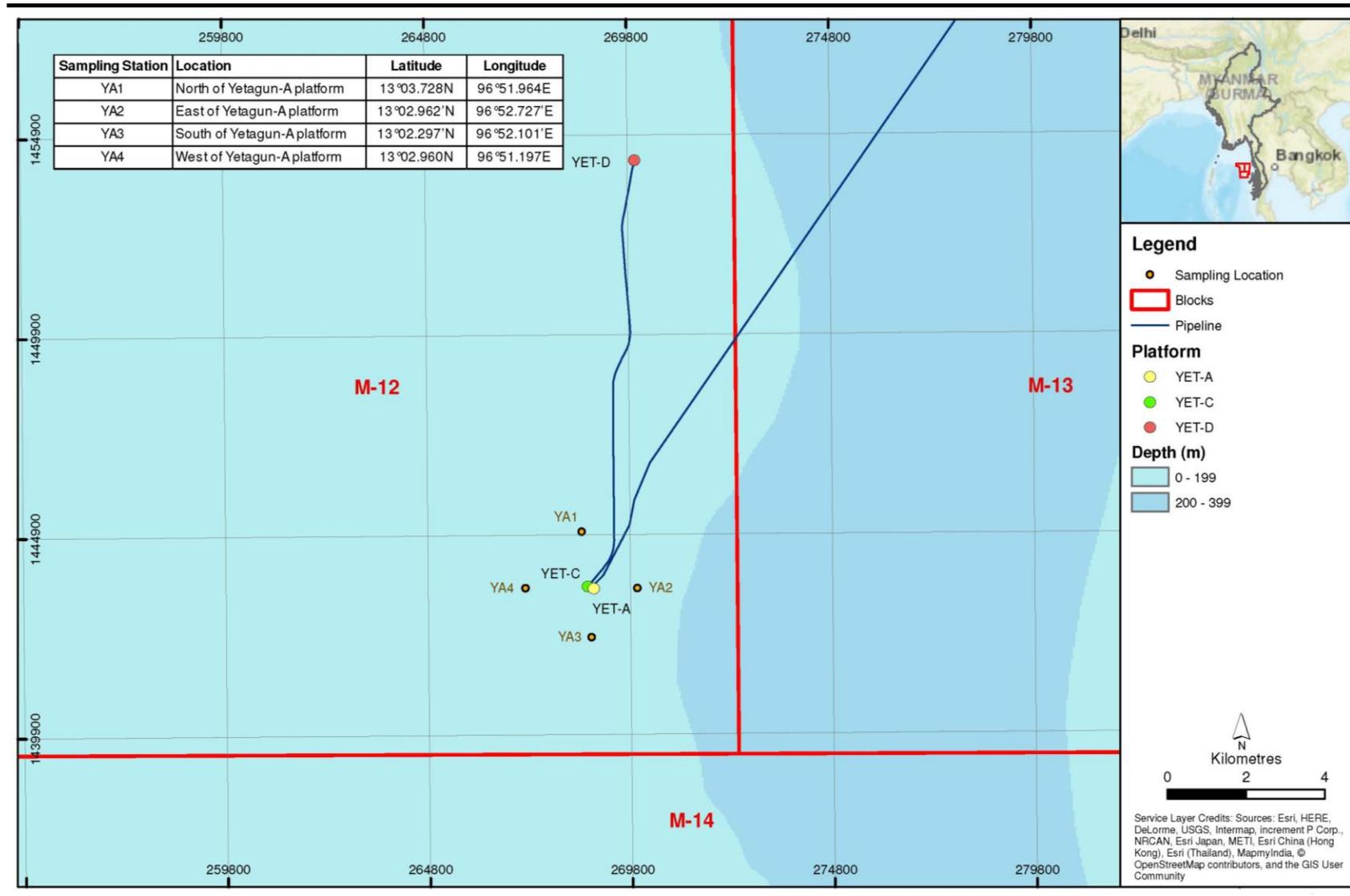
Sampling locations where primary data have been collected are presented in *Figure 5.1* and *Table 5.1*. A summary of the primary baseline sampling programme including physico-chemical and biological parameters is provided in *Table 5.2*. Details of the surveys including sampling procedures and laboratory analyses are presented below.

Surveys were conducted by ERM staff, supported by REM and all ERM staff are appropriately trained marine scientists experienced in undertaking offshore marine baseline surveys in Myanmar as well as in other areas in Asia Pacific. Sampling followed international good practice for marine baseline surveys and all samples collected were analysed in accredited laboratories in Myanmar, Thailand and Hong Kong.

**Table 5.1 Marine Baseline Survey Sampling Locations**

Sampling Station	Location	Latitude	Longitude
YA1	North of Yetagun-A platform	13°03.728N	96°51.964E
YA2	East of Yetagun-A platform	13°02.962'N	96°52.727'E
YA3	South of Yetagun-A platform	13°02.297'N	96°52.101'E
YA3	West of Yetagun-A platform	13°02.960N	96°51.197E

Figure 5.1 Sampling Stations for Marine Baseline Survey Study in April 2018



**Table 5.2 Sampling Programme for Marine Baseline Study at the Yetagun Field Area in April 2018**

Parameter	Stations				Total Number of Samples
	YA1	YA2	YA3	YA4	
<b>Seawater Sampling</b>					
Transparency	1	1	1	1	4
pH	3	3	3	3	12
Turbidity	3	3	3	3	12
Salinity	3	3	3	3	12
Temperature	3	3	3	3	12
Dissolved Oxygen	3	3	3	3	12
Total Suspended Solids (TSS)	3	3	3	3	12
Oil and Grease	3	3	3	3	12
<b>Metals:</b>	3	3	3	3	12
Arsenic (As)	3	3	3	3	12
Cadmium (Cd)	3	3	3	3	12
Chromium (Cr6+)	3	3	3	3	12
Copper (Cu)	3	3	3	3	12
Lead (Pb)	3	3	3	3	12
Zinc (Zn)	3	3	3	3	12
Mercury (Hg)	3	3	3	3	12
Total Petroleum Hydrocarbon (TPH)	3	3	3	3	12
<b>PAHs:</b>	3	3	3	3	12
Acenaphthene	3	3	3	3	12
Acenaphthylene	3	3	3	3	12
Anthracene	3	3	3	3	12
Fluorene	3	3	3	3	12
2-Methyl naphthalene	3	3	3	3	12
Naphthalene	3	3	3	3	12

Parameter	Stations				Total Number of Samples
	YA1	YA2	YA3	YA4	
Phenanthrene	3	3	3	3	12
Benz(a)anthracene	3	3	3	3	12
Benzo(a)pyrene	3	3	3	3	12
Chrysene	3	3	3	3	12
Dibenzo(a,h)anthracene	3	3	3	3	12
Fluoranthene	3	3	3	3	12
Pyrene	3	3	3	3	12
<b>Nutrients:</b>	3	3	3	3	12
Total Nitrogen					
Nitrate	3	3	3	3	12
Ammoniacal Nitrogen	3	3	3	3	12
Total Phosphorus	3	3	3	3	12
Chlorophyll-a	3	3	3	3	12
Chemical Oxygen Demand	3	3	3	3	12
Biological Oxygen Demand	3	3	3	3	12
Phytoplankton Biomass	1	1	1	1	4
Zooplankton Density	1	1	1	1	4
<b>Seabed Sediment Sampling</b>					
Particle Size Distribution (PSD)	1	1	1	1	4
Total Organic Carbon	1	1	1	1	4
<b>Metals:</b>	1	1	1	1	4
Aluminium(Al)					
Arsenic (As)	1	1	1	1	4
Cadmium (Cd)	1	1	1	1	4
Chromium (Cr)	1	1	1	1	4
Copper (Cu)	1	1	1	1	4

Parameter	Stations				Total Number of Samples
	YA1	YA2	YA3	YA4	
Lead (Pb)	1	1	1	1	4
Zinc (Zn)	1	1	1	1	4
Nickel (Ni)	1	1	1	1	4
Iron (Fe)	1	1	1	1	4
Mercury (Hg)	1	1	1	1	4
Total Petroleum Hydrocarbon (TPH)	1	1	1	1	4
PAHs:	1	1	1	1	4
Acenaphthene	1	1	1	1	4
Acenaphthylene	1	1	1	1	4
Anthracene	1	1	1	1	4
Fluorene	1	1	1	1	4
2-Methyl naphthalene	1	1	1	1	4
Naphthalene	1	1	1	1	4
Phenanthrene	1	1	1	1	4
Benz(a)anthracene	1	1	1	1	4
Benzo(a)pyrene	1	1	1	1	4
Chrysene	1	1	1	1	4
Dibenzo(a,h)anthracene	1	1	1	1	4
Fluoranthene	1	1	1	1	4
Pyrene	1	1	1	1	4
Oil & Grease	1	1	1	1	4
Total PCB	1	1	1	1	4
Macrobenthos	1	1	1	1	4

### *Seawater and Plankton Sampling Procedures*

Seawater samples were collected using a 7.5 litre capacity Niskin Water Sampler attached to a clean steel cable of the winch. Using the winch to lower the sampling equipment through the water column, seawater samples were collected from three different depths (below surface, mid-level depths and above the seabed) at each sampling station. Once the sampler was retrieved on board the vessel, water probes were used to immediately record *in-situ* measurements and samples directly transferred to the appropriate pre-labelled storage bottles, labelled, preserved as applicable and stored at <4°C. In addition, a Secchi disk attached to a rope was used to take a measurement of the transparency depth of the water column.

For phytoplankton, sample was collected at each station by combing four seawater samples from the upper water column (1.5m and 25m depths) that were sieved through a 20 µm mesh plankton net. For zooplankton, samples were collected using a 50 µm mesh zooplankton net (30 cm diameter aperture) from the upper water column (~25 m) by the vertical haul method. Plankton adhering to the inside of the net were washed down into the end of the net and into the cod end, emptied into pre-labelled sample bottles and preserved with Lugol's solution and 10% formalin solution respectively.

Representative photographs of the seawater and plankton sampling conducted for the primary marine baseline surveys are presented in *Figure 5.2*.

### *Sediment and Macrobenthos Sampling Procedures*

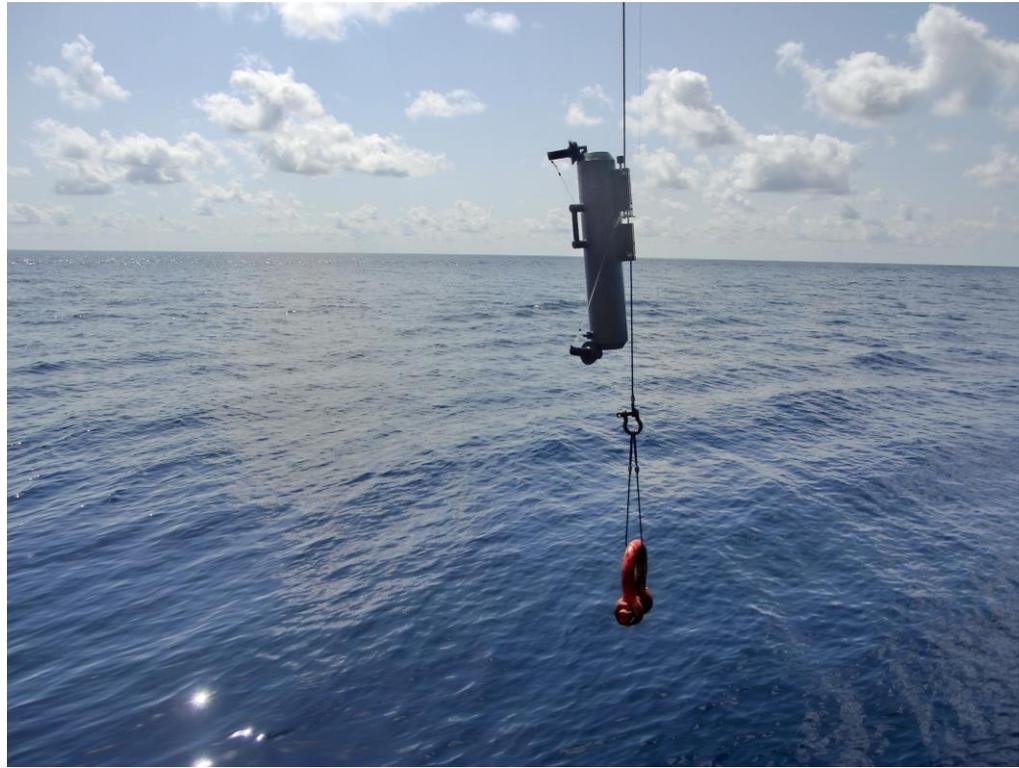
Sediment samples were collected from the seabed using a 0.1m<sup>2</sup> day grab sampler deployed on a clean cable wire, designed for operation in an open water environment. After retrieval, each collected grab sample will be inspected and once accepted labelled and photographed. Sediment samples for hydrocarbon analysis were transferred into appropriate pre-labelled storage bottles using a seawater rinsed metal utensil while samples for metals analysis were collected using seawater rinsed plastic utensil and then stored at <4°C. The day grab and all other utensils were rinsed with seawater after each sample has been collected to avoid cross contamination between samples.

Sediment for macrobenthos analysis was sieved on-board the survey vessel by 1 mm and 0.5 mm mesh sieves. The sediment were washed onto a sieve stack and gently rinsed with seawater to remove all fine material. The remaining fauna were collected and transferred to ziplock plastic bags and preserved in formalin solution to ensure tissue preservation prior to delivery to the laboratory for taxonomic sorting and identification.

Photographs of the sediment, and benthos primary marine baseline surveys are presented in *Figure 5.3*.

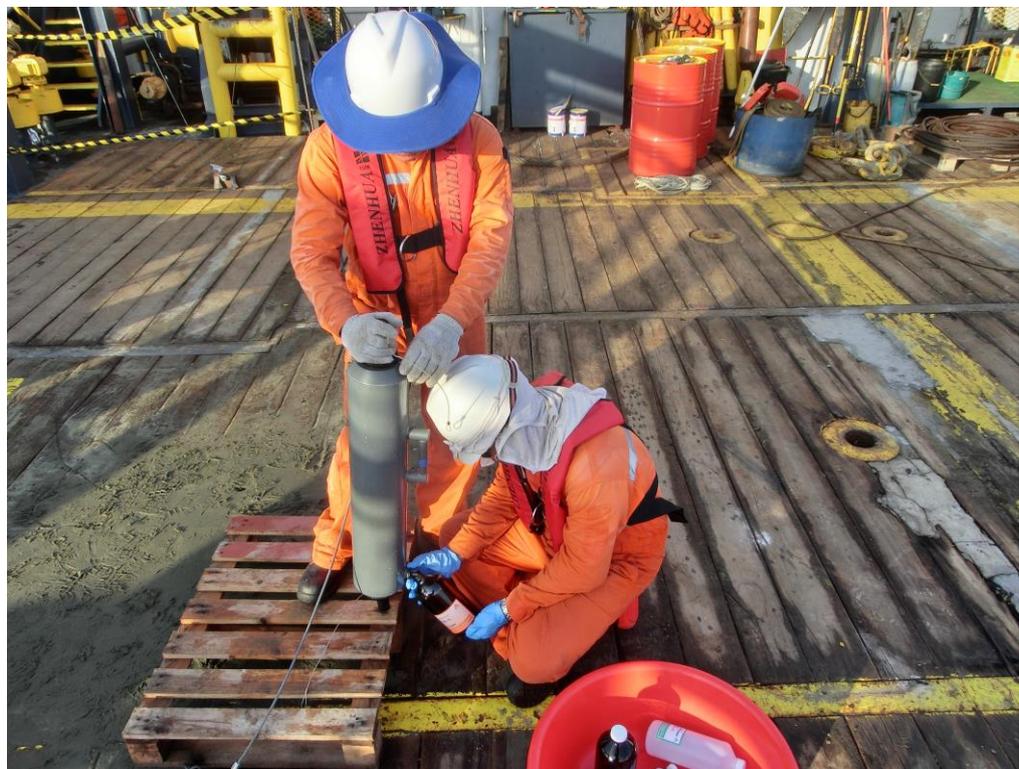
**Figure 5.2** *Representative Photos of Seawater Sampling Equipment and Procedures from the Primary Marine Baseline Surveys conducted in April 2018*

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Niskin water sampler being lowered into water column

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Collecting water from returned water sampler

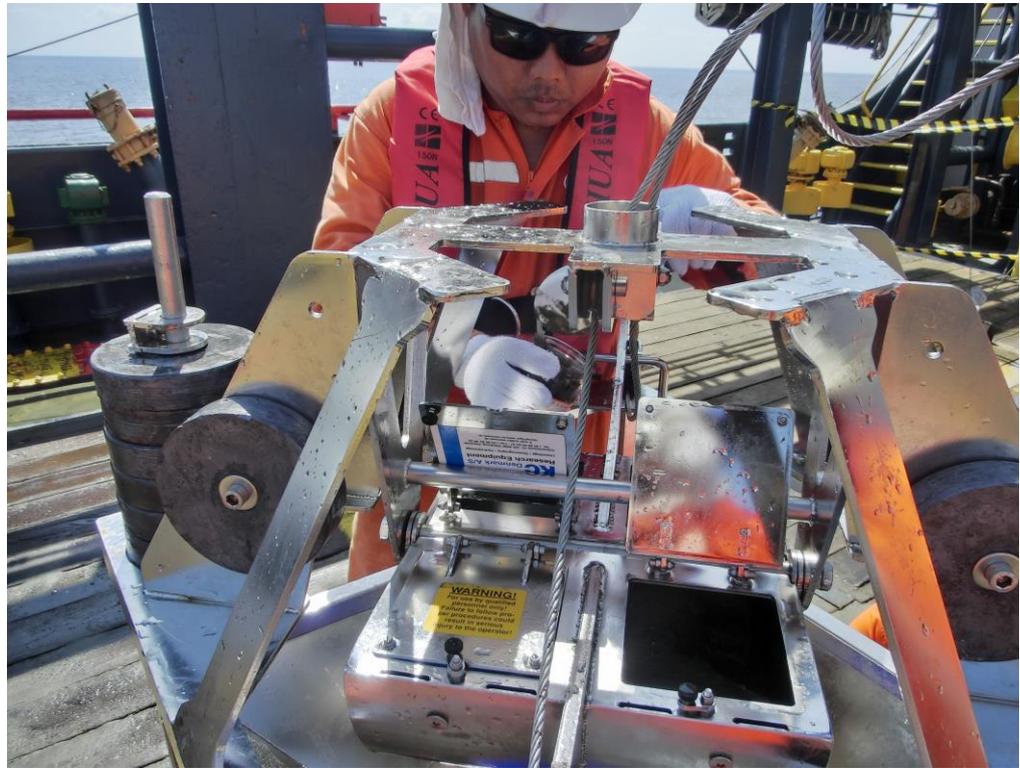
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Collecting plankton sample

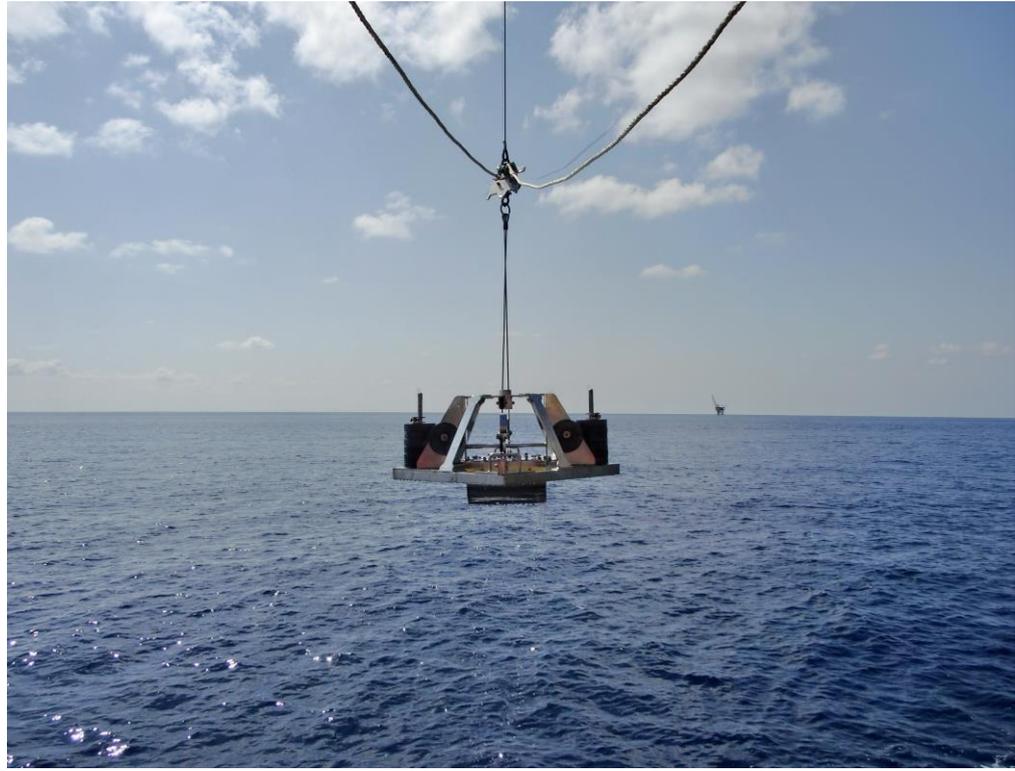
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**Figure 5.3** *Representative Photos of Sediment and Macrobenthos Sampling Equipment and Procedures from the Primary Marine Baseline Surveys conducted in April 2018*



Transferring sediment sample to sample bottle





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Deploying the sediment grab to the seabed

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### *Laboratory Analyses*

All seawater and sediment samples transferred from the survey vessel to the laboratory were accompanied by Chain of Custody (COC) forms to ensure accuracy of the records. Analysis was conducted by an accredited laboratory and the methods used are American Public Health Association (APHA) and Environmental Protection Agency of United States (USEPA) where applicable, and/or other acceptable international analytical methods. Standard Quality Assurance and Quality Control (QA/QC) procedures were employed during laboratory analysis of samples.

For macro-benthos analysis, standard and accepted techniques were used for sorting organisms from the sediments. Samples were placed in a petri dish under a 10-power magnification dissecting microscope. The petri dish was scanned systematically and all animals and fragments were removed using forceps. Organisms representing major taxonomic groups including Polychaeta, Arthropoda, Mollusca, and miscellaneous taxa were sorted into separate, labelled vials containing ethanol solution.

Taxonomic identifications were performed (using stereo dissecting and high-power compound microscopes) to the family level except for dominants, which will be identified, where possible, to species level. Careful sampling procedure minimises fragmentation of organisms, however if breakage of soft-

bodied organisms occurred; only anterior portions of organism fragments were counted. All fragments were retained and weighed to determine biomass. Rare or questionable taxa were compared against reference collection specimens for confirmation and consistency of identification. Biomass determinations were made by taking the blotted wet mass of each taxonomic fraction.

### 5.3 PUBLIC ADMINISTRATION AND PLANNING

The Project is located 140 km from the mainland. The Project is located in the offshore waters of Tanintharyi Region; the closest Township is LaungLon, Dawei District, in Tanintharyi Region. Some information on the population and demographics of this Township and District are provided in this section. However, there are no specific plans or strategies for the Project Area.

The demography of Dawei District is provided in Table 5.3.

**Table 5.3 Demographic data in Study Area**

Township	Households	Population	Male	Female
Dawei	24,943	125,605	60,044	65,561
LaungLon	25,735	118,317	55,558	62,759
ThayetCahung	22,874	105,662	50,421	55,241
Yebyu	22,073	100,768	50,782	49,986

Source: Myanmar Population Census Data (2014)

### 5.4 PROTECTED AND ENVIRONMENTALLY SENSITIVE AREAS

A total of 43 designated or proposed protected areas with IUCN categories existing in Myanmar (Istituto Oikos and BANCA, 2011) however some are proposed as protected area without authorized designation (i.e. “soft” designation). None of these protected or environmentally sensitive areas lie within the Project Area. The closest is a designated Shark Protection Area located 138 km from the Project Area. The area was established in 2004 as a national Marine Protected Area (MPA) and covers an area of 11,836 km<sup>2</sup> where there are restrictions on fishing activities.

In 2012, the Wildlife Conservation Society (WCS) identified 132 Key Biodiversity Areas (KBAs) alongside Myanmar environmental experts (Holmes et al, 2013). These KBAs are regarded as areas holding significant populations of species of high conservation concern but are not legally recognized nor

designated as protected areas in Myanmar. A large area encompassing islands and surrounding waters of the Myeik Archipelago is designated as a KBA with three sea turtle species recorded (refer to *Section 4.4.2* above for further information on sea turtles potentially nesting at Myeik Archipelago). This KBA is located over 88 km from the Project Area.

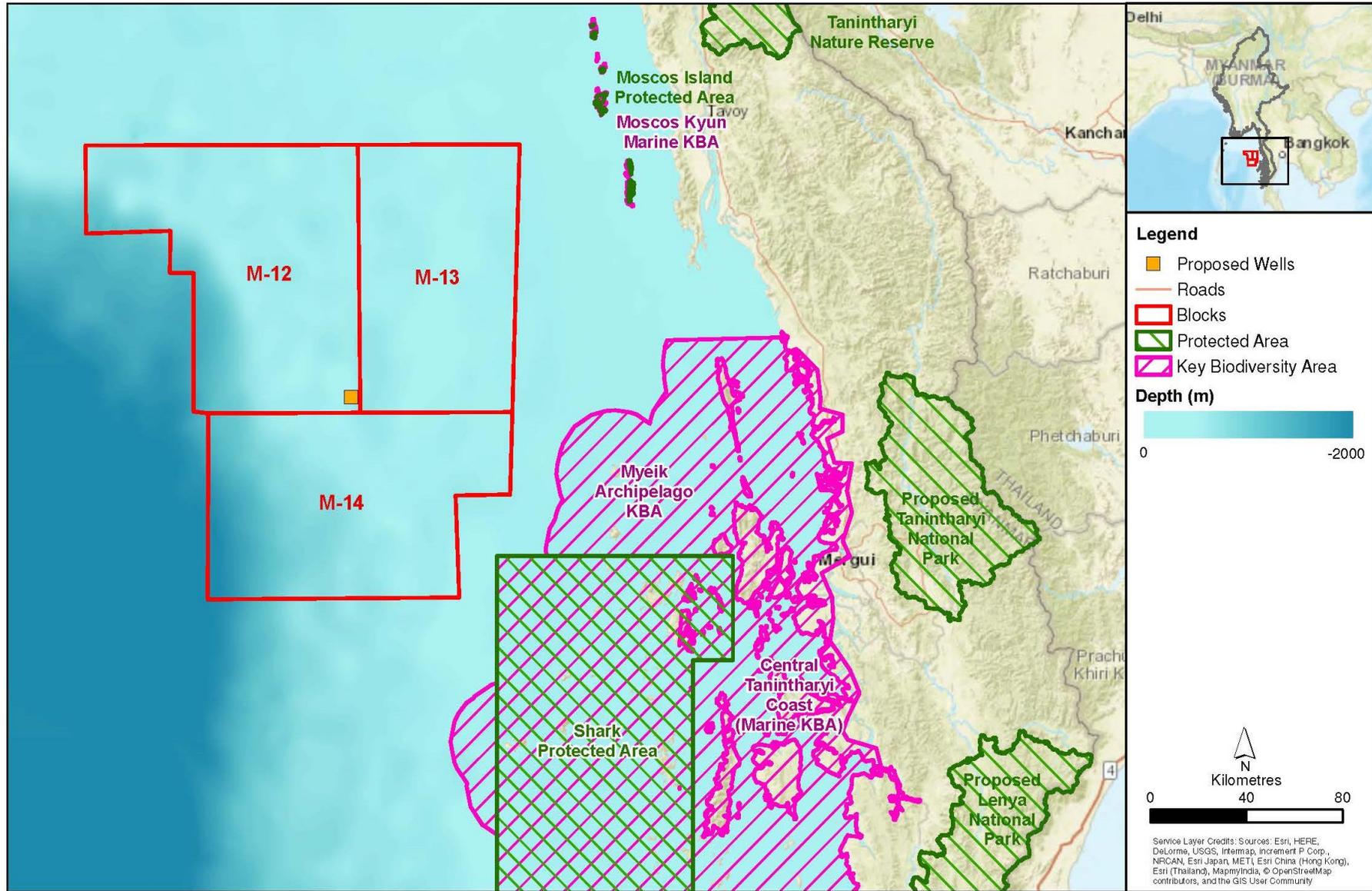
The closest KBA to the Project overlaps with the Shark Protected Area mentioned above. Other KBA's include the Myeik Archipelago and the Moscos Island group (Moscos Kyun), which are located over 100 km from the Project Area. This KBA was identified due to four key species of sea turtles potentially nesting on the islands (*Figure 5.4*).

The KBA's within the Study Area are provided in *Table 5.4* and protected areas and restricted fishing areas in the Study Area in *Figure 5.4*.

**Table 5.4** *Key Biodiversity Areas (KBAs) in the Study Area*

Name	Area (km <sup>2</sup> )	Key species
Myeik Archipelago	43,963	Leatherback, green turtle, hawksbill turtle
Moscos Kyun	57	Leatherback, green turtle, hawksbill turtle, olive ridley
Lampi Island Marine Protected Area	225	Hornbill, numerous shark species, turtle species

Figure 5.4 Protected Areas and Restricted Fishing Areas in the Study Area



Source: WCS, 2014

## 5.5 *PHYSICAL COMPONENTS*

### 5.5.1 *Climate and Meteorology*

The weather and climate of Myanmar is primarily influenced by the Northeast and the Southwest monsoons and the short transitional periods between them. The southwest monsoon (June to September) is characterised by extensive cloud cover, and light rain almost daily, interspersed with rain squalls or thunderstorms. The northeast monsoon (December to April) brings less cloud, scant rainfall, mild temperatures and lower humidity during winter (Suwannathatsa et al 2012). The spring and autumn transition periods between the monsoons (April and May, October and November) are generally hot with very variable weather and heavy squalls.

Climate data is available from Dawei, which is located 140 km from the Project Area and is the closest District. Within Myanmar, Dawei is affected first by the southwest monsoon and is reported to experience an average of 142 rainy days and 17.9 ft. of precipitation per year (FAO, 2014).

Over a 39-year period, the maximum temperature in Dawei was 35°C in April and the lowest temperature was ~25°C in January (worldweatheronline). The average temperature of Dawei is about 26°C year-round with April and May as the hottest months. Annual variations above or below the average seldom exceeds 3°C.

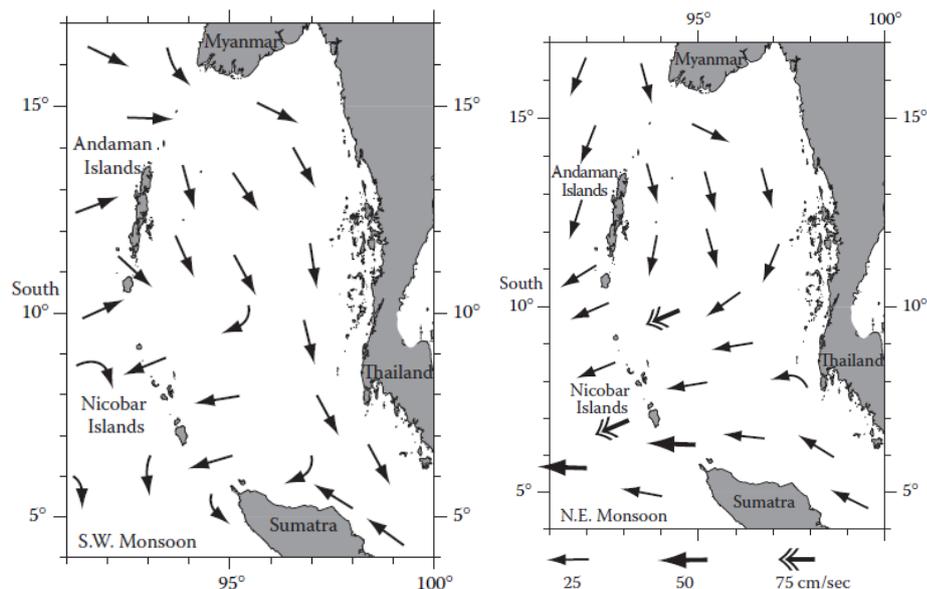
Average monthly wind speeds in the Andaman Sea in the vicinity of the Project Area are reported to range from 3.5 m/s to 7.5 m/s (Steedman Science & Engineering 1994). The most common wind direction is from the north-northeast from November to April and southwest from May to October (worldweatheronline).

The predominant surface currents at the central eastern area of the Andaman Sea (where the Project Area is located) are generally towards to the south or southeast during both the southwest monsoon and the northeast monsoon. In both seasons, flows in the vicinity of the Project Area predominantly continue to circulate southwards and eastwards, generally exiting the Andaman Sea to the south of the Andaman Islands or Malacca Strait, as presented in *Figure 5.5* (Soegiarto, 1985).

### 5.5.2 *Oceanography and Hydrography*

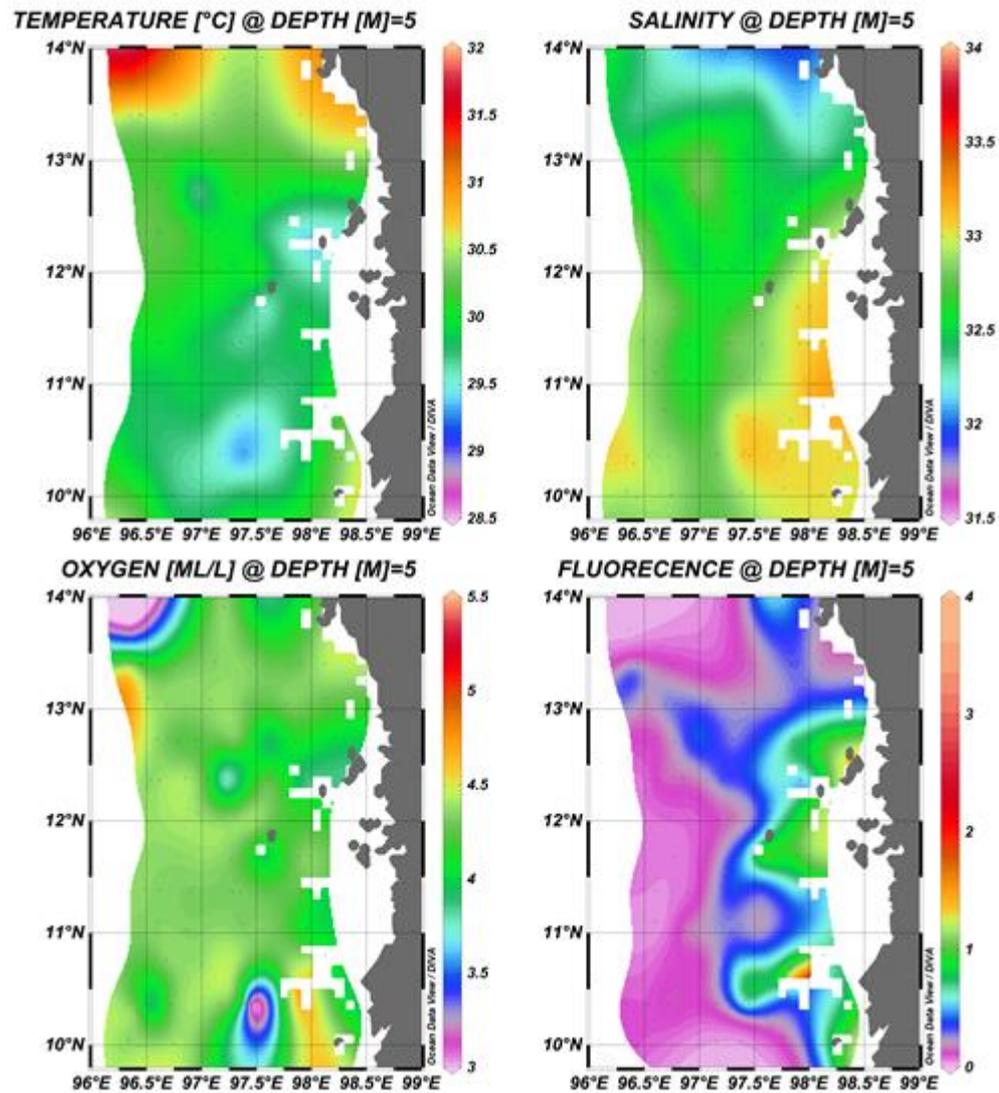
The predominant surface currents at the central eastern area of the Andaman Sea (where the Project Area is located) are generally towards to the south or southeast during both the southwest monsoon and the northeast monsoon. In both seasons, flows in the vicinity of the Project Area predominantly continue to circulate southwards and eastwards, generally exiting the Andaman Sea to the south of the Andaman Islands or Malacca Strait, as presented in *Figure 5.5*.

**Figure 5.5** *Predominant Surface Currents in the Andaman Sea in the Northeast and Southwest Monsoon Seasons*



Data on temperature, salinity, oxygen, and fluorescence were recorded during a survey of the waters of Tanintharyi Region was conducted in 2015 as part of the 'Dr. Fridtjof Nansen' survey (Myanmar Ecosystem Survey, 2015) (Figure 5.6). In the east of the survey area (where the Project Area is located) the near-surface temperatures (5 m depth) were around 32°C and salinity at 5 m ranged from 31 to 34. Oxygen levels in surface waters were generally high (~4 - 5 ml/l), and showed relatively high variability.

Figure 5.6 Near-surface (5m depth) Temperature, Salinity, Oxygen and Fluorescence along the Tanintharyi Coastal Region



### 5.5.3 Seabed Bathymetry and Composition

The bathymetry along the coast of Myanmar falls under two distinct types with the narrow continental shelf and deep water in the north, which is typical of the Bay of Bengal, and the wide continental shelf and shallow waters in the south, which is typical of the Andaman Sea and the Gulf of Martaban. The Project Area is located in the latter.

The Project Area is in water depths of around 110 m.

### 5.5.4 Natural Hazards

#### Storms and Cyclones

A tropical cyclone is a storm with rotating winds at speeds of greater than 74 miles per hour. Myanmar is vulnerable to cyclones, which often originate in the Bay of Bengal during pre- and post-monsoon seasons. The Andaman Sea/Bay of Bengal area averages two cyclones per year but can range from 0 to four.

Gale force winds (17.2 m/s or over) are mainly associated with local rain squalls and with severe tropical storms or cyclones. The threat of cyclones affects different areas at different times of the year, overall affecting all areas though the major tracks do not tend pass over the Andaman Sea; i.e., over the Project Area.

The Project is expected to take place Q4 2018 to avoid northeast monsoon storms and cyclones which are most frequent from mid-May to early December. Standard operating procedures for poor weather will be employed during such an event.

#### *Earthquakes*

A review of available literature has shown that Myanmar is seismologically unstable and vulnerable to earthquakes (Theilen and Pararas-Carayannis, 2009). Historic records show that at least 15 major earthquakes with magnitudes  $M \geq 7.0$  RS have occurred in Myanmar in the last hundred years. Historical records of earthquakes are noted within the Study Area and the magnitudes of the earthquakes were ranked 5 or less (Union of Myanmar, 2009).

#### *Tsunami*

Myanmar is an earthquake-prone country and at moderate risk for tsunamis. Tsunamis have been recorded in the Myanmar coastal areas. The recent 2004 tsunami generated by the Sumatra earthquake caused moderate damage to the Rakhine Coast, Ayeyarwady Delta, and the Tanintharyi Coast with more than 60 lives and hundreds of boats lost (Union of Myanmar, 2009).

### 5.5.5

#### *Water Quality and Properties*

Water quality conditions in the Yetagun Field are known through primary data collected in 2018 from marine baseline environmental surveys. Environmental sampling locations where primary data have been collected are shown in *Figure 5.1*.

#### *Water Temperature and Salinity*

Temperature, salinity, oxygen and fluorescence were recorded during a survey of the waters of Tanintharyi Region was conducted in in 2015 as part of the 'Dr. Fridtjof Nansen' survey (Myanmar Ecosystem Survey, 2015). In the east of the survey area (where the Project Area is located) the near-surface temperatures (5 m depth) were around 32°C and salinity at 5 m depth, ranged from 31 to 34 throughout the survey area. Oxygen levels in surface waters were generally high (~4 - 5 ml/l), and showed relatively high variability. Nearshore waters of the Tanintharyi Coast are influenced by inputs from large river rivers such as "Ye", "Dawei", "Tanintharyi" and "Lenya" rivers. Information collected on temperature, salinity, fluorescence and oxygen levels is presented visually in *Figure 5.6*.

Based on primary data collected in Marine Baseline Survey in April 2018, seawater temperature and salinity was largely similar among the sampling

locations and vertical gradient in seawater temperature and salinity was observed, in which temperature decreased and salinity increased progressively from the surface to the bottom. A summary of seawater temperatures and salinity levels at different depths at sampling location in the surrounds of the Yetagan platform are presented in *Table 5.5*.

#### *pH*

Photosynthetic organisms consume CO<sub>2</sub>, which in turn generates an increase in pH. High pH values are thus evidence of a high production by phytoplankton. Seawater pH was similar among sampling locations and in general pH levels were observed to decrease with depth. The higher pH in surface waters than at depth was indicative of the higher phytoplankton production in these well-lit surface waters. A summary of pH levels recorded at different depths at sampling location in the surrounds of the Yetagan platform are presented in *Table 5.5*.

In comparison to National Environmental Quality (Emissions) Guidelines, pH levels of ambient waters were well within discharge standards (pH 6-9) for this parameter.

The amount of total suspended solids (TSS) refers to the weight of particulate matter in a water sample which is an indication of the water turbidity or clarity. Water turbidity is due to the presence of suspended matter consisting in silt, detritic origin particles and planktonic organisms. In the marine environment, turbidity is subject to sharp variations due to the episodic, dynamic events which remobilise the sediment in suspension (such as swells or currents). Inshore coastal waters tend to be more turbid than offshore open ocean waters due to suspension of sediment by wave action in shallow waters and sediment-laden runoff from the land. In surface waters, turbidity can be influenced by the presence of phytoplankton.

Low TSS concentrations were recorded in water samples collected from the Marine Baseline Survey in April 2018, which is typical of conditions in offshore environments away from the influence of coastal processes. In 2018, TSS concentrations in seawater samples were found to range <2 - 11 mg/l of suspended solids. Similar (<2-3 mg/l) concentrations recorded throughout the water column at each sampling station with the exception of at the middle depth at station YA-4, where a slightly higher concentration (11 mg/l) was recorded (*Table 5.6*). Overall, the TSS results revealed high water clarity indicative of oceanic conditions, which were further corroborated by both the low turbidity (0.4 - 0.9 NTU) in situ measurements and the measured deep light penetration with the black and white Secchi disk visible to observers on deck down to 20 to 25 depths (*Table 5.5*).

In comparison to National Environmental Quality (Emissions) Guidelines, TSS levels of ambient waters were well below discharge standards (50mg/l) for this parameter.

At the time of sampling in April 2018, dissolved oxygen (DO) concentrations were found to be similar among the sampling stations, ranging from 5.31 mg/l in surface water to 3.30 mg/l in bottom water (*Table 5.6*). As is typical, DO was found to vary with water depth with higher concentrations recorded in the surface water than those recorded in the middle and bottom of the water column, which may be associated with higher photosynthetic activity at the water surface and wave and wind mixing. Among the sampling stations, DO concentrations at all depths at YA-4 and at the bottom depth at YA-2 were recorded <4 mg/l indicating relatively low oxygen levels at the time of sampling.

Biological oxygen demand (BOD) and chemical oxygen demand (COD) measure the content of organic matter in the seawater. At the time of sampling in April 2018, COD and BOD recorded in the collected water samples was low with all samples exerting <20 mg/l of COD and < 2 mg/l of BOD (*Table 5.5*). Overall, the COD and BOD measurements in 2018 indicated low organic content with no evidence of organic pollution.

In comparison to National Environmental Quality (Emissions) Guidelines, BOD and COD levels of ambient waters were well below discharge standards (30 mg/l and 125 mg/l respectively) for these parameters.

#### *Nutrients and Chlorophyll a*

Nutrients in seawater are represented by dissolved inorganic substances including nitrogen forms (ammonia, nitrites, nitrates), phosphorous, silica, sulphur and various other trace elements. In the marine environment, the main source of nutrients are runoff from the land and rivers (including sewage and fertilisers), wind-driven continental upwelling and cycling of nutrients from decomposition of organic remains. Nitrogen is considered the key nutrient in the marine environment, as its availability is the most important factor governing the rate of phytoplankton growth (primary production).

Water samples collected in the Marine Baseline Survey in 2018 were found to contain slightly higher total nitrogen (TN) concentrations with increased depth ranging from 0.1 mg/l in surface waters to 0.4 mg/l in bottom waters of the water column (*Table 5.5*). Similarly, nitrate concentrations were found to range <0.01 mg/l in surface waters to 0.26 mg/l in bottom waters of the water column (*Table 5.5*). Ammonia concentrations in all samples from all depths were <0.01 mg/l (*Table 5.5*). Total phosphorus (TP) concentrations also showed slightly higher concentration with increase water depth ranging from <0.01 mg/l in surface waters to 0.03 mg/l in bottom waters of the water column (*Table 5.5*). Overall, results of the marine baseline survey indicated low nutrient conditions at the Yetagun field, which is typical of offshore oceanic environments. These low nutrient availability conditions were found to also be reflected in the low chlorophyll a concentrations (<0.1 to 0.6 mg/l) (a proxy for phytoplankton standing crop) that occurred in the collected water samples.

In comparison to National Environmental Quality (Emissions) Guidelines, total nitrogen, total phosphorus and ammonia levels of ambient waters were well below discharge standards (10 mg/l, 2 mg/l and 10mg/l respectively) for these parameters.

### *Metals*

Dissolved metals are naturally present at trace levels in the marine environment which is related to mineral composition of regional geology. In offshore environments, oil and gas operations can introduce metals into the marine environment via the temporary discharge of drilling fluids (although these metals are tightly bound to barite and clay and thus of low bioavailability) and through operational discharge of produced water (although due to low initial concentrations and dilution effects, concentrations are reduced to undetectable levels beyond the immediate vicinity of offshore facilities). Corrosion (e.g., from seawater cooling circuits and sacrificial anode anticorrosion system) also result in introduction of dissolved metals, although at undetectable low concentrations.

A summary of metal concentrations recorded in seawater samples collected in the Marine Baseline Survey in 2018 are presented in *Table 5.5*. Based on the analysis of the water samples, metal concentrations were found to be low and are considered to be representative of an unpolluted offshore environment with concentrations reflecting natural background conditions.

In comparison to National Environmental Quality (Emissions) Guidelines, arsenic, copper, lead, zinc, chromium, cadmium and mercury levels of ambient waters were well below discharge standards (100 µg/l, 500 µg/l, 100 µg/l, 2,000 µg/l, 500 µg/l, 100 µg/l and 10 µg/l respectively) for these parameters.

### *Total Petroleum Hydrocarbons (TPH), Polycyclic Aromatic Hydrocarbons (PAH) and Oil & Grease*

Total petroleum hydrocarbon (TPH), polycyclic aromatic hydrocarbons and oil and grease concentrations in all water samples collected in the Marine Baseline Survey in April 2018 were below their respective detection limits with no evidence of detectable contamination in the water column of the Study Area. The only exception was a water sample collected at the surface from YA2, in which a very low concentration (136 µg/l) of C15 - C28 was found, though the reason for this value was not known but possibly related to bilge water discharge from the survey vessel. TPH were analysed according to their carbon fractions C6 - C9, C10 - C14, C15 - C28 and C29 - C36 with detection limit of < 50, < 50, <100 and < 50 ug/l, respectively. Different PAHs were analysed with detection limits of <2 ug/l and <4 ug/l depending on the parameter (*Table 5.6*). The oil and grease concentration in all seawater samples was <2 mg/l or Non Detectable and were considered to be negligible. Overall, the Marine Baseline Survey was taken as indicating no evidence of hydrocarbon contamination at levels of environmental concern.

In comparison to National Environmental Quality (Emissions) Guidelines, oil and grease levels of ambient waters were well below discharge standards (10 mg/l equivalent to 10,000 ug/l) for this parameter.

**Table 5.5 Marine Water Quality Survey Results Collected at Surface, Mid and Bottom depths within the Water Column**

Parameter	YA1-S	YA1-M	YA1-B	YA2-S	YA2-M	YA2-B	YA3-S*	YA3-M	YA3-B	YA4-S	YA4-M	YA4-B	ASEAN Quality Criteria	Marine Water
Water Depth (m)	1.5	50	90	1.5	50	90	1.5	50	90	1.5	50	90		
Transparency (Secchi depth) (m)	25	-	-	21	-	-	20	-	-	21	-	-	-	
pH	7.58	7.48	7.4	7.81	7.52	7.43	7.86	7.68	7.45	7.85	7.63	7.42	-	
Turbidity (FNU)	0.4	0.5	0.9	0.9	0.5	0.5	0.3	0.4	0.5	0.5	0.5	0.6	-	
Salinity (psu)	29.0	31.2	31.5	29.9	31.2	30.2	30.0	30.5	31.8	31.8	30.9	29.9	-	
Temperature (°C)	31.3	28.0	27.3	30.2	27.6	24.0	31.2	29.8	26.6	32.1	29.6	26.5	Increase not more than 2°C above the maximum ambient temperature.	
DO (mg/L)	5.31	4.66	4.63	4.86	4.22	3.84	3.67	3.86	4.22	3.79	3.58	3.30	4mg/L	
TSS (mg/L)	<2	3	<2	3	<2	<2	<2	<2	<2	2	11	<2	Permissible maximum increase over seasonal average concentration	10%
Ammonia	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.07 mg/L	
TP (mg/L)	<0.01	0.02	0.03	<0.01	0.02	0.04	<0.01	<0.01	0.02	<0.01	0.01	0.03	-	
Nitrate (mg/L)	<0.01	0.05	0.13	<0.01	0.04	0.26	<0.01	<0.01	0.15	<0.01	0.02	0.22	0.06 mg/L	
TN (mg/L)	0.1	0.2	0.3	0.1	0.2	0.4	0.1	<0.1	0.3	0.1	0.1	0.3	-	
BOD (mg/L)	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	-	
COD (mg/L)	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	-	
Chlorophyll a (ug/L)	<0.1	0.4	0.3	<0.1	0.3	0.1	<0.1	0.3	0.3	<0.1	0.6	0.2	-	
Oil and Grease (mg/L)	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	0.14mg/L	
Metal													-	
- Chromium (ug/L)	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	50 ug/L	
- Mercury (ug/L)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.16 ug/L	
- Arsenic (ug/L)	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	-	
- Cadmium (ug/L)	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	10 ug/L	
- Copper (ug/L)	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	8 ug/L	
- Lead (ug/L)	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	8.5 ug/L	
- Zinc (ug/L)	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	-	
TPH (ug/L)														
- C6-C9	<20	<20	<20	<20	<20	<20	----	<20	<20	<20	<20	<20	-	
- C10-C14	<50	<50	<50	<50	<50	<50	----	<50	<50	<50	<50	<50	-	
- C15-C28	<100	<100	<100	136	<100	<100	----	<100	<100	<100	<100	<100	-	
- C29-C36	<50	<50	<50	<50	<50	<50	----	<50	<50	<50	<50	<50	-	
PAHs (ug/L)													-	

Parameter	YA1-S	YA1-M	YA1-B	YA2-S	YA2-M	YA2-B	YA3-S*	YA3-M	YA3-B	YA4-S	YA4-M	YA4-B	ASEAN Marine Water Quality Criteria
Water Depth (m)	1.5	50	90	1.5	50	90	1.5	50	90	1.5	50	90	
- Naphthalene	<2	<2	<2	<2	<2	<2	----	<2	<2	<2	<2	<2	-
- 2-Methylnaphthalene	<2	<2	<2	<2	<2	<2	----	<2	<2	<2	<2	<2	-
- 2-Chloronaphthalene	<2	<2	<2	<2	<2	<2	----	<2	<2	<2	<2	<2	-
- Acenaphthylene	<2	<2	<2	<2	<2	<2	----	<2	<2	<2	<2	<2	-
- Acenaphthene	<2	<2	<2	<2	<2	<2	----	<2	<2	<2	<2	<2	-
- Fluorene	<2	<2	<2	<2	<2	<2	----	<2	<2	<2	<2	<2	-
- Phenanthrene	<2	<2	<2	<2	<2	<2	----	<2	<2	<2	<2	<2	-
- Anthracene	<2	<2	<2	<2	<2	<2	----	<2	<2	<2	<2	<2	-
- Fluoranthene	<2	<2	<2	<2	<2	<2	----	<2	<2	<2	<2	<2	-
- Pyrene	<2	<2	<2	<2	<2	<2	----	<2	<2	<2	<2	<2	-
- N-2-Fluorenyl Acetamide	<2	<2	<2	<2	<2	<2	----	<2	<2	<2	<2	<2	-
- Benz(a)anthracene	<2	<2	<2	<2	<2	<2	----	<2	<2	<2	<2	<2	-
- Chrysene	<2	<2	<2	<2	<2	<2	----	<2	<2	<2	<2	<2	-
- Benzo(b) & Benzo(k)fluoranthene	<4	<4	<4	<4	<4	<4	----	<4	<4	<4	<4	<4	-
- 7.12-Dimethylbenz(a)anthracene	<2	<2	<2	<2	<2	<2	----	<2	<2	<2	<2	<2	-
- Benzo(a)pyrene	<2	<2	<2	<2	<2	<2	----	<2	<2	<2	<2	<2	-
- 3-Methylcholanthrene	<2	<2	<2	<2	<2	<2	----	<2	<2	<2	<2	<2	-
- Indeno(1.2.3.cd)pyrene	<2	<2	<2	<2	<2	<2	----	<2	<2	<2	<2	<2	-
- Dibenz(a,h)anthracene	<2	<2	<2	<2	<2	<2	----	<2	<2	<2	<2	<2	-
- Benzo(g,h,i)perylene	<2	<2	<2	<2	<2	<2	----	<2	<2	<2	<2	<2	-
- Low Molecular Weight PAH													-
- High Molecular Weight PAH													-
- Total PAH													-
-													-

**Note:**

Low molecular weight PAHs are the sum of concentrations of acenaphthene, acenaphthalene, anthracene, fluorene, 2-methylnaphthalene, naphthalene and phenanthrene.

High molecular weight PAHs are the sum of concentrations of benzo(a)anthracene, benzo(a)pyrene, chrysene, dibenzo(a,h)anthracene, fluoranthene and pyrene.

Note: ND- Not Detected (ie lower than detection limit)

\* Glass bottle containing sample for TPH/PAH analysis for YA-3S was found broken following transit to the overseas laboratory.

## 5.5.6

### *Sediment Characteristics*

Sediment composition is an important factor in determining the short and long term fate of contaminants in the marine environment. It is well established that the ability of many contaminants to become associated with sediments is a function of the particle size (specific surface area) of the sediment, thus finer sediments have a greater potential to contain higher concentrations of contaminants, if present.

Primary marine baseline surveys in April 2018 established that seabed areas in the Yetagun field were found to mostly consist of clayey sediment. A summary of the seabed characteristics for samples collected in April 2018 are presented in *Table 5.6*.

**Table 5.6** *Physical Characteristics of Marine Sediment Recorded in April 2018*

Location	Clay (%)	Silt (%)	Sand (%)	Gravel (%)	Modified Classification	Folk
<b>Yetagun Field</b>						
YA1	3	12	85	0	Greyish brown, slightly clayey, silty SAND with shell fragments	
YA2	3	10	87	0	Greyish brown, slightly clayey, silty SAND with shell fragments	
YA3	3	10	87	0	Greyish brown, slightly clayey, silty SAND with shell fragments	
YA4	3	13	84	0	Greyish brown, slightly clayey, silty SAND with shell fragments	

## 5.5.7

### *Sediment Quality*

#### *Total Organic Carbon*

Total Organic Carbon (TOC) is the material derived from decaying organisms, bacterial growth, and metabolic activities of living organisms. It is generally considered to be both a measure of the amount of available food for detritus feeders within sediments and a measure of the total amount of oxidisable organic material. The amount of TOC can be an important influence on the community structure of benthic assemblages and is also an important factor governing sediment quality as it influences the chemical partitioning and bioavailability of any contaminants present.

The content of organic matter found to occur in seabed sediment from samples collected in the Marine Baseline Survey in April 2018 are presented in *Table 5.7*. The organic content of marine sediments was found to be similar at all sampling stations ranging from 0.16 to 0.21% and was considered typical of unpolluted offshore marine environments.

*Total Petroleum Hydrocarbons (TPH), Polycyclic Aromatic Hydrocarbons (PAH), Oil and Grease*

Seabed sampling for the Marine Baseline in April 2018 found total hydrocarbon concentration in all sediment samples was < 1 mg/kg, and the oil and grease concentration in all samples was < 0.1 %. In the same way, concentration of individual PAHs in all samples were found <0.5 mg/l or <1 mg/kg depending on detection levels for individual PAH compounds.

TPH were analysed according to their carbon fractions (C6 - C9, C10 - C14, C15 - C28 and C29 - C36). No concentrations above the detection limit were registered for all hydrocarbon fractions in any of the sediment samples collected. Concentrations of the C6 - C9, C10 - C14, C15 - C28 and C29 - C36 fractions in all sediment samples were < 5, < 50, <100 and < 100 mg/kg respectively.

PAHs were analysed for individual PAH compounds. As with TPH, no concentrations above the detection limit were found to occur for all PAH compounds in any of the samples. PAHs were found to be undetectable (i.e. <0.5 mg/kg or <1 mg/l depending on PAH compound).

Overall, no evidence of hydrocarbon contamination was found in the collected marine sediment samples from the field area.

*Metals*

Concentrations of metals in different sampling locations from the Marine Baseline Survey in April 2018 are presented in *Table 5.7*. Based on the results, no marked spatial differences in metal concentrations in the marine sediments were observed between the sampling stations. Metal concentrations were considered to be indicative of naturally-occurring background metal concentrations with no metal at concentrations of environmental concern recorded at the sampled Yetagun Field area.

*PCB*

Polychlorinated biphenyls (PCB) are synthesised chemicals that were historically used in the manufacture of certain fluids particularly for electrical equipment. Although PCB are subject to bans internationally, PCBs are known to be persistent in the environment with a tendency to sink in water. Analysis of collected marine sediment from the field area found no evidence of PCB contamination. No detectable levels of PCB were found in any of the collected sediment samples at the Yetagun Field.

**Table 5.7 Marine Sediments Survey Results**

Parameter	YA1	YA2	YA3	YA4	ISQG Trigger Level	
					Low	High
Total Organic Carbon (%)	0.16	0.2	0.2	0.21	-	-
Metals						
Arsenic (mg/kg)	8	7	5	5	20	70
Cadmium (mg/kg)	<0.2	<0.2	<0.2	<0.2	1.5	10
Chromium (mg/kg)	20	20	18	19	80	370
Copper (mg/kg)	3	5	4	4	65	270
Lead (mg/kg)	8	8	7	8	50	220
Mercury (mg/kg)	0.05	0.09	0.05	0.08	0.15	1
Nickel (mg/kg)	18	18	15	16	21	52
Silver (mg/kg)	<1.0	<1.0	<1.0	<1.0	1.0	3.7
Zinc (mg/kg)	35	36	30	34	200	410
Oil & Grease (%)	<0.1	<0.1	<0.1	<0.1		
TPH (mg/kg)					550	-
- C6-C9	<2	<2	<2	<2	-	-
- C10-C14	<50	<50	<50	<50	-	-
- C15-C28	<100	<100	<100	<100	-	-
- C29-C36	<100	<100	<100	<100	-	-
PAHs						
Naphthalene	<0.5	<0.5	<0.5	<0.5	160	2100
2-Methylnaphthalene	<0.5	<0.5	<0.5	<0.5	-	-
2-Chloronaphthalene	<0.5	<0.5	<0.5	<0.5	-	-
Acenaphthylene	<0.5	<0.5	<0.5	<0.5	16	500
Acenaphthene	<0.5	<0.5	<0.5	<0.5	44	640
Fluorene	<0.5	<0.5	<0.5	<0.5	19	540
Phenanthrene	<0.5	<0.5	<0.5	<0.5	240	1500
Anthracene	<0.5	<0.5	<0.5	<0.5	-	-
Fluoranthene	<0.5	<0.5	<0.5	<0.5	600	5100
Pyrene	<0.5	<0.5	<0.5	<0.5	665	2600
N-2-Fluorenyl Acetamide	<0.5	<0.5	<0.5	<0.5	-	-
Benz(a)anthracene	<0.5	<0.5	<0.5	<0.5	261	1600
Chrysene	<0.5	<0.5	<0.5	<0.5	384	2800
Benzo(b) &						
Benzo(k)fluoranthene	<1	<1	<1	<1	-	-
7.12-						
Dimethylbenz(a)anthracene	<0.5	<0.5	<0.5	<0.5	-	-
Benzo(a)pyrene	<0.5	<0.5	<0.5	<0.5	430	1600
3-Methylcholanthrene	<0.5	<0.5	<0.5	<0.5	-	-
Indeno(1.2.3.cd)pyrene	<0.5	<0.5	<0.5	<0.5	-	-
Dibenz(a,h)anthracene	<0.5	<0.5	<0.5	<0.5	63	260
Benzo(g,h,i)perylene	<0.5	<0.5	<0.5	<0.5	-	-
Low molecular weight PAH	<3.5	<3.5	<3.5	<3.5	552	3160
High molecular weight PAH	<3.0	<3.0	<3.0	<3.0	1700	9600
Total PAH	<10.5	<10.5	<10.5	<10.5	4000	45000
Total Polychlorinated biphenyls (PCB) (mg/L)	<0.1	<0.1	<0.1	<0.1	23	-

Note:

- (1) Interim Sediment Quality Guidelines (ISQG) are Australian criteria for marine sediments provided for reference only in the absence of Myanmar national criteria.
- (2) Sum LPAH- Low molecular weight PAHs are the sum of concentrations of acenaphthene, acenaphthalene, anthracene, fluorene, 2-methylnaphthalene, naphthalene and phenanthrene
- (3) Sum HPAH - High molecular weight PAHs are the sum of concentrations of benzo(a)anthracene, benzo(a)pyrene, chrysene, dibenzo(a,h)anthracene, fluoranthene and pyrene.

**Table 5.8 Marine Sediments Survey Results of PSD, TOC, TPH and Metals**

Parameter	YA1	YA2	YA3	YA4	ISQG Trigger Level	
					Low	High
Particle Size Distribution						
- Gravel (%) (>2.00mm)	0	0	0	0	-	-
- Sand (%) (0.063 - 2.00mm)	85	87	87	84	-	-
- Silt (%) (0.002 - 0.063mm)	12	10	10	13	-	-
- Clay (%) (<0.002mm)	3	3	3	3	-	-
TOC (%)	0.16	0.2	0.2	0.21	-	-
Oil & Grease (%)	<0.1	<0.1	<0.1	<0.1	-	-
TPH (mg/kg)					550	-
- C6-C9	<2	<2	<2	<2	-	-
- C10-C14	<50	<50	<50	<50	-	-
- C15-C28	<100	<100	<100	<100	-	-
- C29-C36	<100	<100	<100	<100	-	-
Metals						
Arsenic (mg/kg)	8	7	5	5	20	70
Cadmium (mg/kg)	<0.2	<0.2	<0.2	<0.2	1.5	10
Chromium (mg/kg)	20	20	18	19	80	370
Copper (mg/kg)	3	5	4	4	65	270
Lead (mg/kg)	8	8	7	8	50	220
Mercury (mg/kg)	0.05	0.09	0.05	0.08	0.15	1
Nickel (mg/kg)	18	18	15	16	21	52
Silver (mg/kg)	<1.0	<1.0	<1.0	<1.0	1.0	3.7
Zinc (mg/kg)	35	36	30	34	200	410
PAHs						
Naphthalene	<0.5	<0.5	<0.5	<0.5	160	2100
2-Methylnaphthalene	<0.5	<0.5	<0.5	<0.5	-	-
2-Chloronaphthalene	<0.5	<0.5	<0.5	<0.5	-	-
Acenaphthylene	<0.5	<0.5	<0.5	<0.5	16	500
Acenaphthene	<0.5	<0.5	<0.5	<0.5	44	640
Fluorene	<0.5	<0.5	<0.5	<0.5	19	540
Phenanthrene	<0.5	<0.5	<0.5	<0.5	240	1500
Anthracene	<0.5	<0.5	<0.5	<0.5	-	-
Fluoranthene	<0.5	<0.5	<0.5	<0.5	600	5100
Pyrene	<0.5	<0.5	<0.5	<0.5	665	2600
N-2-Fluorenyl Acetamide	<0.5	<0.5	<0.5	<0.5	-	-
Benz(a)anthracene	<0.5	<0.5	<0.5	<0.5	261	1600

Parameter	YA1	YA2	YA3	YA4	ISQG Trigger Level	
					Low	High
Chrysene	<0.5	<0.5	<0.5	<0.5	384	2800
Benzo(b) & Benzo(k)fluoranthene	<1	<1	<1	<1	-	-
7.12-Dimethylbenz(a)anthracene	<0.5	<0.5	<0.5	<0.5	-	-
Benzo(a)pyrene	<0.5	<0.5	<0.5	<0.5	430	1600
3-Methylcholanthrene	<0.5	<0.5	<0.5	<0.5	-	-
Indeno(1.2.3.cd)pyrene	<0.5	<0.5	<0.5	<0.5	-	-
Dibenz(a,h)anthracene	<0.5	<0.5	<0.5	<0.5	63	260
Benzo(g,h,i)perylene	<0.5	<0.5	<0.5	<0.5	-	-
Low molecular weight PAH					552	3160
High molecular weight PAH					1700	9600
Total PAH					4000	45000
Total Polychlorinated biphenyls (PCB) (mg/L)	<0.1	<0.1	<0.1	<0.1	23	-

Note:

- (4) NAGD Screening Levels are the same as ISQG-Low Trigger Levels
- (5) Cells highlighted in grey indicating that the stations exceed the ISQG-Low Trigger Levels
- (6) ND - Not Detected (ie lower than limit of reporting)
- (7) Sum LPAH- Low molecular weight PAHs are the sum of concentrations of acenaphthene, acenaphthalene, anthracene, fluorene, 2-methylnaphthalene, naphthalene and phenanthrene
- (8) Sum HPAH - High molecular weight PAHs are the sum of concentrations of benzo(a)anthracene, benzo(a)pyrene, chrysene, dibenzo(a,h)anthracene, fluoranthene and pyrene.

## 5.6 *BIOLOGICAL COMPONENTS*

### 5.6.1 *Offshore Benthic Habitats*

The Yetagun Field in Blocks Block M-12, M-13 and M-14 encompasses relatively deep water habitats of the continental shelf (>100m water depths). The deeper water communities (e.g. continental shelf) within the Area of Influence are thought to be composed of common, well-represented and widely distributed species such as polychaetes, molluscs and echinoderms.

A quantitative assessment of macroinvertebrate community structure and distribution of the Ayeyarwady continental shelf was undertaken during a survey in 2002 (Ansari et al, 2011). The survey, which had some stations spanning the continental shelf within and adjacent to Block M-12, M-13 and M-14, identified 27 major taxa, including polychaete (32.4%), crustacean (25%), mollusca (4.2%) and echinodermata (4.5%). Abundance of benthic invertebrates was found higher at inshore coastal water compared to offshore areas.

A survey to investigate macrobenthic faunal communities in the vicinity of the Yetagun platforms was previously conducted in 1998 for previous EIA Studies for the field development and export pipeline (AATA 1998). Samples were collected from eight stations spanning the vicinity of the Yetagun Complex to nearshore environment along the export pipeline route. The survey recorded that sediments were generally dominated by polychaete worms with the exception of arthropods at two stations near the Yetagun platforms. Macrobenthos abundance was found be lowest abundance and less diverse at the deeper stations near the Yetagun platform compared to the shallow nearshore environment.

Given data from 1998 were considered not recent enough to inform this EIA Study, a new primary marine baseline survey was conducted. Benthic grab sampling of the seabed habitat within the surrounds of the Yetagun-A production platform, where drilling operations will occur, were conducted in April 2018.

The survey in April 2018 recorded a total of 31 individual organisms, with a total biomass of 0.283 g in 4 sediment grab samples. The specimens belong to 7 Phyla (Annelida, Arthropoda, Chordata, Cnidaria, Echinodermata, Mollusca and Nemertinea), from a total of 15 Families in 7 Classes. A summary of the numerical abundance, biomass and taxonomic richness of macro-benthos inhabiting the seafloor habitat within the operational area in 2018 is provided in *Table 5.9*.

**Table 5.9** *Macrobenthos Abundance, Biomass and Taxonomic Richness Recorded in April 2018*

Location	Total abundance (grab)	Total biomass (g/grab)	No of species (grab)	No of families (grab)	No of classes (grab)	No of phyla (grab)
YA1	6	0.0492	6	5	2	2
YA2	4	0.0222	4	4	3	2
YA3	7	0.0933	7	6	5	5
YA4	14	0.1184	11	9	3	3
Mean	7.75	0.0708	7	6	3.25	3

In April 2018, it was found that, overall, the majority (54.84%) of the number of macrobenthic organisms (i.e. abundance) recorded at Yetagun field were from the Class Polychaeta (Phylum Annelida (marine worms), followed by Class Crustacea (Phylum Arthropoda, 22.58 of the total). At sampling locations, assemblages were dominated by polychaete worms or crustaceans (Phylum Arthropoda), which was the same finding as reported from surveys in 1998.

A summary of the percentage abundance of different Classes of macrobenthic organisms in sediment from different sampling locations is provided in *Table 5.10*.

**Table 5.10** *Percentage (%) Abundance of Main Groups of Macrobenthos in Seabed Sediments from Sampling Stations in April 2018*

Class	Common Name	YA1	YA2	YA3	YA4	Mean
Anopla	Ribbonworm	0.00	0.00	14.29	14.29	7.14
Anthozoa	Anemone	0.00	0.00	14.29	0.00	3.57
Crustacea	Crustacean	0.00	50.00	28.57	21.43	25.00
Gastropoda	Snail	0.00	25.00	0.00	0.00	6.25
Osteichthyes	Fish	16.67	0.00	0.00	0.00	4.17
Polychaeta	Bristleworm	83.33	25.00	28.57	64.29	50.30
Stellerioidea	Brittlestar	0.00	0.00	14.29	0.00	3.57

In conclusion, benthic grab sampling in the surrounds of the proposed drilling centre at the Yetagun field in April 2018 have revealed a sparse abundance, high variability and low diversity of infauna dominated by bristleworms (polychaetes) with other fauna including crustaceans, ribbonworms, anemones, gastropods, fish and brittlestars. The benthic habitat within the study area spanning the outer continental shelf consists of bare, unconsolidated sandy and muddy sediments supporting a sparse assemblage of benthic organisms. Based on the grab samples collected in 2018, the abundance of macrobenthic organisms inhabiting the seabed across the seabed near the proposed drilling centre was found to be patchy but with similar low abundance at each sampled locations with benthic organisms in samples mainly consisting of small-bodied individuals. Overall the infauna associated with the soft unconsolidated

sediment at the Yetagun field are expected to be widespread and well-represented along the continental shelf in the region and thus regarded as low sensitivity.

Given the deeper water depths at the Yetagun field (approximately 110 m), insufficient light reaches the seabed to allow the growth of primary producers such as seagrass, macroalgae or zooxanthellate scleractinian (reef building) corals and these groups are absent from the seabed in the vicinity of the operational area.

## 5.6.2 *Coastal Habitats within the Study Area*

Although the Project is located over 140 km from the mainland and 100 km from outlying islands, the following sections provide a brief overview of the coastal habitats neighbouring the Project Area. Given the distance between habitats and Project activities, it is unlikely that there will be any impact on these coastal receptors. The locations of coastal habitats are shown in *Figure 5.7*.

### *Coral Habitats*

UNEP satellite analyses show that coral reefs (usually fringing or patch reefs in Myanmar) occur along the coast of Tanintharyi Region. The coral formation in Myeik Archipelago consists of fringing reefs, submerged pinnacles and seamounts, limestone caves, sheer and sloping rock walls, and boulder-strewn sand bottoms (BOBLME, 2015). The number of coral species has increased significantly (51 species in 1972 to 512 species in 2014) as a result of the recent data researched by the Marine Science Department at Mawlamyine University. These 512 species were recorded from 24 islands of the northern Myeik Archipelago.

Given that the water depth ranges from 104 m to >1,000 m within the Blocks, it is unlikely that coral reefs are present.

### *Mangroves*

Along the Tanintharyi Region coastline, there are well developed mangrove areas distributed along the sheltered side of islands, river mouths and fringing tidal river areas. There are also mangrove stands for sheltered areas along the coast. Mangroves recorded along the Tanintharyi Region coast include *Rhizophora*, *Xylocarpus*, *Avicennis*, *Bruguiera*, *Sonneratia* and *Ceriops*. The predominant species in the Tanintharyi coastal mangroves are *Rhizophora mucronata* and *Rhizophora apiculata*. The known distribution of mangrove habitat in the Study Area along the Tanintharyi Region coast is illustrated in *Figure 5.7*.

Reclamation of mangrove areas is well recorded in the Study Area. The use of mangrove forest for agricultural land and firewood in Tanintharyi Region, Ayeyarwady Delta and Rakhine State regions, has seen a reduction in the recorded 85,533 ha of mangroves at the beginning of the 1990s by approximately 50 percent in 2002 (U Tin Tun).

## Seagrass

Seagrass beds occur along the nearshore habitats of the Tanintharyi Region and typically occur in less than 65 ft. (20 m) water depth in sheltered intertidal or subtidal areas (Short FT, et al, 2001). Seagrass beds are expected to serve as nurseries and habitats for fish and invertebrates, and may also provide a food source (except *Enhalus acoroides* - a fibrous species) for species of international and national conservation interest including marine turtles and dugongs (*Dugong dugon*). Dugongs feed almost exclusively on seagrass (Lanyon, et al., 1989). Locally, seagrasses are known as "Leik Sar Phat Myet", meaning grass for the turtles. Seagrasses are recorded from the coasts of Tanintharyi Region, south Mon State and Rakhine State and, but are reported to be absent from the delta zone of the Ayeyarwady River mouths and Gulf of Mottama due to high turbidity, hypo-salinity and mud silt substrate (Novak et al. 2009).

Based on data from U. Soe-Htun and Tint Swe (2013), Myanmar has 10 species of seagrass. These are *Cymodocea rotundata*, *C. serrulata*, *Halodule pinifolia*, *H. uninervis*, *Syringodium isotofolium*, *Enhalus acoroides*, *Halophila beccarii*, *H. decipiens*, *H. ovalis*, and *Thalassia hemprichii*. Of these, *Cymodocea rotundata*, *C. serrulata* and *Enhalus acoroides* typically dominant in seagrass beds. Most of these seagrass species are found in Tanintharyi coastal areas.

## RAMSAR sites

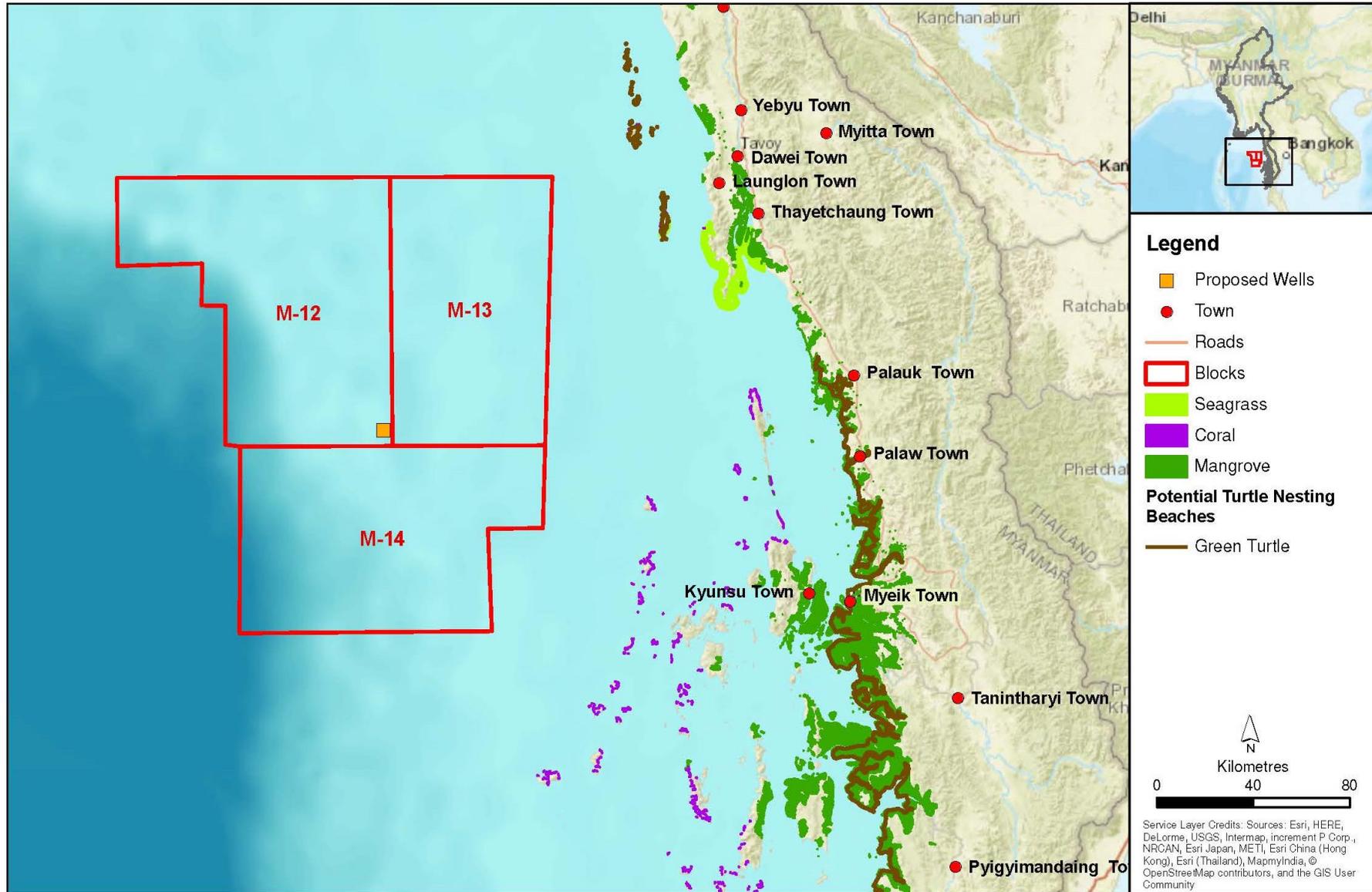
The Ramsar Convention is an international treaty for the conservation and sustainable use of wetlands. In Myanmar, four sites have been designated:

- Moeyungyi Wetlands Wildlife Sanctuary in Bago Region;
- Indawgyi Wildlife Sanctuary in Kachin State;
- Meinmahla Kyun Wildlife Sanctuary with the Outer Delta Islands in the Ayeyawaddy Delta; and
- The northern part of the Gulf of Mottama.

The nearest RAMSAR site to the Project Area is the Gulf of Mottama, covering an area of 42,500 hectares, which is situated at the mouth of the Sittaung River (Figure 5.8). The site supports a large number of species including marine fish, invertebrates and up to 90,000 migratory water birds in the non-breeding season. Among these water birds is the critically endangered spoon-billed sandpiper (*Eurynorhynchus pygmeus*), of which the site hosts more than half of the remaining global population.<sup>1</sup>

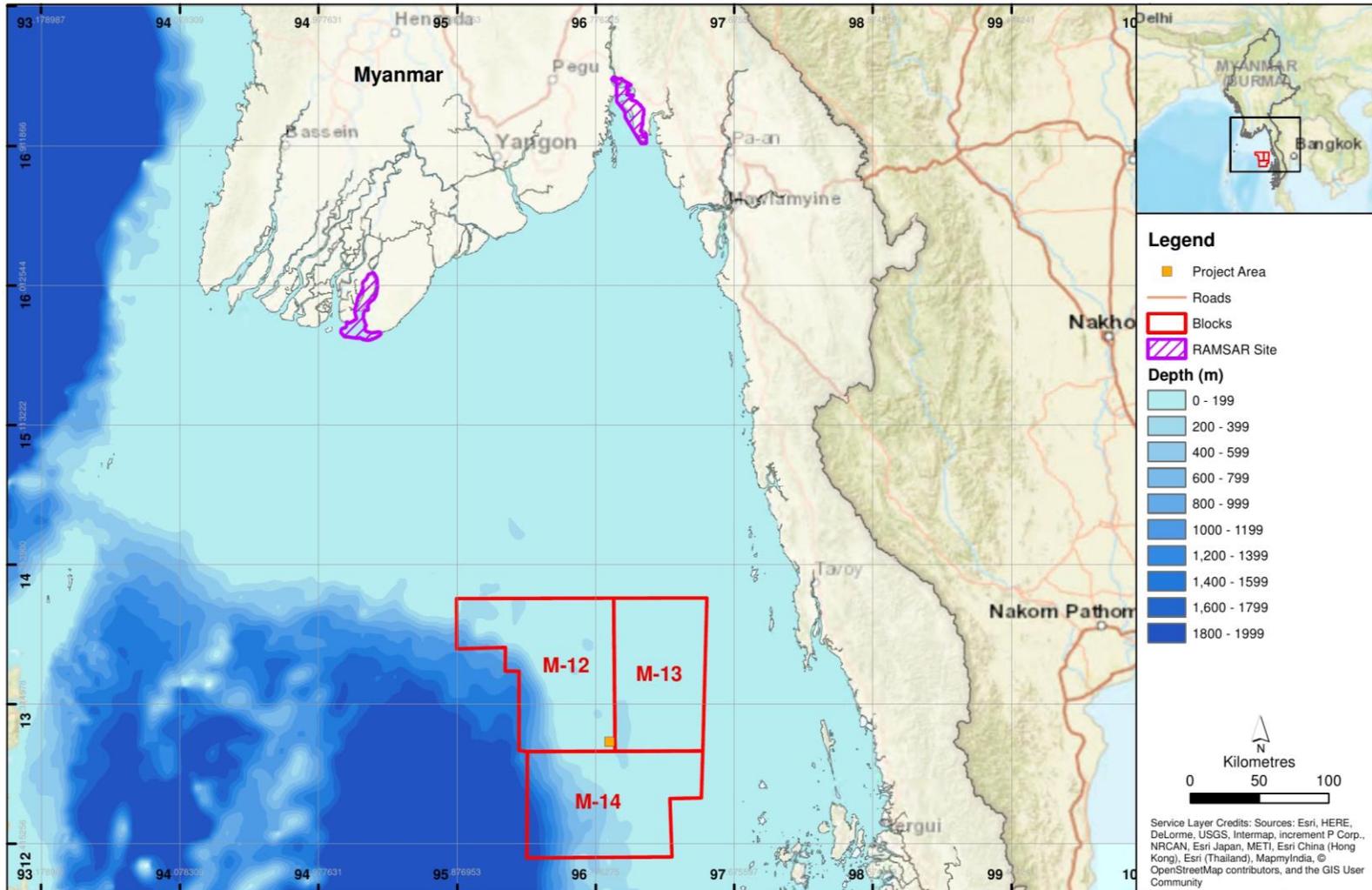
<sup>1</sup> <https://www.ramsar.org/news/myanmar-designates-the-gulf-of-mottama-as-a-ramsar-site>

Figure 5.7 Sensitive Coastal Habitats in the Study Area



Source: Ocean Data Viewer, UNEP-WCMC

Figure 5.8 RAMSAR Sites in Relation to the Project Area



### 5.6.3

#### *Plankton*

There are limited data on the species composition, abundance and distribution of plankton within the Study Area. A survey to investigate phytoplankton and zooplankton communities in the vicinity of the Yetagun platforms was previously conducted in 1998 for previous EIA Studies for the field development and export pipeline (AATA 1998). Phytoplankton were found to be represented by typical forms that are common in tropical marine environments of the Indian Ocean. Algal groups included diatoms, dinoflagellates, cyanobacteria, silicoflagellates, prasinophytes, and prynesiophytes. The survey found lower phytoplankton abundance near the Yetagun platform compared to abundance at nearshore locations, which likely reflected higher nutrient availability in nearshore waters from terrestrial runoff. As is typical, zooplankton communities were found dominated by copepods at all stations with no clear trend in abundance away from coast. Oceanic taxa such as the copepod *Candacia pachydactyla* and pteropods *Diacra quadridentata* were indicators of deeper water environment being only found from the deepest waters near the Yetagun platforms.

Given data from 1998 were considered not recent enough to inform this EIA Study, a new primary marine baseline survey was conducted. Phytoplankton and zooplankton sampling of the water column at four locations within the surrounds of the Yetagun-A production platform, where drilling operations will occur, were conducted in April 2018.

The survey in April 2018 recorded a total of between 46,810 to 149,856 algal cells/L in four water column-integrated samples. The specimens belong to two Divisions (Cyanophyta, Chromophyta), three Classes (Cyanophyceae, Bacillariophyceae, Dinophyceae), 20 Families and 23 Species. Of the major algal groups (Classes), surveys found phytoplankton were dominated by either diatoms (Bacillariophyceae), or cyanobacteria (Cyanophyceae). As is typical, dinoflagellates (Dinophyceae) contributed only a small portion of the phytoplankton community. Common phytoplankton species included representatives of *Nitzschia*, *Oscillatoria* and *Rhizosolenia* which are common cosmopolitan and tropical neritic species.

A summary of the numerical abundance and taxonomic richness of phytoplankton inhabiting the pelagic habitat within the operational area in 2018 is provided in *Table 5.11*. A summary of the relative abundance of the major algal groups (Classes) is presented in *Table 5.12*.

**Table 5.11 Phytoplankton Abundance and Taxonomic Richness Recorded in April 2018**

Location	Total Abundance (cells/L)	No Species	of	No Families	of	No Classes	of	No Divisions	of
YA1	96,032	18		18		3		2	
YA2	46,810	19		18		3		2	
YA3	149,856	17		15		3		2	
YA4	48,380	18		17		3		2	
Mean	85,270	18		17		3		2	

**Table 5.12 Relative Abundance of Algal Groups (Classes) Recorded in April 2018**

Location	Diatoms (Bacillariophyceae)	Cyanobacteria (Cyanophyceae)	Dinoflagellates (Dinophyceae)
YA1	50.2	41.3	8.5
YA2	14.1	73.1	12.8
YA3	74.6	20.3	5.1
YA4	29.2	55.0	15.8
Mean	42.0	47.4	10.5

For zooplankton, the survey in April 2018 recorded a total of between 855 to 1,377 individuals/ m<sup>3</sup> from the 4 vertical haul samples from the upper ~25m of the water column, which was similar to previous findings from the 1998 survey. The specimens belonged to 8 Phyla (Protozoa, Chaetognatha, Annelida, Arthropoda, Mollusca, Echinodermata and Chordata) and 9 Classes (Sarcodina, Ciliata, Sagittoidea, Polychaeta, Crustacea, Gastropoda, Bivalvia, Echinoidea and Larvacea) and 14 taxa. A summary of the numerical abundance and taxonomic richness of zooplankton inhabiting the pelagic habitat within the operational area in 2018 is provided in Table 5.13.

**Table 5.13 Zooplankton Abundance and Taxonomic Richness Recorded in April 2018**

Location	Total abundance (ind/m <sup>3</sup> )	No of taxa (net haul)	No of classes (net haul)	No of phyla (net haul)
YA1	1,377	14	9	7
YA2	1,585	14	9	7
YA3	855	14	9	7
YA4	1,056	13	8	7
Mean	1,218	14	9	7

In April 2018, it was found that, overall, the majority (79.4%) of the number of zooplankton organisms (i.e. abundance) recorded at Yetagun field were from the Class Crustacea (Phylum Arthropoda), followed by Class Larvacea (Phylum Chordata, 9.5% of the total) and the Class Sagittoidea (Phylum Chaetognatha, 5.2% of the total). At sampling locations, zooplankton assemblages were dominated by copepods (Phylum Arthropoda), which was the same finding as reported from surveys in 1998.

A summary of the density abundance of different Classes of zooplankton organisms in the upper pelagic habitat from different sampling locations is provided in *Table 5.14*.

**Table 5.14** *Density (individuals/m<sup>3</sup>) of Main Groups of Zooplankton in Pelagic Habitat (upper 25m) from Sampling Stations in April 2018*

Class	Common Name	YA1	YA2	YA3	YA4	Mean
Sarcodina	Ameoba	8	9	8	0	6
Ciliata	Ciliate	4	32	7	5	12
Sagittioidea	Arrow worm	60	83	42	72	65
Polychaeta	Bristleworm larvae	7	4	2	0	3
Crustacea	Cyclopoid Copepod	278	211	126	189	201
	Calanoid Copepod	288	185	126	219	205
	Harpacticoid Copepod	48	41	16	31	34
	Nauplius of Copepod (larvae)	500	792	391	397	520
	Copepod Zoea (larvae)	2	18	8	7	9
Gastropod	Sea snail larvae	38	28	23	31	30
Bivalvia	Bivalve larvae	15	8	6	6	9
Echinoidea	Sea urchin larvae	7	9	11	10	9
Larvacea	Larvacean	120	163	89	90	115

Plankton populations are naturally extremely patchy and variable over time. Most species of plankton have short generation times, high fecundity and high abundance over a large area, particularly, in the open water, offshore environment. For these reasons plankton populations within the Project Area are not considered to be potentially impacted by the project activities

#### 5.6.4 *Fish*

Fish communities in the Study Area occupy a range of habitats from coral and rocky reefs and seagrass habitat in shallow waters to deep-water habitats below the sun-lit euphotic zone (>200 m or 650 feet) in open ocean, and the open water pelagic zone. As the Project is located in water depths of approximately 357 ft. (109m), the focus of this section will be on fish species that inhabit this area.

A fisheries survey was conducted by the Institute of Marine Research (IMR) Norway in 2015 on the Tanintharyi inner shelf (between 66 - 164 feet water depth) (Krastad et al, 2015). Leiognathidae (pony fishes) was the most important group with catch rates of 34.4 kg/h followed by the Cephalopoda (octopus and squid) (28.8 kg/h) who showed the biggest catch rate in the survey area in this region. The following groups were Synodontidae (Lizardfish) (14.6 kg/h), Carangids (jacks) (14.4 kg/h), and Scombrids (mackerels) (6.8 kg/h).

Whale sharks (*Rhincodon typus*) are listed as a species of conservation concern of the IUCN Red List and have been observed in the waters offshore Tanintharyi Region (pers comm with fishermen). This species is highly migratory occurring in both tropical and temperate waters, though there is a general lack of knowledge on many aspects of whale shark biology, including definitive migration patterns.

### 5.6.5

#### *Marine Mammals*

##### *Cetaceans (Whales and Dolphins)*

A total of 25 cetacean (whale and dolphin) species have been recorded as either Confirmed or Probable in Myanmar waters (Holmes et al. 2014; IUCN, 2017).

Of the whale and dolphin species potentially present in Myanmar waters, most are far-ranging migratory oceanic species while several others are coastal species with closer affinities to shallow water habitat areas and estuarine areas. IUCN-listed threatened cetacean species in Myanmar waters are oceanic species that typically inhabit offshore open waters, namely the blue whale (*Balaenoptera musculus*) (Endangered), fin whale (*Balaenoptera physalus*) (Endangered) and sperm whale (*Physeter macrocephalus*) (Vulnerable). The blue whale and the fin whale are also listed as endangered species recognized as of prime importance to the Region and deserving special attention under the ASEAN Agreement on the Conservation of Nature and Natural Resources (ASEAN, 1985). Other common open water species such as humpback whale (*Megaptera novaeangliae*) and Bryde's whale (*Balaenoptera edeni*) are known to occur in offshore waters in Myanmar; however these are listed as Least Concern and Data Deficient on IUCN Red List, respectively.

From conversations with local fishermen, dolphins are regular seen and are commonly caught in gillnets and crab nets. It is assumed that all the whales listed above could be present in the Project Area given the wide ranges of these animals.

##### *Sirenians (Dugongs)*

The Dugong (*Dugong dugong*) is a large, herbivorous, exclusively marine mammal and is the only extant (living) member of the family Dugonidae. It is one of the only four extant species of the order Sirenia. Dugong is listed as vulnerable to extinction by the IUCN Red List of Threatened Species (IUCN, 2017), on the Convention on the Conservation of Migratory Species of Wild Animal (Bonn Convention), and on Appendix 1 of the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES). Along with the Irrawaddy dolphin (*Orcaella brevirostris*); dugong are also protected under the Myanmar Protection of Wildlife and Conservation of Natural Areas Law since 1994 under the category "completely protected".

Dugongs are rare and are mostly found west of the Ayeyarwady Delta and further north of the main coastline. Occurrence of dugong at some islands of Myeik Archipelago such as Sular Island, La Ngan Island, Bo Lut Island and War

Kyunn Island, as well as waters in the Rakhine Coast, has been reported by local communities (Ilangakoon and Tun, 2007).

### 5.6.6

#### Marine Turtles

Five (5) of the world's seven (7) marine turtle species are regularly seen nesting and foraging in the coast of Myanmar. These include the Hawksbill (*Eretmochelys imbricata*), Green (*Chelonia mydas*), Loggerhead (*Caretta caretta*), Olive Ridley (*Lepidochelys aolivacea*), and Leatherback (*Dermochelys coriacea*) as shown in Table 5.15. From IUCN data, the Hawksbill, Green, Olive Ridley and Leatherback turtles are most likely to be present in the Project Area (Table 5.15).

**Table 5.15** *Distribution of marine Turtles in Andaman Sea*

Location	Species				
	Hawksbill ( <i>Eretmochelys imbricata</i> )	Green ( <i>Chelonia mydas</i> )	Loggerhead ( <i>Caretta caretta</i> ),	Olive Ridley ( <i>Lepidochelys aolivacea</i> ),	Leatherback ( <i>Dermochelys coriacea</i> )
Myanmar	Ayeyarwady Region, Rakhine State, Taninthayi Region and Yangon Region	Ayeyarwady Region, Rakhine State, Mon State, Taninthayi Region and Yangon Region (Coco Island)	Rakhine State	Ayeyarwady Region, Rakhine State, Mon State, Taninthayi Region and Yangon Region (Coco Island)	Ayeyarwady Region, Taninthayi Region and Yangon Region
IUCN Status <sup>1</sup>	Critically Endangered	Endangered	Endangered	Vulnerable	Vulnerable

**Source:** IUCN (2014) The IUCN Red List of Threatened Species Version 3.1 (latest version) [http://bim.aseanbiodiversity.org/mmchm/index.php?option=com\\_content&view=article&id=21&Itemid=27](http://bim.aseanbiodiversity.org/mmchm/index.php?option=com_content&view=article&id=21&Itemid=27)

Turtles undertake migrations from foraging areas to mating, inter-nesting and nesting areas (Miller 1997). In general, mature adult turtles (approximately 30 to 50 years old) undertake the migration from coastal shallow foraging areas to shallow water inter-nesting areas near nesting beaches every two to eight years. On arrival, turtles mate in the waters adjacent to nesting beaches and females may nest multiple times at approximately two week intervals before returning to foraging areas. Eggs hatch after eight to 10 weeks of incubation with hatchlings dispersing into the open ocean where they forage for the next five to 20 years. The nearest potential turtle nesting site is on the Moscos Islands. The green turtle (*Chelonia mydas*) is known to nest here, which is listed on the IUCN Red List as Endangered (WCS, 2014).

UNEP data suggest sandy shore habitat along Moscos Island and the adjacent Tanintharyi coastline are nesting sites for species including green turtles, hawksbill, Olive Ridley and Leatherback (UNEP, 2017). Annual turtle nesting

<sup>1</sup> IUCN (2014) The IUCN Red List of Threatened Species Version 3.1 (latest version) [http://bim.aseanbiodiversity.org/mmchm/index.php?option=com\\_content&view=article&id=21&Itemid=27](http://bim.aseanbiodiversity.org/mmchm/index.php?option=com_content&view=article&id=21&Itemid=27)

activity in Myanmar waters is reported to occur between September and March with the peak period of activity occurring from December to January. Given the location of the Project Area in relation to known nesting beaches, there is a potential for marine turtles to be present within these blocks when traversing open waters to and from seasonal nesting areas and adjacent mating areas. All known nesting beaches are outside the Project Area.

### 5.6.7

#### *Seabirds*

The most abundant group of seabirds in offshore Myanmar are the terns, of which 13 species regularly occur. Other seabirds which may use these waters include gulls, storm petrels, Jaegers (also known as Skuas), tropic birds, boobies, noddies and frigatebirds. Seabird species tend to be highly migratory, far ranging and widely distributed away from breeding areas. Offshore Myanmar waters are used by seabirds for foraging and loafing (resting). Islands and islets can also be used for roosting, resting and moulting. Only two species, the Little Tern (*Sterna albifrons*) and the Brown Booby (*Sula leucogaster*), are reported to have breeding colonies in Myanmar. Outlying islands of the Myeik Archipelago and Moscos Island which are located about 88 km and over 100 km respectively from the potential well locations is expected to be potential suitable nesting site for individuals of these species, though this is not confirmed by observation. However, no Important Bird and Key Biodiversity Areas identified for the presence of seabird species are reported from the Study Area.

Of the seabird species that occur in the Study Area, only species of seabird that spend large quantities of time underwater while foraging for food, either underwater swimmers or aerial divers, are considered potentially vulnerable to underwater sound impacts. Feeding by seabirds involves snatching prey items from or below the water surface (terns, noddies, tropic birds, frigate birds, gulls), by paddling (petrels) and mainly kleptoparasitism (i.e. taking from others) (jaeger). Of the species potentially present, only boobies feed by aerial diving.

Although detailed data on distribution, abundance, habitat utilisation and seasonality of seabirds specific to the Study Area are limited at present, noting the above it can be conservatively assumed that seabirds may be expected to occasionally pass within or close by to the Project Area.

## 5.7

### *INFRASTRUCTURE AND SERVICES*

### 5.7.1

#### *Education and Schools*

Myanmar Census data (Myanmar population and housing census, 2015) notes that Tanintharyi Region had 1,007 primary schools, 142 middle schools, and 102 high schools. The literacy rate for youth between the ages of 15 to 24 years was higher than the overall literacy rate of Myanmar at 95.8%. The literacy rate of females is reported to be higher than that of the males. The number of university and schools in Tanintharyi Region are shown in *Table 5.16*.

**Table 5.16 University and Schools in Study Area**

Township	University/ College	High School	Middle School	Primary School
Dawei	5	7	12	89
Lounglon	2	13	5	2
Thayetchaung	-	12	35	81
Myeik	4	21	18	83

Source: Myanmar population and housing census, 2015

### 5.7.2 Electricity and Energy

In Tanintharyi Region, 47% of the population use private generators, 22% use candles, 8% use electricity, and 23% use other source such as kerosene and solar as the main source of energy for electricity.

ERM field visits in July 2018 found that the local community in the Study Area do not have access to electricity provided by the government. Most of the households use the electricity distributed by private business and the cost per unit is 350 MMK; much higher than the national average unit cost.

Firewood is the main source for cooking as around 50% of people use it for cooking, 43.5% use charcoal and 4.4% use others such as electricity, coal.

The different sources for energy usage are shown in *Table 5.17*.

**Table 5.17 Main source of Energy**

Township	Private Generator	Electricity	Candle	Others (Kerosene, Solar, etc.)
Dawei	71.7%	4.4%	11.3%	12.6%
Lounglon	54.9%	7.7%	19.4%	18%
Thayetchaung	48.6%	2.4%	14.5%	34.5%
Myeik	55.0%	10.5%	19.5%	15%

Source: Myanmar population and housing census, 2015

## 5.8 SOCIO-ECONOMIC COMPONENTS

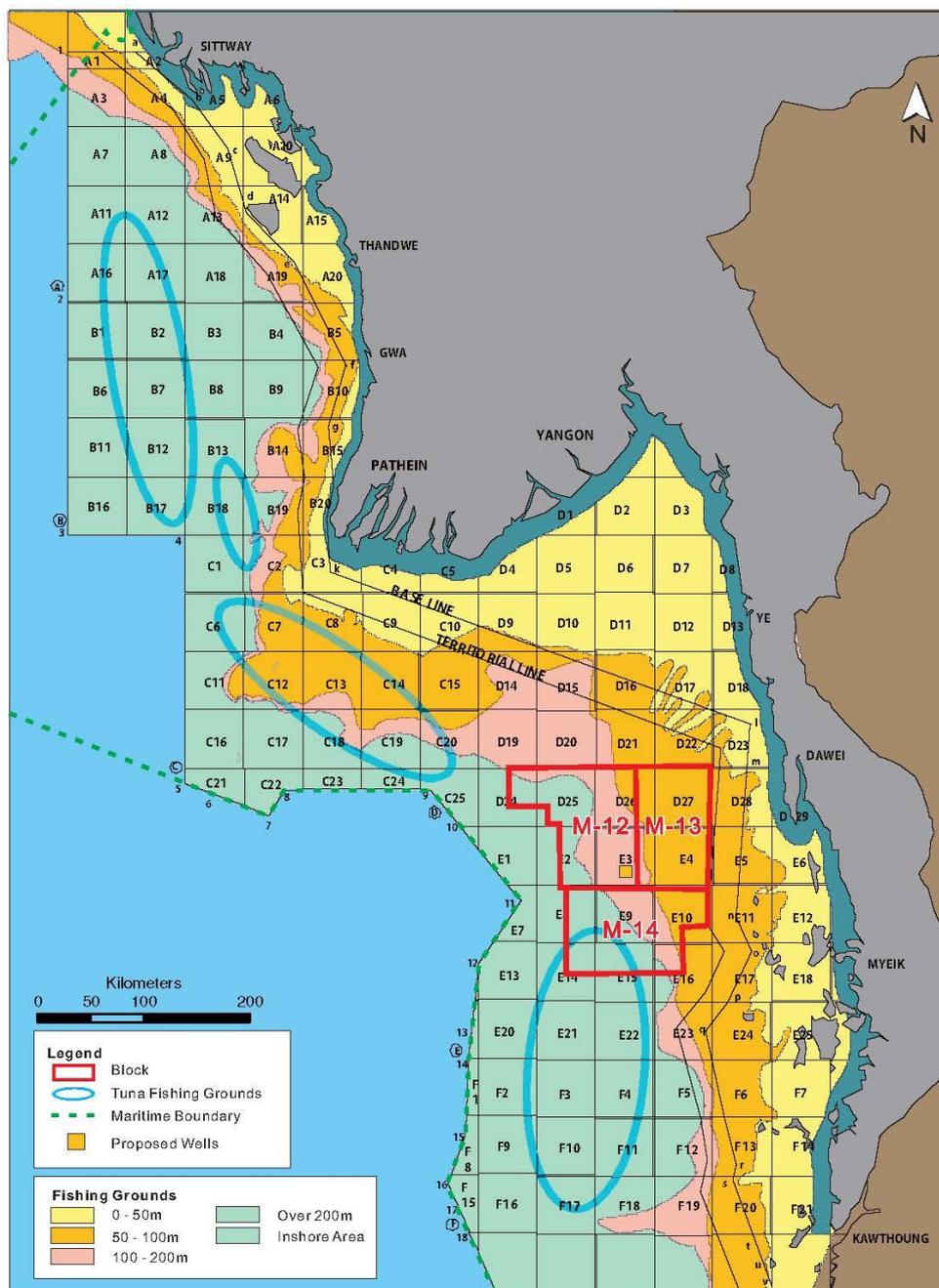
### 5.8.1 *Fishing Operations and Resources*

The Department of Fisheries (DoF) has instituted two fishing zones which provide a restriction on fishing activities and a degree of protection to fisheries resources. Fishing Zone 1, for traditional coastal fisheries, extends from the shoreline to 10 nautical miles from the shore. Fishing Zone 2 extends from the outer limit of Fishing Zone 1 to the 200 nautical mile Exclusive Economic Zone (EEZ) limit (*Figure 5.9*). The DoF at the national level controls offshore fishing activities and licenses, while inshore licenses are granted at the Region/State level. As the Project is offshore, the impact to fishing is a key concern. Public consultation was undertaken in July 2018. It was noted the fishing grounds used by large licensed commercial vessels (mainly purse seine vessels), including those operating from Dawei and Myeik, may overlap with the waters of the Project Area. In addition, discussions with regional local DoF representatives indicated it is likely mostly fishers from Tanintharyi Region potentially operate in these Blocks.

The peak fishing season is usually November to April as the sea conditions are calmer and vessels may fish further offshore. During the rainy season (i.e. generally May to October), fishing is often constrained to the Fishing Zone 1 (inshore) by adverse sea conditions. Fishing is still conducted during the monsoon season but this is generally within the nearshore fishing area; within 16 km from the coast. Furthermore DoF restrict seasonally fishing (i.e. 15 May to 15 August) when only a proportion of commercial fishing vessels are permitted to fish.

DoF indicated there are year round restrictions on fishing at the Shark Protection Area at the Myeik Archipelago.

Figure 5.9 Fishing Blocks in Tanintharyi Waters



Source: Department of Fisheries (2003), modified by ERM (2018)

Focus group discussions with fishers, fishing associations, and the DoF were conducted in July 2018. A summary of all data collected is provided in *Table 5.18* showing the size of boats, distance of fishing grounds offshore, number of fishermen and average time spent at sea.

**Table 5.18 Fishing Data on Boats by Township**

Village	Township	Type of Boats	Carrying Capacity	Distance covered (miles)	Usually moves in Depth of (ft.)	Number of HHs	Average fishing trip (time spent)	Number of Fishermen
Maung Ma Kan	LaungLon	Small (15-20) ft.	50-100 viss	1-2 miles	10-20 ft	100	daily round trip	40
		Medium (40-50) ft.	1000-1500 viss	100-200 miles	-	50	1 month	50
		Large (60-70) ft.	1500-2000 viss	200-300 miles	600 ft	20	1 month	20
Kyauk Sin	LaungLon	Small (15-20) ft.	300 viss	7-15 miles	-	-	24 hr (daily round trip)	25
		Medium (40-50) ft.	1000 viss	100 miles	-	-	20 days	5
		Large (60-70) ft.	1500 viss	100-200 miles	-	-	20-25 days	5
Ti Zit	LaungLon	Small (15-20) ft.	300 viss	12 miles	-	200	-	400
Pyin Gyi	LaungLon	Small (15-20) ft.	500 viss	30-35 miles	220 ft	2 or 3	24 hr (daily round trip)	26

Village	Township	Type of Boats	Carrying Capacity	Distance covered (miles)	Usually moves in Depth of (ft.)	Number of HHs	Average fishing trip (time spent)	Number of Fishermen
Tha Bawt Seik	LaungLon	Medium (40-50) ft.	800 viss	50- 60 miles	300 ft	3 or 4	72 hr (3days)	100
		<b>Large (60-70) ft.</b>	<b>1000 viss</b>	<b>100 miles</b>	<b>300-400 ft</b>	<b>5 or 6</b>	<b>5- 7 days</b>	<b>200</b>
		Small (15-20) ft.	300 viss	10 miles	40 ft	10	24 hr (daily round trip)	30%
		Medium (40-50) ft.	3000 viss	30 miles	200 ft	10	24 hr (daily round trip)	50%
		<b>Large (60-70) ft.</b>	<b>10000 viss</b>	<b>100 miles</b>	<b>300-400 ft</b>	<b>15</b>	<b>24 hr (daily round trip)</b>	<b>20%</b>
Tha Bawt Seik	LaungLon	Small (15-20) ft.	400 viss	10 miles	90 ft	80 HH	1 day	100 boats
		<b>Medium (40-50) ft.</b>	<b>3000 viss</b>	<b>10-60 miles</b>	<b>330 ft</b>	<b>50 HH</b>	<b>7-8 days</b>	<b>50 boats</b>
		<b>Large (60-70) ft.</b>	<b>10000 viss</b>	<b>over 60 miles</b>	<b>1500 ft</b>	<b>200 HH</b>	<b>25 days</b>	<b>200 boats</b>
Tha Bawt Seik	LaungLon	Small (15-20) ft.	<1000viss	20 miles	115 ft.	70	7 days	80
		<b>Medium (40-50) ft.</b>	<b>1000viss</b>	<b>30- 100 miles</b>	<b>130-190 ft.</b>	<b>80</b>	<b>1 month (summer)</b>	<b>200</b>

Village	Township	Type of Boats	Carrying Capacity	Distance covered (miles)	Usually moves in Depth of (ft.)	Number of HHs	Average fishing trip (time spent)	Number of Fishermen
							<b>10 days (rainy)</b>	
		<b>Large (60-70) ft.</b>	<b>&gt;1000 viss</b>	<b>&gt;100miles</b>	<b>&gt;330 ft.</b>	-	-	-
San Hlan	LaungLon	Small (15-20) ft.	300 viss	20-35 miles	115 ft.	5 per fishing boat	3-5 days	>40
		Medium (40-50) ft.	500 viss	35-50 miles	130 ft.	7-8 per fishing boat	5-7 days	>50
		<b>Large (60-70) ft.</b>	<b>1000-3000 viss</b>	<b>&gt;100 miles</b>	<b>390 ft.</b>	<b>8-10 per fishing boat</b>	<b>7 days</b>	<b>&gt;10</b>
Pan Tin Inn	LaungLon	Small (15-20) ft.	Unknown	12 miles	100 ft.	30%	3 days	100
		<b>Medium (40-50) ft.</b>	<b>Unknown</b>	<b>100 miles</b>	<b>600 ft.</b>	-	<b>30 days</b>	<b>around 100</b>
		<b>Large (60-70) ft.</b>	<b>Unknown</b>	<b>Over 100 miles</b>	<b>600 ft.</b>	<b>30%</b>	<b>45 days</b>	<b>200</b>

Source: ERM Field Trip (2018), 1 viss = 1.34 kg, those shown in **bold** could have overlap of fishing grounds with Project Area.

From the data collected in July 2018, the townships with potential overlap of fishing activity and the Project Area are provided in bold in Table 5.6. This includes boats over 40 ft. long from Maung Ma Kan, Kyauk Sin, and Pan Tin Inn. Boats over 60 ft. long from San Hlan, Tha Bawt Seik, and Pyin Gyi also may fishing in the Project Area.

The preferred fishing grounds were recorded as those around the islands; such as Bote Island and Heinze (Moscos) Islands. Kyauk Sin and Myeik fishers noted that the Project Area and offshore is their preferred fishing ground.

The impact to these offshore fisheries will be assessed in this EIA Report in *Chapter 6*.

### 5.8.2 *Oil and Gas Infrastructure and Activities*

Blocks M-12, M-13, and M-14 are surrounded by other offshore Blocks including Block M-9 and M-11. It is understood that oil and gas production activities are being carried out in these blocks. Planned activities will be discussed with the Block holders (PTTEP). An assessment of the potential cumulative impacts with other oil and gas operations is provided in *Chapter 7*.

### 5.8.3 *Shipping and Navigation*

Within offshore Tanintharyi Region waters, shipping and other marine traffic (excluding fishing) is typically limited to regional vessel movements. The main shipping lane in the area connects Yangon in Myanmar to Malaysia and Singapore via the Malacca Strait. As the western extent of the Project Area is located within this shipping lane, vessel encounters can be expected (*Figure 5.10*) (Marine Traffic Website, 2018).

Apart from regional shipping, there are existing levels of marine traffic within Blocks M-12, M-13 and M-14 associated with operation of the Yetagun Gas Field. Similarly, marine traffic *en route* to PTTEP's Zawtika Field from via the Malacca Strait may also pass through the Project Area.



## 5.9 PUBLIC HEALTH COMPONENTS

In Tanintharyi Region, there are 22 midwives, 22 nurses, and 11 medical doctors per 100,000 population. In 2011, the total number of hospitals in Tanintharyi Region was 30, and the average available hospital beds per 100,000 population was 72. (Myanmar Regional Statistics, 2013).

The health facilities in townships of Dawei District (the closest to the Project Area) are provided in *Table 5.19*.

**Table 5.19 Health Facilities in Dawei, LongLon, ThaYetChaung and Myeik Township**

Township	Public Hospital	Private Hospital	Public Clinic	Private Clinic	Rural Health Centre (RHC)	Sub RHC
Dawei	3	4	4	8	7	22
LoungLon	3	-	1	-	7	31
ThaYetChaung	3	-	-	-	6	26
Myeik	2	-	5	4	6	26

Source: Myanmar Population and Housing Census, 2015

## 5.10 CULTURAL COMPONENTS

No known offshore sites of culture heritage are identified as within the Project Area.

## 5.11 VISUAL COMPONENTS

Given that the Project is located over 140 km from the nearest mainland coastline and over 100 km from the nearest outlying islands of the Myeik Archipelago, there are unlikely to be any visual impacts from the Project.

## 5.12 TOURISM

The Project Area is located over 100 km from the nearest island (within the Myeik Archipelago) and in 100 m water depth. There are no tourism / ecotourism activities in the Project Area or Area of Influence.

The Project will not affect the tourism industry given the distance offshore. Some information on tourism in the Myeik Archipelago is provided below<sup>4</sup>.

The Myeik Archipelago covers 16,735 square miles and consists of numerous islands. The islands are famous for clean sand and clear waters and rich marine resources with good snorkelling / scuba diving options. The closest island is over 100 km from the Project and therefore not in the Area of Influence. Other tourism activities in the Myeik Archipelago include fishing, boat trips, and water sports.

<sup>4</sup> <http://tourism.gov.mm/myeik-archipelago/>

This section presents the environmental and social impact assessment methodology, impact assessment, and recommended mitigation measures, to reduce or avoid potential impacts, where appropriate.

The impact assessment methodology provides a basis to characterise the potential impacts of the Project and is based on models commonly employed in impact assessment and takes into account international best practices.

Potential impacts arising from both planned (routine and non-routine) activities and unplanned events are assessed. Unplanned events are those not anticipated to occur during the normal course of Project activities, for example a vessel collision resulting in a spill of fuel or damage to a fishing boat.

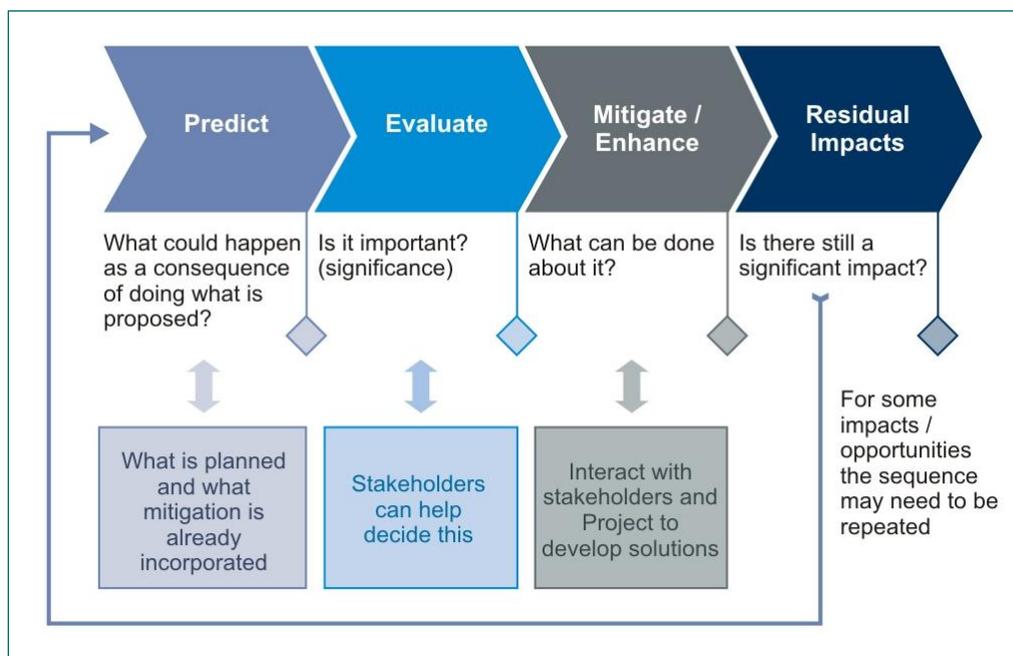
### 6.1

#### **IMPACT ASSESSMENT METHODOLOGY**

Impact identification and assessment starts with scoping and continues through the remainder of the impact assessment process. The principal impact assessment steps are summarised in *Figure 6.1* and comprise:

- *Impact prediction:* to determine what could potentially happen to resources/receptors as a consequence of the Project and its associated activities.
- *Impact evaluation:* to evaluate the significance of the predicted impacts by considering their magnitude and likelihood of occurrence, and the sensitivity, value and/or importance of the affected resource/receptor.
- *Mitigation and enhancement:* to identify appropriate and justified measures to mitigate negative impacts and enhance positive impacts.
- *Residual impact evaluation:* to evaluate the significance of impacts assuming effective implementation of mitigation and enhancement measures.

Figure 6.1 Impact Assessment Process



6.1.1 Prediction of Impacts

Prediction of impacts is an objective exercise to determine what could potentially happen to the environment as a consequence of the Project activities. This is a repeat of the process undertaken in scoping, whereby the potential interactions between the Project and the baseline environment are identified. In the impact assessment stage, these potential interactions are updated based on additional Project and baseline information. From these potential interactions, the potential impacts to the various resources/receptors are identified, and are elaborated to the extent possible. The diverse range of potential impacts considered in the impact assessment process typically results in a wide range of prediction methods being used including quantitative, semi-quantitative and qualitative techniques.

6.1.2 Evaluation of Impacts

Once the prediction of impacts is complete, each impact is described in terms of its various relevant characteristics (e.g., type, scale, duration, frequency, extent). The terminology used to describe impact characteristics is shown in Table 6.1.

Table 6.1 Impact Characteristic Terminology

Characteristic	Definition	Designations
Type	The relationship of the impact to the Project (in terms of cause and effect).	Direct Indirect Induced
Extent	The “reach” of the impact (e.g., confined to a small area around the Project footprint, projected for several kilometres, etc.).	Local Regional International
Duration	The time period over which a resource / receptor is affected.	Temporary Short-term

Characteristic	Definition	Designations
		Long-term Permanent
Scale	The size of the impact (e.g., the size of the area damaged or impacted, the fraction of a resource that is lost or affected, etc.)	[no fixed designations; intended to be a numerical value]
Frequency	A measure of the constancy or periodicity of the impact.	[no fixed designations; intended to be a numerical value]

The definitions for the *type* designations are shown in Table 6.2. Definitions for the other designations are resource/receptor-specific, and are discussed in the resource/receptor-specific chapters.

**Table 6.2** *Impact Type Definitions*

Designations (Type)	Definition
Direct	Impacts that result from a direct interaction between the Project and a resource/receptor (e.g., sound emitted from the survey leading to behavioural changes in marine fauna).
Indirect	Impacts that follow on from the direct interactions between the Project and its environment as a result of subsequent interactions within the environment (e.g., reduction in water quality from waste discharges leading to toxic effects in marine fauna).
Induced	Impacts that result from other activities (which are not part of the Project) that happen as a consequence of the Project (e.g., influx of camp followers resulting from the importation of a large Project workforce).

The above characteristics and definitions apply to planned and unplanned events. An additional characteristic that pertains **only to unplanned events** is **likelihood**. The **likelihood** of an unplanned event occurring is designated using a qualitative scale, as described in Table 6.3.

**Table 6.3** *Definitions for Likelihood Designations*

Likelihood	Definition
Unlikely	The event is unlikely but may occur at some time during normal operating conditions.
Possible	The event is likely to occur at some time during normal operating conditions.
Likely	The event will occur during normal operating conditions (i.e., it is essentially inevitable).

### 6.1.3 *Impact Magnitude, Receptor/Resource Sensitivity and Impact Significance*

Once an impact's characteristics are defined, the next step in the impact assessment phase is to assign each impact a 'magnitude'. Magnitude is a

function of some combination (depending on the resource/receptor in question) of the following impact characteristics:

- Extent
- Duration
- Scale
- Frequency

Additionally, for unplanned events only, magnitude incorporates the 'likelihood' factor discussed above.

Magnitude essentially describes the intensity of the change that is predicted to occur in the resource/receptor as a result of the impact. As discussed above, the magnitude designations themselves are universally consistent, but the definitions for these designations vary on a resource/receptor-by-resource/receptor basis, as further discussed in each of the resource/receptor-specific chapters. The universal magnitude designations are:

- Positive
- Negligible
- Small
- Medium
- Large

In the case of a *positive* impact, no magnitude designation (aside from 'positive') is assigned. It is considered sufficient for the purpose of the IA to indicate that the Project is expected to result in a *positive* impact, without characterising the exact degree of positive change likely to occur.

In addition to characterising the magnitude of impact, the other principal impact evaluation step is definition of the sensitivity / vulnerability / importance of the impacted resource/receptor. There are a range of factors to be taken into account when defining the sensitivity / vulnerability / importance of the resource/receptor, which may be physical, biological, cultural or human. Other factors may also be considered when characterising sensitivity/vulnerability/importance, such as legal protection, government policy, stakeholder views and economic value.

As in the case of magnitude, the sensitivity/vulnerability/importance designations themselves are universally consistent, but the definitions for these designations vary on a resource/receptor basis. The universal sensitivity/vulnerability/importance designations are:

- Low

- Medium
- High

Once magnitude of impact and sensitivity/vulnerability/importance of resource/receptor have been characterised, the significance can be assigned for each impact. Impact significance is designated using the matrix shown in Figure 6.2.

Figure 6.2 *Impact Significance*

		Sensitivity/Vulnerability/Importance of Resource/Receptor		
		Low	Medium	High
Magnitude of Impact	Negligible	Negligible	Negligible	Negligible
	Small	Negligible	Minor	Moderate
	Medium	Minor	Moderate	Major
	Large	Moderate	Major	Major

The matrix applies universally to all resources/receptors, and all impacts to these resources/receptors, as the resource/receptor-specific considerations are factored into the assignment of magnitude and sensitivity/vulnerability/importance designations that enter into the matrix. Box 6.1 provides a context for what the various impact significance ratings signify.

It is important to note that impact prediction and evaluation take into account any embedded controls (i.e., physical or procedural controls that are already planned as part of the Project design, regardless of the results of the impact assessment process). An example of an embedded control is a standard acoustic enclosure that is designed to be installed around a piece of major equipment. This avoids the situation where an impact is assigned a magnitude based on a hypothetical version of the Project that considers none of the embedded controls.

Box 6.1 *Context of Impact Significances*

An impact of **negligible** significance is one where a resource/receptor (including people) will essentially not be affected in any way by a particular activity or the predicted effect is deemed to be 'imperceptible' or is indistinguishable from natural background variations.

An impact of **minor** significance is one where a resource/receptor will experience a noticeable effect, but the impact magnitude is sufficiently small (with or without mitigation) and/or the resource/receptor is of low sensitivity/ vulnerability/ importance. In either case, the magnitude should be well within applicable standards.

An impact of **moderate** significance has an impact magnitude that is within applicable standards, but falls somewhere in the range from a threshold below which the impact is minor, up to a level that might be just short of breaching a legal limit. Clearly, to design an activity so that its effects only just avoid breaking a law and/or cause a major impact is not

best practice. The emphasis for moderate impacts is therefore on demonstrating that the impact has been reduced to a level that is as low as reasonably practicable (ALARP). This does not necessarily mean that impacts of moderate significance have to be reduced to minor, but that moderate impacts are being managed effectively and efficiently.

An impact of **major** significance is one where an accepted limit or standard may be exceeded, or large magnitude impacts occur to highly valued/sensitive resource/receptors. An aim of IA is to get to a position where the Project does not have any major residual impacts, certainly not ones that would endure into the long-term or extend over a large area. However, for some aspects there may be major residual impacts after all practicable mitigation options have been exhausted (i.e. ALARP has been applied). An example might be the visual impact of a facility. It is then the function of regulators and stakeholders to weigh such negative factors against the positive ones, such as employment, in coming to a decision on the Project.

### *Identification of Mitigation and Enhancement Measures*

Once the significance of an impact has been characterised, the next step is to evaluate what mitigation and enhancement measures are warranted. For the purposes of this impact assessment, ERM has adopted the following mitigation hierarchy:

- **Avoid at Source; Reduce at Source:** avoiding or reducing at source through the design of the Project (e.g., avoiding by siting or re-routing activity away from sensitive areas or reducing by restricting the working area or changing the time of the activity).
- **Abate on Site:** add something to the design to abate the impact (e.g., pollution control equipment, traffic controls, perimeter screening and landscaping).
- **Abate at Receptor:** if an impact cannot be abated on-site then control measures can be implemented off-site (e.g., noise barriers to reduce noise impact at a nearby residence or fencing to prevent animals straying onto the site).
- **Repair or Remedy:** some impacts involve unavoidable damage to a resource (e.g. agricultural land and forestry due to creating access, work camps or materials storage areas) and these impacts can be addressed through repair, restoration or reinstatement measures.
- **Compensate in Kind; Compensate Through Other Means:** where other mitigation approaches are not possible or fully effective, then compensation for loss, damage and disturbance might be appropriate (e.g., planting to replace damaged vegetation, financial compensation for damaged crops or providing community facilities for loss of fisheries access, recreation and amenity space).

The priority in mitigation is to first apply mitigation measures to the source of the impact (i.e., to avoid or reduce the magnitude of the impact from the associated Project activity), and then to address the resultant effect to the resource/receptor via abatement or compensatory measures or offsets (i.e., to

reduce the significance of the effect once all reasonably practicable mitigations have been applied to reduce the impact magnitude).

#### *Residual Impact Evaluation*

Once mitigation and enhancement measures are declared, the next step in the impact assessment process is to assign residual impact significance. This is essentially a repeat of the impact assessment steps discussed above, considering the assumed implementation of the additional declared mitigation and enhancement measures.

#### *Management and Monitoring*

The final stage in the impact assessment process is definition of the management and monitoring measures that are needed to identify whether: a) impacts or their associated Project components remain in conformance with applicable standards; and b) mitigation measures are effectively addressing impacts and compensatory measures and offsets are reducing effects to the extent predicted.

1. An Environmental and Social Management Plan, which is a summary of all actions which PCML has committed to executing with respect to environmental/social/health performance for the Project, is also included as part of the IEE report. The Environmental and Social Management Plan includes mitigation measures, compensatory measures and offsets and management and monitoring activities.

## **6.2**

### ***IDENTIFICATION OF IMPACTS***

For the Project, potential impacts have been identified through a systematic process whereby the activities (both planned and unplanned) associated with the Project have been considered with respect to their potential to interact with environmental and social resources or receptors.

The results from the scoping process for the Project are presented in the Scoping Matrix in *Table 6.4*. The scoping matrix displays Project activities against resources/receptors, and supports a methodological identification of the potential interactions each Project activity may have on the range of resources/receptors within the Area of Influence for the Project.

**Table 6.4 Potential Interactions and Significance of Impacts to Receptors / Receivers from Planned Activities / Emissions of the Project Activities**

Project Activity/ Hazards	Physical				Biological							Socio-economic			
	Sediment Quality	Seabed Features/ Profile	Air Quality	Water Quality	Fish and Pelagic Communities	Planktonic Communities	Offshore Benthic Habitats and Communities	Nearshore Habitats and Communities	Marine Mammals	Marine Turtles	Seabirds and Shorebirds	Subsea Infrastructure	Public Health and Safety	Fisheries	Navigation/ Traffic and Transport
<b>Planned Events</b>															
Emissions from MODU, support vessel(s) and machinery engines															
Presence of MODU and support vessels															
Routine offshore discharges / waste generation and disposal															
Drilling cuttings and mud discharges															
Lighting on the MODU and support vessels															
Sound generated by the MODU and support vessels															
Waste Generation															
Sound from vertical seismic profiling (VSP), drilling, support vessel movements and equipment															
Well cleanup / testing															
<b>Unplanned Events</b>															
Spills/ Leaks															
Invasive Species															

Project Activity/ Hazards	Physical				Biological							Socio-economic			
	Sediment Quality	Seabed Features/ Profile	Air Quality	Marine Water Quality	Fish and Pelagic Communities	Planktonic Communities	Offshore Benthic Habitats and Communities	Nearshore Habitats and Communities	Marine Mammals	Marine Turtles	Seabirds and Shorebirds	Subsea Infrastructure	Public Health and Safety	Fisheries	Navigation/ Traffic and Transport
Dropped Objects/ Lost Equipment															
Fires and explosions															
Well blowout															
<b>Key</b>															
Interaction not reasonably expected															
Non-Significant Impact															
Potentially Significant Impact															

## 6.2.1 *Scoped Out Impacts*

Potential interactions that were deemed not to result in a potentially significant impact (grey in the matrix) have been scoped out with justification and will not be considered in more detail in the EIA phase. The rationale for scoping out the following impacts associated with the development is provided in the *Table 6.5*.

**Table 6.5** *Scoped-out Impacts Analysis*

Impact	Rationale for scoping out of assessment
<b>Planned Events</b>	
Impacts from air emissions from MODU, support vessel(s), machinery engines and on ambient air quality	Atmospheric emissions generated during the drilling program may arise from internal combustion engines on the MODU, support vessels and machinery engines resulting in the release of SO <sub>2</sub> , NO <sub>x</sub> , ozone depleting substances, CO <sub>2</sub> , particulates and volatile organic compounds. These emissions may result in a localised reduction in air quality in the area. The exhaust emissions are expected to disperse rapidly in the offshore location and will be temporary and small in volume. Therefore, significant impacts to air quality are not considered likely. The MODU and vessels will be in compliance with MARPOL regulations for the prevention of air pollution from ships (Annex VI), and no significant impacts on ambient air quality are anticipated.
Impact from lighting on MODU on marine fish, turtles and seabirds	Lighting from MODU and other vessels can cause behavioural responses in which animals (turtles, seabirds, fish and dolphins) can alter their foraging and breeding activity. In addition, it is possible that seabirds may fly over the Project Area. However, as the well locations are 100 km from the nearest coastline and lighting will only impact a small area; there is unlikely to be a significant impact on marine fauna and seabirds. The MODU will be stationed next to existing Yetagun production platforms and additional lighting would represent a small incremental increase. The drilling activity will also be temporary; reducing the potential for impact.
Impacts from routine MODU and vessel discharges on marine environment	The MODU and support vessels will routinely discharge sewage, grey water, putrescible (food) waste, bilge water and deck drainage. These discharges will occur at least 12 nautical miles (~12 miles) from the coast and as such will not impact sensitive marine habitats in shallow waters, typically less than 20 m water depth.  Localised impacts at the point of discharge may include temporary eutrophication of the water column with potential adverse effects to marine biota. However, the drilling is only of short duration (approximately 65 days at each well location) and there will likely be rapid dilution and dispersion in the open ocean environment. In addition, discharges from the MODU and support vessels will

Impact	Rationale for scoping out of assessment
Impacts from underwater sound generated by the MODU and support vessels	<p>comply with relevant MARPOL 73/78 regulations (and the Environmental Quality (Emission) Guidelines of Myanmar) and no significant impacts are expected to occur.</p> <p>Drilling noise is generally low level, low frequency and continuous with most energy concentrated below 1 kHz. Reported continuous sound produced by drilling activities may produce received sound levels of 110 to 130 dB re 1 µPa @ 1 m. Supply vessels peak frequency or band ranges from 1-500 Hz at a peak source level of 170-190 dB re 1 µPa @ 1 m. As such, the routine operation of the Project vessels does not have the intensity and characteristics that can potentially cause physiological damage to marine fauna.</p>
Standard waste generation and disposal	<p>There will be no planned discharge of solid wastes to the marine environment. Solid waste does not include food waste which will be discharged overboard in accordance with MARPOL. All solid wastes will be managed under a waste management plan (or equivalent) specifying the segregation (as required) and appropriate storage, transfer and transport of wastes in order to reduce the risk of accidental loss of wastes to the marine environment. All non-hazardous and hazardous solid wastes generated offshore are to be disposed of by a licensed waste management contractor and therefore no significant impacts are expected to occur.</p>

### Unplanned Events

Impacts from invasive marine species on the marine environment	<p>Invasive marine species present within the water column may be collected with the intake of seawater and survive within ballast tanks. Marine species may then be relocated and discharged with the ballast water at the drilling locations in Blocks M-12, M-13 and M-14. There is also potential for the introduction from biofouling present on the hull of the MODU and support vessels. This can lead to the introduction of IMS which can become invasive if the environmental conditions at the point of release are suitable.</p> <p>During the drilling program, the MODU will remain offshore and there is no plan to enter nearshore waters in Myanmar therefore reducing the potential to introduce invasive species into sensitive areas where the proliferation of non-native species may occur. In addition, vessels will have valid anti-fouling coating certificates. On this basis, no significant impacts are expected to occur.</p>
Impacts from dropped objects on marine habitats	<p>There is the potential for objects to be dropped from the MODU and/or support vessels overboard into the marine environment resulting in the localised disturbance of benthic habitats. Dropped objects refer to larger drill equipment such as drill pipes and do not include smaller objects such as personal protective equipment. Marine benthic habitats within Blocks M-12, M-13 and M-14 are considered to be of low sensitivity given the water depth. Any impacts will be localised and unlikely to lead to significant impacts to habitats or species.</p>

Impact	Rationale for scoping out of assessment
	Dropped materials and equipment will be recovered where it is safe and practicable to do so.
Impacts from unplanned venting of gas during drilling (well kick)	A well kick can occur if encountering unexpected reservoir pressure. A kick is an undesirable influx of formation fluid into the wellbore. To manage a kick, fluid is circulated to the surface in a controlled manner and any gas is processed and released to the atmosphere via a separator and a vent line. The volume of any gas is small and may result in a temporary decrease in local air quality. PCML and their contractors will ensure that the standard procedures are in place for well control. Given the minor volumes and the offshore location, no significant impacts on ambient air quality are expected.
Marine fauna collision	The Project vessels consist of a MODU and associated support vessels. There is the potential for the vessels to collide with marine fauna (especially marine mammals). However, this is unlikely given the small number of vessel movements during the drilling program. The MODU will be stationary for the drilling operation.

## 6.2.2

### *Scoped-In Impacts*

The wells are located at least 140 km from the nearest social receptors in Dawei Township, Tanintharyi and 100 km from anyone in the closest outlying islands of the Myeik Archipelago. The planned impacts are not expected to be large enough in spatial extent to reach the shore.

For interactions where possible significant effects could occur, these interactions include:

- Potential short-term disturbance to offshore fishing activities and shipping within the Project Area;
- Potential impacts from anchoring and the discharge of drill cuttings with residual drilling mud on water quality, sediment quality and marine ecology;
- Increases in ambient underwater sound from the MODU, vessels and exploration drilling operations including from VSP (short-term). These activities have the potential to impact ecologically sensitive receivers, e.g. marine mammals, marine turtles and fish that may be present within the Project Area;
- Potential impacts from vessel operational discharges on marine water quality;
- Potential impacts on marine biodiversity and secondary impacts on fisheries from the accidental release of invasive species; and

- Potential water contamination and secondary impacts to biodiversity, fishing activity, and public health from accidental spills or leaks (e.g. during offshore re-fueling).

Although the scoping process identified a number of potential impacts, they are expected to be short term due to the limited duration of the exploration drilling. The potential for impacts is well understood with little or no evidence of adverse consequences on the majority of environmental or social receptors from previous experience within the industry. Proven mitigation measures have been shown to be effective in managing impacts that might occur to levels considered to be acceptable.

### 6.3 *IMPACT ASSESSMENT AND MITIGATION MEASURES*

#### 6.3.1 *Impacts from Physical Presence of the MODU and Support Vessels on Fishing and Shipping Activity*

##### *Source of Impact*

The presence of the MODU, support vessels, and the exclusion zones around the vessels has the potential to exclude some fishing and shipping vessels from the Project Area. Some fishermen may therefore have to move outside of the exclusion zone in order to catch fish and shipping will need to change course to avoid this area.

The stakeholder consultation undertaken in July 2018 was utilised to gather information on the type and scale of fishing that could occur in the Project Area. The assessment will focus on fishing activity in offshore, open water at a distance of 140 km from the mainland coast. The Project could impact fishers from the presence of the MODU and other Project vessels and the overlap of these with the local fishing grounds. Temporary disturbance of fishing activities may occur during the 7-8 month drilling period due to the presence of the vessels and associated 5 NM safety exclusion zone. The winter season (November to April) was identified as the main fishing season. The Project is scheduled to be conducted in Q4 2018 and therefore overlaps with this time.

From the data collected in July 2018, the townships with potential overlap of fishing activity and the Project Area are boats over 40 ft. long from Maung Ma Kan, KyaukSan, and Pan Tin Inn. Boats over 60 ft. long from San Hlan, Tha Bawt Seik, and Pyin Gyi also may fishing in the Project Area.

The preferred fishing grounds were recorded as those around the islands; such as Bote Island and Heinze (Moscos) Islands. KyaukSin and Myeik noted that the Project Area and offshore is their preferred fishing ground.

### Existing Controls

In order to ensure potential impacts from the production drilling on the fishers and the fishing community are avoided or reduced as far as practicable, the following control measures as mentioned in *Section 6.4.1* are planned:

- A 5 NM radius safety exclusion zone will be maintained around the MODU as required.
- MODU and support vessels will comply with international regulations for collision avoidance, navigation and maintenance.
- Myanmar speaking crew members will be available on board the MODU.
- Timely sharing of information on the details of the Project in order to inform stakeholders (in the form of a Notice to Mariners).
- Disclosure and implementation of the grievance mechanism for the Project and timely investigation of any grievances.

### Significance of Impact

With the implementation of the existing / in place controls, and given the short duration of the drilling activity (approximately 65 days per well) and the localised scale of impacts as described above, the impact magnitude is expected to be **small**. Receptors are of **medium** sensitivity. It is expected that the impacts on fishing activities are likely to be **minor** (*Table 6.6*).

**Table 6.6** *Assessment of Impacts from Physical Presence on Fishing and Shipping Activity*

Impact	Physical Presence on Fishing and Shipping Activity				
Impact Type	Direct	Indirect	Induced		
Impact Duration	Temporary	Short-term	Long-term	Permanent	
Impact Extent	Local	Regional		International	
Impact Scale	Impact scale will be limited to a relatively small number of vessels (compared to the overall number of vessels engaged in fishing) in the offshore waters				
Frequency	7-8 months				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource Sensitivity	Low	Medium		High	
Impact Significance	Negligible	Minor	Moderate	Major	

### Additional Mitigation, Management and Monitoring

Given the controls in place; no additional mitigation is required.

### *Significance of Residual Impacts*

It is anticipated that there may be a **minor** residual impact caused by disturbance to fishing and shipping activity from physical presence of MODU and support vessels.

#### **6.3.2** *Impacts from Drill Cuttings and Drilling Fluid Discharges to Sediment Quality, Marine Water Quality, Benthic Communities, and Fish & Pelagic Communities*

##### *Source of Impact*

A total of up to three wells are planned to be drilled for the Project. For a typical well, the cuttings and fluid volumes for each section are shown in *Table 4.2*. 900 m<sup>3</sup> of cuttings using seawater and sweeps and WBDF will be discharged to the marine environment at the seabed from the drilling of the top-hole sections. It is anticipated that approximately 740 m<sup>3</sup> of cuttings (per well) using NADF will be discharged at 15 m below the surface waters after treatment on-board the MODU will be discharged at 15 m below the surface waters after treatment on-board the MODU.

Wells are expected to take approximately 65 days with an estimated total of 1,640 m<sup>3</sup> of wet cuttings discharged overboard (refer to *Section 4.4.1*).

##### Drilling Fluid Characteristics

Drilling fluids consist of a mixture of additives such as bentonite clay, barite, lignite, lignosulphate, lime, brine, gellents and emulsifiers which are suspended in a base fluid.

Seawater and sweeps used to drill the top-hole sections consists mostly of seawater with the addition of bentonite.

WBDF consists of approximately around 70-98% fresh or saline water, with the remaining 2-30% comprising of drilling fluid additives that are generally inert or readily biodegradable organic polymers. There is the potential that WBDF will be used on some of the bottom-hole sections; however this assessment assumes the discharge of NADF for all bottom-hole sections.

When NADF is used, a low toxicity, Paraffin Group III non-aqueous base fluid (NABF) will be used. NADF are designed by the industry to be of low toxicity with faster biodegradability than traditionally-used fluids (Neff, J. M., 2005). For oil on cuttings (OOC), the guidelines adopted by the Project and assessed with the agreement of MOGE and MONREC make reference to the 2015 IFC offshore oil and gas guidelines and presented in *Table 3.4*. Drilling fluids to be used are non-toxic or have low toxicity upon discharge to receiving waters. Chemical selection for drilling fluids will conform to Offshore Chemical Notification Scheme (OCNS) rating of additives (GESAMP, 1993), with priority

given to using additives rated as PLONOR (Pose Little or No Risk), Group E and F or Gold rating (OSPAR, 2004). Products that are not on the OCNS rating will be risk assessed for offshore use.

### Drill Cuttings Characteristics

Drill cuttings, which are the rock fragments removed from the well, will primarily consist of claystone, siltstone, sandstone, and shale, and will range from very fine (4.5 to 6 microns) to very coarse (>1 cm) particles with a thin film of drilling fluids. Where NADF are used (if required), drill cuttings tend to clump together to make larger particle sizes (Neff JM, et al, 2000). Coarser particles (sand and gravel), which comprise the majority of cuttings will rapidly settle albeit subject to dispersion by currents during their descent, while fine particles (fine silt and clay) will tend to remain in suspension being dispersed and diluted to lower concentrations down current of the discharge pipe.

### Drill Cuttings Dispersal and Deposition Modelling

To assess the dispersion and fate of discharged drill cuttings and unrecoverable drilling fluids during the Project, a modelling study was commissioned to inform the assessment of environmental risks and impacts from cuttings and unrecoverable fluids discharge (ERM 2018). The study included numerical modelling techniques using the GEMSS®-GIFT application to predict total suspended sediments (TSS, mg/L) and sediment deposition on the seabed (thickness, mm). The full modelling report is provided in **Appendix F**.

Drill cutting modelling for the disposal of cuttings and NADF was conducted to predict the magnitude of sedimentation rate, deposition thickness on the seabed and TSS concentration during the drill process for a single well in the Project Area.

The modelling examined scenarios involving cuttings discharge near the seabed (for top hole sections) and cuttings discharged to the sea surface (bottom-hole sections). Modelling was conducted to examine discharges under different seasonal conditions (northeast (NE) and southwest (SW) monsoon). The results are presented in *Table 6.7*.

**Table 6.7**      *Modelling Results from Drill Cuttings Modelling*

Parameter	March
Maximum Sedimentation Rate (mg/cm <sup>2</sup> /day)	8,532
Location of Maximum Sedimentation Rate (m)	Drill Centre
Seabed Area affected for Sedimentation Rate > 1 mg cm <sup>-2</sup> day <sup>-1</sup> (km <sup>2</sup> )	2.128
Maximum Deposition Thickness (mm)	1,139
Location of Maximum Deposition Thickness (m)	Drill Centre
Seabed Area affected for thickness > 0.3µm (km <sup>2</sup> )	10.00
Maximum TSS concentration (mg/L)	481.93
Location of Maximum TSS Concentration (m)	About 360 m Southwest of Drill Center, close to seabed

The results indicated maximum sedimentation and deposition would remain close to the drill centre in both seasons. Modelling results indicate that the concentrations of suspended mud particles will decrease over distance from the drilling location and over time, reducing to below 1 mg/L within a maximum of approximately 4 km southeast of the release site. The maximum TSS concentration predicted during the cuttings and mud discharge is about 481.93 mg/L at about 360 m southwest of the drill centre and near seabed level. The predicted maximum TSS concentration for cuttings and mud discharge modelled is shown in *Figure 6.3*. It is also important to note that the TSS concentrations shown in *Figure 6.3* reflects the maximum concentration at any one time over the entire simulation period and should not be interpreted as an instantaneous concentration (i.e. at a snapshot in time).

Figure 6.3 Predicted Maximum Total Suspended Solids Concentration for Cuttings and Mud Discharge

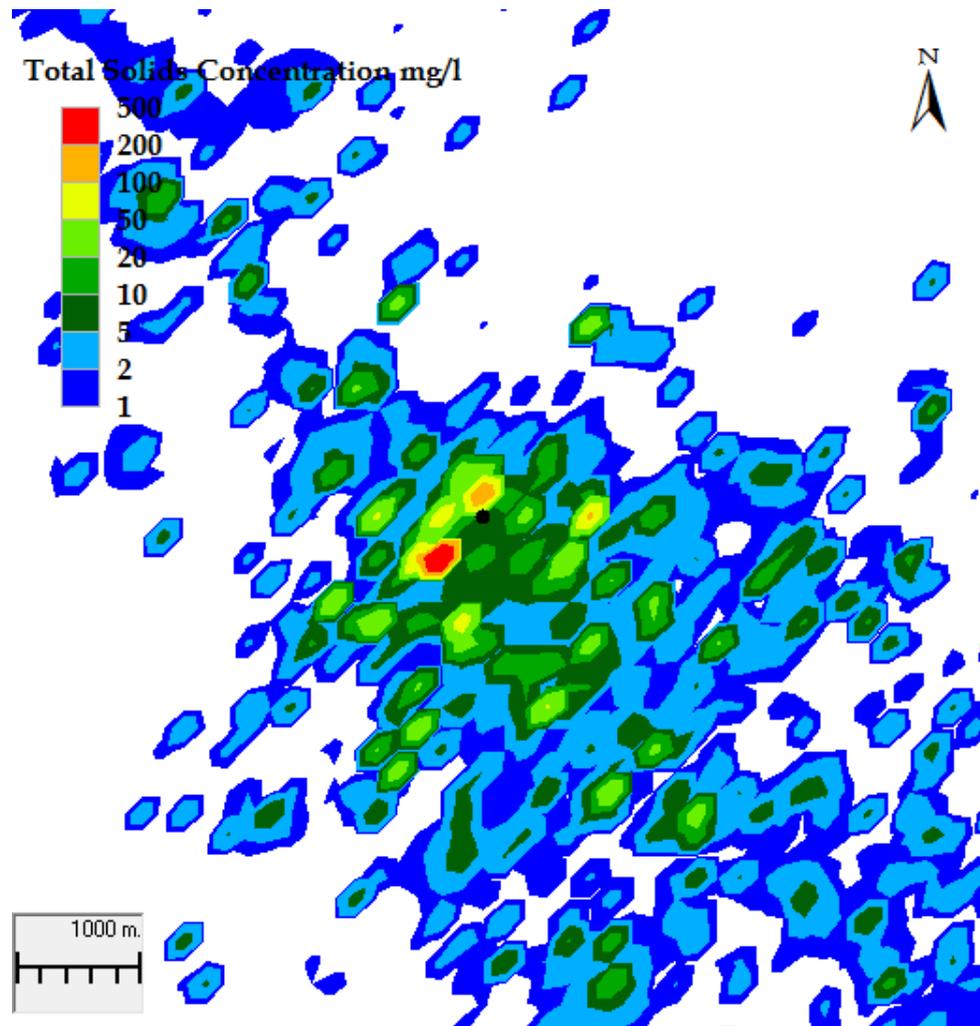


Figure 6.4 give an overview of maximum sedimentation rates from the modelled discharge of cuttings and mud. As shown, sedimentation is predicted to cover a wide area but relative high sedimentation rate occur near the drill centre. The patches of area with low sedimentation rate predicted are expected to be suspended mud particles settling further away when conditions allow. Also the maximum sedimentation rate is predicted to be elongated in the southeast - northwest axis, reflecting the local prevailing current during the period.

Figure 6.4 Predicted Maximum Sedimentation Rate for Cuttings and Mud Discharge

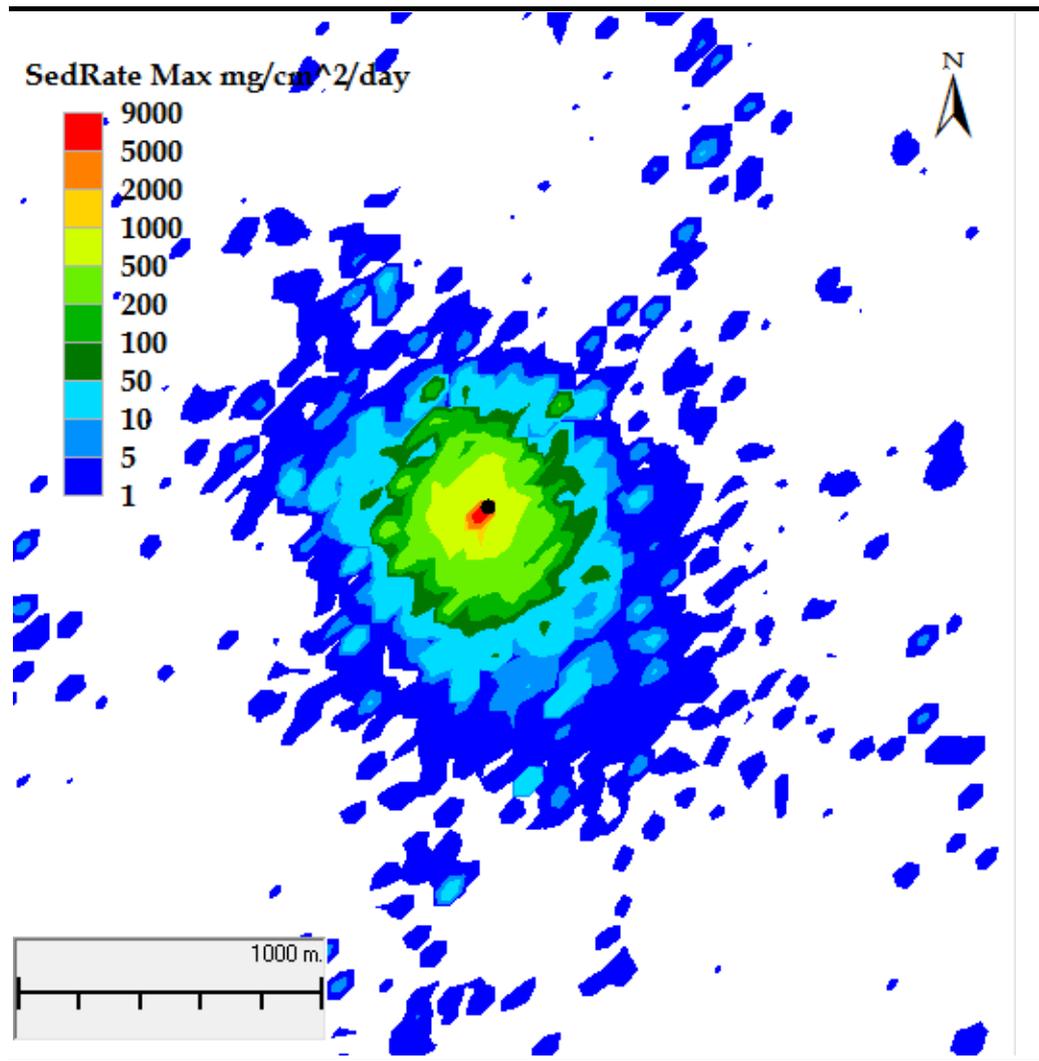
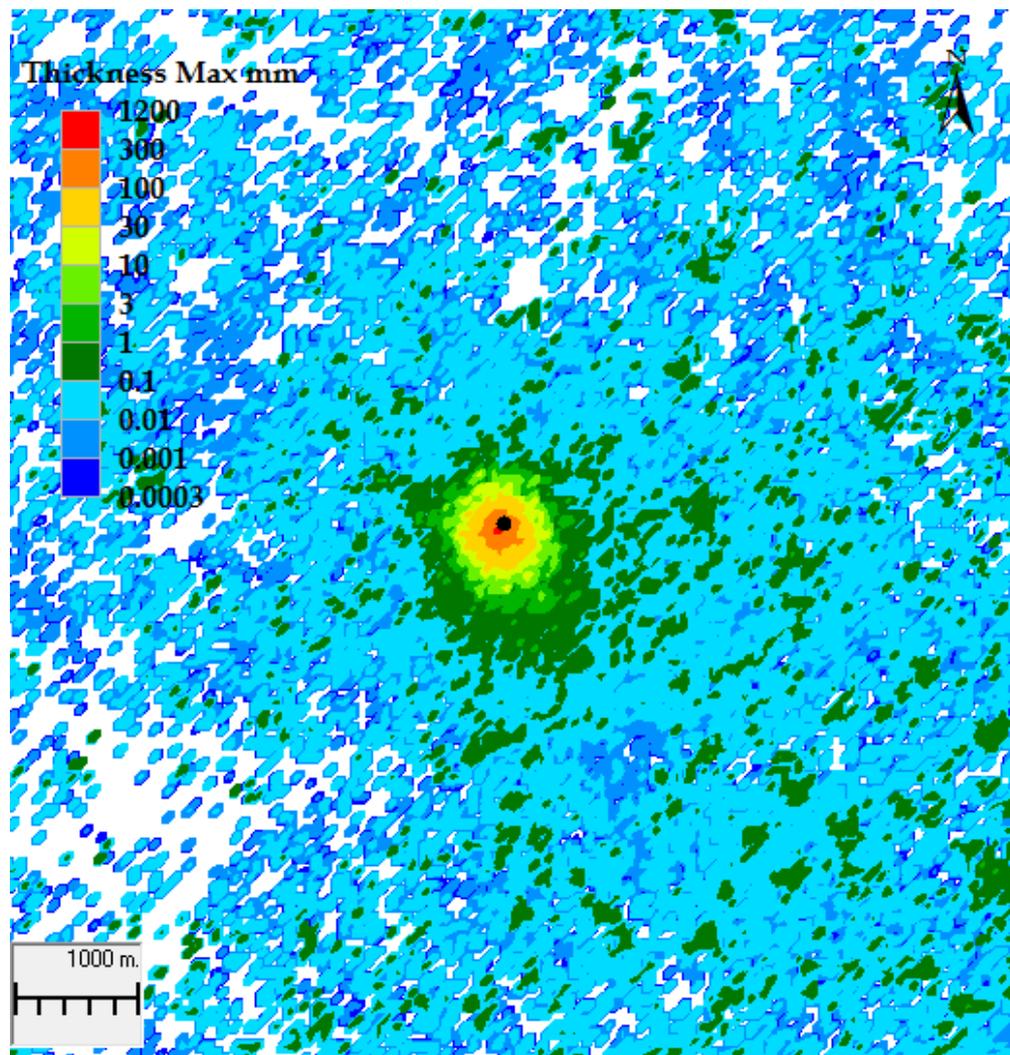


Figure 6.5 show the sea floor deposition thickness from the modelled discharge of cuttings and mud. The model predicted that the discharged cuttings will be deposited as a cutting pile on the seabed. The maximum deposition thickness (1,139 mm) is predicted to occur at the drill centre. This thickness takes into account lateral transport of deposited particles and is calculated on the basis of a 50 x 50 m model grid cell, and illustrates formation of a cuttings pile will be localised at the well site. Although the total discharge volume for cuttings and mud is substantial (cuttings of 2,294 m<sup>3</sup> and mud of 1,350 m<sup>3</sup>), the release is modelled to occur over a 69-day period, which result in relatively low release rates.

Figure 6.5 Predicted Deposition Thickness for Cuttings and Mud Discharge



#### Impacts to Sediment Quality

The direct discharge of cuttings to the seabed from drilling the top-hole sections will represent the most pronounced source of impact to sediment quality from the Project. This discharge of an anticipated 900 m<sup>3</sup> per well of cuttings at the seabed will result in the formation of a small cuttings pile immediately around the well site (*Figures 6.3 and 6.4*). From the modelling results, the maximum deposition thickness would be around the well site. The modelling suggests that impacts are localised to around the drill centre and will not impact any sensitive habitats.

For deeper hole sections using WBDF and/or NADF (if required), where cuttings are discharged at the sea surface, cuttings discharged overboard will also be expected to contribute to the cuttings pile given the relatively shallow (<300 m) water depths at the wells (Neff JM, et al, 2000, IOGP 2016). Except where clays flocs form, WBDF cuttings do not tend to clump and therefore settle more slowly in the water column and will disperse widely. Even though NADF (if used) drill cuttings do tend to clump together which would increase

their settling velocity, they will be laterally dispersed by currents on their descent through the water column before they eventually settle forming scattered and isolated thin veneer patches of fine particles on the seabed (Hinwood, JB., et al, 1994, & IOGP, 2016).

As mentioned in *Section 5.5.6*, baseline surveys of sediment quality were conducted in April 2018 in the Project Area. It was noted that TPH and oil and grease were below detection limits, metal concentrations were considered to be indicative of naturally occurring background conditions with no metal at concentrations of environmental concern. As such, the results suggest no contamination of sediments. Upon completion of drilling, concentrations of most contaminants would be expected to gradually return to within the range of background conditions, through mechanisms including dissolution, biodegradation and resuspension, and transport by bottom currents. An exception is likely to be barium contained in barium sulphate (barite) present in drilling fluids, which is insoluble and relatively persistent in the marine environment. Barite is however a non-toxic PLONOR substance and will be present in relatively low concentrations and will not pose an environmental concern as it is insoluble.

Potential oxygen reduction can occur in the sediment of cuttings piles particularly where NADF is used due to microbial biodegradation of the adhered synthetic base organic fluid. Given the use of NADF for bottom-hole sections and discharged at the seabed, there will be limited potential for oxygen reduction as the cuttings will spread over a wider area.

#### Impact to Benthic Communities

The wells will be drilled in water depths between around 110 m and no coral, seagrass, or mangroves habitat is present in the Project Area. An understanding of the benthic communities present in the vicinity of the indicative well locations has been established through primary baseline surveys conducted in April 2018 (refer to *Section 5.6.1*). The benthic habitat within the Area of Influence consists of bare unconsolidated sandy and muddy sediments supporting a sparse assemblage of benthic organisms, dominated by worms (i.e. bristleworms) with other fauna including gastropods, crustaceans, and anemones. These macrofauna are expected to be widespread and well-represented along the continental shelf and slope in the region and thus regarded as of low environmental sensitivity.

Potential impacts to benthic communities from the discharge of drill cuttings and fluids include:

- Sediment depositional impacts to benthic communities and potential alteration of the sediment particle size characteristics of the seabed;
- Toxicity and bioaccumulation effects; and

- Deoxygenation effects to infauna due to microbial process on organically enriched sediments.

Sessile benthic marine organisms may become buried or their feeding and respiratory apparatus could become clogged. However effects would be confined to the immediate surrounds of the well where sediment deposition exceeds 1 kg/m<sup>2</sup>.

The impact from NADF is reduced as Group III NABF will be selected for the Project, which is the least toxic compared to Groups I and II. Group III NABF is either sufficiently water soluble such that they typically do not bio accumulate in marine organisms or are insoluble making them not biologically available (IOGP, 2016). Most of the organic compounds in NADF are biodegradable and are broken down over time by microbes. In addition, metals present in drill cuttings and fluids are strongly bound to particles which make them insoluble. Hence they are not biologically available even when digested by a marine organism (USEPA, 2000). As cuttings and adhered NADF will be diluted and dispersed on sea surface discharge, after their long descent to the seabed, any potential for toxicity effects to occur to benthic organisms is substantially reduced.

Reduction in oxygen levels in sediments have the potential to cause secondary impacts to benthic in-faunal communities if oxygen concentrations decline to levels where anoxic or hypoxic conditions form. This effect is typically associated with biodegradation of the organic content of NADF and can be the main factor in determining potential impacts to infauna. Species sensitive to anoxic environments are eliminated and replaced by tolerant and opportunistic species, so species diversity decreases, but the number of individuals often increases (Neff JM, et al, 2000). According to the modelling results, any potential for reduced oxygen levels in sediments would be limited to up to 180 m from the well site. In addition, the veneer of fine-sized particles from deposition of NADF drill cutting particles is expected to be reworked in the surficial sediment by natural processes such as bioturbation (USEPA, 2000).

Overall, any effects to benthic species or habitats will be highly localised to around the well head and recovery by recruitment of new colonising organisms and migration from adjacent undisturbed seabed area is expected to commence shortly after drilling finishes (Balcom et al, 2012, Neff, J. M., 2005; IOGP, 2016). Recolonization is typically well advanced within a year, though processes are likely to take longer in open ocean water environment with a peak community reached in the order of more than two years.

### Impacts to Water Quality

The main potential source of impact to water quality will be the discharge of NADF and cuttings at the sea surface after treatment on-board the MODU.

The drilling fluid and cuttings modelling indicated the maximum TSS concentrations would reach up to 480 mg/L at about 360 m east of the drilling site occurring close to the seabed.

Plume dilutions by a factor of 10,000 within a downstream current distance of 100 m have been reported (Hinwood JB, et al, 1994), with dilution to ambient concentrations (based on suspended solid concentrations and light transmittance) within 350 to 1,500 m downstream from the discharge location (UNEP, 1985). From the modelling data, the reduction in water quality was considered in terms of maximum TSS concentration. Maximum TSS at 100 m from the well site was 11.2 mg/L and for reduction of down to 1 mg/L the maximum impact area was 2.6 km from the well site. Given the short duration of the exploration activities (65 days per well) and the localised impact modelled, the plume is expected to result in localised, minor reductions in water quality.

### Impacts to Fish and Pelagic Communities

Marine water column organisms are at a lower risk of harm from drill cuttings discharge due to the rapid dilution and dispersal by prevailing currents. Mobile organisms, such as fish and larger crustaceans usually avoid or move away from plumes of suspended drill cuttings, which reduce the potential for impact (IOGP, 2016).

Given that fish and pelagic organisms are mobile and would have a temporary, transient exposure to the plume, the potential for toxicity effects to occur is considered negligible and this biota are considered to be of low sensitivity to the Project activities.

### *Existing/ In Place Controls*

The following controls will also be implemented:

- For existing facilities such as the MODU used for the Project (as per the 2015 IFC offshore oil and gas guidelines and the MOGE Letter to PSC Companies, Ref. MD-3/6(0736) 2016, Dated 19 September, 2016): Use of Group III non-aqueous base fluids and treatment in cutting dryers. Maximum residual Non Aqueous Phase Drilling Fluid (6.9% (C16 -C18 internal olefins) or 9.4% (C12-C14 ester or C8 esters) on wet cuttings.
- Where cuttings are discharged overboard, they will be discharged 15m below the water line.
- All chemicals that are discharged to the marine environment are selected for low toxicity where possible and subject to internal justification including environmental consideration with reference to OCNS rating of additives.

- NADF shall only be used where seawater and sweeps or WBDF cannot provide the required technical specifications.
- All residual NADF must be returned to a shore for reconditioning, re-use or disposal or alternatively contaminated muds may be left in situ in the well behind suitable barriers. No bulk discharge of NADF drilling fluids will take place.

*Significance of Impact*

With the implementation of the existing / in place controls, and given the short duration of the drilling activity (approximately 65 days per well) and the localised scale of impacts as described above, the impact magnitude is expected to be **small**. Receptors are of **medium to low** sensitivity. The impact from operational discharges would be of **negligible** significance for benthic communities, and fish and pelagic communities and **minor** residual impact significance for sediment, and water quality (refer to *Table 6.8* to *Table 6.11*).

**Table 6.8** *Assessment of Impacts from Discharge of Drill Cuttings and Drilling Fluids on Sediment Quality*

<b>Impact</b>	Deposition of cuttings on seabed sediments and change in sediment quality			
<b>Impact Type</b>	Direct	Indirect	Induced	
<b>Impact Duration</b>	Temporary	Short-term	Long-term	Permanent
<b>Impact Extent</b>	Local	Regional	International	
<b>Impact Scale</b>	Drill cutting pile formation around the well site (typically <200 m radius) and minor increase in sedimentation rate in wider area.			
<b>Frequency</b>	Discharges and formation of the cuttings pile will occur over the duration of drilling (approximately 65 days per well).			
<b>Impact Magnitude</b>	Positive	Negligible	Small	Medium
<b>Resource Sensitivity</b>	Low	Medium	High	
<b>Impact Significance</b>	Negligible	Minor	Moderate	Major

**Table 6.9** *Assessment of Impacts from Discharge of Drill Cuttings and Drilling Fluids on Benthic Communities*

<b>Impact</b>	Sediment deposition on benthic communities			
<b>Impact Type</b>	Direct	Indirect	Induced	
<b>Impact Duration</b>	Temporary	Short-term	Long-term	Permanent
<b>Impact Extent</b>	Local	Regional	International	
<b>Impact Scale</b>	Impacts to benthic community under the cutting pile limited to the immediate surrounds of the well site (typically <200m)			
<b>Frequency</b>	Discharges and deposition of cuttings will occur over the duration of drilling activity (approximately 65 days per well).			
<b>Impact Magnitude</b>	Positive	Negligible	Small	Medium
<b>Resource Sensitivity</b>	Low	Medium	High	
<b>Impact Significance</b>	Negligible	Minor	Moderate	Major

**Table 6.10** *Assessment of Impacts from Discharge of Drill Cuttings and Drilling Fluids on Water Quality*

Impact	Reduction in water quality			
Impact Type	Direct	Indirect	Induced	
Impact Duration	Temporary	Short-term	Long-term	Permanent
Impact Extent	Local	Regional		International
Impact Scale	Localised and temporary impacts to water quality are expected within the plume.			
Frequency	Discharges will occur over the duration of drilling (approximately 65 days per well).			
Impact Magnitude	Positive	Negligible	Small	Medium
Resource Sensitivity	Low	Medium		High
Impact Significance	Negligible	Minor	Moderate	Major

**Table 6.11** *Assessment of Impacts from Discharge of Drill Cuttings and Drilling Fluids on Fish and Pelagic Communities*

Impact	Exposure of fish and pelagic communities to sediment plume			
Impact Type	Direct	Indirect	Induced	
Impact Duration	Temporary	Short-term	Long-term	Permanent
Impact Extent	Local	Regional		International
Impact Scale	Localised potential for change in behaviour - avoidance.			
Frequency	Discharges will occur over the duration of drilling (approximately 65 days per well).			
Impact Magnitude	Positive	Negligible	Small	Medium
Resource Sensitivity	Low	Medium		High
Impact Significance	Negligible	Minor	Moderate	Major

*Additional Mitigation, Management and Monitoring*

Given the **minor** and **negligible** significance, no additional mitigation is considered necessary provided the existing controls are appropriately implemented.

A monitoring programme will be implemented the following the installation of the subsea facilities and drilling activities. The purpose of the monitoring will be to verify the predicted impacts have not been exceeded and are no worse than were expected to occur. Details of the monitoring to be conducted are presented in *Section 8*.

*Significance of Residual Impacts*

The residual impact from operational discharges would be of **negligible** significance for benthic communities, and fish and pelagic communities and **minor** residual impact significance for sediment, and water quality.

### 6.3.3

#### *Impacts from Underwater Sound from Drilling, VSP, and Vessel Movements on Marine Fauna (Fish, Mammals, and Turtles)*

##### *Source of Impact*

Different sources of underwater sound are described as below.

##### Vessels

Vessel noise will vary with the size, speed and engine types and activity being undertaken. Indicative reported noise levels for supply, support, and construction vessels range from 164 to 182 dB re 1 $\mu$ Pa at 1m. Peak frequencies typically occur between 100 Hz to 2 kHz. When engaged, thruster noise from dynamic positioning of the MODU remains below the main propeller propulsion noise at full power. Vessel noise is higher when holding position due to the need to frequently engage short forward and reverse propeller thrusts. When on standby, engines are typically at low throttle with lower noise levels.

Information on the vessels required is presented in *Section 4.4.4*.

##### Drilling

MODUs produce noise from a combination of on-board machinery and drill pipe operation. The noise generated is typically low intensity and continuous. Reported noise levels for drill rigs and drill ships range from 59 to 185 dB re 1 $\mu$ Pa at 1m (Simmonds et al 2004). Noise produced during drilling is predominantly below 2 kHz (33.01 dB) with peak frequencies below 500 Hz (26.98 dB). Tones are thought to be derived from the rotating drill string.

##### Vertical Seismic Profiling (VSP)

The use of vertical seismic profiling (VSP) has the potential to generate elevated underwater sound in the vicinity of the well. VSP uses a small airgun array, typically comprising either a system of three 250 inch<sup>3</sup> airguns with a total volume of 750 inch<sup>3</sup> of compressed nitrogen at approximately 2,000 pounds per square inch (psi). During VSP, four to five receivers are positioned in a section of the wellbore and the airgun array is discharged approximately five times at 20 second intervals. The generated sound pulses are reflected through the seabed and are recorded by the receivers to generate a profile along a section of the wellbore. This process is repeated as required for different stations in the wellbore and will involve approximately 18 hours of source release, within a 24 hour period.

Acoustic modelling undertaken for VSP for similar drilling activities indicates that sound pressure levels generated at source (1 m) are equivalent to 216 dB re 1 $\mu$ Pa (Chevron, 2008). Applying a spherical loss propagation approach,

sound levels are predicted to attenuate to approximately 160 dB re 1 $\mu$ Pa within 600 m of the source.

### Impacts to Marine Fauna

Depending on received sound levels and the sensitivity of the specific marine fauna, exposure to underwater sound has the potential to affect receptors in four main ways:

- **Physical Injury.** Direct physical injury of the fauna due to rupture or damage of body tissue, which may lead to mortality in extreme cases.
- **Auditory Injury.** Permanent injury to hearing organs (known as a Permanent Threshold Shift (PTS)).
- **Physiological and Behavioural Changes.** Physiological changes include temporary auditory fatigue (known as Temporary Threshold Shift (TTS)). Temporary behavioural changes include changes in swimming behaviour or direction of fauna.
- **Masking or interfering with other biologically important sounds.** This includes vocal communication, echolocation signals and sounds produced by predators or prey.

Sound thresholds above which injury to marine mammal and turtle hearing (i.e. TTS /PTS) could occur will not be exceeded and is therefore not considered further. Any impacts from vessel and drilling sound will be limited to behavioural disturbance and/or masking of other biologically important sounds, where frequencies overlap which is discussed below.

Underwater sound can affect marine fauna as described below.

### **Marine Mammals**

Marine mammals are considered the receptor most susceptible to impacts from anthropogenic underwater sound sources. Whales and dolphins in particular utilise sound for communication, socialising, breeding and (for dolphins) foraging and feeding. It reported that threshold levels for behavioural disturbance to cetaceans are variable beginning at between 120 to 160 dB re 1 $\mu$ Pa (rms) (Southall, et al 2007). However, behavioural responses to noise by marine mammals are likely to be highly variable and context specific. Exposure to underwater sound may cause cetaceans to exhibit behavioural changes such as avoidance or displacement and in some cases causes a change in vocalisations, diving and foraging activities, and may temporarily alter migratory pathways (Weilgar, et al 2013). Vocalisation changes may represent attempts to overcome 'masking' effects and compensating for the additional sound in the environment (Di Iorio & Clark, 2010). However, masking will only occur in the low frequencies (below 5 kHz) as vessel and drilling noise is

not likely to occur at the higher frequencies used by toothed cetaceans for echolocation.

Low frequency mammals (baleen whales such as Bryde's whales) are considered to be most sensitive to the frequency levels generated by VSP (<500 Hz) (Southall, et al, 2007). These species are known to be present in the waters off Rakhine State. Mid and high frequency mammals (toothed whales such as dolphins and sperm whales) are considered to be most sensitive to sound greater than 1 kHz and are therefore less sensitive to the low frequency sound from VSP. These species are also known to be present in Rakhine waters.

In addition to effects of underwater sound, cetaceans can also be disturbed by vessel movement. Many short-term behavioural responses to vessel traffic have been recorded in cetaceans, including changes in swim direction and speed, surface times and inter-breathing intervals, changes in proximity to other individuals, etc (Lemon et al, 2006); (Kruse et al, 1991); (Blane and Jaakson, 1994) and (Lusseau, 2003).

Little information is available on sensitivity of dugongs to sound; however, similar to dolphins, they are understood to be most sensitive to sound frequencies greater than 1 kHz (Anderson and Barclay, 1995), and therefore are not anticipated to be affected significantly by sounds generated by the VSP source. However, suitable dugong habitat (seagrass beds) is located over 100 km away and therefore will not be impacted.

### **Marine Turtles**

Only a few studies have looked into hearing capabilities of marine turtles which have shown that turtles respond to low frequency sound, with highest hearing sensitivity in the frequency range 100-700 Hz (Bartol and Musick, 2003). This coincides with the frequency range for VSP (<500 Hz). Marine turtles are considered less susceptible than marine mammals to increases in ambient underwater sound as turtles do not have an external hearing organ and can only direct sound through vibrations in their skull and the shell (Lenhardt et al, 1983). Marine turtles, which may present in the operational area on occasion, have been shown to respond to sounds higher than 166 dB re 1 µPa (rms) and when levels were higher than 175 dB re 1 µPa- (rms) demonstrated "erratic behaviour" or "agitation" (McCauley et al, 2000). As with marine mammals, turtles have also been observed to alter their diving behaviour in response to underwater sound.

### **Fish**

Fish hearing abilities can vary widely even within families, but generally fish hear best at low frequencies below 1 kHz (Ladich, F., 2000). Hearing sensitivity in bony fish is a function of the inner ear, specialised auditory structures and, if present, the swim bladder, which provides an indirect route for sound to reach the inner ear (Finneran and Hastings, 2000). Some fish have

a special connection between the swim bladder and the inner ear, providing an enhanced indirect route. These fish are considered to be 'hearing specialists' as they are capable of detecting less intense and higher frequency sound waves compared to non-specialised fish 'hearing generalists'. Underwater sound can cause a change in fish swimming behaviour or direction.

#### *Existing/In Place Controls*

Measures to control/ minimise adverse impacts from an increase in underwater sound levels and will include:

- Visual check for marine mammals or marine turtles within 1 km (observation zone) of the MODU or vessel for 20 minutes prior to commencing VSP operations.
- Soft start - build up power for VSP slowly to give adequate time for marine mammals or marine turtles to leave the area (20 minutes at minimum). If a marine mammal or marine turtle is sighted within the shut-down zone (500 m), the acoustic source should be shut down completely.
- Soft start procedures should only resume after the marine mammal(s) or marine turtle(s) has been observed to move outside the shutdown zone (500 m) or when 30 minutes have lapsed since the last sighting.
- Visual observations of the observation zone (1 km) will be maintained continuously during VSP to identify if there are any marine mammals or marine turtles present.
- During the pre-start meeting, all crews will be alerted to immediately report to the trained observer when they observe any marine mammals or turtles during and prior to the activity. The pre-start meeting will cover the likelihood of marine mammal or marine turtle observations and required actions if they are sighted.
- An observer will be utilised during VSP operations to monitor and record marine mammals and marine turtles observations and all records will be reported to MONREC following completion of the activity.

#### *Significance of Impacts*

Individual noise sources associated with vessels and the MODU are expected to range up 185 dB re 1µPa at source which will reduce as sound attenuates to lower levels over a number of kilometres. The noise level would be expected to reduce to below levels that may potentially elicit a behavioural response from marine mammals within in the order of a few hundred meters. Noise sensitive individuals may therefore be expected to avoid the areas where drilling and construction activities are taking place, but this impact will be localised and any behavioural responses are not expected to be biologically significant for the

survival of affected individuals, which are likely to be transient in the operational area. The potential for impact will be limited to an intermittent and short term duration and localised to the MODU and vessel locations.

VSP will be undertaken within an 18 hour period. Behavioural effects on the most sensitive fauna (marine mammals and marine turtles) are only likely within a radius of 600 m of the sound source. Therefore, effects from underwater sound will be localised and temporary and any resulting significant impacts to marine fauna are therefore considered unlikely.

The magnitude of impact from increased sound levels is therefore **small**.

Marine mammals and marine turtles are considered highly sensitive receptors as some of the species present in Rakhine waters are considered international and national species of conservation concern and due to their sensitivity to underwater sound. Based on the **high** ranking for receptor sensitivity attributed to marine mammals and marine turtles, it is anticipated that, with all the existing control measures in place, the impact will be of **moderate** significance. Although, given the duration and scale of the potential impact, the impact with the associate mitigation is unlikely to have a significant impact (Table 6.12).

As fish are not considered to be as sensitive to underwater sounds as marine mammals and marine turtles, there are considered to be of **medium** sensitivity (acknowledging the presence of hearing specialist species), and it is anticipated that, with all the existing control measures in place, the impact will be of **minor** significance (

Table 6.13).

**Table 6.12** *Summary of Impact Assessment of Ambient Underwater Sound on Marine Mammals and Marine Turtles*

<b>Impact</b>	Increase in underwater sound leading to behavioural changes on marine mammals			
<b>Impact Type</b>	Direct	Indirect	Induced	
<b>Impact Duration</b>	Temporary	Short-term	Long-term	Permanent
<b>Impact Extent</b>	Local	Regional		International
<b>Impact Scale</b>	Localised behavioural changes to a small number of individuals.			
<b>Frequency</b>	Once for approximately 18 hours over the duration of drilling			
<b>Impact Magnitude</b>	Positive	Negligible	Small	Medium
<b>Resource Sensitivity</b>	Low	Medium	High	
<b>Impact Significance</b>	Negligible	Minor	Moderate	Major

**Table 6.13** *Summary of Impact Assessment of Ambient Underwater Sound on Fish*

<b>Impact</b>	Increase in underwater sound leading to behavioural changes or physical impact on fish
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Impact Type	Direct	Indirect	Induced		
Impact Duration	Temporary	Short-term	Long-term	Permanent	
Impact Extent	Local	Regional	International		
Impact Scale	Localised behavioural changes to a small number of individuals.				
Frequency	Once for approximately 18 hours over the duration of drilling				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource Sensitivity	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	

#### *Additional Mitigation, Management and Monitoring*

The control measures adopted by the Project are considered international good practice for reducing the impact of underwater sound.

All marine species sightings during drilling operations will be reported to MONREC in the Environmental Monitoring Report.

#### *Significance of Residual Impacts*

The residual impact from an increase in underwater sound levels would be of **moderate** significance for marine mammals and marine turtles and of **minor** significance for fish.

### 6.3.4

#### *Impacts from Unplanned Hydrocarbon Spills to Marine Water Quality, Marine Fauna and Habitats (Plankton, Fish & Pelagic Communities, Benthic Communities, Marine Mammals, Marine Turtles and Seabirds) and Public Health & Safety, Fisheries, and Shipping*

##### *Source of Impact*

There is the inherent potential for unplanned releases of hydrocarbons with offshore oil and gas operations. Spills are not predicted to occur during normal operating conditions, but rather represent unlikely and exceptional incidents.

For the Project, these potential spills scenarios have been identified:

- Accidental fuel spills including deck spills.
- Vessel collision during drilling activities or transit or with third party/other Project vessels.
- Loss of well integrity/control (gas release only).

Minor spills on the deck of the vessels can occur due to accidental releases from stored hydrocarbons/harmful chemicals, or equipment present on the deck such as small quantities of lubricating oils, hydraulic fluid, or other chemicals.

In rare cases, vessel collision can lead to rupture of the fuel tank leading to a release of fuel to the marine environment. For this to occur, the collision must

be of sufficient force to penetrate the vessel hull in the location of the fuel tank; which is unlikely. The volumes spilled would be potential spill volume is expected to be approximately 100 m<sup>3</sup> of MGO. This volume was modelled for the Project and the results are provided below.

No oil spill will occur from a potential loss of well control as the wells will be targeting dry gas. Loss of well control situations are rare in offshore gas drilling. If this did occur, a gas plume could be generated but will have a limited, localised impact on the marine environment, such as the physical displacement of transient and/or mobile fauna. The extent of the plume is expected to be relatively small in comparison to the surrounding offshore water environment.

Potential impacts from unplanned hydrocarbon spills may include:

- Decline in water quality.
- Toxic effects to marine fauna.
- Oiling of marine megafauna (turtles, whales) and birds.

Impacts to marine water quality, marine mammals, marine turtles, fishes, and seabirds which may be found within the offshore area are discussed below.

#### Marine Water Quality

Spills and leaks can cause a localised decline in water quality. However, with the existing controls in place and compliance with national and international standards, impacts from discharges will be localised and readily diluted and dispersed in the open water environment of the Project Area.

#### Benthic Communities

From a loss of well control, as the gas is released from the seabed there may be alteration in the composition of the microbial community and mobile epifauna around the well site (Kimes et al. 2014). The presence of gas in the water column is not expected to result in toxicity effects to pelagic fish and plankton, as dissolved methane and hydrates are inert and non-toxic and will be dispersed to low concentrations by prevailing currents. Any spill and leaks from the deck or vessel collisions will be diluted and dispersed and are unlikely to impact the seabed and benthic communities given the water depth (110 m).

#### Marine Mammals

Marine mammals are mobile and a number of field and experimental observations indicate whales and dolphins may be able to detect and avoid surface slicks from fuel spills (Smith et al, 1983). Nevertheless, observed instances have occurred where whales and dolphins have swum into oiled areas

without seeming to detect the slicks, or because the slicks were unavoidable. Marine mammals exposed to surface slicks in the event of a spill, are at risk of lethal and sub lethal effects from inhalation of volatile components, as well as skin contact and/or ingestion of hydrocarbons (Etkins, D.S., 1997, and, IPIECA, 1995). Fouling of whale baleen plates may disrupt feeding by reducing the ability to take in prey, while toothed whales including dolphins, which are gulp feeders, may be less susceptible. Likely spill volumes are small (i.e. not from a loss of well control situation) and the spills will evaporate rapidly. Significant numbers of marine mammals are not expected to be present in the area potentially affected by a spill and any marine mammals present are likely to be able to avoid the area. As such, the potential for impact to marine mammals from spill of hydrocarbons is considered unlikely and will reduce with increased distance away from the spill source.

### Seabirds

Offshore waters can be potential foraging grounds for seabirds that are vulnerable when coming into contact with surface slicks during feeding or resting on the sea surface and typically do not exhibit avoidance behaviour. Physical contact of seabirds with surface slicks may result in fouling of feathers causing them to matt and lose their insulating, buoyancy and water-repelling properties. This may also lead to mortality as birds sink and drown, due to hypothermia (loss of thermoregulation) or as they lose the ability to fly leading to starvation. Physical contact with slick or vapours can also cause irritation and injury to a bird's eyes, skin and mouth cavities. Ingestion and inhalation of hydrocarbons from preening can damage internal organs, suppress immune system and reduce reproductive success (AMSA, 2012, IPIECA, 1995).

Seabirds are not expected to be encountered in significant numbers at the well location as it will be over 100 km from the coast. In addition, no large slicks are expected since the release would be fuel or hydrocarbons (as this is not an oil well). Given that, the relatively small volumes of hydrocarbons potentially released and the tendency for fuel spills to evaporate rapidly, the potential for impact to seabirds is considered unlikely.

### Marine Turtles

Marine turtles are not known to exhibit avoidance behaviour when they encounter an oil slick (Odell, DK. and MacMurray, C., 1986) although contact with slicks can result in hydrocarbon adherence to body surfaces (Gagnon, MM and Rawson CA., 2010) causing irritation leading to inflammation and infection and damage to the salt gland (Etkins, D.S., 1997). Oiling can also irritate and injure skin which is most evident on pliable areas such as the neck and flippers (Lutcavage, et al, 1995). On contact with surface slicks, turtles may also experience irritation and injury to airways and lungs, eyes and mucous membranes of the nose and mouth. Ingested oil such as tarballs can cause buoyancy problems due to build-up of fermentation gases in the gut.

As discussed previously, the potential exposure to a slick would be highly localised. While marine turtles (adults, hatchlings and juveniles) may be present in the area affected by a spill, they are not expected to be present in significant numbers. Given the limited extent of exposure and its rapid dilution and dispersion, impacts to marine turtles are not expected to have any population-wide effects and will be localised.

### Fish

It is rare for fish mortality to occur from spills and leaks, especially in open water environments (ITOPF, 2011) such as those found in the Project Area. It is suggested that pelagic fish species (like those present in the Project Area) can detect and avoid oil spills by swimming into deeper water or away from the affected areas. As such, fish are unlikely to be impacted.

### Oil Spill Modelling

For the oil spill modelling, 100 m<sup>3</sup> of diesel was released at the sea surface within 15 min from the vessel collision location.

*Figure 6.6* and *Figure 6.7* show the likelihood of surface oil at any concentration reaching locations during the two week simulation including below visible concentrations (<0.04 µm). A 100% probability contour near the release centre is a region where every simulation showed that oil travelled over that location on the surface at least once. If a region is coloured 20% probability, that means one-fifth of the simulations showed a trajectory which pass through that region. The resulting oil trajectory was generally towards the south or southwest in both January and April.

Figure 6.6 Likelihood (%) of Exposure to Surface Oil at any Concentration from a 15 Minute 100 m<sup>3</sup> Diesel Surface Spill in January

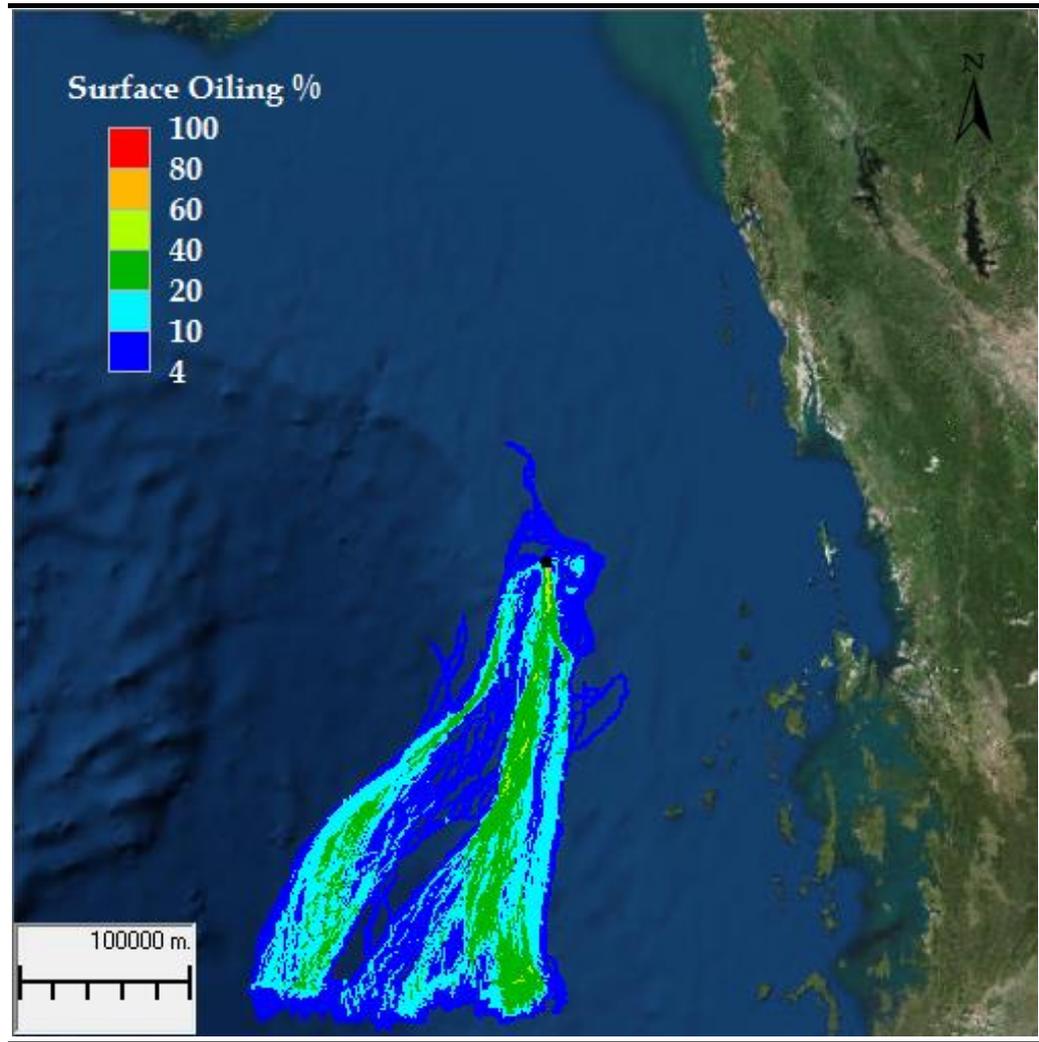
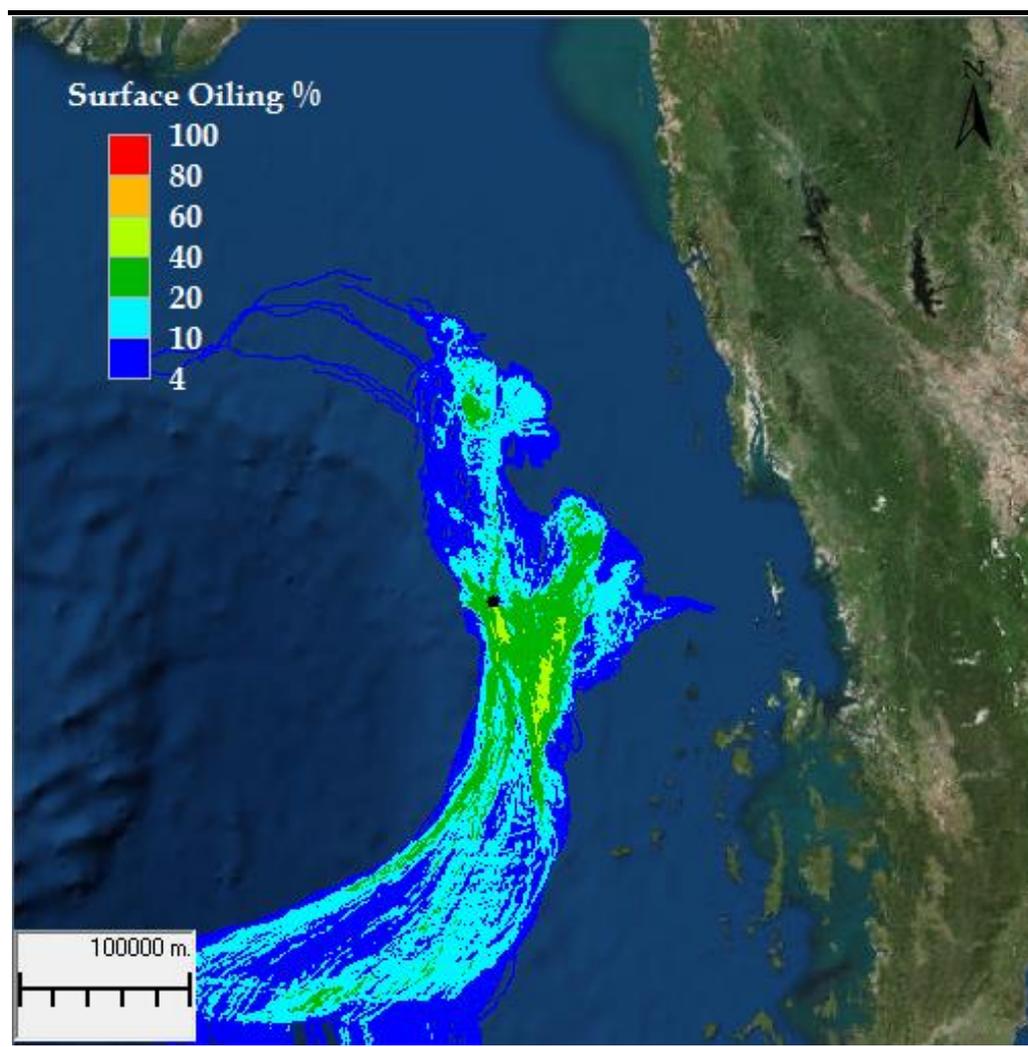


Figure 6.7 Likelihood (%) of Exposure to Surface Oil at any Concentration from a 15 Minute 100 m<sup>3</sup> Diesel Surface Spill in April



In general, the surface oil represents approximately 19% and 17% of the mass 24 hours after the release respectively in January and April. Two days after the release has ended, this surface proportion decreased to 12% and 11% respectively. In two weeks after the release has ended, up to 94% and 91% of the diesel would be lost to the atmosphere through evaporation, resulting in minimum (1.4% for January 1.3% for April) remaining on surface, less than 8% dissolved in water and less than 1% entrained in water in droplet form. In the model, the biodegradation process was conservatively assumed to be zero; however, the oil compounds remaining in the water column would breakdown with half-lives in the range of days to weeks, depending on the complexity of the molecule and the presence of the necessary hydrocarbon-consuming bacteria.

The results are summarised in *Table 6.14*.

**Table 6.14 Oil Spill Results Summary**

Composition	January	April
Total Shoreline Exposed to Surface Oiling (km)	0	0
Minimum Travel Time to Reach Shoreline (day)	No shoreline oiling predicted	No shoreline oiling predicted
Zone of Potential Visible Surface Oiling (>0.04 µm) (km <sup>2</sup> )	27404	40310
Zone of Potential Surface Oiling with harmful effect on seabirds (>10 µm) (km <sup>2</sup> )	158	456
Maximum Instantaneous Oil thickness (mm)	0.1053	0.1053
Max. Instantaneous Dissolved Aromatics (ppb)	29128	40945
Zone with Potential for Exposure to Dissolved Aromatic Concentrations above 50 ppb (km <sup>2</sup> )	1163	1989

The oil spill modelling results are provided in full in **Appendix F**.

*Existing/ In Place Controls*

Standard measures to control or minimise the potential adverse impacts from unplanned spills will include:

- Preparation and implementation of vessel standard operating procedures.
- Adherence to MARPOL 73/78 Annex I:
- Vessels will hold a valid International Oil Pollution Prevention (IOPP) Certificate (Regulation 7).
- Vessels will maintain an oil record book (Regulation 17).
- Shipboard Oil Pollution Emergency Plans (SOPEPs) will be developed and kept on-board vessels (Regulation 37).
- Chemicals and/or hydrocarbons will be handled and stored in compliance with the Material Safety Data Sheet (MSDS).
- All chemical and/or hydrocarbon wastes will be segregated into clearly marked containers prior to onshore disposal by a licensed waste management contractor, as per the relevant MSDSs.
- Spill response kits will be located in proximity to hydrocarbon storage/bunkering areas and appropriately stocked/replenished as required.

- Standard maritime safety/navigation procedures will be implemented including:
- Adhere to steering and sailing rules including maintaining look-outs (e.g. visual, hearing, radar etc.), proceeding at safe speeds, assessing risk of collision and taking action to avoid collision (monitoring radar).
- Adhere to navigation light display requirements, including visibility, light position/shape appropriate to activity.
- Adhere to navigation noise signals as required.
- Adherence to minimum safe manning levels.
- Maintenance of navigation equipment in efficient working order (compass/radar).
- Navigational systems and equipment required are those specified in Safety of Life at Sea (SOLAS) Chapter V (Regulation 19).
- Automatic Identification System (AIS) installed as required by vessel class in accordance with SOLAS Chapter V (Regulation 19).
- Establishment of a 5 NM radius safety exclusion zone around the MODU.
- In the event of a vessel collision, the SOPEP will be implemented if required.

#### *Significance of Impact*

The above controls will help reduce the likelihood of a spill. If a fuel spill does occur, it will be highly localised and will evaporate and disperse rapidly in the offshore waters of the Project Area.

As discussed above, spills are unlikely to have significant effects on the marine environment or species. Given only small volumes are likely in the event of a spill, the considerable distance of the Project Area (over 100 km) from coastal habitats, and the highly dispersible nature of the fuel, a spill would only affect water quality and marine fauna in close proximity to the spill release location. In addition, large marine fauna (fish, turtles and mammals) may exhibit avoidance behaviour and move away from the spill-affected area.

Therefore, a spill to the marine environment will result in a negligible magnitude impact. Marine fauna and habitats that may be impacted by a spill/ leak have varying degrees of sensitivity. However, the impact would be of **negligible** significance overall given the very low likelihood of a spill / leak occurring (*Table 6.15*).

**Table 6.15** *Assessment of Impacts from Accidental Spills on Marine Water Quality, Marine Fauna, and Habitats*

<b>Impact</b>	Water contamination and secondary impacts to biodiversity from accidental spills				
<b>Impact Type</b>	Direct	Indirect		Induced	
<b>Impact Duration</b>	Temporary	Short-term	Long-term	Permanent	
<b>Impact Extent</b>	Local	Regional		International	
<b>Impact Scale</b>	Localised potential to a small number of individuals				
<b>Frequency</b>	Infrequent				
<b>Likelihood</b>	Rare				
<b>Impact Magnitude</b>	Positive	Negligible	Small	Medium	Large
<b>Resource Sensitivity</b>	Low	Medium		High	
<b>Impact Significance</b>	Negligible	Minor	Moderate	Major	

*Additional Mitigation, Management and Monitoring*

Provided that the control measures are in place, the likelihood of a spill occurring is unlikely and no additional mitigation is required. Preventative controls designed to avoid spills, or contain and prevent spills from reaching the marine environment will be implemented via compliance with legislative requirements and PCML procedure.

*Significance of Residual Impacts*

The residual impact from an unplanned spill would be of **negligible** significance.

**6.3.5** *Impacts from Unplanned Collisions on Fishing and Shipping Activity*

*Source of Impact*

Potential unplanned collisions between fishing vessels or other shipping may result in damage to fishing gear (e.g. nets/lines damaged), and damage to vessels. Additional concerns associated with interactions with other vessels include potential for fuel oil spillage. The potential impacts from an accidental release of fuel are provided in *Section 6.3.4*.

Any damages to fishing gear may adversely impact the fishermen who would have to pay for replacement equipment and may not be able to fish until the damage is fixed. This could lead to secondary effects on livelihoods of fishing communities.

A lightly used shipping lane exists between ports in Singapore and Malaysia to Yangon which transects the western side of Block M-12 and M-13 (*Figure 5.9*). The issues associated with other marine users are the same as those mentioned above for fishing except for damage to fishing gear.

### Existing/In Place Controls

The existing controls for fisheries and other marine users from unplanned collisions will be the same as those mentioned for impacts on fishing activity from the physical presence of the MODU, construction/installation vessels, and support vessels in Section 6.4.1.

### Significance of Impacts

During the drilling, the MODU will be accompanied by the support vessels that act as fishing liaison as well as look out for the presence of other marine users. As mentioned in Section 6.3.1, some offshore fishing vessels from Tanintharyi may be present in the Project Area. These offshore fishing vessels have fishing grounds that cover a wide area (and also may have on-board advance navigational and communication systems to warn them of the presence of the MODU. It should be noted that as the Project Area offshore is relatively small, the potential for encountering fishing vessels is low and the likelihood of collision with the controls in place is rare.

Shipping vessels in transit with a good standard of navigational equipment can easily avoid the Project activities without disruption.

Given the measures in place, the low likelihood of collision, and the small area to be impacted by the exclusion zone, the impact from collision is of **negligible** significance (Table 6.16).

**Table 6.16** *Assessment of Impacts from Unplanned Collisions on Fishing Vessels and Other Marine Users*

<b>Impact</b>	Unplanned Collisions			
<b>Impact Type</b>	Direct	Indirect	Induced	
<b>Impact Duration</b>	Temporary	Short-term	Long-term	Permanent
<b>Impact Extent</b>	Local	Regional	International	
<b>Impact Scale</b>	Affect the vessels using Block A1			
<b>Frequency</b>	Duration of the installation and drilling activities (intermittently 2020 through to 2025).			
<b>Likelihood</b>	Unlikely.			
<b>Impact Magnitude</b>	Positive	Negligible	Small	Medium
<b>Resource Sensitivity</b>	Low	Medium (Fishing vessels)	High (livelihoods)	
<b>Impact Significance</b>	Negligible	Minor	Moderate	Major

### Additional Mitigation, Management and Monitoring

With the existing controls in place, no additional mitigation measures are required. A number of factors will be tracked to monitor the effectiveness of mitigation measures.

These will include the following:

- Number of interactions between support vessels and fishing boats.
- Feedback from ongoing stakeholder engagement.
- Tracking of grievances raised and response actions to be reported to ECD in regular monitoring reports.

*Significance of Residual Impacts*

With the control measures in place (i.e., exclusion zone), impacts due to unplanned collisions on fishing vessels and other marine users are likely to be of **negligible** significance.

### 7.1 *METHODOLOGY AND APPROACH*

Cumulative impacts encompasses impacts that result from the incremental impact, on areas or resources used or directly impacted by the project, from other existing, planned or reasonably defined developments at the time the risks and impacts identification process is conducted. IFC (2012) defines cumulative impacts as those generally recognised as important on the basis of scientific concerns and or concerns from affected communities<sup>(5)</sup>.

Cumulative impacts summarised in this section refer to the additional impacts that may be generated by other developments or activities in the vicinity of the Project Area, that when added to the impacts of the proposed drilling combine to cause a greater impact. Such impacts may arise due to spatial overlap (e.g. overlap in spatial extent of water quality changes) or temporal overlap (e.g. sound impacts caused by seismic & drilling activities at the same time from different sources).

### 7.2 *POTENTIAL IMPACTS AND MITIGATION MEASURES*

The Project Area is surrounded by oil and gas blocks operated by other Companies however, at the time of writing there are no other oil and gas activities in these Blocks that are likely to overlap with the timing of the Project activities.

Near the Project Area is the existing Yetagun Platform and PCML are also planning on drilling some exploration wells and conducting a 3D seismic survey. There could be overlap with these activities.

The main impacts arise from the temporary disturbance of fishing activity, specifically fishermen that fish near the continental shelf area where the Project Area overlaps with potential fishing grounds. The mitigation measures listed in the above sections are standard international best practise and will be adopted during all drilling and seismic activities.

With the standard mitigation measures in place, any impacts are unlikely to marine species will be of **Minor** significance.

The potential for cumulative spills of fuel from the vessels is extremely unlikely to occur, and as both vessels use light fuels which are readily diluted and dispersed and implement standard mitigation measures, impacts would be expected to be **Minor**.

<sup>(5)</sup> IFC Performance Standards on Environmental and Social Sustainability, January 2012, International Finance Corporation, World Bank Group

In terms of social impacts, although the Project Area is large the exclusion zone will be limited to a mobile safety zone around the vessel and a stationary zone around the drilling rig. As such, the area from which fishermen will be temporarily displaced is relatively small. It is expected that the social impacts from the Project, if properly mitigated, will be localised to the area where fishing occurs and temporary in nature (a few days). Therefore, the impact will be of **Minor** significance to fishing activities but this is expected to be a **Negligible** impact on livelihoods.

This Section provides the Environmental Management Plan (EMP) for the planning and operation of the Project. This EMP provides the procedures and processes which will be applied to the Project activities to check and monitor compliance and effectiveness of the mitigation measures to which PCML has committed. In addition, this EMP is used to ensure compliance with statutory requirements and corporate sustainability policies.

### **8.1 PROJECT DESCRIPTION BY PROJECT PHASE**

The Project will cover the drilling of three infill wells within the Project Area, which will be drilled in waters depths of about 110 m and at least 140 km from the mainland coastline and over 100 km from the nearest islands (Kyunsu) of the Myeik Archipelago.

The wells will be drilled using a mobile offshore drilling unit (MODU) which will have an exclusion area of 5 NM radius in which other shipping or fishing vessels cannot enter. Given the wells will be drilled at the existing Yetagun production platform, this exclusion area will overlap the existing exclusion area that surrounds the Yetagun Complex.

As this Project is only exploration activity, there is only one Phase – Operation. There is no permanent infrastructure so no pre-construction, construction, or decommissioning phases.

### **8.2 PROJECT'S ENVIRONMENTAL, SOCIO-ECONOMIC AND, WHERE RELEVANT, HEALTH POLICIES AND COMMITMENTS, LEGAL REQUIREMENTS AND INSTITUTIONAL ARRANGEMENTS**

The Project is being conducted in line with PCML HSE Management Policy, the requirements of the Production Sharing Contract (PSC), Myanmar regulatory requirements, and international conventions, standards and guidelines.

A summary of the Project environmental and social standards are shown in *Table 8.1*.

**Table 8.1 Project Environmental and Social Standards**

Parameter	Standard	Requirement
Drilling fluids and cuttings (non-aqueous drilling fluid)	NEQ and IFC EHS Guidelines (2015)	<ul style="list-style-type: none"> <li>• Non-aqueous drilling fluid, re-inject or ship-to-shore; no discharge to sea</li> <li>• Drilled cuttings, re-inject or ship-to-shore; no discharge except:</li> <li>• Oil concentration lower than 6.9% by weight on dry cuttings (as per IFC 2015 EHS Guidelines)</li> <li>• Mercury maximum 1 mg/kg dry weight in stock barite</li> <li>• Cadmium maximum 3 mg/kg dry weight in stock barite</li> <li>• Discharge via a caisson at least 15 metres below sea surface</li> </ul> <p><i>(Note: ECD allows an exemption to the above guidelines for exploration drilling with the limits presented in IFC EHS Guidelines for Offshore Oil and Gas (2015) permitted.)</i></p>
Drilling fluids and cuttings (water-based drilling fluid)	NEQ and IFC EHS Guidelines (2015)	<ul style="list-style-type: none"> <li>• Water-based drilling fluid, re-inject or ship-to-shore; no discharge to sea</li> <li>• Water-based drilling fluids and cuttings, re-inject or ship-to-shore; no discharge to sea except:</li> <li>• Mercury 1 mg/kg dry weight in stock barite</li> <li>• Cadmium 3 mg/kg dry weight in stock barite</li> <li>• Maximum chloride concentration must be less than four time's ambient concentration of fresh or brackish receiving water</li> <li>• Discharge via a caisson at least 15 meters below sea surface</li> </ul>
Completion and well work-over fluids	NEQ and IFC EHS Guidelines (2015)	<ul style="list-style-type: none"> <li>• Ship-to-shore or re-inject, no discharge to sea except:</li> <li>• Maximum one day oil and grease discharge should not exceed 42 mg/l; 30 day average should not exceed 29 mg/l</li> <li>• Neutralize to attain a pH of 5 f or more</li> </ul>

Parameter	Standard	Requirement
Air Emissions	MARPOL Annex VI	<ul style="list-style-type: none"> <li>Vessels will be in compliance with applicable MARPOL 73/78 Regulations for the prevention of air pollution from ships (Annex VI).</li> <li>Use of low sulphur fuel (sulphur content not to exceed 3.5% m/m) when it is available</li> <li>An International Air Pollution Prevention (IAPP) certification for the Project vessels, as applicable or required by vessel class.</li> </ul>
Sewage	MARPOL Annex IV / NEQ Guidelines	<ul style="list-style-type: none"> <li>The Project vessels will comply with applicable MARPOL requirements, including: discharge of untreated sewage into the sea is prohibited, except when the ship has in operation an approved sewage treatment plant or when the ship is discharging comminuted and disinfected sewage using an approved system at a distance of more than 3 nm from the nearest land.</li> <li>Sewage which is not comminuted or disinfected has to be discharged at a distance of more than 12 nm from the nearest land.</li> <li>The discharge of sewage can only occur when the vessel is en route and travelling at no less than 4 knots.</li> <li>An International Sewage Pollution Prevention (ISPP) certificate and International Oil Pollution Prevention (IOPP) certificate will be required, as appropriate to vessel class.</li> </ul>

Parameter	Standard	Requirement
Waste Discharges (including food waste)	MARPOL Annex I & V	<ul style="list-style-type: none"> <li>Vessels will operate in compliance with MARPOL Annexes I: any oil-in-water content of discharges should not exceed 15 ppm.</li> <li>General waste (excluding food) will not be disposed of to sea in line with MARPOL Annex V Requirements.</li> <li>Combustible wastes will be segregated and disposed by incinerator on-board, should an incinerator be available on the selected vessel (in line with MARPOL Annex V requirements). No discharge of food waste is permitted less than 3 nm from the coast. Maceration is required at greater than 3 nm and less than 12 nm from the coast. Hazardous wastes will be stored on the vessels in appropriate containers with labels.</li> <li>Hazardous waste storage will be designated in accordance with their Materials Data Sheet (MSDS) (in line with MARPOL Annex V requirements). Hazardous wastes will be returned to the vessels' selected shore base and sent to a licensed disposal facility by a licensed waste contractor (in line with MARPOL Annex V requirements).</li> </ul>
Spills	MARPOL Annex I	Support and chase vessel standard operating procedures to be prepared and implemented including (if appropriate) an offshore bunkering procedure. Shipboard Oil Pollution Emergency Plans (SOPEPs) will be prepared and implemented.

### 8.3

#### *SUMMARY OF IMPACTS AND MITIGATION MEASURES*

The EIA has assessed the potential impacts and proposed mitigation and management measures to reduce the level of the impact. The EIA concluded that potential impacts are typically short term and are well understood from previous experience in the industry, with little or no evidence of adverse consequences on the majority of environmental or social receptors.

Through the Project development and the EIA process, PCML has made commitments to ensure appropriate environmental and social performance. A summary of the Project impacts and the committed measures designed to manage and mitigate those impacts is presented in *Table 8.2*.

Table 8.2 Summary of Impacts and Mitigation Measures

Potential Impact/Issue	Control / Mitigation Measures	Significance of Residual Impact
<b>Drilling Phase</b>		
Impacts from Physical Presence of the MODU and Support Vessels on Fishing and Shipping Activity	<ul style="list-style-type: none"> <li>A 5 NM radius safety exclusion zone around the MODU.</li> <li>MODU and support vessels will comply with international regulations for collision avoidance, navigation and maintenance.</li> <li>Myanmar speaking (crew members) available on board the MODU.</li> <li>Timely sharing of information (in the form of a Notice to Mariners).</li> <li>Disclosure and implementation of the Feedback grievance mechanism.</li> </ul>	Minor
Impacts from Drill Cuttings and Drilling Fluid Discharges to Sediment Quality, Marine Water Quality, Benthic Communities, and Fish & Pelagic Communities	<ul style="list-style-type: none"> <li>Maximum residual Non Aqueous Phase Drilling Fluid will be 6.9% on wet cuttings.</li> <li>Where cuttings are discharged overboard, they will be discharged 15m below the water line.</li> <li>All chemicals selected for low toxicity where possible and subject to internal justification.</li> <li>NADF shall only be used where seawater and sweeps or WBDF cannot provide the required technical specifications.</li> <li>All residual NADF returned to a shore for reconditioning, re-use or disposal. No bulk discharge of NADF drilling fluids will take place.</li> </ul>	Minor (sediment quality)
		Negligible (benthic quality)
		Minor (water quality)
		Negligible (fish and pelagic species)
Impacts from Underwater Sound from Drilling, VSP, and Vessel Movements on Marine Fauna (Fish, Mammals, and Turtles)	<ul style="list-style-type: none"> <li>Visual check for marine fauna within 1 km (observation zone) of the MODU or vessel for 20 minutes prior to commencing VSP operations.</li> <li>Soft start - build up power for VSP slowly to give adequate time for marine fauna to leave the area (20 minutes at minimum).</li> <li>Soft start procedures should only resume when fauna have moved outside the shutdown zone (500 m) or when 30 minutes have lapsed since the last sighting.</li> <li>Visual observations of the observation zone (1 km) must be maintained continuously to identify if there are any mammals or turtles present.</li> <li>During the pre-start meeting, alert all crews to immediately report to the trained observer when they observe any marine mammals or turtles during and prior to the activity.</li> <li>An observer will be utilised during VSP operations to monitor and record marine mammals and marine turtles observations and all records will be reported to MONREC following completion of the activity.</li> </ul>	Minor (fish)
		Moderate (marine mammals and turtles)
Impacts from unplanned spills on marine fauna	<ul style="list-style-type: none"> <li>Preparation and implementation of vessel standard operating procedures.</li> <li>Adherence to MARPOL 73/78 Annex I.</li> <li>Chemicals and/or hydrocarbons will be handled and stored in compliance with the Material Safety Data Sheet (MSDS).</li> <li>Spill response kits will be available and kept stocked.</li> <li>Standard maritime safety/navigation procedures will be implemented</li> <li>Establishment of a 5 NM radius safety exclusion zone around the MODU.</li> <li>In the event of a vessel collision, the SOPEP will be implemented, if required.</li> </ul>	Negligible
Impacts from Unplanned Collisions on Fishing and Shipping Activity	<ul style="list-style-type: none"> <li>A 5 NM radius safety exclusion zone around the MODU.</li> <li>MODU and support vessels will comply with international regulations for collision avoidance, navigation and maintenance.</li> <li>Myanmar speaking (crew members) available on board the MODU.</li> <li>Timely sharing of information (in the form of a Notice to Mariners).</li> <li>Disclosure and implementation of the Feedback grievance mechanism.</li> </ul>	Negligible

#### 8.4 **OVERALL BUDGET FOR IMPLEMENTING THE EMP**

It is estimated that the overall budget for implementing the EMP for the Project is up to \$800k USD. Many of the management and mitigation measures are embedded controls as part of the standard operational costs.

#### 8.5 **MANAGEMENT AND MONITORING SUB-PLANS**

Given that there are no significant impacts from the Project (under *Chapter 6* of this EIA Report); no separate management plans are required for the following:

- Air: the emissions to air are not likely to cause any significant impact. However routine atmospheric emissions will be monitored with emphasis on greenhouse gases (CO<sub>2</sub>/SO<sub>x</sub>) and provided in the Environmental Monitoring Report;
- Noise: the noise emissions will not cause any significant impact; and
- Community: the Project is located 140 km from the nearest human receptor and communities and therefore will not have an impact.

Management sub-plans are, however, prepared for **Sediment & Drill Cuttings, Biodiversity, Emergency Response, and Waste Management** and are provided in the following sections. PCML's contractors will also have Waste Management and Emergency Response Plans and the vessel will have a SOPEP.

For this short duration infill drilling, no specific management plans are required for pre-construction, construction, operation and decommissioning phases as this activity only has the Operational Phase.

**Table 8.3 Management Actions (Commitment)**

Potential Impact / Risk	Mitigation Measures	Management Action	Responsible	Implementation Schedule	Reporting
Impacts from exhaust emissions on ambient air quality	Use of low sulphur fuel (sulphur content not to exceed 3.5% m/m) when it is available.	Contractor to provide specifications of fuel to be used by MODU and vessels.	Contractor	Pre-mobilisation, during drilling campaign and subsea facilities installation.	Copy of marine fuel specifications.
	Vessels will be in compliance with applicable MARPOL 73/78 Regulations for the prevention of air pollution from ships (Annex VI).	Routine atmospheric emissions will be monitored with emphasis on greenhouse gases (CO <sub>2</sub> /SO <sub>x</sub> )		During Drilling	Monitoring Report
		Contractor to provide MARPOL certification for the MODU and vessels.		Pre-mobilisation	MARPOL certification.
Impacts of sewage and grey water on marine water quality and localised adverse impacts to marine biota	<p>The MODU and support vessels will comply with applicable MARPOL 73/78 Annex IV requirements (Reg. 4 and 8), including:</p> <ul style="list-style-type: none"> <li>vessels will have valid International Sewage Pollution Prevention (ISPP) Certificate;</li> <li>discharge of sewage into the sea is prohibited, except when the vessel has in operation an approved sewage treatment plant or when the ship is discharging comminuted and disinfected sewage using an approved system at a distance of more than 3 nm from the nearest land; and</li> <li>sewage which is not comminuted or disinfected has to be discharged at a distance of more than 12 nm from the nearest land.</li> </ul>	Contractor to provide MARPOL and ISPP certification and maintain vessel discharge log book for MODU and vessels.	Contractor	Pre-mobilisation, during drilling campaign and subsea facilities installation.	MARPOL certification, ISPP certificate and vessel discharges log book
Impacts of putrescible (food) wastes on marine water quality and localised adverse impacts to marine biota	<p>The MODU and support vessels will comply with applicable MARPOL 73/78 Annex V requirements (Reg 3), including:</p> <ul style="list-style-type: none"> <li>Waste discharged by the MODU is passed through a grinder so that it is capable of passing through a screen with no opening wider than 25 millimetres: this applies to support vessels within the 5 NM safety exclusion zone.</li> </ul>	Contractor to provide MARPOL certification and maintain vessel discharge log book for MODU and vessels.	Contractor	Pre-mobilisation, during drilling campaign and subsea facilities installation	MARPOL certification and vessel discharges log book

Potential Impact / Risk	Mitigation Measures	Management Action	Responsible	Implementation Schedule	Reporting
Impacts of bilge water and deck drainage on marine water quality and localised adverse impacts to marine biota	<p>The MODU and support vessels will comply with applicable MARPOL 73/78 Annex I requirements (Reg. 7, 14 and 17) including:</p> <ul style="list-style-type: none"> <li>vessels will have valid International Oil Pollution Prevention (IOPP) certificate, as appropriate to vessel class;</li> <li>bilge water contaminated with hydrocarbons must be contained and disposed of onshore, unless the oil in water (OIW) content is within 15 ppm and an IMO approved oil/water separator (OWS) (as required by vessel class) is used to treat the bilge water;</li> <li>vessels will maintain an oil record book; and</li> <li>no direct overboard drainage from sludge/drain/dirty oil/bilge water collecting tanks.</li> </ul>	Contractor to provide MARPOL certification and maintain vessel discharge log/oil record book for MODU and vessels.	Contractor	Pre-mobilisation, during drilling campaign and subsea facilities installation	MARPOL certification, (IOPP) Certificate and vessel discharges log book (oil record book)
Impacts of drill cuttings and drilling muds on marine water quality	<ul style="list-style-type: none"> <li>Drill cuttings with NADF will be recycled and treated Maximum residual Non Aqueous Phase Drilling Fluid will be 6.9% on wet cuttings.</li> <li>Where cuttings are discharged overboard, they will be discharged 15m below the water line.</li> <li>All chemicals selected for low toxicity where possible and subject to internal justification.</li> <li>NADF shall only be used where seawater and sweeps or WBDF cannot provide the required technical specifications.</li> <li>All residual NADF returned to a shore for reconditioning, re-use or disposal. No bulk discharge of NADF drilling fluids will take place.</li> </ul>	Drill cuttings with NADF will be recycled and treated Maximum residual Non Aqueous Phase Drilling Fluid will be 6.9% on wet cuttings.	PCML / Contractor	Pre-mobilisation and during drilling campaign.	Chemical use and approval records.
		NADF shall only be used where seawater and sweeps or WBDF cannot provide the required technical specifications. All chemicals selected for low toxicity where possible and subject to internal justification.	PCML	Pre-mobilisation and during drilling campaign	Chemical use and approval records.
		All residual NADF returned to a shore for reconditioning, re-use or disposal. No bulk discharge of NADF drilling fluids will take place. All mud use and discharge to be recorded.	PCML	Pre-mobilisation and during drilling campaign	Chemical use and approval records.

Potential Impact / Risk	Mitigation Measures	Management Action	Responsible	Implementation Schedule	Reporting
Impacts due to non-hazardous and hazardous waste generation and disposal from vessels.	<p>The MODU and support vessels will comply with applicable MARPOL 73/78 Annex V requirements (Reg 10.2 and 10.3) including:</p> <ul style="list-style-type: none"> <li>• Vessel Waste Management Plan (or equivalent) must contain as a minimum: <ul style="list-style-type: none"> <li>- Waste handling equipment, waste storage containers, and spill response equipment appropriate to the type and volume of waste will be provided at waste storage areas.</li> <li>- All hazardous wastes will be segregated prior to onshore disposal.</li> </ul> </li> <li>• General waste (excluding food) will not be disposed of to sea.</li> <li>• Vessels &gt;400 tonnes (or certified for &gt;15 persons on-board) will have a garbage record book.</li> <li>• Where safe and practicable to do so, lost objects will be recovered</li> <li>• Any accidental release of foreign material to the marine environment that does not meet MARPOL discharge standards will be reported if required to relevant Authorities.</li> </ul>	<p>Contractor Waste Management plan and contractor to maintain garbage record book for MODU and vessels.</p> <p>Reporting of any accidental release of wastes to the marine environment</p> <p>The Waste Management Plan will be finalised after selection of the contractors and will be provided to ECD prior to drilling.</p>	Contractor	Pre-mobilisation, during drilling campaign and subsea facilities installation	Contractor Waste Management Plan, garbage record book. Report of any accidental release of wastes
Introduction of invasive marine species to the marine environment	<ul style="list-style-type: none"> <li>• MODU and vessels to have valid Fouling Coating Certificates.</li> <li>• MODU will not enter nearshore waters in Myanmar.</li> </ul>	MODU and vessels maintain valid Fouling Coating Certificates.	PCML and Contractor	Pre-mobilisation	MODU/ Vessel FCC certification
		Vessels to maintain records of ballast water uptake and discharge locations.		Pre-mobilisation, during drilling campaign and subsea facilities installation	Contractor ballast water log book
		MODU not to enter nearshore waters		During the drilling campaign	MODU log book
Impacts on Fishing Activity from Physical	A 5 NM radius safety exclusion zone will be maintained around the MODU as required. The Vessel Master will endeavour to manage vessel access and activities within this zone.	Implementation of 5 NM safety exclusion zone.	Contractor	During drilling campaign	Vessel communications log

Potential Impact/ Risk	Mitigation Measures	Management Action	Responsible	Implementation Schedule	Reporting
Presence of MODU and Vessels and Unplanned Collisions	<p>MODU and support vessels will comply with the following:</p> <ul style="list-style-type: none"> <li>international regulations for collision avoidance (COLREGs 1972) including maintaining look-outs (e.g. visual, hearing, radar etc.), proceeding at safe speeds, assessing risk of collision and taking action to avoid collision (monitoring radar).</li> <li>Navigation light display requirements, including visibility, light position/shape appropriate to activity.</li> <li>Maintenance of minimum safe manning levels.</li> <li>Maintenance of navigation equipment in efficient working order (compass/radar / communications).</li> <li>Navigational systems and equipment as specified in Regulation 19 of Chapter V of SOLAS.</li> <li>AIS installed as required by vessel class in accordance with Regulation 19 of Chapter V of SOLAS.</li> </ul>	PCML inspection to confirm implementation of relevant navigational and communication requirements for MODU and support vessels operating at sea.	Contractor	Pre-mobilisation, during drilling campaign and subsea facilities installation	MODU/vessel certification and vessel log books. PCML inspection report.
	Myanmar speaking (crew members) available on board the MODU.	Contractor to ensure the provision of Myanmar speaking crew on board the MODU.	Contractor	During drilling campaign and subsea facilities installation	Vessel log books/contact with fishermen.
	Timely sharing of information (in the form of a Notice to Mariners).	Notice to Mariners issued prior to operations commencing via the DoF	PCML	Pre-mobilisation	Notice to Mariners
	Disclosure and implementation of the Grievance Mechanism for the Project and timely investigation of any grievances.	PCML to disclose Grievance Mechanism to maritime authorities, fisheries authorities, fishing communities and other marine users.	PCML	Pre-mobilisation, during drilling campaign and subsea facilities installation	PCML's notice released to relevant stakeholders.
Impacts from underwater sound generation on marine fauna.	Trained observer utilised during VSP operations to monitor and record marine mammal observations.	Trained observer on board maintaining watch during daylight hours	Contractor	During VSP operations	Copy of personnel training records for marine mammal observation requirements.

Potential Impact / Risk	Mitigation Measures	Management Action	Responsible	Implementation Schedule	Reporting
	<p>Visual check for marine mammals and turtles within 1 km (observation zone) of the MODU or vessel for 20 minutes prior to commencing VSP operations.</p> <p>Visual inspections of the observation zone (1 km) must be maintained continuously during VSP to identify if there are any marine mammals or turtles present.</p>	<p>Contractor to ensure that visual inspection is undertaken prior to VSP operation. Visual inspection undertaken with 1km radius.</p>			
	<p>Undertake a 20 minute soft-start before testing of all airguns at full power.</p> <p>Ensure shut down if marine mammal, or turtle within 500 m of the array and only continue 30 minutes after last sighting and if mammals outside the 500 m zone.</p>	<p>Soft start - build up power for VSP slowly to give adequate time for marine fauna to leave the area (20 minutes at minimum). If a whale or marine turtle is sighted within the shut-down zone (500 m), the acoustic source should be shut down completely.</p> <p>Soft start procedures should only resume after the whale(s) or turtle(s) has been observed to move outside the shutdown zone (500 m) or when 30 minutes have lapsed since the last sighting.</p>	Contractor	During operations VSP	Marine mammal observation report
	<p>During the pre-start meeting, alert all crews to immediately report to the trained observer when they observe any marine mammals or turtles during and prior to the activity. The pre-start meeting will cover the likelihood of whale observations and required actions if they are sighted.</p>	<p>Contractor to ensure crew instructed to report any marine mammal, whale shark or turtle sighting to the trained observer.</p>			
	<p>All sightings of marine mammals / marine turtles / whale sharks must be recorded and reported to MONREC following completion of the drilling campaign.</p>	<p>All sightings of marine mammals / marine turtles / whale sharks must be recorded during the VSP. Details to be recorded shall include the estimated distance to the animal, and where possible, the species, number of animals, direction of movement (if any) and behavioural activity.</p> <p>All information on marine fauna sightings will be reported to MONREC following completion of the drilling campaign.</p>	Contractor	During operations VSP	Marine Fauna, (marine mammal, turtles, whale sharks) observation
			PCML	After completion of the drilling campaign	Report/ Monitoring Report

Potential Impact / Risk	Mitigation Measures	Management Action	Responsible	Implementation Schedule	Reporting
Impacts from unplanned spills on marine fauna and habitats	MODU and support vessels operate in compliance with MARPOL 73/78 Annex I (Reg 7, 17 and 37) including: - Vessels will hold a valid International Oil Pollution Prevention (IOPP) certificate. - Vessels will maintain an oil record book. SOPEP to be developed as appropriate to class	Contractor to provide MARPOL certification and maintain oil record book for MODU and vessels. SOPEP available.	Contractor	Pre-mobilisation	MARPOL certification, (IOPP) Certificate and vessel discharges log book (oil record book). SOPEP
	Implement procedures for chemical handling and storage on board MODU and vessels including: Chemicals and/or hydrocarbons will be handled and stored in compliance with the SDSs and to prevent release to the marine environment.	Appropriate storage and handling of chemicals based on the SDSs.	Contractor	Pre-mobilisation, during drilling campaign, subsea facilities installation	Any spills to be reported and response measures implemented where appropriate. Crew induction training records.
	Spill response kits located in proximity to chemical and hydrocarbon storage/bunkering areas and appropriately stocked/replenished as required.	Contractor to provide and replenish spill response kits adjacent to chemical and hydrocarbon storage/bunkering areas.	Contractor	Pre-mobilisation, During drilling campaign	N/A
	Crew trained in spill prevention and use of spill response equipment.	Crew induction to include spill prevention and use of spill response equipment.	Contractor	Pre-mobilisation, during drilling campaign, subsea facilities installation	Crew induction training records
	Any unplanned hydrocarbon spills from vessel collision to be reported to MOGE to notify relevant third parties.	Any spills to be reported including details of any spill response measures implemented.	PCML	During drilling campaign and subsea facilities installation	Spill reporting
	PCML OPEP developed and implemented in the event of a spill resulting from a vessel collision beyond the capability of the SOPEP	OPEP available on board MODU.	PCML	Pre-mobilisation, during drilling campaign and subsea facilities installation	OPEP
	A 5 NM radius safety exclusion zone will be maintained around the MODU as required. The Vessel Master will endeavour to manage vessel access and activities within this zone.	Implementation of 5 NM safety exclusion zone.	Contractor	During drilling campaign and installation of subsea facilities and installation of subsea facilities	Vessel communications log. Photo log

Potential Impact / Risk	Mitigation Measures	Management Action	Responsible	Implementation Schedule	Reporting
	MODU and vessels will comply with the international regulations for collision avoidance.	PCML inspection to confirm implementation of relevant navigational and communication requirements for MODU and vessels operating at sea.	Contractor	Pre-mobilisation, during drilling campaign and installation of subsea facilities	MODU/vessel certification and vessel log books.
	Myanmar speaking (crew members) available on board the MODU	Contractor to ensure the provision of Myanmar speaking crew on board the MODU.	Contractor	During drilling campaign and installation of subsea facilities	Hiring certificates, contracts.
Impacts from Routine Operational Discharges	<ul style="list-style-type: none"> <li>Discharges of oil to the sea in produced water will meet, as a minimum, the National Environmental Quality (Emissions) Guidelines. Oil and grease content will not exceed 42 mg/l daily maximum; 29 mg/l monthly average.</li> <li>Adequate sampling points will be provided to check oil in water content. Chemical selection and use will be risk based, so as to minimize the discharge of hazardous chemicals to sea.</li> </ul>	Oil and grease content will not exceed 42 mg/l daily maximum; 29 mg/l monthly average.	PCML	During drilling campaign and installation of subsea facilities	Aqueous Discharges Report
		Adequate sampling points will be provided to check oil in water content. Chemical selection and use will be risk based, so as to minimize the discharge of hazardous chemicals to sea.	PCML	During drilling campaign and installation of subsea facilities	Aqueous Discharges Report
Impacts to Cultural Heritage	Since it is an offence to damage or destroy ancient objects or monuments whether known or unknown or transport ancient objects to outside of Myanmar (refer Protection and Preservation of Antique Object Law and Protection and Preservation of Ancient Monument Law), discoveries or finds of ancient objects shall be reported and relevant laws followed.	Discovery of any ancient objects will be reported to Administrative Office and Department of Archaeology	Contractor and PCML	During drilling campaign and installation of subsea facilities	Notification of suspected Ancient Object find.
General	Compliance with all laws listed in Table 3.3 of the EIA Report.	PCML will operate in compliance with all law listed in Table 3.1 of the EIA Report	PCML	Throughout Project	N/A
	Undertake environmental and social monitoring	PCML will undertake monitoring as mentioned in the management plan sections of the EIA Report	PCML / Contractor	Throughout Project	Environmental Monitoring Report
	Submit Environmental Monitoring Report	PCML will submit the Environmental Monitoring Report to ECD every 6 months (i.e., after the Project has completed)	PCML	After survey	Environmental Monitoring Report

## 8.5.1

### *Waste Management Plan*

#### *Objectives*

A waste management plan will be prepared to outline the methods and practices to meet the requirements of this EIA and applicable regulations.

The objectives of the plan are to:

- i. ensure waste is managed in a controlled and appropriate manner in compliance with statutory requirements concerning the management of waste
- ii. ensure resources are recovered where possible and safe to do so, for re-use and recycling
- iii. detail responsibilities, both offshore and onshore (supply bases) for waste management
- iv. outline the appropriate handling, storage, transportation and disposal of waste
- v. describe the recording and tracking for all wastes generated

#### *Legal Requirements*

The WMP will be completed in accordance with MARPOL requirements and National Emission (Quality) Guideline by MONREC.

#### *Implementation Schedule*

The WMP will be enacted throughout the life of the Project (7-8 months).

#### *Management Actions*

PCML's contractors for the infill drilling will develop a Waste Management Plan (WMP). WMPs are guides for reducing, handling, and disposing of waste during the Operation of the Project. The management actions for WMP are provided in *Table 8.3*.

The Waste Management Plan is based on the MARPOL 73/78 Annex V applicable to garbage generated on ships. Drilling rigs and production platforms are included in this definition of "ships", and aims to reduce the amount of garbage – both plastics and other persistent wastes – that "ships" dump into the oceans. A simplified overview of the discharge provisions of the revised MARPOL Annex V (resolution MEPC. 201(62) which entered into force on 1 January 2013 is mentioned in **Appendix G**.

The storage and minimisation of solid wastes will be conducted as per the waste stream information presented in **Appendix E**.

#### *Monitoring Plans*

PCML will submit an Environmental Monitoring Report, to MOGE and MONREC every 6 months as per the requirements of the EIA Procedure.

Monitoring will be required in order to demonstrate compliance with some of PCML’s project commitments (compliance monitoring), and will also provide verification of the overall design and effectiveness of the implemented control measures. The key objectives of PCML’s monitoring activities are as follows:

- To monitor discharges and emissions to ensure compliance with PCML’s environmental commitments;
- To provide an early indication that any of the environmental control measures or practices are failing to achieve acceptable standards; and
- To provide a basis for continuous review and improvements to the operational monitoring programme.
- The Environmental Monitoring Report will include the reporting listed in *Table 8.4*.

**Table 8.4** *Environmental Monitoring Recording*

Project Activity/ Environmental Aspect	Monitoring Measures	Reporting	Frequency
Waste Management	Amounts and types of waste produced and how it is discharged / disposed of.	Month waste inventory – Environmental Monitoring Report	Monthly during the drilling

*Projected Budgets and Responsibilities*

The budget for the WMP is within the operational cost of the Project (*Section 8.3*).

Resources include the appropriate human resources and specialised skills. The roles and responsibilities for environmental and social management and implementation of the EMP are outlined in *Table 8.5*.

**Table 8.5** *Environmental & Social Management Organisation Roles and Responsibilities*

Position	Responsibility
<b>Office-based Personnel</b>	
	<ul style="list-style-type: none"> <li>• Oversee the implementation of infill drilling activities undertaken as per this EMP.</li> </ul>
PCML Exploration Manager	<ul style="list-style-type: none"> <li>• Provide sufficient resources to implement the management measures in this EMP.</li> <li>• Relevant personnel will be provided with an environmental induction at the start of the infill drilling.</li> </ul>

Position		Responsibility
PCML HSE Manager		<ul style="list-style-type: none"> <li>• Prepare environmental component of relevant Induction Package.</li> <li>• Assist with the review, investigation and reporting of environmental incidents.</li> <li>• Oversee environmental monitoring and inspections/audits undertaken as per the requirements of this EMP.</li> <li>• Liaise with relevant regulatory authorities as required.</li> <li>• Assist in preparation of external regulatory reports required, in line with environmental approval requirements and PCML incident reporting procedures.</li> <li>• Monitor and close out corrective actions identified during environmental monitoring or inspections.</li> </ul>
Geophysical Operations Manager		<ul style="list-style-type: none"> <li>• Operational and technical aspects of the Project including contractor supervision during operations.</li> </ul>
Geophysical Operations Leader	HSE	<ul style="list-style-type: none"> <li>• Advise and monitor on implementation of HSE and Social (Fisheries) protection measures.</li> </ul>
PCML Corporate Affairs Adviser		<ul style="list-style-type: none"> <li>• Implement the SEP.</li> <li>• Report on stakeholder consultation.</li> <li>• Ensure ongoing liaison as required.</li> </ul>
MODU-based Personnel		
PCML HSE Adviser Offshore		<ul style="list-style-type: none"> <li>• Oversee that the activities are undertaken as outlined in this EMP.</li> <li>• Support the Exploration Manager to ensure the monitoring requirements are met and the EMP is implemented during the infill drilling.</li> <li>• Ensure environmental incidents are reported.</li> <li>• Ensure periodic environmental inspections are completed</li> </ul>
Vessel Master		<ul style="list-style-type: none"> <li>• Oversee the vessel management system and procedures are implemented.</li> <li>• Ensure that personnel commencing work on the vessel receive an environmental induction and are competent to undertake the work they have been assigned.</li> <li>• Ensure SOPEP drills are conducted as per the vessel's schedule.</li> <li>• Ensure the vessel Emergency Response Team has been given sufficient training to implement the SOPEP.</li> <li>• Ensure any environmental incidents or breaches of this EMP are reported immediately to the HSE Adviser Offshore.</li> </ul>

PCML will work with and coordinate with the contractors to ensure that all contractors are aware of and competent with respect to:

- Environmental and social impacts that could potentially arise from their activities;
- Necessity of conforming to the requirements of the EIA and EMP (i.e. implementing the control and mitigation measures) in order to avoid or reduce those impacts.
- Roles and responsibilities to achieve that conformity, including with regard to change management and emergency response.

## 8.5.2 *Sediment and Drill Cuttings*

### *Objectives*

The objectives of this plan are to:

- Ensure drill cuttings and fluids are managed in a controlled and appropriate manner consistent with Woodside's Health, Safety and Environment (HSE) Policy, and performance standards;
- Comply with all statutory and contractual requirements concerning the management of waste; and
- Ensure appropriate monitoring occurs for drill cuttings and fluids.

### *Legal Requirements*

*Myanmar National Environmental Quality (Emission) Guideline 2015* includes discharge standards for drill cuttings and fluids they require the treatment and disposal in accordance with applicable standards provided in the IFC EHS Onshore Oil and Gas Development guideline.

### *Implementation Schedule*

Drill cuttings and drill fluids actions will be implemented for the duration of the proposed drilling program.

### *Management Actions*

The management actions for sediment and drill cuttings are provided in *Table 8.3*. The NADF Management Guideline is provided in **Appendix H**.

The WDBF and cuttings will be re-injected where possible however the majority of WDBF cuttings will be discharged to sea. The discharge will be in line with Myanmar Environmental Emissions Guidelines and IFC EHS Guidelines for Offshore Oil and Gas Developments (2015), namely;

- Mercury 1 mg/kg dry weight in stock barite.
- Cadmium 3 mg/kg dry weight in stock barite.

- Maximum chloride concentration must be less than four times ambient concentration of fresh or brackish receiving water.
- Discharge via a caisson at least 15 meters below sea surface.

Where NADF are used, cuttings will be processed on board the MODU prior to discharge to the marine environment in line with Myanmar Environmental Emissions Guidelines and IFC EHS Guidelines for Offshore Oil and Gas Developments (2015); namely:

- Oil concentration lower than 6.9% by weight on wet cuttings (as per IFC 2015 EHS Guidelines).
- Mercury maximum 1 mg/kg dry weight in stock barite.
- Cadmium maximum 3 mg/kg dry weight in stock barite.
- Discharge via a caisson at least 15 metres below sea surface.

#### *Monitoring Plans*

The Environmental Monitoring Report will include the items listed in *Table 8.6* for sediment and communities.

**Table 8.6** *Environmental Monitoring Recording*

Project Environmental Aspect	Activity/ Monitoring Measures	Reporting
Effluent Monitoring	Discharge The amount and type of drilling fluid discharged will be tested to ensure compliance with the EQEG Standards for NADF and WBDF discharges.	Post drilling environmental monitoring report
Marine Sediments	Marine sediments quality will be monitored for particle size, hydrocarbon content, metals, and nutrients as per the same parameters mentioned in Section 5.2.1. Four locations around the platform will be monitored no more than two months after drilling activities. If the discharges are in compliance with baseline conditions and EQEG standards; the frequency of monitoring will be reduced.	Post drilling environmental monitoring report

#### *Projected Budgets and Responsibilities*

The budget for the sediment and drilling cuttings is within the operational cost of the Project and also includes additional monitoring post drilling which will cost around 150,000 USD (*Section 8.3*).

The roles and responsibilities for environmental and social management and implementation of the EMP are outlined in *Table 8.5*.

### 8.5.3 *Biodiversity Management Plan*

#### *Objectives*

The Biodiversity Management Plan (BMP) is developed to maintain or improve biodiversity values during the Project, and to determine risks and impacts prior to the commencement of activities. The BMP should focus on identifying, evaluating, and conserving the relevant aspects of biodiversity, and should serve to avoid and mitigate impacts to biodiversity.

#### *Legal Requirements*

The biodiversity management plan will be undertaken in accordance with the IFC EHS Onshore Oil and Gas Development guideline as well as legislation listed in *Table 3.2* of the EIA Report.

#### *Implementation Schedule*

Biodiversity actions will be implemented for the duration of the proposed drilling program.

#### *Management Actions*

The management actions for biodiversity are provided in *Table 8.3*.

#### *Monitoring Plans*

The Environmental Monitoring Report will include the items listed in *Table 8.7* for biodiversity.

**Table 8.7 *Environmental Monitoring Recording***

Project Activity/ Environmental Aspect	Monitoring Measures	Reporting	Frequency
Marine mammal and fauna observers	Any marine mammals or turtles observed during the activity will be recorded.	Post drilling environmental monitoring report	During Vertical Seismic Profiling activity
Marine Benthic Communities and Organisms (Seabed)	Marine macrobenthos will be sampled for species and families in sediment samples as per the same methodology mentioned in Section 5.2.1.	Post drilling environmental monitoring report	Once within 2 months of drilling activity finishing

### *Projected Budgets and Responsibilities*

The budget for the biodiversity is within the operational cost of the Project and also includes additional monitoring post drilling which will cost around 150,000 USD (*Section 8.3*).

The roles and responsibilities for environmental and social management and implementation of the EMP are outlined in *Table 8.5*.

#### **8.5.4 *Emergency Response Plans (including Medical Response)***

##### *Objectives*

PCML, through the drilling contractor's HSE Plan, will further develop plans and procedures to identify the potential for and response to environmental accidents and health and safety emergency situations and for preventing and mitigating any potentially adverse environmental and social impacts that may arise.

PCML has a number of Emergency Response Plans (ERP) in place, which detail the actions and resources available in the event of various emergency scenarios. Emergency Response Procedures have been drafted for the proposed infill drilling in Myanmar and is provided in **Appendix I**. The ERPs contain instructions for support relating to the following, amongst others:

- Medical emergencies including medevac procedures.
- Search and rescue - includes man-overboard procedures and helicopter ditching.
- Heavy weather/cyclone plan.
- Hazardous material spill response plans.

##### *Legal Requirements*

The Management Plans will be completed in accordance with MARPOL requirements and National Emission (Quality) Guideline by MONREC.

##### *Implementation Schedule*

The ERP will be enacted throughout the life of the Project (7-8 months).

##### *Management Actions*

The management actions of the ERP are provided in *Table 8.3*. The Emergency Response Procedures is provided in **Appendix I** and the contents is summarised below.

##### Vessel Emergency Procedure (including Spill Response)

Spill incidents are classified into those events that can be contained onboard the MOGE and those that can't. The range of onboard events can include liquid and bulk solid loss of containment. Additionally, generation of gas through chemical interaction is another consideration.

All principal spill response responsibilities, consistent with the rig's Emergency Response Organization hierarchy, are shown in the *Figure 8.1*. Once a spill has been identified, the relevant MSDS shall be referred to so that the risks can be assessed accurately and precise information is identified.

The Emergency Response Procedures for the rig is provided in **Appendix I**.

#### Vencedor Medical Evacuation Response Plan (MERP)

The medical case assessment and management protocol is provided in *Figure 8.2*. The Medical Emergency Response Plan (MERP) for the rig is provided in **Appendix J**.

#### Myanmar Operation Cyclone / Adverse Weather Response Plan

The General Plan for PCML operations outlines the contingency measures required when conducting offshore (off the Coast of the Myanmar) and onshore operations in areas affected by Tropical Revolving Storms (TRS). The measures are prescribed in decreasing order of priority:

- To ensure the safety of personnel
- To minimize damage to the facilities
- To permit the continuation of production as safety can be maintained.

The intention of the Plan is to coordinate the response in the event of a TRS.

The Cyclone and Adverse Weather Management Plans are provided in **Appendix K** and **Appendix L**, respectively.

Figure 8.1 Spill Response Chart

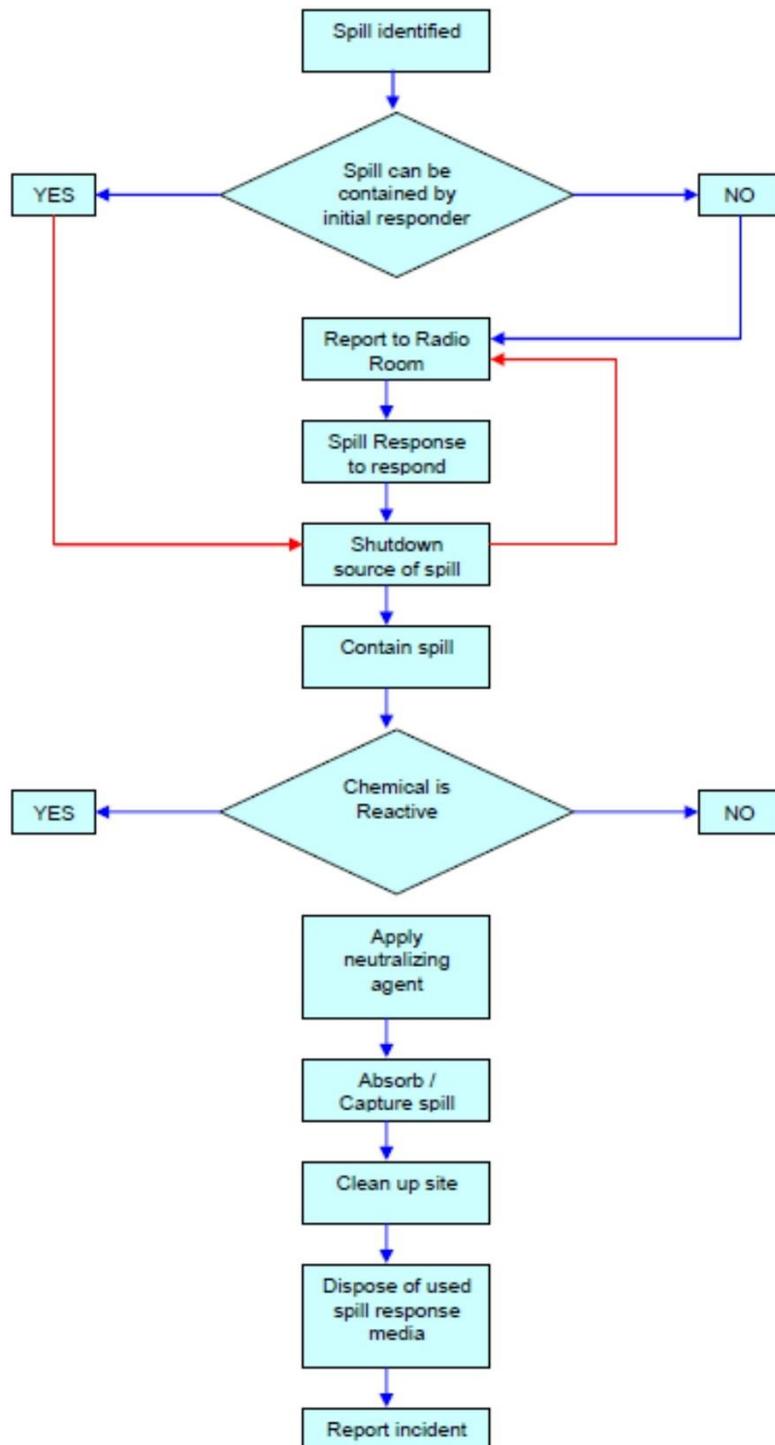
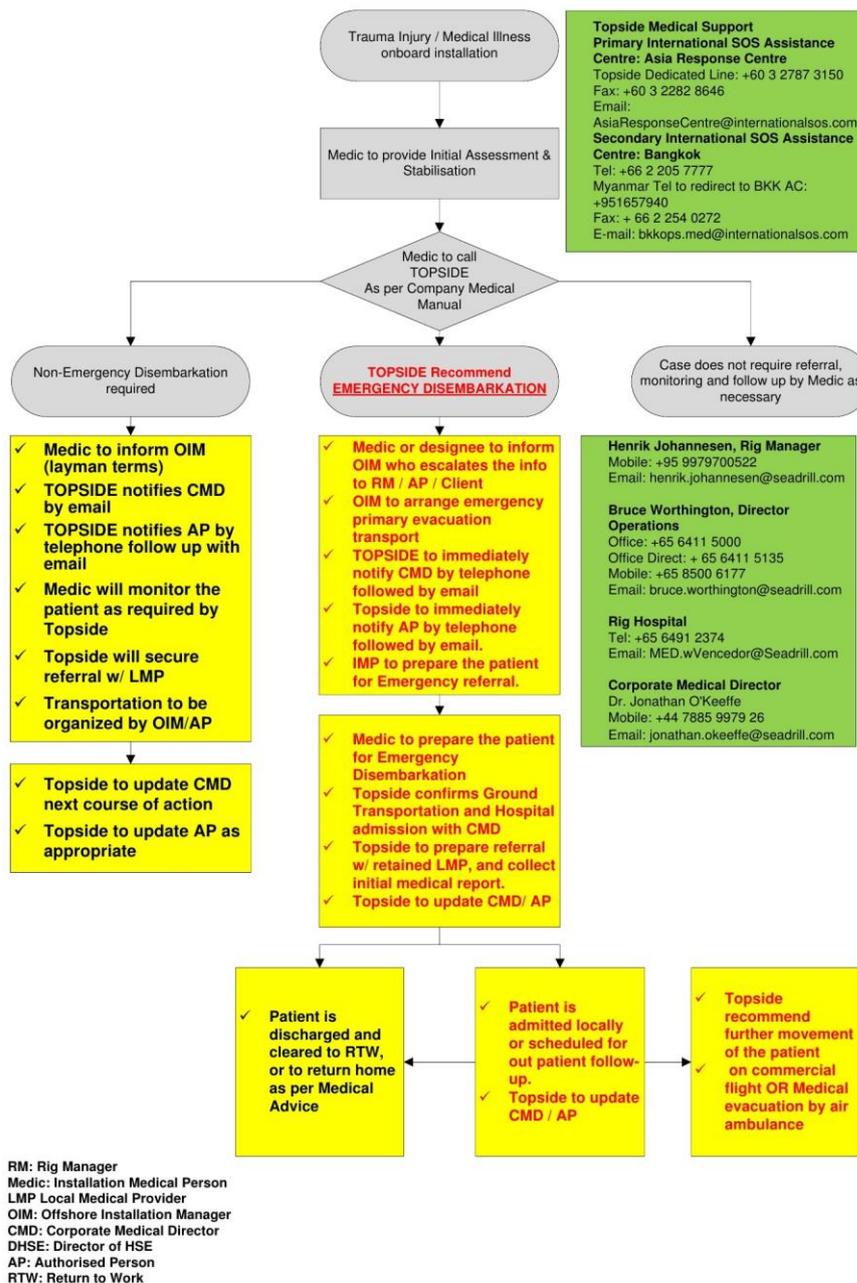


Figure 8.2 Medical Case Assessment and Management Protocol

1. MEDICAL CASE ASSESSMENT & MANAGEMENT PROTOCOL



Monitoring Plans

PCML will submit an Environmental Monitoring Report, to MOGE and MONREC every 6 months as per the requirements of the EIA Procedure.

Monitoring will be required in order to demonstrate compliance with some of PCML’s project commitments (compliance monitoring), and will also provide verification of the overall design and effectiveness of the implemented control measures. The key objectives of PCML’s monitoring activities are as follows:

- To monitor discharges and emissions to ensure compliance with PCML’s environmental commitments;

- To provide an early indication that any of the environmental control measures or practices are failing to achieve acceptable standards; and
- To provide a basis for continuous review and improvements to the operational monitoring programme.

The Environmental Monitoring Report will include the items listed in *Table 8.8*. Given the limited duration of the Project (7-8 months) and lack of significant impacts, no additional monitoring is considered to be required for the Project.

**Table 8.8** *Environmental Monitoring Recording*

Project Environmental Aspect	Activity/ Monitoring Measures	Reporting
Incident reporting	Details of any environment or social Incidents	Incident report forms
Accidental and Leaks	Releases Safety record	Safety record
Non-Compliance Reporting	Non-Compliance with EMP	Inspection check sheets

*Projected Budgets and Responsibilities*

The budget for the waste management is within the operational cost of the Project. PCML have additional third party contracts for oil spill clean-up and management.

Resources include the appropriate human resources and specialised skills. The roles and responsibilities for environmental and social management and implementation of the EMP are outlined in *Table 8.5*.

**8.5.5** *Oil Spill Response Plan*

The Oil Spill Response Plans for the Project are provided in **Appendix M** and summarised below.

*Objectives*

The primary purpose of this plan is to establish effective emergency procedures to respond to oil spill affecting the operations of PCML to:

- Ensure minimal adverse effect to the environment,
- Minimize the spread of hydrocarbons,
- Provide the tools to identify the most appropriate response tactics,
- Protect sensitive areas and

- Mitigate negative effects.

The Oil Spill Response Plan:

- Describes the expectations, scope and content of the oil spill response and management systems for PCML
- Provides guidance to the PCML Emergency Management Team (EMT) for the response to and control of a hydrocarbon spill associated with the operations in PCML
- Identifies the way in which the overall response in PCML will be coordinated
- Sets out roles and responsibilities of key personnel
- Identifies internal and external sources of support, assistance and resources to aid response
- Describe local response strategies and organisations and
- Defines internal and external notification procedures, response organisations, resources and personnel

#### *Legal Requirements*

Oil Spill Response Plan (OSRP) has been prepared in accordance with the international best practice guidelines of the International Maritime Organization (IMO) and International Petroleum Industry Environmental conservation Association (IPIECA). Myanmar requirements and regulations are also taken into account. The OSRP has been developed taking into account the oil spill risk profile, Tier 1, Tier 2 and Tier 3 response arrangements, and in accordance with national and international legislative requirements.

#### *Implementation Schedule*

The ERP will be enacted throughout the life of the Project (7-8 months).

#### *Management Actions*

The management actions of the ERP are provided in *Table 8.3*.

This Oil Spill Response Plan is used mainly for condensate or diesel spill incident caused by PCML Operations within the area of Yetagun field where PCML is the operator of the Production Sharing Contract (PSC). The scope of the plan covers all installations and facilities managed by and/ or operated for PCML including but not limited to the drilling rig, wellhead platforms, FSO, supply vessels and infield pipeline. It focuses primarily on the response to the condensate or diesel spill.

Major environmental impacts from oil spills generally occur in near shore coastal regions where extensive marine biota exists. Although the risk of a

large-scale accidental oil spills is extremely low at the Yetagun field, it is necessary to identify possible environmental impacts and required mitigation measures in the event of such an incident. The most likely sources of spills are: fuel transfer and storage, well testing, condensate transfer, FSO related spills, maintenance, fire or explosion and shipping accident.

It is not possible to describe all oil spill scenarios; therefore, this OSRP sorts out the most important situations. Oil could be spilled or released from the Yetagun Field as a result of accidents, equipment failures or procedural irregularities with surface or subsurface equipment.

*Monitoring Plans*

PCML will submit an Environmental Monitoring Report, to MOGE and MONREC every 6 months as per the requirements of the EIA Procedure.

Monitoring will be required in order to demonstrate compliance with some of PCML’s project commitments (compliance monitoring), and will also provide verification of the overall design and effectiveness of the implemented control measures. The key objectives of PCML’s monitoring activities are as follows:

- To monitor discharges and emissions to ensure compliance with PCML’s environmental commitments;
- To provide an early indication that any of the environmental control measures or practices are failing to achieve acceptable standards; and
- To provide a basis for continuous review and improvements to the operational monitoring programme.

The Environmental Monitoring Report will include the items listed in *Table 8.9*. Given the limited duration of the Project (7-8 months) and lack of significant impacts, no additional monitoring is considered to be required for the Project.

**Table 8.9** *Environmental Monitoring Recording*

Project Environmental Aspect	Activity/ Monitoring Measures	Reporting
Incident reporting	Details of any hydrocarbon spills.	Incident report forms

*Projected Budgets and Responsibilities*

The budget for the waste management is within the operational cost of the Project. PCML have additional third party contracts for oil spill clean-up and management.

Resources include the appropriate human resources and specialised skills. The roles and responsibilities for environmental and social management and implementation of the EMP are outlined in *Table 8.5*.

**9.1 METHODOLOGY AND APPROACH****9.1.1 Purpose of the Consultation**

The specific objectives for stakeholder engagement were to:

- Inform relevant stakeholders about the project and its planned Project activities;
- Identify stakeholders and communities potentially affected by Project activities;
- Gather baseline information on the social and biological environment; and,
- Engage with potentially affected groups to understand potential Project impacts, perceptions and concerns and discuss appropriate mitigation measures.

**9.1.2 Identification of Relevant Stakeholders and Potential Issues**

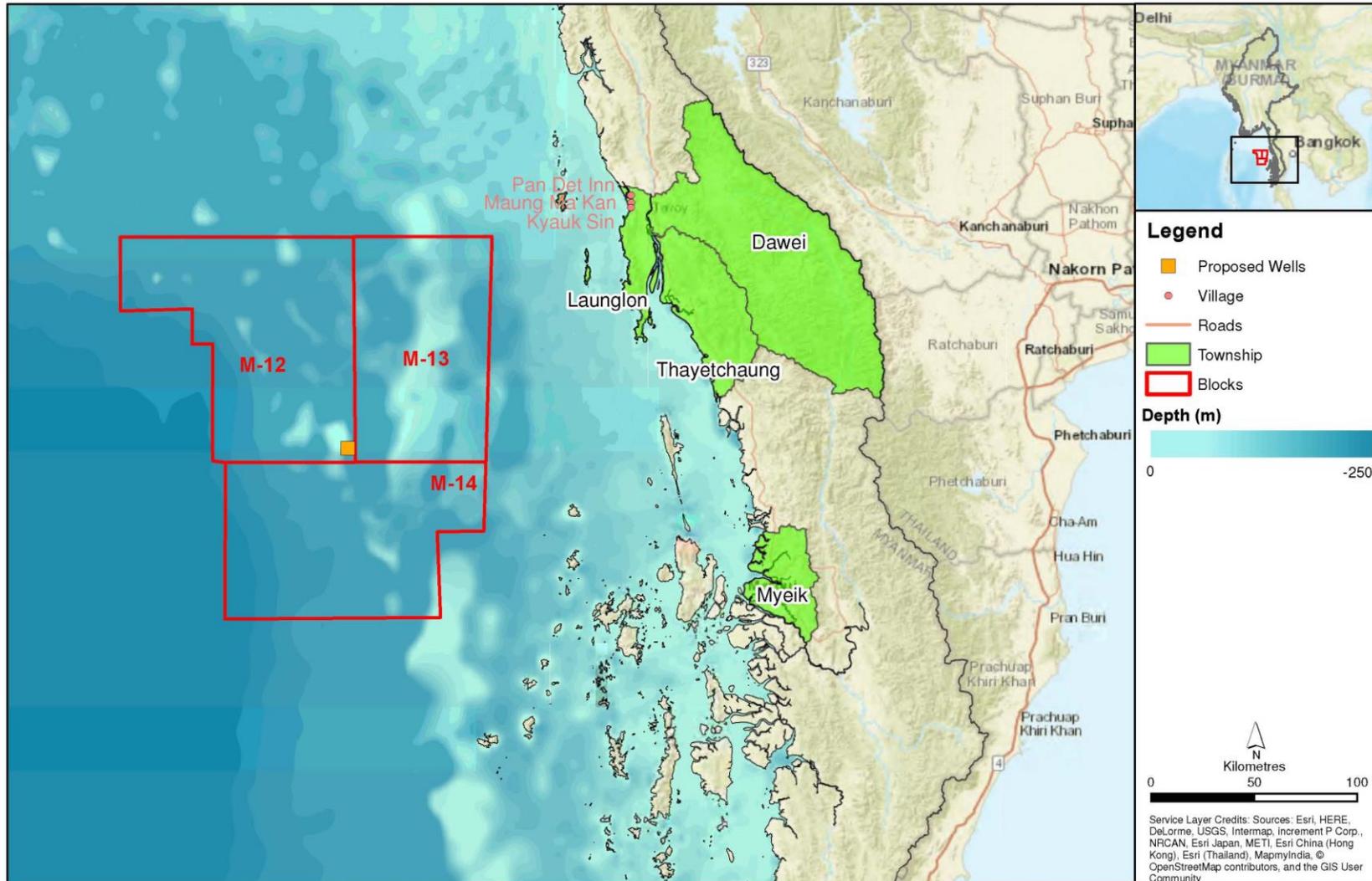
The process of identifying potentially affected stakeholders started with scoping which is conducted to identify relevant issues and select the townships and villages potentially impacted. The scoping exercise involved both desk-based and preliminary consultation with a number of stakeholders including government authorities.

ERM's previous experience of stakeholder engagement in the Region was utilised to inform the stakeholder selection. This information is based on discussions with General Administrative Department (GAD) representatives as well as previous project experience.

*Figure 9.1* shows the location of the townships and village tracts visited for the public consultation.

Stakeholder engagement is an ongoing process and as such new stakeholders may emerge as the Project progresses. This will be captured and inform ongoing stakeholder engagement activity that will be undertaken for the Project.

Figure 9.1 Townships and Villages Consulted



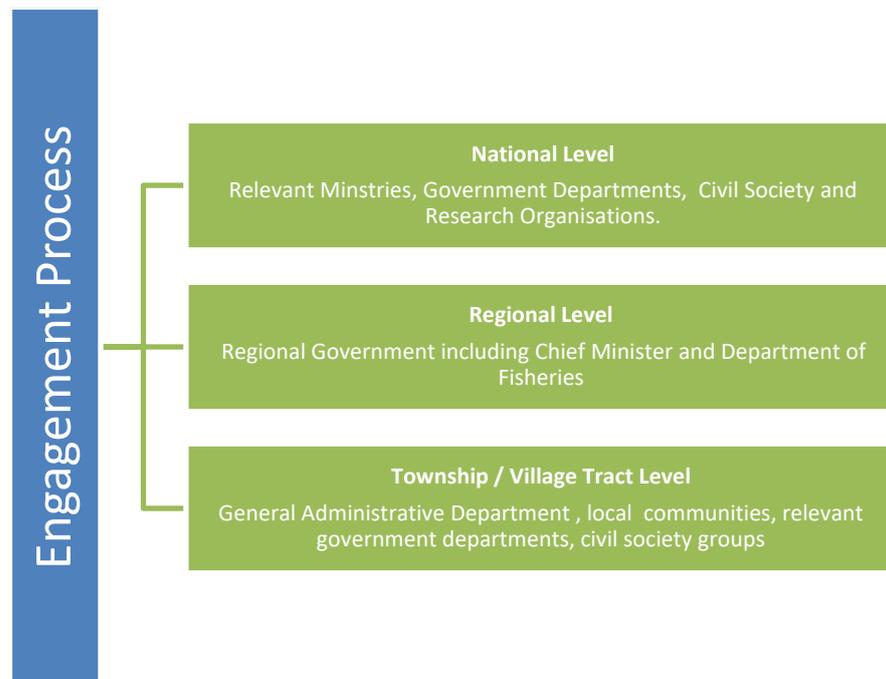
### 9.1.3

#### *Overall Approach and Scope of Engagement for the Impact Assessment*

Stakeholder engagement was conducted across administrative levels, subject to permissions of responsible authorities. *Figure 9.2* provides an overview of the levels engaged including: National Government, Regional and township and village tract levels.

Engagement, as specified in the Myanmar EIA Procedure, was undertaken in two phases in March and July, 2018. A consultation team consisting of ERM, MOGE and PCML representatives conducted meetings and consultations at the administrative levels. To ensure village level representation, a request was made to the Township GAD offices for village tract leaders from the potentially impacted fishing villages to be present.

**Figure 9.2** *Engagement at Three levels with Key Stakeholders*



#### *National Level*

Stakeholder engagement at the national level was focused on government agencies with regulatory and policy making responsibility. The purpose of early engagement was to introduce the Project and PCML, to seek clarity on the EIA process and expectations on stakeholder engagement and disclosure. The opportunity was also used to obtain required permissions for engagement with agencies at regional and township level and get access to data and information for the EIA Study.

In subsequent stages, engagement covered identification of relevant stakeholders at the state, township and village tract level. At the national level, consultation included MOGE and MONREC.

### *Regional Level*

Stakeholder engagement at the Regional Level focused on obtaining required permission for engagement activities at the township level and get access to information on local communities in the Area of Influence. At the Regional level the Project met with the Chief Minister of Tanintharyi Region and delegates.

### *Township / Village Tract Level*

Meetings were conducted with Townships in Thayatchaung, LongLon, Dawei, and Myeik. The necessity for this meeting and the participation was also discussed during the Chief Minister's meeting in Tanintharyi undertaken during scoping phase. The purpose of engagement was to make the township levels aware of the Project, seek an understanding of specific issues and stakeholder concerns, discuss potential impacts and mitigation measures and obtain village and township level social and environmental data.

The purpose of engagement was to make the community aware of the Project, seek an understanding of specific issues and stakeholder concerns in the individual townships, discuss potential impacts and mitigation measures and obtain district and township level social and environmental data.

The key stakeholders engaged with included;

- GAD (District and Township);
- Department of Fisheries;
- Myanmar Fisheries Federation (MFF);
- Village Tract Leaders and Elders;
- Fishing Communities;
- Civil society organizations; and
- NGOs.

## **9.1.4** *Format and Content of Consultation Meetings*

### *Key Principles*

The consultation process was guided by the following key principles:

- **Inclusive:** The consultations were organised to ensure representation of potentially affected and interested stakeholders. Separate focus group discussions (FGDs) were undertaken with fishermen and boat owners.

- **Sharing of information:** At the township and village level consultations, special emphasis was given to build community level understanding of the Project and all the information was provided in Myanmar language.
- **Participatory:** Stakeholders were encouraged to actively participate in the consultations and were always given the opportunity to ask questions.

The approach to consultation, informed by these principles, is described below.

#### *Consultation Approach*

The stakeholder consultation meetings were structured as followed:

- **Introductions and information disclosure:** Introduce PCML, the Yetagun Project, the EIA, the proposed stakeholder engagement process, the potential environmental and social impacts and mitigation to help the stakeholders understand the Project and PCML's intentions for engagement.
- **Question and answer session for all stakeholders in the town hall meeting to raise concerns, comments or ask questions to which PCML can directly respond.**
- **Data collection:** Collection of more in-depth information through FGDs with key stakeholder groups in the town hall meetings and village tracts.

In order to inform stakeholders about the Project and share information on the activities, a two page flyer was produced which contained Project information and details on how to feedback into the Project. All information was communicated through use of visual media (including posters and power point presentations) and was provided in local Myanmar language.

To gather more environmental and social baseline data and to identify potentially affected communities, FGDs were undertaken with village leaders, and were guided by questionnaires covering information relating to:

- **Generic village profile:** Collected information on demographic patterns, communities, occupations, and communication and grievance systems.
- **Focus group discussion (FGD) questionnaires:** Collected information at the fishing group level. In total, nine FGD were conducted in Maung Ma Kan, Kyauk Sin, Pyin Gyi, Tha Pot Seik, San Hlan, Pan Tein Inn, and Ti Zit villages.
- **Environment:** Collected information on marine species and protected areas.

All information collected was summarised and confirmed with stakeholders at the end of the discussion. Stakeholders were also given time to share their

concerns and views and any further clarifications they required at the end of the meetings.

Any queries raised by the stakeholders were responded to, and also noted to feed into the impact assessment process for the EIA.

## 9.2 SUMMARY OF CONSULTATION ACTIVITIES UNDERTAKEN FOR THE EIA PROCESS

### 9.2.1 Scoping Phase

During scoping, consultation meetings were held with various relevant stakeholders at the regional level in Dawei and Myeik. The purpose of the scoping consultations was to present information on the Project, gather information on potentially affected people, and gather information on the potential data gaps and how these can be closed for the EIA Report. Scoping consultation involved face-to-face meetings with a range of stakeholders including the Department of Fisheries (DoF), the Minister of Electricity and Energy, the Regional Environmental Conservation Department (ECD), and the General Administrative Department (GAD), ward administrators, planning department as well as local community representatives. The date, time, location, stakeholder and purpose of each meeting is provided in *Table 9.1*.

**Table 9.1 Consultation Activities Undertaken during Scoping**

Date, time, location	Stakeholder
30 March, 2018, Tanintharyi Regional Government Office	Meeting with Minister of Electricity and Energy; Ministry of Agriculture, Livelihood and Irrigation
2 April, 2018, Hotel Zayar Htet San, Dawei	Meeting with GAD, ECD, DOF, NGOs, media, political parties,
3 April, 2018, Grand Jade Hotel, Myeik	Meeting with GAD, ECD, DOF, DOA, INGOs and NGOs , Media, Political Parties

The minutes of the meetings and photos from the consultation are provided in **Appendix N**; some photos of the meeting are also provided in *Figure 9.3*.

Figure 9.3 Photos from the Scoping Consultation Meetings



Meeting with Minister of Electricity and Energy; Ministry of Agriculture, Livelihood and Irrigation, Dawei



Public Consultation in Grand Jade Hotel, Myeik



Public Consultation in Hotel Zeyar Htet San, Dawei



Attendees at Dawei Public Consultation Meeting

## 9.2.2

### *EIA Phase*

During the EIA Phase, public consultation meetings were conducted in Dawei, Myeik, Thayetchaung and LaungLon Township in Tanintharyi Region. The meeting locations were selected based on previous visits for the Scoping visit. The meetings were conducted in Zayar Htet San Hotel at Dawei, Grand Jade

Hotel at Myeik and General Administrative Department Offices in Thayetchaung and Launglon. The meeting was attended by 37 people in Thayetchaung, 44 people in Dawei, 96 people in LaungLon and 69 people in Myeik consisting of; offshore fishermen, GAD, DoF, other representatives from related department, Rakhine Women's Association (NGO), Media and CSOs.

The date, time, location, stakeholder and purpose of each meeting is provided in *Table 9.2*. Photographs taken during public consultations in Tanintharyi are shown in *Figure 9.4*.

Fishermen were invited from townships across the Dawei, Myeik, LongLon and Thayetchaung to attend the community town hall meetings. Fishery Businessmen from Pyin Gyi, Tha Bawt Seik, Maung Ma Kan, Kyauk Sin, Ti Zit, San Hlan and Pan Tin Inn villages attended the community town hall.

During the consultations, a fishing focus group discussion (FGD) was held in Thayetchaung and Launglon Township with offshore fishermen and fishery businessmen.

The FGD was guided by a questionnaire covering:

- Fishing Methods: information on number / type of boats, fishing season, fishing locations, fishing camps, trip duration and fishing gear used.
- Environment: information on type of fish caught and locations of sensitive habitats (coral reefs, seagrass beds, and mangroves).

It is acknowledged that representatives from not all coastal villages participated in the consultation process. However, given the distant, offshore, open water location of the Project and the absence of any onshore or near-shore activities, it is considered that the sample of villages included in this baseline is representative of the general fishing patterns in the area.

**Table 9.2**      **Consultation Activities Undertaken during EIA**

Date, time, location	Stakeholder
23 August, 2018, 14:30-17:30 PM ThaYetChaung GAD Office	Meeting with GAD, DOF, Village Leaders, Villagers
24 August, 2018, 10:00-12:00 PM LaungLon GAD Office	Meeting with GAD, Village Leaders, Fishermen, Villagers
24 August, 2018, 13:00-15:00 PM Zayyar Htet San Hotel, Dawei	Meeting with ECD, DOF, Concerned Departments, Media, CSOs, Village Leaders
26 August, 2018, 09:30-11:30 PM Grand Jade Hotel, Myeik	Meeting with ECD, DoF, Concerned Departments, MFF, Media, CSOs, Village Leaders and Fishermen

**9.3**      **RESULTS OF CONSULTATION**

The following section summarises the key issues raised in public consultation meetings and *Table 9.3* presents the responses concerned with these issues.

Figure 9.4 Photos from the Consultation Meetings Undertaken for the EIA Process



PCML presenting during Consultation Meeting in Dawei



ERM presenting during Consultation Meeting in Launglon



Consultation Meeting in Myeik



Consultation Meeting in LaungLon Township



Consultation Meeting in Thayetchaung Township



PCML presenting during Consultation Meeting in Myeik

**Table 9.3 Key Questions Raised During Scoping and EIA Public Consultation**

Comments Received	Response to Comment in Meeting	EIA Study Considerations
<p><u>Impacts on the Marine Environment</u></p> <p>Queries relating to wastes discharge from drilling activities</p>	<p>PCML will conduct all project activities in compliance with National Emission Quality Guideline. Different kinds of wastes must be categorized and treated prior to any discharge. If the drilling cuttings cannot be discharged on the board, they are carried to the disposable land.</p>	<p>The EIA report will assess the potential impacts of planned wastes generation from the Project activities and their discharges / disposal on water quality and secondary impacts to biodiversity, fishing activity, and socio-economic factors.</p>
<p><u>Impacts on the Marine Environment</u></p> <p>Queries relating to accidental wastes discharge, the monitoring program and how local communities can be involved in the monitoring process.</p>	<p>PCML will conduct all project activities in compliance with Myanmar, International Finance Corporation (IFC) guidelines, and international standards. A detailed record for discharge will be made and will be submit to ECD.</p> <p>In terms of monitoring, the EIA report which will be submitted to ECD, will include an Environmental Management Plan and discuss monitoring.</p> <p>ERM will prepare the EIA in compliance with Myanmar Environmental Impact Assessment law and procedures and international standards and then submit to ECD.</p>	<p>Monitoring requirements and details on the respective parties' responsibilities for compliance and demonstrating compliance have been included in the EIA Report.</p>
<p><u>Impacts on the Fishermen and Fisheries</u></p> <p>Fishing community expressed their concern on impacts to fishing. Myeik fishing community expressed that they do not want the project to commence.</p>	<p>Prior to start of the infill drilling activity, a Notice to Mariners will be announced in the newspaper. In this notice, the location of the wells in the Project Area will be described. However, fishing will only be restricted within the 5 NM safety zone around the vessel.</p>	<p>Impacts to fishing have been assessed in the EIA Report.</p>
<p><u>Corporate Social Responsibility (CSR) and Social Benefits</u></p> <p>One of the most common issues raised was accessible to electricity and charge per unit</p>	<p>To get access to electricity, the region needs transmission line that connects with National Grid. The electricity charge per unit will also be lower.</p> <p>The Department of Electricity are planning to implement Mawlamyaing-Yae-Dawei transmission line and Dawei-Myeik-Bokepyin transmission line.</p>	<p>CSR is not part of the environmental and social impact assessment and as such is not discussed in this Report. However, for information, details of PCML's current CSR activities are provided in Section 9.</p>

Comments Received	Response to Comment in Meeting	EIA Study Considerations
	For the CSR programs, PCML have to negotiate with the Regional Government not to overlap with their planned project before starting the project activities.	
<p><u>Benefits to Regional Level from Natural Resources</u></p> <p>As the resources come from Tanintharyi, the local community from the region should get the benefits too.</p>	<p>The profits from this project are under the management of Union Government. The revenue sharing between the Union and State Government is not something that PCML can comment on.</p> <p>The Union Government will share the profits equally for the development of States and Regions.</p>	<p>This is not part of the EIA Study but PCML are aware that this is important for local communities.</p>
<p><u>Disclosure of Information</u></p> <p>One stakeholder mentioned that the operations and schedule for the Project must be disclosed to the public particularly in newspapers.</p>	<p>Information will be disclosed as per the EIA Procedure and a Notice to Mariners will be issued to the DOF before Project activities commence.</p>	<p>The EMP is presented in <i>Section 8</i>.</p>
<p><u>Impacts on the Tourism Industry</u></p> <p>One concern raised about the impacts on the marine flora and tourism.</p>	<p>As the drilling activities operate in the water depth of about 300 ft., there may not have coral reefs and scuba-diving.</p> <p>Concerning sea water, sediment, benthos and sea-bed organisms, samplings are conducted in four directions (East, West, South, and North) of the Project Area.</p>	<p>Impacts to the coast have been scoped out of the EIA as the Project is over 100 km away and will not cause impacts.</p>
<p><u>Contract between MOGE and PCML</u></p> <p>Queries raised about the contract and timeline.</p>	<p>The contract is not a new one and it's "Production Sharing Contract" between MOGE and PCML. The project timeline is 30-yr and started in 2000.</p>	<p>It's not part of the EIA Study.</p>
<p><u>Grievance Mechanism and Compensation</u></p>	<p>PCML has a grievance mechanism and the community can contact the phone number mentioned in the brochure for complaints.</p>	<p>The EMP is presented in <i>Section 9</i>.</p>

Comments Received	Response to Comment in Meeting	EIA Study Considerations
<p>One stakeholder’s concern is about the grievance process if the fishing vessels/nets collapse with the drilling vessels.</p>	<p>For compensation process, if there are laws and regulations for projects located in the sea, PCML will comply with the government instruction.</p>	
<hr/>		
<p><u>Earthquakes or landslides</u></p> <p>Some stakeholders were concerned about if the Project could cause a landslide or earthquake that can impact the shore.</p>	<p>When the gas is taken, the reservoir is naturally filled with oil and water. Drilling does not trigger earthquakes either which can cause landslides, this is caused they the movement of “plates” under the seabed.</p>	<p>This is not considered in the impact assessment as drilling does not cause earthquakes or landslides.</p>

## 9.4

### ONGOING CONSULTATIONS

Stakeholder consultation undertaken to date confirmed that potential impacts as a result of Project activities will be small in scale and of limited extent.

Future engagement activities will consist of the following and are shown in detail in *Table 9.4*:

- Further disclosure of Project information and EIA Report, including opportunities to provide feedback;
- Engagement with relevant regional officials/authorities and government organisations on the outcomes of the EIA; and
- Ongoing communications with interested and potentially affected stakeholders during the operation. While impacts on local communities, ongoing project information will be provided to local areas.

If significant issues, concerns or impacts are identified, further stakeholder consultation with relevant, interested or affected stakeholders may be undertaken during operation.

**Table 9.4 Stakeholder Communication and Notification**

Timing	Purpose	Stakeholder / Group	Method of communication / notification
Following lodgement of EIA for assessment	Disclose EIA Report	<ul style="list-style-type: none"> <li>• Relevant regional officials/ authorities</li> <li>• Relevant Government organisations</li> <li>• Villagers</li> <li>• Other relevant stakeholders</li> <li>• General public</li> </ul>	<ul style="list-style-type: none"> <li>• Hardcopy EIA executive summary (Myanmar) made available in Tanintharyi and Yangon</li> <li>• Publish Project information on signboards at the site;</li> <li>• Regional and national advertising - via newspapers.</li> <li>• EIA (English) and executive summary (Myanmar and English) available on PCML website</li> </ul>
During the Project activities	Address any community concerns that may arise during Project activities	Implement the Grievance Mechanism	Grievance mechanism disclosed to local community and government

## 9.5

### CORPORATE SOCIAL RESPONSIBILITY

The updated CSR Program and proposed budget for 2019 is presented in **Appendix O** (in Myanmar language).

As per the requirements of the EIA Procedure, PCML has disclosed information on the Project on their website, [www.petronas.com](http://www.petronas.com).

Disclosure of the Project was undertaken in the following newspapers:

- The Global New Light of Myanmar, English version, (dated at 11, September, 2018), in page-13, fourth and fifth column (above the bottom right notice) and
- The Mirror (Myanmar Version), (11, September, 2018), in page 22, fourth and fifth column (top right notice)

Scan copies of the advertisements in newspapers are provided in *Figure 9.5* and *Figure 9.6* and the advert text is provided in *Figure 9.7*.

PCML will disclose the final EIA Report in the same newspapers. The EIA Report will also be made available online at PCML's website, <https://www.petronas.com>.

PCML will provide an activity update in the Notice to Mariners prior to the start of the Project. A grievance mechanism will be in place during operation, in line with the steps required under the EIA Procedure, as well as international good practice. An example Notice to Mariners is provided in *Figure 5.8*.

The executive Summary of this EIA Report (Myanmar Version) will be submitted to the Township General Administrative Department (GAD) and Department of Fisheries (DOF) offices in Dawei, and Myeik.



## Nations round on US, allies as UN climate talks wrap up

BANGKOK — Developing countries rounded on the United States and its allies at emergency climate talks on 9 Sunday September, accusing the world's richest nations of stalling a deal aimed at preventing runaway global warming.

Experts from around the world have been locked in discussions this week in Bangkok, aiming to reach a comprehensive rulebook for countries to implement the landmark Paris Accord on climate change.

But talks have foundered over the key issue of how efforts to limit climate change are funded and how contributions are reported.

Delegates representing some of Earth's poorest and smallest nations said on the final day of the summit that the US and other Western economies were failing to live up to their green spending commitments.

"Developed countries are responsible for the vast majority of historic emissions, and many became remarkably wealthy burning fossil fuels," said Amjad Abdullah, the head of a negotiating bloc of small island states.

"Yet, we face devastating climate impacts and some of us could be lost forever to rising seas" without progress on the Paris deal by the end of the year, he added. The Paris deal, struck in 2015,



Environmental activists and supporters take part in a demonstration in front of the United Nations building in Bangkok on Sunday. PHOTO: AFP

aims to limit global temperature rises to less than two degrees Celsius and to below 1.5 degrees Celsius if possible by the end of the century.

To do this, countries agreed to a set of promises, including to establish an annual US\$100 billion fund to help developing nations react to our heating planet.

The US and other developed economies want less oversight on how their funding is gathered and more flexibility over how future funding is structured.

But developing nations insist they need predictable and open funding in order to effectively plan their fight against the fallout from climate change.

A senior source within the African nations' negoti-

ating bloc told AFP the US and others were renegeing on pledges made in Paris by refusing to discuss future climate funding.

"It's as if we started from scratch" in Bangkok, the source said.

### Paris Deal "on brink"

The Bangkok talks were organised as an emergency negotiating session after little progress was made at previous rounds towards a final rulebook.

Under the timeframe

set in Paris, the guidelines for nations must be finalised by the COP24 climate summit in Poland in December. While delegates have made some progress on areas such as new technology and carbon markets, activists said the US — with Western acquiescence — had stonewalled any momentum on the key funding issue.

Harjeet Singh, global lead on climate change for NGO ActionAid, said Sunday the Paris deal was "on the brink". —AFP

## Japan toll 44 after strong quake, no more missing

TOKYO (Japan) — The death toll from a powerful earthquake that triggered massive landslides in northern Japan rose to 44 on Monday with tens of thousands of police and troops still on the ground to support survivors.

Chief Cabinet Secretary Yoshihide Suga said no one was left on a missing list, which suggested the figure could be the final death toll.

Around 40,000 police, fire fighters, troops and maritime safety officials were providing assistance, with more than 2,700 people still forced to stay in shelters after the killer quake struck the northern Japanese island of Hokkaido last week. The majority of the dead are from the small rural town of Atsuma, where a cluster of dwellings were wrecked when a hillside collapsed from the force of the 6.6-magnitude quake, causing deep brown

scars in the landscape.

"The government will strive to get hold of what is needed on the ground and take every possible measure so that people can return to a normal, safe life as soon as possible," Suga told a news conference.

He also warned that islanders should remain on alert as rainfall was forecast in the region, which could trigger fresh landslides. The quake was the latest in a string of natural disasters to batter the island nation. Western parts of the country are still recovering from the most powerful typhoon to strike Japan in a quarter of a century, which claimed 11 lives and shut down the main regional airport. Launching a campaign for another term as head of his ruling party, Prime Minister Shinzo Abe reiterated his government will "do its best" to restore the disaster-hit regions. —AFP

### CLAIM'S DAY NOTICE

M.V TOVE MAERSK VOY. NO. (1825)

Consignees of cargo carried on M.V TOVE MAERSK VOY. NO. (1825) are hereby notified that the vessel will be arriving on 11-9-2018 and cargo will be discharged into the premises of M.L.T.M.L.P where it will lie at the consignee's risk and expenses and subject to the bylaws and conditions of the Port of Yangon.

Damaged cargo will be surveyed daily from 8 am to 11:20 am and 12 noon to 4 pm to Claim's Day now declared as the third day after final discharge of cargo from the Vessel.

No claims against this vessel will be admitted after the Claims Day.

SHIPPING AGENCY DEPARTMENT  
MYANMA PORT AUTHORITY  
AGENT FOR: M/S MCC TRANSPORT  
(S'PORE) PTE LTD

Phone No: 2301185

### REQUEST FOR EXPRESSION OF INTEREST FOR INDEPENDENT CONSULTING SERVICES FOR C 1.1.10 - E-GOVERNMENT ADVISOR TO MINISTRY

The Ministry of Transport and Communications (MoTC) invites Independent Consultants ("Consultant") to indicate their interest to provide their services as e-Government Advisor to support MoTC to undertake the related tasks, as part of the engagement over a one year time period under the World Bank/IDA funded Telecommunications Sector Reform Project.

The Consultant is requested to submit their soft and hard copy of curriculum vitae to the address mentioned below by 01<sup>st</sup> October 2018. Interested Consultant should provide information demonstrating that they have the required qualifications and relevant experience to perform the task.

A firm can also nominate qualified individual consultant for the assignment. In case of a firm nominating the consultant, only the experience and qualifications of individuals shall be used in the selection process and the corporate experience of the firm shall not be taken into account and the contract would be signed with the firm.

Further information can be obtained from the below address during office hours 0930 to 1630 hours and [www.motc.gov.mm](http://www.motc.gov.mm).

Attn: Daw Nwe Ni Soe Yin,  
Director, Information Technology and Cyber Security Department,  
S12 Exchange Building, Ground Floor,  
Zabu Kyathayay Road,  
Zabuthuri Township, Nay Pyi Taw, Myanmar  
Tel: +95 67 422447 Fax: +95 67 422447  
E-mail: [nwenisseyin@e-motc.gov.mm](mailto:nwenisseyin@e-motc.gov.mm),  
[soemvuthaung@e-motc.gov.mm](mailto:soemvuthaung@e-motc.gov.mm)

### ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR EXPLORATORY DRILLING OFFSHORE BLOCKS M-12, M-13 AND M-14 BY PCML

PC Myanmar (Hong Kong) Limited (PCML) proposes to undertake an infill drilling program in blocks M-12, M-13 and M-14 at the offshore of Tanintharyi Region, Myanmar. This is scheduled to commence in Quarter 4 of 2018. The area in which the wells will be drilled is located approximately 100 km from the nearest islands of the Myeik Archipelago and 140 km from the Mainland coastline.

Under the Environmental Conservation Law and Rules of the Republic of the Union of Myanmar, PCML is required to undertake an Environmental Impact Assessment (EIA) in order to obtain an Environmental Compliance Certificate (ECC) for the proposed activity. Environmental Resources Management (ERM) and Environment Quality Management (EQM), on behalf of PCML, are currently undertaking an EIA Study, which includes associated stakeholder engagement. The EIA will be conducted in accordance with the Myanmar Environmental Impact Assessment (EIA) Procedure (2015).

More information about PCML in Myanmar can be found at PETRONAS website [www.petronas.com](http://www.petronas.com)

### INITIAL ENVIRONMENTAL EXAMINATION FOR 3D MARINE SEISMIC SURVEY OFFSHORE BLOCK M-12, M-13 AND M-14 BY PCML

PC Myanmar (Hong Kong) Limited (PCML) proposes to undertake a 3D Marine Seismic Survey in Blocks M-12, M-13 and M-14 at the offshore of Tanintharyi Region, Myanmar. This is scheduled to commence in Quarter 4 of 2018. The area in which the survey will be conducted is located approximately 70 km from the nearest islands of the Myeik Archipelago and 125 km from the Mainland coastline.

Under the Environmental Conservation Law and Rules of the Republic of the Union of Myanmar, PCML is required to undertake an Initial Environmental Examination (IEE) in order to obtain an Environmental Compliance Certificate (ECC) for the proposed activity. Environmental Resources Management (ERM) and Environment Quality Management (EQM), on behalf of PCML, is currently undertaking an IEE Study, which includes associated stakeholder engagement. The IEE will be conducted in accordance with the Myanmar Environmental Impact Assessment (EIA) Procedure (2015).

More information about the PCML in Myanmar can be found at PETRONAS website [www.petronas.com](http://www.petronas.com)



There prepared a grievance mechanism created by PCML so that stakeholders can raise questions or concerns with the Project and have the concerns addressed in a prompt and respectful manner. There will organise a grievance resolution committee. Should a grievance or complaint be made, the complaint/grievance will be received by a Community Liaison Officer or similar. The grievance will be recorded and investigated and responded to. Should the complainant not accept the response, a review will be carried out. Once resolved, the grievance will be closed out and recorded in the Grievance Register.

The Organisation flow Chart of Grievance Redress Committee and Grievance Management Flowchart can be seen in *Figure 9.9* and *Figure 9.10*. For more information and addressing grievance matter to be contacted to:

**Yetagun Infill Drilling Supervisor**

Email: [drillingsupe.infill@petronas.com](mailto:drillingsupe.infill@petronas.com))

Telephone: + (951) 515011/526411 (Ext)3336 (for Yetagun infill related matters)

**Community Liaison Officer - U Than Naing Myint**

Email: [than\\_naingmyint@petronas.com](mailto:than_naingmyint@petronas.com)

Telephone: +(951) 515011/526411 (Ext)3163

Figure 9.9 Organization Flow Chart of Grievance Redress Committee

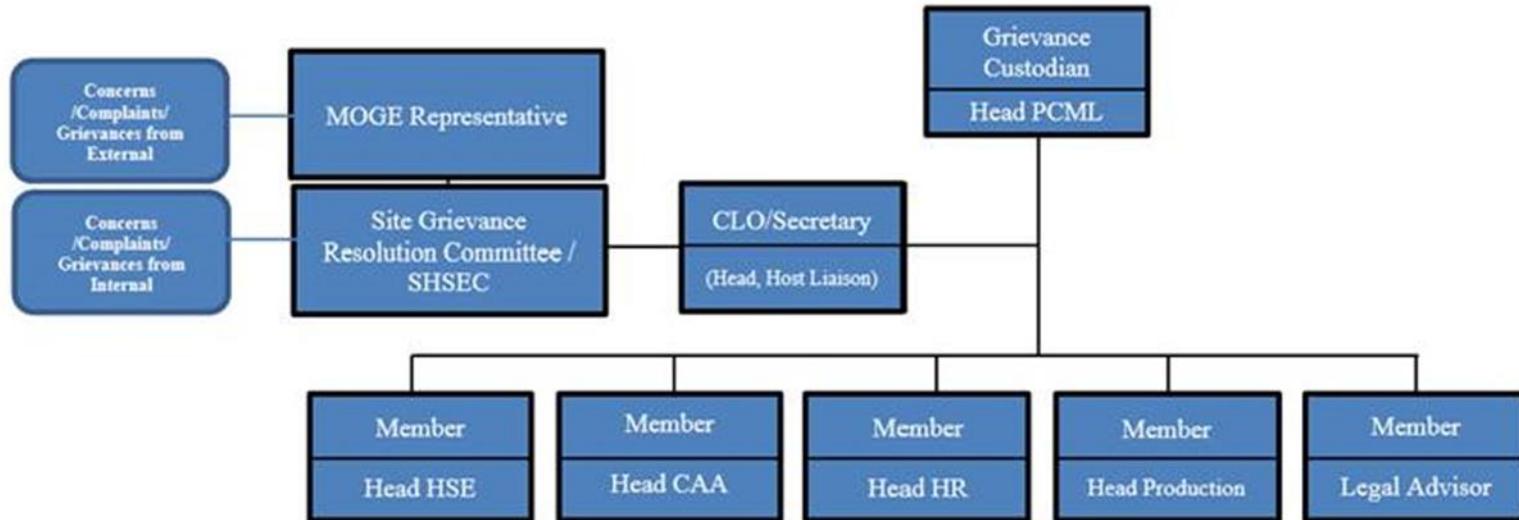
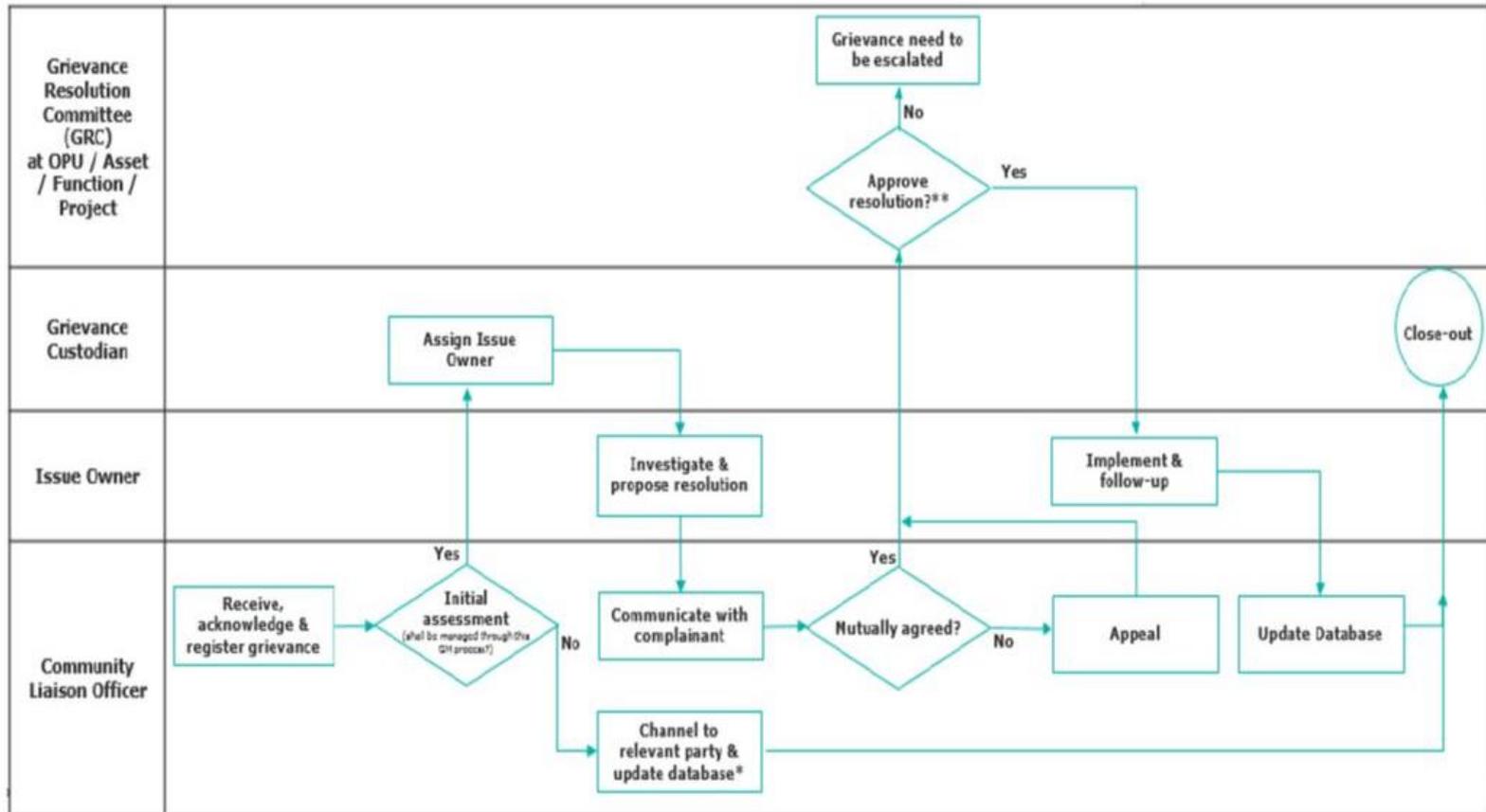


Figure 9.10 Grievance Management Flowchart



\* To be managed and addressed through other existing systems and process e.g. HR, CA, SCM, etc. See details in Section 1.2(4)

\*\* For minor grievances, the process can be simplified by obtaining approval directly from Grievance Custodian

## REFERENCES

- Ansari, ZA, Furtado, R, Badesab, S, Mehta, P and Thwin, S, 2011, Benthic macroinvertebrate community structure and distribution in the Ayeyarwady Continental shelf, Andaman Sea. *Indian Journal of Geo-Marine Sciences*, vol. 41 (3), pp 272-278.
- BOBLME (2015). Situation Analysis of Myeik Archipelago. Available from <http://www.boblme.org/documentRepository/BOBLME-2015-Ecology-36.pdf>
- Climate Data Website. Available from <http://en.climate-data.org/location/311/>, accessed 5 May 2016 Data sources: 1982 to 2012.
- DeRuiter, SL and Doukara, KL., 2012. Loggerhead turtles dive in response to airgun sound exposure. *Endang Species Res.* Vol. 16: 55–63, 2012.
- DiIorio, L. and Clark, C.W. 2010. Exposure to seismic survey alters blue whale acoustic communication. *Biol. Lett.* 6 (1): 51-54. doi:10.1098/rsbl.2009.0651
- Google Earth, 2018.
- Grebe CC, Colman JG, Reid CA (2008) Practical application of an adaptive management approach for a marine seismic survey. IAIA08 Conference Proceedings, The Art and Science of Impact Assessment, 28th Annual Conference of the International Association for Impact Assessment, 4-10 May 2008, Perth Convention Exhibition Centre, Perth, Australia.
- Holmes et al, 2013. Marine Conservation in Myanmar - the current knowledge of marine systems and recommendations for research and conservation. Yangon, WCS and MSAM.
- Howard, R. (Ed.). 2018. Marine Biodiversity of Myeik Archipelago: Survey Results 2013-2017 and Conservation Recommendations. Tanintharyi Conservation Programme, a joint initiative of Fauna & Flora International, the Myanmar Forest Department and Department of Fisheries. pp. 138
- International Whaling Commission (IWC). 2007. Report of the scientific committee. Annex K. Report of the Standing Working Group on environmental concerns. *J. Cetacean Res. Manag.* 9 (Suppl.): 227–296.
- IUCN, 2016. The IUCN Red List of Threatened Species. Version 2016-2. <[www.iucnredlist.org](http://www.iucnredlist.org)>. Downloaded on 08 September 2016.
- McCauley R.D., J. Fewtrell, A.J. Duncan, C. Jenner, M-N. Jenner, J.D. Penrose, R.I.T. Prince, A. Adhitya, J. Murdoch and K. McCabe, 2000. Marine seismic surveys – A study of environmental implications. *APPEA J* 40: 692–706.

Miller, G.W., J.D. Moulton, R.A. Davis, M. Holst, P. Millman, A. MacGillvray, and D. Hannay. 2005. Monitoring seismic effects on marine mammals – southeastern Beaufort Sea, 2001-2002, pp. 511-542. In: S.L. Armsworthy, P.J. Cranford, and K. Lee (eds.), *Offshore oil and gas environmental effects monitoring/Approaches and technologies*. Battelle Press, Columbus, OH.

Myanmar Census, 2014. The Population and Housing Census of Myanmar 2014.

Obura, D.O., Benbow, S. and Zau Lunn (2014) Coral Diversity and Reef Resilience In The Northern Myeik Archipelago, Myanmar. Report No. 3 of the Tanintharyi Conservation Programme, a joint initiative of Fauna and Flora International (FFI) and the Myanmar Forest Department. FFI, Yangon.

Pe. 2004. National Report of Myanmar, On the Sustainable Management of the Bay of Bengal Large Marine Ecosystem (BOBLME) GCP/RAS/179/WBG. Prepared by Myint Pe (National Consultant).

Popper, A. N., and M. C. Hastings, 2009. "The effects of anthropogenic sources of sound on fishes." *Journal of Fish Biology* 75.3: 455-489.

Raman, T. R. Shankar; Mudappa, Divya; Khan, Tasneem; Mistry, Umeed; Saxena, Ajai; Varma, Kalyan; Ekka, Naveen; Lenin, Janaki; Whitaker, Romulus (2013). "An expedition to Narcondam: observations of marine and terrestrial fauna including the island-endemic hornbill" (PDF). *Current Science*. 105 (3): 346–350

Richardson, W.J., Malme, C.I., Green, C.R., Jr., and Thomson, D.H. 1995. *Marine Mammals and Noise*. Academic Press, San Diego, CA 576 pp.

Russell, B.C. (2015). Survey of coral reef fishes of the Myeik Archipelago, Myanmar. Report No. 13 of the Tanintharyi Conservation Programme, a joint initiative of Fauna and Flora International (FFI) and the Myanmar Forest Department. FFI, Yangon

Samuel, Y., S.J. Morreale, C.H. Greene, and M.E. Richmond. 2005. Underwater, low-frequency noise in coastal sea turtle habitat. *J. Acoust. Soc. Am.* 117(3):1465-1472.

San Tha Tun, Win Hteik and Kyaw Thuya (2014). Survey of Mangroves in Aucklan Bay and Adjacent Areas, Kyun-Su and Boke- Pyin Townships, Taninthayi Region. Report No. 4 of the Tanintharyi Conservation Programme, a joint initiative of Fauna and Flora International (FFI) and the Myanmar Forest Department. FFI, Yangon.

Southall, B.L., A.E. Bowles, W.T. Ellison, J.J. Finneran, R.L. Gentry, C.R. Greene, Jr., D. Kastak, D.R. Ketten, J.H. Miller, P.E. Nachtigall, W.J. Richardson, J.A. Thomas, and P.L. Tyack. 2007. Marine mammal noise exposure criteria: Initial scientific recommendations. *Aquatic Mammals* 33:411-521.

Stone, C.J., and Tasker, M.L. 2006. The effect of seismic airguns on cetaceans in UK waters. *J. Cetacean Res. Manag.* 8: 255–263.

Tanintharyi Region Census Report, 2015. Available from: <https://myanmar.unfpa.org/sites/default/files/pub-pdf/Tanintharyi%20Region%20Census%20Report%20-%20ENGLISH.pdf>

Theilen and Pararas-Carayannis, 2009. Natural Hazard Assessment of SW Myanmar – A contribution of remote sensing and GIS methods to the detection of areas vulnerable to earthquakes and tsunami/ cyclone flooding.

Turnpenny, A. W. H. and Nedwell, J. R. 1994. The effects on marine fish, diving mammals and birds of underwater sound generated by seismic surveys. Consultancy Report FCR 089/94, Fawley Aquatic Research Laboratories Ltd., 40pp.

U. Soe-Htun and Tint Swe (2014). Training on Socioeconomic Monitoring (SocMon) Methodology for Evaluation of Socioeconomics and Marine Resources Utilization at Selected Coastal Communities in Myanmar

Wardle, C. S., Carter, T. J., Urquhart, G. G., Johnstone, A. D. F., Ziolkowski, A. M., Hampson, G. & Mackie, D. (2001). Effects of seismic air guns on marine fish. *Continental Shelf Research* 21, 1005–1027.

Weilgart, L., 2013. “A review of the impacts of seismic airgun surveys on marine life.” Submitted to the CBD Expert Workshop on Underwater Noise and its Impacts on Marine and Coastal Biodiversity, 25-27 February 2014, London, UK.

Weir, C.R. (2007). Observations of marine turtles in relation to seismic airgun sound off Angola. *Marine Turtle Newsletter*, 116: 17-20.

Zau Lunn, Undated. Status and challenges of coral reef monitoring in Myanmar, Flora International (FFI)

## **Appendix A - MOGE Approval Letter for Oil on Cuttings**

ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံတော်အစိုးရ  
လျှပ်စစ်နှင့်စွမ်းအင်ဝန်ကြီးဌာန  
မြန်မာ့ရေနံနှင့်သဘာဝဓါတ်ငွေ့လုပ်ငန်း  
MYANMAR OIL AND GAS ENTERPRISE

FAX - 067- 411125  
TEL - 411055,411056



PO BOX 1049  
BUILDING No.44,  
NAY PYI TAW

Letter No. MD-3/6 (0736) 2016

Date ၁၄<sup>th</sup>, September, 2016

All PSC Companies

Subject : Notification on National Environmental Quality (Emission) Guidelines

Reference (1) Environmental Conservation Department Letter No. အီးအိုင်အေ- ၂/၂ (၇၃၁/  
၂၀၁၆) dated on 9<sup>th</sup> September, 2016.

(2) MOGE Letter No. MD 2/6 (0632) dated on 14<sup>th</sup> August, 2016

Dear Operator,

We, MOGE, always appreciate your co-operation for Myanmar Offshore Oil and Gas exploration and development activities.

MOGE sent a negotiation letter to Environmental Conservation Department related to clarification of National Environmental Quality (Emission) Guidelines with reference letter No.2. Environmental Conservation Department replied the comment to MOGE as per attached letter (Reference Letter No.1).

In this regard, MOGE would like to notify all PSC companies to comply with Environmental Conservation Department's replied letter as attached (Section No.3, Sub-Section (B)) according to (International Finance Corporation - Environmental, Health, Safety Guideline for offshore Oil and Gas Development – 2015) described as follows:

- For new facilities: Organic Phase Drilling Fluid Concentration lower than 1 % by weight on dry cuttings.
- For Existing facilities: Use of Group III non- aqueous base fluids and treatment in cutting dryers. Maximum residual Non- Aqueous Phase Drilling Fluid (NADF)

6.9% (C<sub>16</sub>-C<sub>18</sub> internal olefins) or 9.4% (C<sub>12</sub>-C<sub>14</sub> ester or C<sub>8</sub> esters) on wet cuttings.

Your co-operation on this matter is deeply appreciated.

Yours sincerely,



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Myo Myint Oo

Managing Director

Myanma Oil and Gas Enterprise



CC: Ministry of Electricity and Energy

Deputy Managing Director - MOGE

Director (Planning, Admin) - MOGE

## **Appendix B - Material Safety Data Sheets for Cementing Chemicals**

### 3.2.12 Material Safety Data Sheets (MSDS)

Please find attached the first page of each Material Safety Data Sheet as applicable. The complete MSDS files (all pages) are available upon request.

- √ Bentonite Extender D20
- √ D600G GASBLOK
- √ Cement Retarder D110
- √ Retarder D150A
- √ Liquid Trifunctional Additive D194
- √ Spacer B250
- √ Antifoam D047
- √ Defoamer D206
- √ Dispersant D065
- √ Extender D075
- √ Dispersant liquid A080
- √ Retarder A081
- √ Anti-settling agent D081
- √ Fluid loss control agent powder D167
- √ Fluid loss control agent/Gas block agent liquid D168
- √ Fluid loss control liquid D193
- √ Fluid loss control agent powder D207
- √ Spacer agent D182
- √ Viscosifier/free water control agent D208
- √ GasBLOCK agent D500
- √ Retarder D801
- √ Cement D907
- √ Surfactant F103
- √ Surfactant F110
- √ Accelerator S001
- √ Solvent U066



**Safety data sheet number** D020  
**Version** 5  
**Revision date** 19/Oct/2015  
**Supersedes date** 12/Jan/2011

## Safety Data Sheet Bentonite Extender D20

### 1. Identification of the substance/preparation and of the Company/undertaking

#### 1.1 Product identifier

**Product name** Bentonite Extender D20  
**Product code** D020  
**REACH registration number** Exempt Annex V ENTRY 7  
**Denmark Pr. no.** 1107177

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended use** Used as a cementing additive in oilfield applications

**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

**Supplier identification**  
Schlumberger Oilfield UK PLC  
Victory House, Churchill Court  
Manor Royal, Crawley  
West Sussex RH10 9LU  
+ 47 51577424  
SDS@slb.com

#### 1.4 Emergency Telephone Number

**Emergency telephone** - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

### 2. Hazards identification

#### 2.1 Classification of the substance or mixture

**Regulation (EC) No. 1272/2008**

**Health hazards** Not classified

**Environmental hazards** Not classified

**Physical Hazards** Not classified

#### 2.2 Label Elements

##### **Signal word**

None

# SAFETY DATA SHEET

(USA)

(Complies with USA OSHA 29 CFR 1910.1200 and ANSI Z 400.1)

Version: 4

Revision date: 24 April 2012

## 1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND THE COMPANY/UNDERTAKING

**Product Code:** D600G

**Product Name:** D600G GASBLOK\* Gas Migration Control Additive

**Use of the Substance/Preparation:** For industrial use only. Used as a cementing additive in oilfield applications.

**Company Identification:** Schlumberger Technology Corporation  
110 Schlumberger Drive  
Sugar Land, Texas 77478, USA  
Telephone: 1-281-285-7873

**Emergency Telephone Number:** USA: +1-281-595-3518 (24hr)

## 2. HAZARDS IDENTIFICATION

### EMERGENCY OVERVIEW

**Main physical hazards:** No classified physical hazards..

**Main health hazards:** May be mildly irritating to eyes. May be mildly irritating to skin.

**Precautions:** DO NOT FREEZE.

**HMIS classification:** Health: 1 Flammability: 1 Physical hazard: 0

**Form:** Liquid                      **Color:** Milky White                      **Odor:** Mild

**Principle routes of exposure:**  
Eye contact, Skin contact.

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

Product classified as non-hazardous.

Component	CAS-No	Weight %- Range
Aromatic polymer	Proprietary	30 - 60

## 4. FIRST AID MEASURES

**Eye contact:** Rinse immediately with plenty of water, also under the eyelids. Seek medical attention if irritation occurs.

**Skin contact:** Wash off with soap and water.

**Ingestion:** Seek medical attention. Never give anything by mouth to an unconscious person.



## SAFETY DATA SHEET

(USA)

(Complies with USA OSHA 29 CFR 1910.1200 and ANSI Z 400.1)

Version: 5

Revision date: 24 April 2012

### 1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND THE COMPANY/UNDERTAKING

**Product Code:** D110

**Product Name:** Cement Retarder D110

**Use of the Substance/Preparation:** Used as a cementing additive in oilfield applications.

**Company Identification:** Schlumberger Technology Corporation  
 110 Schlumberger Drive  
 Sugar Land, Texas 77478, USA  
 Telephone: 1-281-285-7873

**Emergency Telephone Number:** USA: +1-281-595-3518 (24hr)

### 2. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW	
<b>Main physical hazards:</b>	No classified physical hazards.
<b>Main health hazards:</b>	Prolonged skin contact may cause skin irritation. Ingestion of large amounts may cause nausea, vomiting, diarrhea.
<b>Other Information:</b>	None.
<b>Precautions:</b>	DO NOT FREEZE. Avoid contact with eyes. Do not get on skin or clothing. Wash thoroughly after handling. Do not breathe vapors or spray mist. Have emergency equipment (for fires, spills, leaks, etc.) readily available.
<b>HMS classification:</b>	Health: 1 Flammability: 1 Physical hazard: 0

**Form:** Liquid                      **Color:** Brown                      **Odor:** Sweet

**Principle routes of exposure:**  
 Skin contact. Eye contact.

### 3. COMPOSITION/INFORMATION ON INGREDIENTS

Product classified as non-hazardous. Aqueous solution.

### 4. FIRST AID MEASURES

**Eye contact:** Rinse with plenty of water. Consult a physician if necessary.

**Skin contact:** Rinse with water.

**Ingestion:** Rinse mouth. Consult a physician if necessary. Never give anything by mouth to an unconscious person.

**Inhalation:** Move to fresh air.



**Safety data sheet number** D150A  
**Version** 3  
**Revision date** 04/Jan/2017  
**Supersedes date** 24/Oct/2013

## Safety Data Sheet Retarder D150A

### 1. Identification of the substance/preparation and of the Company/undertaking

#### 1.1 Product identifier

**Product name** Retarder D150A  
**Product code** D150A

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Used as a cementing additive in oilfield applications

**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

##### **Supplier**

Schlumberger Oilfield UK PLC  
Victory House, Churchill Court  
Manor Royal, Crawley  
West Sussex RH10 9LU  
+ 47 51577424

SDS@slb.com

#### 1.4 Emergency Telephone Number

**Emergency telephone** - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

### 2. Hazards identification

#### 2.1 Classification of the substance or mixture

**Regulation (EC) No. 1272/2008**

**Health hazards** Not classified

**Environmental hazards** Not classified

**Physical Hazards** Not classified

#### 2.2 Label elements

##### **Signal word**

None

##### **Hazard statements**

This product is not classified as hazardous therefore no (H) hazard statements assigned.



**Safety data sheet number** D194  
**Version** 3  
**Revision date** 03/Jun/2015  
**Supercedes date** 09/Feb/2009

## Safety Data Sheet Liquid Trifunctional Additive D194

### 1. Identification of the substance/preparation and of the Company/undertaking

#### 1.1 Product identifier

**Product name** Liquid Trifunctional Additive D194  
**Product code** D194

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended use** Used as a cementing additive in oilfield applications  
**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

**Supplier identification**  
Schlumberger Oilfield UK PLC  
Victory House, Churchill Court  
Manor Royal, Crawley  
West Sussex RH10 9LU  
+ 47 51577424  
SDS@slb.com

#### 1.4 Emergency Telephone Number

**Emergency telephone** - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

### 2. Hazards identification

#### 2.1 Classification of the substance or mixture

**Regulation (EC) No. 1272/2008**

**Health hazards** Not classified  
**Environmental hazards** Not classified  
**Physical Hazards** Not classified

#### 2.2 Label Elements

**Signal word**  
None

#### Hazard statements

This product is not classified as hazardous therefore no (H) hazard statements assigned.

**Safety data sheet number** B250  
**Version** 3  
**Revision date** 27/Aug/2015  
**Supersedes date** 03/Feb/2010

## Safety Data Sheet Spacer B250

### 1. Identification of the substance/preparation and of the Company/undertaking

#### 1.1 Product identifier

**Product name** Spacer B250  
**Product code** B250

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended use** Used as a gelling agent in oilfield applications  
**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

**Supplier identification**  
Schlumberger Oilfield UK PLC  
Victory House, Churchill Court  
Manor Royal, Crawley  
West Sussex RH10 9LU  
+ 47 51577424  
SDS@slb.com

#### 1.4 Emergency Telephone Number

**Emergency telephone** - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

### 2. Hazards identification

#### 2.1 Classification of the substance or mixture

**Regulation (EC) No. 1272/2008**

**Health hazards** Not classified  
**Environmental hazards** Not classified  
**Physical Hazards** Not classified

#### 2.2 Label Elements

**Signal word**  
None

**Hazard statements**  
This product is not classified as hazardous therefore no (H) hazard statements assigned.



**Safety data sheet number** D047  
**Version** 2  
**Revision date** 04/Feb/2016  
**Supersedes date** 21/Feb/2014

## Safety Data Sheet ANTIFOAM AGENT D47

### 1. Identification of the substance/preparation and of the Company/undertaking

#### 1.1 Product identifier

**Product name** ANTIFOAM AGENT D47  
**Product code** D047

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended use** Antifoam in oilfield applications  
**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

**Supplier**  
Schlumberger Oilfield UK PLC  
Victory House, Churchill Court  
Manor Royal, Crawley  
West Sussex RH10 9LU  
+ 47 51577424  
SDS@slb.com

#### 1.4 Emergency Telephone Number

**Emergency telephone** - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

### 2. Hazards identification

#### 2.1 Classification of the substance or mixture

**Regulation (EC) No. 1272/2008**

**Health hazards** Not classified  
**Environmental hazards** Not classified  
**Physical Hazards** Not classified

#### 2.2 Label Elements

**Signal word**  
None

**Hazard statements**  
This product is not classified as hazardous therefore no (H) hazard statements assigned.

**Safety data sheet number** D206  
**Version** 3  
**Revision date** 15/Aug/2014  
**Supersedes date** 08/Aug/2011

## Safety Data Sheet Antifoaming Agent D206

### 1. Identification of the substance/preparation and of the Company/undertaking

#### 1.1 Product identifier

**Product name** Antifoaming Agent D206  
**Product code** D206

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended use** Defoamer  
**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

**Supplier identification**  
Schlumberger Oilfield UK PLC  
Victory House, Churchill Court  
Manor Royal, Crawley  
West Sussex RH10 9LU  
+ 47 51577424  
SDS@slb.com

#### 1.4 Emergency Telephone Number

**Emergency telephone** - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

**Italy** Centro Antiveleni Ospedale Niguarda Milan: +39 02 6610 1029

### 2. Hazards identification

#### 2.1 Classification of the substance or mixture

**Regulation (EC) No. 1272/2008**

**Health hazards** Not classified  
**Environmental hazards** Not classified  
**Physical Hazards** Not classified

#### 2.2 Label Elements

**Signal word**  
None

**SDS no.** D065  
**Version** 5  
**Revision date** 28/Mar/2017  
**Supersedes date** 02/Jan/2015

## Safety Data Sheet TIC\* D65 Dispersant

### 1. Identification

#### 1.1 Product identifier

**Product name** TIC\* D65 Dispersant  
**Product code** D065

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Used as a cementing additive in oilfield applications.  
**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

**Supplier**  
**Schlumberger Technology Corporation**  
 110 Schlumberger Drive  
 Sugar Land, Texas 77478, USA  
 Telephone: 1-281-285-7873

**Schlumberger Canada, Ltd.**  
 200, 125 - 9th Avenue SE  
 Calgary, Alberta T2G 0P6, Canada  
 Telephone: 1-613-992-4624

**E-mail address** SDS@slb.com

**Prepared by**  
 Global Regulatory Compliance - Chemicals (GRC - Chemicals)

#### 1.4 Emergency Telephone Number

**Emergency telephone** (24 Hour) Asia Pacific +65 3158 1074, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, USA +1 281 595 3518/+1 866 928 0789, Canada +1 800 579 7421, Argentina: +54 11 5984 3690, Brazil : 0800-720-8000 0800-777-2323 (WGRA)

### 2. Hazards identification

#### 2.1 Classification of the substance or mixture

##### GHS - Classification

**Health hazards** Not classified  
**Environmental hazards** Not classified

##### Physical Hazards

Combustible dust	Category 1
------------------	------------

**Safety data sheet number** D075  
**Version** 1  
**Revision date** 09/Jan/2014  
**Supersedes date** 24/Apr/2012

## Safety Data Sheet Silicate Additive D75

### 1. Identification of the substance/preparation and of the Company/undertaking

#### 1.1 Product identifier

**Product name** Silicate Additive D75  
**Product code** D075

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended use** Used as a cementing additive in oilfield applications  
**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

**Supplier identification**  
Schlumberger Oilfield UK PLC  
Victory House, Churchill Court  
Manor Royal, Crawley  
West Sussex RH10 9LU  
+ 47 51577424  
SDS@slb.com

#### 1.4 Emergency Telephone Number

**Emergency telephone** - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

### 2. Hazards identification

#### 2.1 Classification of the substance or mixture

**Regulation (EC) No. 1272/2008**

**Health hazards** Not classified  
**Environmental hazards** Not classified  
**Physical Hazards** Not classified

#### 2.2 Label Elements

**Signal word**  
None

-



**Safety data sheet number** D080  
**Version** 2  
**Revision date** 22/Jan/2016  
**Supersedes date** 22/Apr/2014

## Safety Data Sheet Cement Liquid Dispersant D80

### 1. Identification of the substance/preparation and of the Company/undertaking

**1.1 Product identifier**

**Product name** Cement Liquid Dispersant D80  
**Product code** D080

**1.2 Relevant identified uses of the substance or mixture and uses advised against**

**Recommended use** Used as a cementing additive in oilfield applications  
**Uses advised against** Consumer use

**1.3 Details of the supplier of the safety data sheet**

**Supplier**  
 Schlumberger Oilfield UK PLC  
 Victory House, Churchill Court  
 Manor Royal, Crawley  
 West Sussex RH10 9LU  
 + 47 51577424  
 SDS@slb.com

**1.4 Emergency Telephone Number**

**Emergency telephone** - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

### 2. Hazards identification

**2.1 Classification of the substance or mixture**

**Regulation (EC) No. 1272/2008**

**Health hazards** Not classified

**Environmental hazards**

Chronic aquatic toxicity	Category 2
--------------------------	------------

**Physical Hazards** Not classified

**2.2 Label Elements**



**Safety data sheet number** D081  
**Version** 2  
**Revision date** 05/Jun/2015  
**Supersedes date** 14/Oct/2013

## Safety Data Sheet Liquid Retarder D81

### 1. Identification of the substance/preparation and of the Company/undertaking

#### 1.1 Product identifier

**Product name** Liquid Retarder D81  
**Product code** D081  
**Denmark Pr. no.** 1005744

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended use** Used as a cementing additive in oilfield applications  
**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

**Supplier identification**  
Schlumberger Oilfield UK PLC  
Victory House, Churchill Court  
Manor Royal, Crawley  
West Sussex RH10 9LU  
+ 47 51577424  
SDS@slb.com

#### 1.4 Emergency Telephone Number

**Emergency telephone** - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

### 2. Hazards identification

#### 2.1 Classification of the substance or mixture

**Regulation (EC) No. 1272/2008**

**Health hazards** Not classified  
**Environmental hazards** Not classified  
**Physical Hazards** Not classified

#### 2.2 Label Elements

**Signal word**  
None



**Safety data sheet number** D153  
**Version** 2  
**Revision date** 30/Jul/2015  
**Supersedes date** 20/Sep/2013

## Safety Data Sheet Anti-Settling Agent D153

### 1. Identification of the substance/preparation and of the Company/undertaking

#### 1.1 Product identifier

**Product name** Anti-Settling Agent D153  
**Product code** D153

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended use** Used as a cementing additive in oilfield applications  
**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

**Supplier**  
Schlumberger Oilfield UK PLC  
Victory House, Churchill Court  
Manor Royal, Crawley  
West Sussex RH10 9LU  
+ 47 51577424

SDS@slb.com

#### 1.4 Emergency Telephone Number

**Emergency telephone** - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

### 2. Hazards identification

#### 2.1 Classification of the substance or mixture

**Regulation (EC) No. 1272/2008**

##### Health hazards

Specific target organ toxicity (repeated exposure)	Category 2
--	------------

**Environmental hazards** Not classified

**Physical Hazards** Not classified

#### 2.2 Label Elements

**SDS no.** D167  
**Version** 3  
**Revision date** 23/May/2015  
**Supersedes date** 21/Jul/2009

## Safety Data Sheet UNIFLAC\* S D167

### 1. Identification

#### 1.1 Product identifier

**Product name** UNIFLAC\* S D167  
**Product code** D167

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Used as a cementing additive in oilfield applications  
**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

**Supplier**  
**Schlumberger Technology Corporation**  
110 Schlumberger Drive  
Sugar Land, Texas 77478, USA  
Telephone: 1-281-285-7873

**Schlumberger Canada, Ltd.**  
200, 125 - 9th Avenue SE  
Calgary, Alberta T2G 0P6, Canada  
**E-mail address** SDS@slb.com

**Prepared by**  
Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Gulan Sun

#### 1.4 Emergency Telephone Number

**Emergency telephone** (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

### 2. Hazards identification

#### 2.1 Classification of the substance or mixture

##### GHS - Classification

**Health hazards** Not classified  
**Environmental hazards** Not classified

##### Physical Hazards

Combustible dust



**Safety data sheet number** D168  
**Version** 3  
**Revision date** 19/Feb/2015  
**Supercedes date** 18/Apr/2014

## Safety Data Sheet UNIFLAC\* L D168

### 1. Identification of the substance/preparation and of the Company/undertaking

#### 1.1 Product identifier

**Product name** UNIFLAC\* L D168  
**Product code** D168

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Used as a cementing additive in oilfield applications

**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

##### **Supplier**

Schlumberger Oilfield UK PLC  
Schlumberger House, Buckingham Gate  
Gatwick Airport  
West Sussex RH6 0NZ

+ 47 51577424

SDS@slb.com

#### 1.4 Emergency Telephone Number

**Emergency telephone** - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

**Classification according to Regulation (EC) No. 1272/2008 [CLP]**

**Health hazards** Not classified

**Environmental hazards** Not classified

**Physical Hazards** Not classified

#### 2.2 Label elements

##### **Signal word**

None

##### **Hazard statements**

**Safety data sheet number** D193  
**Version** 3  
**Revision date** 11/Jun/2014  
**Supersedes date** 30/Jun/2011

## Safety Data Sheet Fluid Loss Control Additive D193

### 1. Identification of the substance/preparation and of the Company/undertaking

#### 1.1 Product identifier

**Product name** Fluid Loss Control Additive D193  
**Product code** D193  
**Norway Pr. no.** 14047  
**Denmark Pr. no.** 1558525

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended use** Used as a cementing additive in oilfield applications

**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

**Supplier identification**  
Schlumberger Oilfield UK PLC  
Victory House, Churchill Court  
Manor Royal, Crawley  
West Sussex RH10 9LU  
+ 47 51577424  
SDS@slb.com

#### 1.4 Emergency Telephone Number

**Emergency telephone** - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

<b>Denmark</b>	Poison Control Hotline (DK): +45 82 12 12 12
<b>Netherlands</b>	National Poisons Information Center (NL): +31 30 274 88 88 (NB: this service is only available to health professionals)
<b>Norway</b>	Poison information centre: +47 22 59 13 00
<b>Malaysian</b>	Local emergency number; +603 2161 7655

### 2. Hazards identification

#### 2.1 Classification of the substance or mixture

**Regulation (EC) No. 1272/2008**

##### Health hazards

Skin sensitisation	Category 1
--------------------	------------

**Environmental hazards** Not classified

**Physical Hazards** Not classified



## MATERIAL SAFETY DATA SHEET

(USA)

(Complies with USA OSHA 29 CFR 1910.1200 and ANSI Z 400.1)

Version: 2

Revision date: 17 May 2011

### 1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND THE COMPANY/UNDERTAKING

**Product Code:** D207

**Product Name:** General Purpose FLAC D207

**Use of the Substance/Preparation:** Used as a cementing additive in oilfield applications

**Company Identification:** Schlumberger Technology Corporation  
 110 Schlumberger Drive  
 Sugar Land, Texas 77478, USA  
 Telephone: 1-281-285-7873

**Emergency Telephone Number:** USA: +1-281-595-3518 (24hr)

### 2. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW	
<b>Main physical hazards:</b>	No classified physical hazards.
<b>Main health hazards:</b>	May cause mechanical irritation to eyes.
<b>Other Information:</b>	Dust. Suspended dust may present a dust explosion hazard. Water slick. Contaminated surfaces will be extremely slippery.
<b>Precautions:</b>	Keep away from heat, sparks, and flame. Avoid dust formation. Do not breathe dust.
<b>HMS classification:</b>	Health: 0 Flammability: 1 Physical hazard: 0

**Form:** Powder                      **Color:** White                      **Odor:** None

**Principle routes of exposure:**  
 Skin contact. Eye contact. Respiratory system.

### 3. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No	Weight %- Range
Polyglucoside derivative	Proprietary	60 - 100

### 4. FIRST AID MEASURES

**Eye contact:** Rinse immediately with plenty of water, also under the eyelids. Seek medical attention if irritation occurs.

**Skin contact:** Wash off with soap and water.



**Safety data sheet number** D182  
**Version** 2  
**Revision date** 05/Apr/2017  
**Supersedes date** 18/Jun/2014

## Safety Data Sheet MUDPUSH\* II Spacer D182

### 1. Identification of the substance/preparation and of the Company/undertaking

#### 1.1 Product identifier

**Product name** MUDPUSH\* II Spacer D182  
**Product code** D182

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Used as a cementing additive in oilfield applications

**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

##### **Supplier**

Schlumberger Oilfield UK PLC  
Victory House, Churchill Court  
Manor Royal, Crawley  
West Sussex RH10 9LU  
+ 47 51577424

SDS@slb.com

#### 1.4 Emergency Telephone Number

**Emergency telephone** - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

**Classification according to Regulation (EC) No. 1272/2008 [CLP]**

**Health hazards** Not classified

**Environmental hazards** Not classified

**Physical Hazards** Not classified

#### 2.2 Label elements

##### **Signal word**

None

##### **Hazard statements**

This product is not classified as hazardous therefore no (H) hazard statements assigned.



**Safety data sheet number** D208  
**Version** 1  
**Revision date** 17/Oct/2014  
**Supersedes date** 08/Jun/2010

## Safety Data Sheet ScavengerPlus D208

### 1. Identification of the substance/preparation and of the Company/undertaking

#### 1.1 Product identifier

**Product name** ScavengerPlus D208  
**Product code** D208  
**Denmark Pr. no.** 2366154

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended use** Used as a cementing additive in oilfield applications  
**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

**Supplier identification**  
Schlumberger Oilfield UK PLC  
Victory House, Churchill Court  
Manor Royal, Crawley  
West Sussex RH10 9LU  
+ 47 51577424  
SDS@slb.com

#### 1.4 Emergency Telephone Number

**Emergency telephone** - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

### 2. Hazards identification

#### 2.1 Classification of the substance or mixture

**Regulation (EC) No. 1272/2008**

**Health hazards** Not classified  
**Environmental hazards** Not classified  
**Physical Hazards** Not classified

#### 2.2 Label Elements

**Signal word**  
None

#### Hazard statements

This product is not classified as hazardous therefore no (H) hazard statements assigned.

**Safety data sheet number** D500  
**Version** 2  
**Revision date** 26/Jul/2017  
**Supersedes date** 19/Dec/2013

## Safety Data Sheet GASBLOK\* LT D500

### 1. Identification of the substance/preparation and of the Company/undertaking

#### 1.1 Product identifier

**Product name** GASBLOK\* LT D500  
**Product code** D500

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Gas control agent

**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

**Supplier**  
Schlumberger Oilfield UK PLC  
Schlumberger House, Buckingham Gate  
Gatwick Airport  
West Sussex RH6 0NZ

+ 47 51577424

SDS@slb.com

#### 1.4 Emergency Telephone Number

**Emergency telephone** - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

<b>Denmark</b>	Poison Control Hotline (DK): +45 82 12 12 12
<b>Norway</b>	Poison information centre: +47 22 59 13 00

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

**Classification according to Regulation (EC) No. 1272/2008 [CLP]**

##### Health hazards

Skin sensitisation	Category 1
--------------------	------------

**Environmental hazards** Not classified

**Physical Hazards** Not classified

#### 2.2 Label elements



**Safety data sheet number** D801  
**Version** 1  
**Revision date** 09/Oct/2014  
**Supercedes date** 03/Jan/2008

## Safety Data Sheet Mid-Temp Retarder-L D801

### 1. Identification of the substance/preparation and of the Company/undertaking

#### 1.1 Product identifier

**Product name** Mid-Temp Retarder-L D801  
**Product code** D801

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended use** Used as a cementing additive in oilfield applications

**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

**Supplier identification**  
Schlumberger Oilfield UK PLC  
Victory House, Churchill Court  
Manor Royal, Crawley  
West Sussex RH10 9LU  
+ 47 51577424  
SDS@slb.com

#### 1.4 Emergency Telephone Number

**Emergency telephone** - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

### 2. Hazards identification

#### 2.1 Classification of the substance or mixture

**Regulation (EC) No. 1272/2008**

**Health hazards** Not classified

**Environmental hazards** Not classified

**Physical Hazards** Not classified

#### 2.2 Label Elements

##### **Signal word**

None

##### **Hazard statements**

This product is not classified as hazardous therefore no (H) hazard statements assigned.

**Safety data sheet number** D907  
**Version** 4  
**Revision date** 29/Sep/2016  
**Supersedes date** 05/Mar/2014

## Safety Data Sheet Cement Class G D907

### 1. Identification of the substance/preparation and of the Company/undertaking

#### 1.1 Product identifier

**Product name** Cement Class G D907  
**Product code** D907  
**Norway Pr. no.** 110136  
**Denmark Pr. no.** 1005867

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Used as a cementing additive in oilfield applications  
**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

**Supplier**  
Schlumberger Oilfield UK PLC  
Victory House, Churchill Court  
Manor Royal, Crawley  
West Sussex RH10 9LU  
+ 47 51577424

SDS@slb.com

#### 1.4 Emergency Telephone Number

**Emergency telephone** - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

<b>Denmark</b>	Poison Control Hotline (DK): +45 82 12 12 12
<b>Italy</b>	Centro Antiveleni Ospedale Niguarda Milan: +39 02 6610 1029
<b>Netherlands</b>	National Poisons Information Centre (NL): +31 30 274 88 88 (NB: this service is only available to health professionals)
<b>Norway</b>	Poison information centre: +47 22 59 13 00

### 2. Hazards identification

#### 2.1 Classification of the substance or mixture

**Regulation (EC) No. 1272/2008**

##### Health hazards

Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 1
Specific target organ toxicity (single exposure)	Category 3

**Environmental hazards** Not classified

**Physical Hazards** Not classified



Safety data sheet number F103  
Version 3  
Revision date 13/Apr/2017  
Supercedes date 24/Jun/2014

## Safety Data Sheet EZEFL0\* F103 Surfactant

### 1. Identification of the substance/preparation and of the Company/undertaking

#### 1.1 Product identifier

Product name EZEFL0\* F103 Surfactant  
Product code F103  
Denmark Pr. no. 1088973

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Surfactant in oilfield applications

Uses advised against Consumer use

#### 1.3 Details of the supplier of the safety data sheet

Supplier  
Schlumberger Oilfield UK PLC  
Victory House, Churchill Court  
Manor Royal, Crawley  
West Sussex RH10 9LU  
+ 47 51577424

SDS@slb.com

#### 1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

Denmark	Poison Control Hotline (DK): +45 82 12 12 12
Italy	Centro Antiveleni Ospedale Niguarda Milan: +39 02 6610 1029
Netherlands	National Poisons Information Centre (NL): +31 30 274 88 88 (NB: this service is only available to health professionals)

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP]

##### Health hazards

Acute toxicity - Oral	Category 4
Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 1
Specific target organ toxicity - Single exposure	Category 3

Environmental hazards Not classified

# MATERIAL SAFETY DATA SHEET

(USA)

(Complies with USA OSHA 29 CFR 1910.1200 and ANSI Z 400.1)

Version: 2

Revision date: 19 May 2009

## 1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND THE COMPANY/UNDERTAKING

**Product code:** F110  
**Product name:** EZEFL0\* F110 Surfactant  
**Company identification:** Schlumberger Technology Corporation  
110 Schlumberger Drive  
Sugar Land, Texas 77478, USA  
Telephone: 1-281-285-7873  
**Emergency telephone number:** USA: +1-281-595-3518 (24hr)

## 2. HAZARDS IDENTIFICATION

### EMERGENCY OVERVIEW

#### DANGER

**Main physical hazards:** Flammable liquid.  
**Main health hazards:** Causes eye irritation. Causes skin irritation. Contains methanol. Can be fatal or cause blindness if swallowed. Cannot be made non-toxic. Toxic: danger of very serious irreversible effects in contact with skin. May cause Central Nervous System (CNS) depression.  
**Other hazards:** Vapors may cause flash fire or explosion.  
**Precautions:** Keep away from open flames, hot surfaces and sources of ignition. Avoid contact with eyes. Do not get on skin or clothing. Wash thoroughly after handling. Do not breathe vapors or spray mist.  
**HMS classification:** Health: 3 Flammability: 3 Physical hazard: 0

**Form:** Liquid                      **Color:** Clear colorless                      **Odor:** Alcohols  
**Principle routes of exposure:**  
Eye contact. Skin contact. Respiratory system.

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No	Weight %- Range
Methanol	67-56-1	15-40
Ethoxylated alcohols	Proprietary	10-30
Ethoxylated alcohols #2	Proprietary	10-30

## 4. FIRST AID MEASURES

**Eye contact:** Immediately flush eyes with water for 15 minutes while holding eyelids open. Seek medical attention.



**Safety data sheet number** S001  
**Version** 2  
**Revision date** 13/Mar/2015  
**Supersedes date** 22/Dec/2010

## Safety Data Sheet Calcium Chloride S1

### 1. Identification of the substance/preparation and of the Company/undertaking

#### 1.1 Product identifier

**Product name** Calcium Chloride S1  
**Product code** S001  
**Denmark Pr. no.** 2087702

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Used as a cementing additive in oilfield applications

**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

**Supplier**  
 Schlumberger Oilfield UK PLC  
 Victory House, Churchill Court  
 Manor Royal, Crawley  
 West Sussex RH10 9LU  
 + 47 51577424

SDS@slb.com

#### 1.4 Emergency Telephone Number

**Emergency telephone** - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

<b>Italy</b>	Centro Antiveleni Ospedale Niguarda Milan: +39 02 6610 1029
--------------	---

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

**Classification according to Regulation (EC) No. 1272/2008 [CLP]**

##### Health hazards

Serious eye damage/eye irritation	Category 2
-----------------------------------	------------

**Environmental hazards** Not classified

**Physical Hazards** Not classified

#### 2.2 Label elements



**Safety data sheet number** U066  
**Version** 2  
**Revision date** 28/Sep/2016  
**Supersedes date** 26/Jun/2014

## Safety Data Sheet Mutual Solvent U66

### 1. Identification of the substance/preparation and of the Company/undertaking

#### 1.1 Product identifier

**Product name** Mutual Solvent U66  
**Product code** U066  
**Norway Pr. no.** 17121  
**Denmark Pr. no.** 1005912

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Solvent in oilfield applications  
**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

**Supplier**  
Schlumberger Oilfield UK PLC  
Victory House, Churchill Court  
Manor Royal, Crawley  
West Sussex RH10 9LU  
+ 47 51577424

SDS@slb.com

#### 1.4 Emergency Telephone Number

**Emergency telephone** - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518  
- Brazil 0800 707 7022

### 2. Hazards identification

#### 2.1 Classification of the substance or mixture

**Regulation (EC) No. 1272/2008**

##### Health hazards

Acute oral toxicity	Category 4
Acute dermal toxicity	Category 4
Acute inhalation toxicity - Vapour	Category 4
Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 2

**Environmental hazards** Not classified

**Physical Hazards** Not classified

#### 2.2 Label elements



# Appendix C - Drilling Rig Inspection Report

## **INSPECTION REPORT**



### **WEST VENCEDOR**

**INSPECTION DATES: 12 – 17 August 2018**

**ModuResources AP Pte Ltd**  
Registered Number: 201632344K  
1 Bukit Batok Street 22  
GRP Building #03-01  
Singapore 659592

**FINAL TECHNICAL REPORT**

**Project Number:** MRAP0211.1

**Client:** Petronas Myanmar

**Project Title:** Initial Rig Condition Survey

**Report Authors:** Giulio de Liso, Barrie Warrilow, Carlos Goncalves

**Technical Approval:** Pat Rutherford

**Date of Issue:** 22-Aug-2018

This report has been written for Petronas Myanmar as a result of an inspection conducted on the Semi-Submersible Tender Rig WEST VENCEDOR from 12 to 17 August 2018, while the unit was located near Labuan – off-shore Malaysia. This report specifies what has been observed and in what manner.

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Note: The numbering system in this report corresponds with the ModuResources survey programme and numbers which are omitted apply to equipment which was not applicable or reviewed during this survey.

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## **2.0 INTRODUCTION**

### **2.1 Rig Data**

Rig Type:	Semi-Submersible Tender Rig
Owner:	Seadrill
Built:	2009
Location:	Off-shore coast of Labuan – Malaysia GPS Coordinates: 05° 09.11' N ; 115° 10.47' E
Inspection dates:	12 – 17 August 2018
References/project number:	MRAP0211.1/2

### **2.2 Scope of Work**

The equipment inspection covered the following areas:

- Hull and Marine systems
- Drilling equipment
- Mud system
- Electrical equipment and systems
- Hazardous Area equipment and compliance
- Power plant
- Safety systems and equipment
- Lifting equipment
- Maintenance system
- Pressure vessels
- BOP and well control equipment
- Spare parts
- Assessment of compliance with appropriate standards and Fitness for Purpose

### **2.3 Applicable Standards**

The inspection criteria which have been used as reference during this inspection are internationally recognized standards, customer's safety and operating standards, the original equipment manufacturer's maintenance and operating specifications and accepted oilfield operating and safety practices.

### 3.0 EXECUTIVE SUMMARY

The WEST VENCEDOR is a purpose built SSETR (Semi-Submersible Self-Erecting Tender Rig) rig of 'KFELS SS3600E-GOM-C42 design' featuring a 10K dual BOP, off-line pipe handling, stand building & designed to work on TLP's and SPAR's in up to 6,500ft of water with pre-laid mooring. The vessel had an ABS Classification with +A1 'Column Stabilized Drilling Tender' Class notation. The rig was built and commissioned in 2009 at Keppel FELS shipyards in Singapore and completed its most recent operational drilling program offshore Indonesia during the first quarter of 2018. It was then towed to the outer port limits of Labuan harbor in Malaysia during March 2018 and placed in a "Warm" stack mode with a substantially reduced crew living permanently on the rig.

The ModuResources survey team had been informed that whilst the rig was in a "Warm" stacking mode and that the critical equipment identified, had been kept in a semi-operational state with regular operation tasks routinely conducted by the limited crew.

The limited crew assigned to the WEST VENCEDOR, were not assigned to the rig during its recent operational period in Indonesia. The only three Seadrill employed personnel, the OIM, TSL and Barge master had never worked on the rig and, although they both had considerable working experience on rig, had very limited operational experience working on tender assist drilling rigs. This lack of specific rig experience presented challenges when trying to collect the documentation required to verify the equipment's compliance with regulatory requirements and industry specific standards and specifications.

#### **Unit Specifications, Hull and Marine Equipment**

The marine documentation shown to the MR surveyors was incomplete at the time of the survey, the surveyors were informed that all documentation was present but could not be located; possibly due to the rig being very short handed and the crew that was onboard being new to the rig.

The rig was in "hotel" mode with no drilling equipment in operation The systems seen in use were satisfactory and a painting program was ongoing

The rigs general appearance was satisfactory.

#### **Drilling Equipment**

The derrick was disassembled and in its storage positions on the main deck of the rig. This situation made access very difficult and limited the visual inspection.

The accessible equipment inspected was in satisfactory visual condition.

Although the ModuResources surveyors were given access to where the related equipment specific files were stored in the WEST VENCEDOR Tool-pushers office, it proved to be very time consuming identifying the correct, relevant documentation. Additionally, the validity of the documentation could also be questioned as most of the documentation was not filed in an orderly and controlled manner.

#### **5-Yearly inspection status**

The surveyors requested details of the last 5-yearly critical load path equipment inspections and not all of the information was made available during the survey period. The short time frame for the survey meant that there was insufficient time to get the certification sent from the shore based maintenance team located in Dubai.

Certification and inspection reports were available for the cranes, however there was no information sighted for the API RP7L category IV disassembly and inspection of all of the critical load path items on the BOP hoisting arrangement.

Equipment	Certificate Date	Due Date	Standard
Crown Block	Oct-2014	Oct-2019	API RP8B
Travelling Block	No Info	No Info	API RP8B
Deadline Anchor	No Info	No Info	API RP8B
Drawworks	Nov 2017	Nov-2022	API RP7L
Rotary Table	Oct-2014	Oct-2019	API RP7L
BOP Hoisting System	No Info	No Info	API RP7L
Heavy Lift Crane	Jan-2015	Jan-2020	ABS
Port Crane	Jan-2015	Jan-2020	ABS

### Rig Power Plant

Four of the six engine/generators were observed running (one at the time) with the hotel load required for living quarters and services (compressed air, potable water, cooling pumps for engines, lighting circuitries). Each generator ran at 40% – 50% of maximum load. The functionality of two generators on line did not show any problem with load sharing (although the load sharing should be tested at substantial load which, at the time of the inspection, was not available)

The main concerns and problems to be rectified before commencement of the RDIT were:

- The main engines did not respond at the shut-down alarms and require investigation from the manufacturer. (High water temperature and low lubricating oil pressure did not cause the engines to stop)
- The main engines were all approaching the major overhaul period and a well planned maintenance schedule has to be produced so as not to affect drilling operations or minimally affect the Power Management System.
- The main ship UPS was damaged and out of service. This issue will leave the essential rig users non-operational in case of main power loss.
- The communications UPS was damaged and by-passed. This issue will leave the radio communication equipment non-operational in case of main power loss.
- The 24VDC batteries and charger for the generator control panels was found operational but below nominal voltage. Failure of this battery rack will prevent the generators from re-start after a black-out.
- Numerous battery back-up emergency luminaries were not operational and require batteries and/or fluorescent tube replacement. This issue has got safety implications as several rig areas were left in total darkness after a main loss of power (during the transition time from main to emergency generator power or in case of emergency power failure and abandon rig ESD activation).

The main diesel generators and power distribution/conversions will be extensively tested during the RDIT with the analysis of engine parameters revealed for the machinery and the PMS (Power Management System).

### Drill String Equipment

The MR surveyors were informed that the drill string was currently in Singapore for storage and testing and that various items had been taken for use on other rigs in the fleet.

A full inventory of drill string and related equipment needed to be produced with relevant documentation.

### **Well Control**

As a tender assist drilling rig, when the WEST VENCEDOR is not in active operation next to an offshore platform, the drilling package is broken down into various packages and stored in pre-assigned spaces on the pipe deck of the rig. These stored packages are not usually connected to any other package or any power sources and are not designed to be operated independently. They are designed to be operational and linked together once the entire drilling package has been assembled at a suitable location.

The drilling package was in this "stored" state on the WEST VENCEDOR at the start of the survey on Sunday the 12<sup>th</sup> August.

In relation to the BOP, its related equipment and the well control equipment on the drilling package, this "Warm" stacking procedure did not really apply. The related major pieces of equipment had been prepared for long term storage and as there was no power supplied to the separate packages, the equipment was effectively "Cold" stacked.

In summary, the visual inspections conducted on the BOP, its related equipment and the well control equipment which was stored on the WEST VENCEDOR, appeared to be in a satisfactory condition. A brief synopsis of the equipment inspected, which include details of all the findings and their related recommendations, is provided in the section "E" of this report.

### **Mud System and Cement System**

The mud pumps fluid end had been removed for the stacking period and all parts greased and stored. The pumps and related equipment were started on a regular basis as part of the owners warm stacking procedure. In the mud treatment systems only the shakers and degasser remained, the MR surveyors were verbally informed that mud centrifuges, Desander, etc. would be installed by third party vendors before drilling operations commenced.

Documentation of 5 yearly inspection/overhauls needed to be brought up to date.

The MR surveyors were informed that the cement unit would "possibly be changed out", however the current unit was satisfactory.

Documentation of HP pipework wall thickness testing was incomplete with no original wall thickness and minimum dimensions given in the document .The results needed to be correctly analyzed and future inspections need to include the critical dimensions.

### **Instrumentation and Communication**

As per other drilling equipment, the drilling instrumentation was disassembled and no calibration certificates were produced by the rig owner during the time of the survey. The RDIT will provide a clear definition of the functionality, features and eventual defects or weaknesses for the drilling instrumentation control package. Seadrill has to verify the instruments calibration (with certificates) before commencing of the RDIT.

Communication on the rig was mainly done with the 'Gaitronic' call stations which were widely used during the survey time. Automatic internal telephones were not installed on the WEST VENCEDOR. Telephones communicating with the satellite system were noted in the radio room and OIMs office.

At the time of this survey there was no radio operator assigned to the crew.

The radio room was noted to be equipped with the required communication systems although the radio equipment will suffer a total black-out condition in case of main loss of power due to

the defective UPS. Functionality of the radio room equipment after back-out will be tested (once the UPS has been repaired or replaced) during the conduction of the RDIT

### **Accommodation**

The accommodation was seen to be sufficiently maintained although the cabins will require a general cleaning before up-manning. Only two persons, from the catering contractor, were covering for all services (galley, laundry, housekeeping).

The galley was well laid out and the mess was capable of seating half of the maximum POB crew. The accommodation was protected from the environment, properly heated and cooled, located outside hazardous areas and not seriously affected by noise or vibration.

Changing rooms were located on the port and starboard sides on main deck level.

There was one recreation room, a meeting room and a gym provided.

### **Safety Equipment**

The gas detection system had not being maintained or tested for the last three months.

All gas detector have to be tested and calibrated as per manufacturer recommendation before commencing of the next drilling contract.

The fire warning sound was not sufficiently audible in the control room if the fire rack panel door was kept in close position. This had already led to the activation of a false fire alarm through the automated activation of the PAGA system as it was not noticed by the operator. The rig requires a local panel warning. Refer to section L.2.7 of this report.

The test performed on the fire alarm system did not activate the ventilation automatic shut-down effects as per the 'Cause & Effects' matrix. This has to be investigated and rectified.

The rig was mainly covered by the Hi-Fog water mist system at all areas. The Hi-Fog system was last inspected by third party contractor in January 2018 and certification was valid until January 2019

### **Pollution Prevention Equipment**

The sewage system was operational. The waste food macerator fitted at deck level, aft side needed to be moved away from the safety shower area where it had been installed.

### **Maintenance System**

Seadrill (Rig owner) used a computer based maintenance system known as 'SAM'.

At the time of this survey the SAM system had been de-activated from the shore base support office since July 2018. Maintenance work orders had not been automatically generated.

Basic maintenance was covered by the rig crew via a 'warm stacked maintenance' plan developed on board and recorded on hard copies where required.

The re-activation of the computerized programmed maintenance system should be capable in producing (or highlighting) those 6-monthly or yearly scheduled maintenance work orders that may have been overlooked during the out of service period.

### **Spare Parts**

The general store was spacious and noted to be in a tidy condition.



The rig owner should ensure that a critical spare part list is available and regarded as high priority within the computerized system.

Single point failure items (single equipment whose failure may led to a complete stop of operations until replacement is found) required attention for spares availability on anchor winches, VFDs and motors; furthermore, the condition of single point failure components such as the spare top drive loop and motor should be determined and confirmed whether immediately reliable for use.

## 4.0 SURVEY FINDINGS

The detailed findings of the survey and a brief synopsis of the items audited within each system are provided in this report. Where available, photographs are included to emphasise/clarify the issue encountered.

A list of these findings has also been compiled in an Excel spreadsheet accompanied with a photo folder. This is provided in soft copy with this report.

Audit findings are classified in accordance with the criteria below.

**Table 2 1 Survey Action Items**

Ranking	Criteria
Low	Deficiencies that do not affect the efficiency or operability of equipment but are noted as not meeting industry best practice.
Medium	Deficiencies that may lead to the premature failure, damage or reduced operability of essential equipment.
High	Deficiencies that are likely to lead to the failure of essential equipment, stop a unit from operating, or prevent a unit operating to specifications. These deficiencies can be related to a regulatory or industry specification or have the potential to cause a serious injury, loss of life or a serious environmental impact.

**A: UNIT SPECIFICATIONS, HULL AND MARINE EQUIPMENT**

**A.1 MAIN DIMENSIONS/TECHNICAL DESCRIPTION**

**A.1.1 Main Dimensions**

Hull length is	:	308ft including anchor racks
Hull breadth is	:	118 ft
Hull Depth is	:	67 ft

**A.1.2 Technical Capability Description**

Accommodation (POB)	:	160
Mooring winches	:	4 double line
Rated Drilling Depth (ft)	:	30,000 ft
Drawworks	:	3,000 hp
Derrick	:	Gross nominal capacity 1,330,000 lbs
Static Hook Load (kips)	:	1,000,000 with 12 lines
Top drive	:	Varco TDS-8 SA - 650 tons
Engines (main)	:	Each engine was rated at 1,850 HP / 1,384 KW
Engine (emergency)	:	CAT 3512BTA; 1,030 KW, 480 VAC
Mud Pumps	:	Lewco W-1712
Shale shakers	:	NOV/Brandt VSM300
Annular BOP	:	Hydrill / MSP 21-1/4"
Ram BOP's	:	Cameron Type U with FXT Bonnet
Cranes	:	Favell Favco PC 300
		Favell Favco 7.5/10k

**A.2 UNIT STRUCTURE AND STORAGE CAPACITIES**

**A.2.1a Tanks**

Not inspected due to time, lack of personnel on board and lack of maintenance historical data availability.

**A.2.1b Open Deck Storage Areas**

Not inspected due to the drilling mast and equipment being stored on deck.

### A.2.1c Below Deck Storage Areas

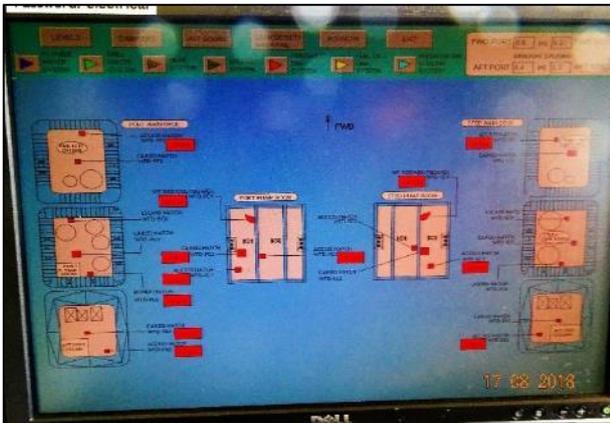
Not inspected

### A.2.2 Hull Structure

Maintenance and painting as required has been planned by the rig crew.

### A.2.3 Watertight Integrity and Compartments

Water tight doors, seals and operating mechanism were noted in good condition and each individual door was monitored in the control room from the VMS (Vessel Management System) monitoring station.



A.2.3  
Watertight door – Control panel at VMS in ballast control room.

### A.2.4 Overflow and Vent Checks

Overflow and vent checks were mostly in good condition and clearly identified as per tank.

## A.4 RIG SKIDDING SYSTEM

### A.4.1 Substructure Support Beams

Not applicable

### A.4.2 Rig Skidding System (drill floor)

Not inspected due to disassembly and storage.

## A.5 OPERATIONAL CAPABILITIES

### A.5.1 Variable Load Capacity

The rig was reported to have a variable load capacity of 3,600 tonne

### A.5.2 General Operational Requirements

The general operating requirements for the rig could not be ascertained as the rig was not fully crewed for operations.

### A.5.3 Registration and Classification General Requirements

The MR surveyors were shown a document package by Seadrill personnel which was lacking in some of the required documentation. These documents need to be seen.

Registration and Classification Certificate	Issue Date	Expiry Date	Survey Due Date
Certification of Classification Certificate (ABS)	27-10-15	17-12-19	12-1-18
International Load Line Certificate	27-12-19	17-12-19	12-01-18
Certificate of Registry (Flag)	02-06- 15	No info	No info
I.O.P.P. Certificate	27-10-15	17-12-19	15-11-2017
International Tonnage Certificate	06-12-2009	No info	No info
MODU Safety Certificate	22-12-2015	17-12-2019	22-12-2015
Safety Equipment Certificate	27-07-2017	No info	22-06-2016
Safety Construction Certificate	No info	No info	No info
Ship's Radio Station License	31-03-2016	02-02-2021	No info
Cargo Gear Certificate (if covered by class)	No info	No info	No info
Rig's certificate of insurance	20-02-18	20-02-2019	No info
Others:			
Annual independent survey of Fire-fighting equip.	No info	No info	No info
Lifting gear independent yearly inspection report	22-02-2017	22-02-2018	
Employers liability insurance	No info	No info	
Life boat falls certificates	No info	No info	
Life boat inspection certificate	No info	No info	
Life raft inspection certificate	16-11-2017	16-11-2018	
Life raft falls certificate (if davit launched)	N/A		
Life raft hydrostatic release certificates	No info		

**A.5.3 Registration and Classification General Requirements  
Action Items:**

A.5.3#1	Low	Produce all missing documentation.
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**A.5.4 Review of Other Documentation**

Not inspected

**A.6 ENVIRONMENTAL LIMITS**

Not ascertained during the survey.

**A.7 MOORING SYSTEM**

**A.7.1 Anchor Winches**

Make Oil States Skagit Smatco  
Model TMW 300 – double drums.



A.7  
Anchor winches.

All of the four (4) double drum anchor winches were function tested, with cable being pulled in and paid out. The dynamic motor and band brakes were both seen in operation on all winches. No abnormalities were noted during the test. Small patches of corrosion were developing on all of the winches and this should be removed and the steel recoated before it becomes serious.



A.7  
Anchor emergency release panel.



A.7#2  
Remove and treat corrosion

**A.7.1 Anchor Winches Action Items:**

A.7.1#1	Low	Produce documentation of NDT inspection.
A.7.1#2	Medium	Remove and treat corrosion on all winches.

**A.7.2 Anchors**

Not inspected.

**A.7.3 Anchor Lines**

Type 6 x 41 WS, IWRC, RHRL EEIPS  
Size 3 ins.

The MR surveyors were shown documentation of five wires being changed out in Feb 2017 whilst the rig was in Singapore, however no certification was available.



A.7.3  
View of winch and line

**A.7.3 Anchor Lines Action Items:**

A.7.3#1	Low	Produce wire certification documents.
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**.7.3.1 Pennant Lines**

Not inspected

**A.7.3.2 Anchor Buoys**

Not inspected as they were in use.

**A.7.4 Towing Gear**



A.7.4  
Towing bridle tugger and fish plate.

The towing assembly was rigged up during the survey with no abnormalities noted. The MR surveyors were shown documentation of an MPI inspection on the towing gear carried out on 24-01-17 by Uniclumb Singapore.

**A.7.4 Towing Gear Action Items:**

A.7.4#1	Low	Produce wire line certification
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### A.7.5 Supply Vessel Mooring System

Not inspected

## A.8 PIPE SYSTEMS AND LOADING HOSES

### A.8.1 Potable Water System and Hoses



A.8  
The potable water pump.

The pot water pumps were seen in use during the survey with no issues noted. The pump was running with no vibration or excessive noise.

No loading hose was fitted to the bunkering station during the survey period. See F.16

### A.8.2 Drilling Water System and Hoses

The drill water pumps (port and stb) were not in use during the survey; they were visually inspected with no issues found.

The load hose (one) was attached to the Port side bunkering station and was seen to be a fair condition. Hose see F1.6

### A.8.3 Fuel Oil System and Hoses



A.8.3  
Fuel oil pump

The fuel transfer pump (port) and the fuel oil service pump were witnessed in operation during the inspection period; they ran smoothly with no excessive vibration.

**A.8.4 Bulk Mud System and Hoses**

Capacity 2600 ft<sup>3</sup>  
 Working Pressure 44psi



A.8.4 Bulk mud tank

The two bulk mud tanks were visually satisfactory with no signs of corrosion. The MR surveyors were shown documentation of a PSV testing on all tanks dated 7<sup>th</sup> Feb 2017 Bulk hoses were in storage during the survey; see F.16. The manual valves were operated and found to be free in movement. The MR surveyors were informed that internal & external inspections were carried out by the class inspector at approx. 2-3 year intervals.

**A.8.4 Bulk Mud System and Hoses Action Items:**

A.8.4#1	Low	Produce internal inspection documentation.
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**A.8.5 Bulk Cement System and Hoses**

Capacity 1600 ft<sup>3</sup>  
 Working Pressure 44psi



Bulk cement tanks

The four bulk cement tanks were visually satisfactory with no signs of corrosion. The MR surveyors were shown documentation of a PSV testing on all tanks dated 7<sup>th</sup> Feb 2017 Bulk hoses were in storage during the survey see F.16 The manual valves were operated and found to be free in movement.

The MR surveyors were informed that internal & external inspection was carried out by the class inspector at approx. 2-3 year intervals.

**A.8.5 Bulk Cement System and Hoses Action Items:**

A.8.5#1	Low	Produce internal inspection documentation.
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**A.8.6 Base Oil System and Hoses**



A.8.6  
Base oil pump in the pump room



A.8.6  
DMA manifold off the engine room

The oil base (DMA) pump mounted in the lower Stbd pump room was seen to be in a satisfactory condition. It was not seen in use during the survey.

**A.8.7 Brine System and Hoses**

There was no dedicated brine system.

**A.8.8 Sea Water and Ballast System**

The ballast pumps were not seen in operation but were visually satisfactory. The general service sea water pumps were seen in operation and both ran smoothly without excessive vibration or noise



A.8.8  
Ballast pump.



A.8.8  
Salt water service pump.

### A.8.9 Bilge System



A.8.9  
Pump room bilge pump.

The bilge pumps were seen in use during the survey and functioned with no leaks, unusual noise or adverse vibration.

### A.8.10 Other Piping Systems

The MR surveyors were verbally informed that all mud pipe work for both high and low pressure mud systems had been flushed out but that corrosion inhibitor had not been used in the process.

## A.9 CRANES, HOISTS AND MATERIAL HANDLING

### A.9.1a Cranes, Revolving (Main)

Make Favell Faco  
Model PC300  
Swl 250 metric tonnes.  
SN 1536

The port main crane was function tested with no load, slewed 360 degrees. All of the block and boom limits were successfully tested. Radius charts were displayed in the crane cab. The air-condition operators cab was well situated with a good field of vision, all controls and alarms were well displayed.

The crane ran smoothly in operation no excess juddering when slewing and all winches running without issue.

The MR surveyors were shown documentation of load testing carried out carried out by ABS offshore Malongo, Angola on both of the rigs cranes on 06-Dec-2014. A third party contractor conducted a full 5 yearly inspection of the crane in January 2015. The detailed report was available on board for review.

A limited MPI inspection of the pedestal, boom clevis and both main and whip line hooks was carried out by Uniclumb on 16-Feb-2017.



A.9.1a  
Port crane – Engine compartment



A.9.1a  
Port crane



A.9.1a  
Raising boom for function test.

Crane Identity	Wire installed on	Certificate No.	Replacement due date	Wire details
<b>Port Crane No.1</b>				
Boom wire	6 Mar 15	11000393-1	No info	FOE 02.10.0043
Main hoist wire	5-Jan-15	11000939-4	No info	FOE.02.10.0046
Whip line	6 Mar 15	88372	No info	32mm34 LR 2160 GAL RHL MBL 101T
Pendant wires	n/a			
<b>Stbd Crane No. 2</b>				
Boom wire	5-Jun-17	86941 5/79752/1	No info	24mm DF 34 LR PI 1960 GAL MBL 53.8T X 195MTS Q499341
Main hoist wire	Aug- 17	87398	No info	20mm DF 34LR PI 1960 GAL RHL MBL 53.8 T1X35 MTSQ516431
Pendant wires	Oct 2014	KIM AA590	<b>Oct 18</b>	PR48MM X25MRT COMPACT 25X7) RHLL GRADE 2160 NON ROTATING

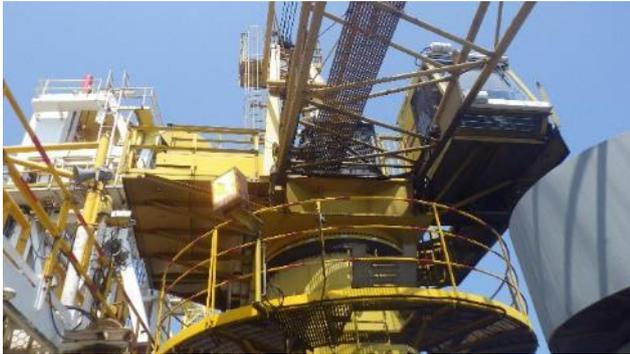
**A.9.1a Cranes, Revolving (Main) Action Items:**

A.9.1a#1	Low	Produce documentation of five yearly overhaul to OEM standards, NDT and recertification.
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**A.9.1b Cranes, Revolving (Secondary)**

Make Favelle Faco  
Model 7.5/10k

SWL 44 metric tonnes – main block.



A.9.1b  
STBD crane view



A.9.1b  
Oil leaks on hydraulic motors

The crane seen was in use during the survey period, visually inspected and found to be in a satisfactory condition. As with the port crane the cab was air-conditioned and well laid out. Hydraulic oil leaks were noted on the hydraulic motors and pumps. The MR surveyor was informed that parts were on order for the repairs but the PO was not seen.

**A.9.1b Cranes, Revolving (Secondary) Action Items:**

A.9.1b#1	Low	Produce documentation of overhaul and NDT inspection.
A.9.1b#2	Medium	Rectify hydraulic pump and motor oil leaks.

**A.9.2 Forklift**

Make Toyota  
Model 7FB 25  
SWL 2,500KG

This equipment was observed in use during the survey with no abnormalities noted. The MR surveyors were shown MPI documentation carried out by Uniclumb in 24-01-2017. This unit was overdue its annual lifting gear inspection.



A.9.2  
Fork lift view

**A.9.2 Forklift Action Items:**

A.9.2#1	Medium	Have the overdue annual NDT inspection carried out on the load carrying components.
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**A.9.3 Monorail Overhead Cranes**

None were installed on the rig.

**A.9.4 Air Hoist/Derrick Winches**

Make Ingersoll Rand Force 5  
Model FA5A-24MK1GP-3621-J1235.



A.9.4  
Derrick winch.

None of the derrick winches were installed at their operating positions at the time of the survey and could not be seen in use. The winches were visually inspected only and seen to be in fair condition.

**A.9.4 Air Hoist/Derrick Winches Action Items:**

A.9.4#1	Low	Produce documentation records of base NDT, load testing and wire certs.
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**A.9.4.1 Rig Floor Winches (Non Man-Riding)**

Make Ingersoll Rand Force 5  
 Model FA5A-24MK1GP-3621-J1235



A.9.4.1  
 Rig floor winch view

The rig floor winches were not in use during the survey and were not installed on the drill floor. All of the accessible winches were visually inspected only and seen to be in fair condition.

**A.9.4.1 Rig Floor Winches (Non Man-Riding) Action Items:**

A.9.4.1#1	Low	Produce documentation records of base NDT, load testing and wire certs.
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**A.9.4.2 Monkeyboard Work Winches**

Make Ingersoll Rand  
 Model BU1APTAB-GP-J1235



A.9.4.2

The two monkey board winches were in a fair visual condition when viewed from a distance. Not in use.

**A.9.4.2 Monkeyboard Work Winches Action Items:**

A.9.4.2#1	Low	Produce documentation of wire certification, base NDT and load test.
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**A.9.4.3 Rig Floor (Man-Riding Winches)**

Make Ingersoll Rand force 5  
 Model FA5A-24MK1GP-3621-J1235



A.9.4.3  
 Man rider in storage.

Satisfactory visual condition

Not in use during the survey, stored in the sack store with the wire removed.

**A.9.4.3 Rig Floor (Man-Riding Winches) Action Items:**

A.9.4.3#1	Low	Produce documentation records of NDT, load testing, yearly inspection by third party and wire documentation
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**A.9.4.4 Utility Winches (i.e. Deck Winches)**

Make  
 Make Ingersoll Rand Force 5  
 Model Model FA5A-24MK1GP-3621-J1235

Not seen in use during the survey, in storage. All were in a satisfactory visual condition.

**A.9.4.4 Utility Winches (i.e. Deck Winches) Action Items:**

A.9.4.4#1	Low	Produce documentation records of base NDT, load testing and wire certification.
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**A.9.5 Transfer Baskets/Containers/Lifting Gear**

**A.9.5.1 Personnel Transfer Baskets**



A.9.5.1  
Personnel basket in use

Make Billy Phugh company inc  
Model 904-4 1/2  
SN 1053-14

Seen in use during the survey, visually in a satisfactory condition.

**A.9.5.1 Personnel Transfer Baskets Action Items:**

A.9.5.1#1	Low	Produce documentation records of load testing, overhaul and third party inspection.
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**A.9.5.2 Cargo Containers**

None on board.

**A.9.5.3 General Lifting Gear**

The MR surveyor was informed that the lifting register and color coding currently in use was not complete and that all lifting equipment, shackles and pad eyes etc. will be re-certified before recommencing operations.



A.9.5.3  
The lifting gear colour code is displayed around the rig.



A.9.5.3

**A.9.5.3**

**General Lifting Gear Action Items:**

A.9.5.3#1	Low	Produce recertification documentation and a complete lifting register of all fixed and movable lifting equipment used on board.
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**A.10 HELICOPTER LANDING DECK**

**A.10.1 Helideck Structure and Markings**

The helideck marking was appropriate and very visible although it will need to be inspected by the next helicopter service company.

There was a Gas alarm lamp (red colour) providing a clear signal to the helicopter pilot that the rig was experiencing a gas alarm. This warning light was automatically activated through the gas control panel.

The helicopter perimeter lights were obviously affected by the non-operational 10kV main ship UPS failure (refer to section C.1.14 of this report for more details) and in case of power loss from the emergency board will not be energized.

This will be tested as part of the RDIT after the UPS replacement is installed.



A.10.1

The red gas alarm warning light on the helideck..



A.9.10.1  
One of the helideck perimeter lights.



A.9.10.1  
Helideck perimeter drain and catch netting.

## A.10.2 Helicopter Refueling System

The helifuel system had not been in use for a considerable time and needed to be fully serviced to the satisfaction of the new helicopter service provider.

## A.11 AUXILIARY EQUIPMENT

### A.11.1 Water Distillation

Make	ALFA-LAVAL
Model	D-PU-2-36-C125
Produces	50m <sup>3</sup> per day



A.11.1  
Water maker - View

The one water distillation unit with its associated water heaters was seen in use during the survey supplying the rigs pot water needs. No abnormalities were noted.

As there was only one water maker on board, consideration should be given to a secondary potable water source during upcoming operations in case of the unit's failure.

**A.11.1 Water Distillation Action Items:**

A.11.1#1	Medium	Consider arranging a secondary water source in case of failure.
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**A.11.2 Boilers**

Not part of the rig inventory.

**A.11.3 Air Conditioning Systems**

The air conditioning plans were observed operating satisfactorily in the accommodation block and switchboard room.

**A.11.4 Refrigerating Systems**

Two refrigeration units were available.

One refrigeration unit referred to as the 'Local' chiller/freezer in use at the time of the survey.

One refrigeration unit referred to as the 'Western' chiller / freezer which was off-line at the time of the survey.

The local chiller / freezer unit temperatures were respectively recorded at +6°C and -18°C.

**A.11.5 Air Compressors/Air System**

Make Ingersoll Rand.

Model LS200S-1500 HAWC.

CFM 683 ACFM-125psi

Compressor No.	Running Hours	Hours until next major service
1	34,896	5,104
2	36,291	3,709
3	35,050	4,950
4	30,231	9,769

The four water cooled rig air compressors were in a satisfactory condition, well housed with no signs of damage or corrosion. They were all observed in use during the survey period with no abnormalities noted.

The MR surveyor was informed by Seadrill personnel that the compressor air ends are changed out on an hourly basis at 40,000 hrs. as per OEM standards



A.11.5  
Main compressors - View

### **Cold start Compressor**

Make Ingersol Rand

Model Model T-30 3000C / XM31DNN-NN

The cold start compressor was in a satisfactory visual condition. It was not seen in use during the survey period.



A.11.5  
Cold start compressor

### **A.11.6 Air Receivers**



One of the three main air receivers.( one bulk air)

The three main air receivers mounted in the sack store deck head were satisfactory with no signs of corrosion. Access to the drill floor air receivers was not possible due to the storage position. The MR surveyors was shown documentation by Seadrill personnel of the pressure relief valves that are tested every two years. Last test being in Feb 2017.

**A.11.6 Air Receivers Action Items:**

A.11.6#1	Low	Produce internal inspection and pressure testing certification.
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**A.11.7 Fuel and Lubrication Oil Centrifuges**

Make Westfalla  
Model DT89-02-A66



A.11.7  
Fuel oil purifier

The two FO separators were seen in operation with no leaks, excessive noise or vibration. Both were well installed with easy access for maintenance and fitted with adequate drip pans.

**B: DRILLING EQUIPMENT**

**B.1 DERRICK AND DRILLFLOOR**

**B.1.1 Derrick/Mast**

Make MH Pyramid.

The mast consists of four sections that are vertically assembled using two winches installed on the mast base. The mast bottom, top section and top drive are lifted as a single lift. The intermediate sections are lifted and installed separately.

At the time of the survey the mast was laid down in its storage position reducing access for inspection. Visual inspection of the accessible areas showed the mast sections to be well painted with no structural damage or deformation seen.



**B.1.1**  
Laid down mast and drill floor.

**B.1.1 Derrick/Mast Action Items:**

B.1.1#1	Low	Produce Cat 4 inspection/NDT documentation.
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**B.1.2 Racking Platform**

The racking platform could only be visually inspected from a distance due to lack of access. The fingers on both sides of the diving board were however showing signs of distortion and this must be rectified. The attachment frame for the derrickman fall arrestor was not marked with SWL load or colour coded.



B.1.2  
Racking board



B.1.2#3  
Derrickman fall arrestor attachment point had no SWL markings.



B.1.2#2 Investigate deformation in pipe fingers.

**B.1.2**

**Racking Platform Action Items:**

B.1.2#1	Low	Produce NDT and CAT 4 documentation on structure.
B.1.2#2	Medium	Investigate deformation in the pipe fingers and rectify.
B.1.2#3	Low	NDT/ load test derrickman fall arrestor frame and enter in lifting register.

**B.1.3 Automated Pipe Handling**

Not applicable for this rig. All pipe handling was manual.

**B.1.4 Casing Stabbing Board**

Make MH-Pyramid  
 Model Casing Stabbing Board (CSB), dual fall-prevention - EKAB/PT/PZ,



B.1.4  
Laid down stabbing board.

The stabbing board was laid down on the main deck during the survey with no visual defects noted.

**B.1.4 Casing Stabbing Board Action Items:**

B.1.4#1	Low	Produce load testing, NDT and certification documentation
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**B.1.5a Substructure**

The MH-Pyramid substructure was designed for a simultaneous casing load of 1,000,000 lbs and a setback of 1,200,000 lbs as per API Spec 4F.



B.1.5a  
Substructure view



B.1.5a#2  
Corrosion on sub structure.

The sub structure was visually inspected in its stored position which reduced access. It was in a satisfactory condition viewed from a distance, with some areas of coating breakdown resulting in light corrosion which should be removed and treated

**B.1.5a Substructure Action Items:**

B.1.5a#1	Low	Produce documentation of NDT/Cat inspections.
B.1.5a#2	Low	Remove and treat corrosion.

**B.1.5b Drill Floor**

The drill floor at the time of the survey was in its storage position with no equipment installed. The structure had no serious corrosion or structural damage noted. Documentation of inspection according to API RP 4G Cat 4 was requested but not produced.



B.1.5b  
Drill floor view while disassembled.

**B.1.5a Drill Floor Action Items:**

B.1.5b#1	Low	Produce documentation of CAT 4 and NDT inspections.
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**B.1.6 Weather Proofing**

No weather proofing windwalls were installed.

**B.1.7**

**Derrick TV Camera System**

Not installed during the survey period

**B.2 DRAWWORKS AND ASSOCIATED EQUIPMENT**

**B.2.1 Drawworks**

Make Lewco  
Model LDW 3000



Drawworks.



Drillers operation panel

The draw works were visual inspected in its storage position and found to be in a satisfactory visual condition with no visible damage or corrosion.

The surveyor was shown documentation by Seadrill personnel of a 5 yearly inspection by PT offshore hydraulics Indonesia carried out -21-11-17

**B.2.1**

**Drawworks Action Items:**

B.2.1#1	Low	Produce NDT inspection documentation for the critical load path areas.
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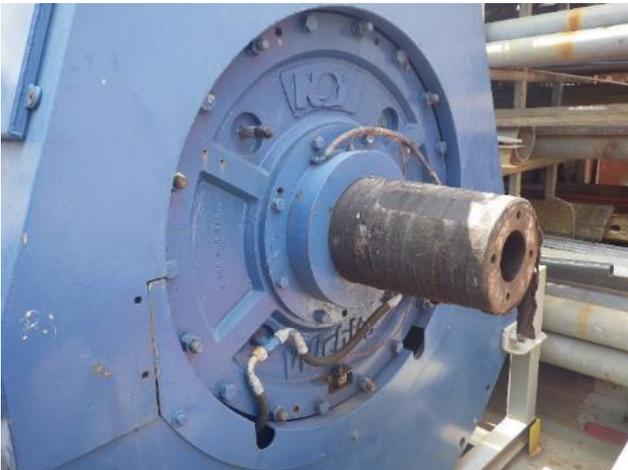
**B.2a Auxiliary Brake**

Make NOV  
Model V436



B.2a  
Auxiliary brake.

The brake as installed on the drawworks was in a satisfactory condition as was the spare unit on board. The surveyor was informed by Seadrill personnel that a 5 yearly overhaul by the OEM was carried out in Feb 2013 however no documents not seen.



B.2a  
Spare brake assembly.

The spare brake was stored on the main deck with both coupling shaft ends protected.

**B.2.2a Auxiliary Brake Action Items:**

B.2.2a#1	Low	Produce NDT, major overhaul documentation.
B.2.2a#2	Medium	Produce air gap / resistance and voltage readings

**B.2.2b Band Brake – Conventional**

Disk brakes were installed.

**B.2.2c Disc Brake – Universal**

The disc brake was not inspected due to access issues and lack of available manpower. The MR surveyor was informed by Seadrill personnel that the brakes had been overhauled by PT hydraulics Indonesia in November 2017. Documentation was not seen.

**B.2.2c Disc Brake - Universal Action Items:**

B.2.2c#1	Low	Produce inspection documentation.
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**B.2.3 Sandline Unit**

Not applicable

**B.2.4 Slickline Unit**

Make NOV  
Model Elmar



Slick line in storage

The slick line stored in the sack store at the time of the survey was in a satisfactory condition, the MR surveyor was informed that it was rarely used.

**B.3 DERRICK HOISTING EQUIPMENT**

**B.3.1 Crown Block**

Make MH-Pyramid Crown Block  
Model 500 ton  
Sheaves Six (6)  
Wire size 1-½"

The crown block was visually inspected from a distance in its storage position with no abnormalities noted.

The MR surveyors were informed that the crown block had subjected to a 5yr yearly inspection in 2014 and that NDT was carried out on accessible load path areas every twelve months. The MR surveyors were also informed that sheave was checked on the 9/02/2018 when No1 and No3 showed slight wear. Documentation was not verified.

**B.3.1 Crown Block Action Items:**

B.3.1#1	Low	Produce documentation of Cat 4/ NDT inspections
B.3.1#2	Low	Produce sheave wear measurements.

**B.3.2 Travelling Block**

Make MH Pyramid  
 Model 500 ton  
 SN 10563-14-01  
 API SPEC 8C



B.3.2 Travelling block

The travelling block, attached to the top drive, was hung off from the crown section of the mast at the time of the survey. It was inspected from a distance with no abnormalities noted. The MR surveyors were informed by Seadrill personnel that the block had been given its 5 yearly inspection by OEM but no documentation seen.

**B.3.2 Travelling Block Action Items:**

B.3.2#1	Low	Produce documentation of NDT for the last API RP8B Cat III and Cat IV inspection.
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**B.3.3 Hook**

Not installed, the top drive was attached to the travelling block via a beckett.

**B.3.4 Swivel**

Incorporated in the top drive.

**B.3.5 Drilling Line**



B.3.5  
Drill line at the time of the survey.

The drill line had all been run back onto the storage drum when the mast was rigged down. The cable was in a satisfactory visual condition, well protected and lubricated. The MR surveyor requested but did not receive wire line certification. The MR surveyor was shown documentation of an NDT inspection being carried out by Keppel Fells limited January 2017.

**B.3.5 Drilling Line Action Items:**

B.3.5#1	Low	Produce wireline certification.
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**B.3.6 Deadline Anchor**

Not inspected due to lack of safe access.

**B.3.7 Block Guidance System**

The dolly tracks were not inspected due to access limitations.

**B.4 ROTATING SYSTEM**

**B.4.1a Rotary Table (Electric Driven)**

Not applicable

**B.4.1b Rotary Table (Hydraulic Driven)**

Make Lewco  
 Model L-495  
 Rated 650 ton  
 RPM 350



.B.4.1b  
Rotary table -View

Due to lack of access the rotary table was not inspected (could only be viewed from below)

The MR surveyor was informed by Seadrill personnel that a 5 yearly inspection was carried out in October 2014; the report was written by the Seadrill Technical Section Leader and at that time backlash on the pinion was measured, the main bearing clearances measured and an oil sample sent for analysis. No information on main beams NDT was available. Documentation not seen.

**B.4.1b Rotary Table (Hydraulic Driven) Action Items:**

B.4.1b#1	Low	Produce documentation of beams NDT inspection
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**B.4.2 Master Bushing**

Not inspected due to the storage position.

**B.4.3 Kelly Bushing**

Not applicable

**B.4.4 Top Drive System**

Make Varco 650 tons  
Model TDS-8SA,

The top currently in use was installed in Oct 2015 with a total of 2,381 running hours to date. The top drive was hung off from the crown on short slings at the time of the visual inspection. No issues were noted

The MR surveyor was informed the top drive main shaft was manually turned on a regular basis as part of the owner's warm stacking procedure.

We were informed by Seadrill personnel that a load path NDT inspection was carried out by PT hydraulics Indonesia in Nov 2017 and that this inspection is carried out every 12 months.

Documentation was not seen



B.4.4  
Top drive

**B.4.4 Top Drive System Action Items:**

B.4.4#1	Low	Produce Cat 4 inspection documentation.
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**B.4.4.1 Top Drive Make-Up/Break-Out System**

Make Varco Pipe handler  
 Model PH100  
 Max Break 1,000,000 ft-lbs  
 Max Make 1,000,000 ft-lbs

Visually inspected along with the top drive with no abnormalities noted

**C: POWER SUPPLY SYSTEMS**

**C.1 RIG POWER PLANT**

**C.1.1 Diesel Engines**

**C.1.1.1 General**

The WEST VENCEDOR was primarily energized by six Caterpillar Engines model 3516BTA each rated at 1,850 BHP / 1,384 KW

All engines were located in the same engine room.

The first visual inspection pointed out a leak at the engine N. 4 oil pump which was contained by a small box collecting the oil spilled.

At the time of the survey only one engine at the time was generally running and connected on line under the limited 'hotel' load which supplied the ship services, luminaries and living quarter facilities.

The generator on-line was consuming approximately half of its available power.

Engine	Serial No.	Hours	Next Major Engine Overhaul	
		12/08/18	Service Type	Hours until due
1	S2P00180	41,253	45,000 hr	3,747
2	S2P00162	42,240	45,000 hr	2,760
3	S2P00177	45,185	45,000 hr	<b>DUE NOW</b>
4	S2P00188	43,987	45,000 hr	1,013 (circa 6 weeks continuous running)
5	S2P00197	43,323	45,000 hr	1,677 (circa 10 weeks continuous running)
6	S2P00198	40,053	45,000 hr	4,947

The rig owner should timely organize the overhaul for the engines in order not to affect the next drilling operations with power or engine redundancy availability.

The engines had an ECM (Electronic Control Module) which was processing and displaying all information received from the sensors. ModuResources was verbally informed that the maintenance crew was provided with the Caterpillar maintenance laptop used for testing and troubleshooting the engines.

ModuResources randomly tested the engines shut-down devices (high jacket water temperature, low lubricating oil pressure and overspeed). The engines all failed to automatically shut down as required by API RP 7C-11F Section 6.3.11; API RP 54 section 9.15.2 and IADC Safety Alert <http://www.iadc.org/safety-meeting-topics/engine-and-generator-safety/> 20 Feb. 2015

This issue has to be rectified before commencing of the RDIT

ModuResources recommends the rig owner calls for a Caterpillar approved agent in order to properly set and calibrate all engines shut-down alarms and warnings. A clear schematic technical description of the alarm philosophy should be made available for maintenance and troubleshooting purposes.

The over-speed alarm shut-down has to be carried out with the automatic closure of the combustion air engine flap or rig saver valve (Refer to API RP 14F section 5.2.2 and API RP 54 section 9.15.1 )

There was a local 'engine cranking panel' (furnished with an audible-visual alarm device) revealing alarms and status for each engine.

At the time of this survey there was no documented evidence available for testing the main engines shut-down alarms as recommended by API RP 14F section 5.2.5.1 (2008).

The seawater cooling pipes for the engines N. 2, N. 3 and N. 4 heat exchanger lines were recently replaced (June 2018)

At the time of the survey the recorded maintenance showed that the turbochargers were changed out every 15,000 hours on every engine.



C.1.1.1  
Engine room - Overview.



C.1.1.1  
Main engine: Local ECM (Electronic Control Module) control panel.



C.1.1.1  
Main Engine: Cranking panel



C.1.1.1#1  
Engine N. 4 oil pump leaking

**C.1.1.1 General Action Items:**

C.1.1.1#1	Medium	Repair the oil leak at the engine N. 4 oil pump.
C.1.1.1#2	Medium	Timely organize the engines overhauls (one engine at the time if conducted during operation) so as not to affect drilling operations or minimally affect the Power Management System.
C.1.1.1#3	High	Have the OEM attend the rig to check all engines-shut down devices and provide the rig crew electrical technicians with training on the maintenance laptop in order to regularly conduct the maintenance operation and eventual troubleshooting. Ref. API RP 7C-11F Section 6.3.11 ; API RP 54 section 9.15.2 ; IADC Safety Alert <a href="http://www.iadc.org/safety-meeting-topics/engine-and-generator-safety/">http://www.iadc.org/safety-meeting-topics/engine-and-generator-safety/</a> 20 Feb. 2015
C.1.1.1#4	Low	Produce clear procedure / instruction for regularly testing the engines shut-down devices as recommended by API RP 14F section 5.2.5.1 (2008)

**C.1.3 AC – Generators**

Manufacturer: Caterpillar  
 Model: AA27589001  
 Rated voltage: 600VAC  
 Rated power: 1600 kW, 3 phase  
 Rated current: 1925 Ampere  
 Power factor: 0.8  
 Rated frequency: 60 Hz.  
 Insulation Class: F  
 Ambient temperature: 50°C  
 Max. temp. rise: 90 °C  
 Enclosure: IP23  
 Built: 2008

The total power available on the rig was 9,600 kW.

Each generator was connectable and protected on line by a ABB Sake E3 automatic circuit breaker rated 2000 Ampere trip and 2500 Ampere frame.

The maintenance on all generators was, at the time of the survey, recorded in the programmed maintenance system database. No major overhaul were conducted on the main generators (main bearings replacement)

The last recorded insulation values are reported in the table below:

Generator ID	Serial No.	Insulation test conducted on	Insulation value
1	21233-01	28 May 2018	800 MΩ
2	21233-02	26 Jan. 2018	550 MΩ
3	21233-03	Not found	Not found
4	21233-04	14 August 2017	1000 MΩ
5	21233-05	13 Oct. 2017	550 MΩ
6	21233-06	13 Oct. 2017	550 MΩ

Insulation test and generator checks were recorded in the programmed maintenance system up to the month of June 2018 when the system was deactivated.

ModuResources recommends conducting an insulation test for all generators (with general cleaning / maintenance of the machines) before commencing of the RDIT.

The generator control cubicle was installed in the main switchboard room and each machine was controlled by a "Woodward" controller capable to also display the essential generator parameters. A windings control monitoring instrument, manual regulation for voltage/frequency, breaker trip command and control switch selection (manual or from PMS) were fitted at each generator panel.

A 'differential current' protection module was located inside each generator cubicle. The differential protection for generators is used for the protection of stator windings of generator against earth faults and phase-to-phase faults. The stator winding faults are very dangerous and can cause considerable damage to the generators. The differential protection system is used for clearing the fault in the shortest possible time for minimizing the extent of a damage.

The generators were logically linked to a 'Power Management System' which could be monitored from the HMI unit located in the main switchboard room and designed to automatically start for load demand on the grid (load dependant start).

The generators 24VDC control source of power was provided by the two batteries installed in the 'generators synchronization control cubicle'

ModuResources noted that the voltage supplied (22.1 V) was still sufficient to keep the generators control instrumentation energized although below the nominal value.

The batteries should be checked and/or replaced by new units and the related chargers inspected in detail whether suitable for use (test voltage output, dimensioning of amperes / kVA, output voltage waveform and possible electro-magnetic interferences).



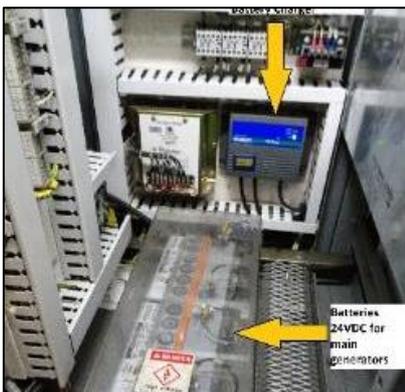
C.1.3  
Generator control panel – Front view  
(In main switchboard room)



C.1.3  
Generator control module (Woodward)  
At each generator control panel.



C.1.3  
Generator  
Differential Current Protection Module.  
At each generator control panel (Internal)



C.1.3#1  
Batteries and charger for 24VDC generator controls.  
Output voltage found at 22.1 V (lower than nominal value)

**C.1.3 AC – Generators Action Items:**

C.1.3#1	High	Check / replace 24VDC batteries for generator controls. Failure of this battery prevents the installation to run or re-start after black-out.
C.1.3#2	Medium	Inspect in detail the battery charger for the generators control batteries and verify whether original component.
C.1.3#3	Low	Conduct maintenance / insulation test before commencing of the RDIT.

**C.1.4 VFD System**

Seven VFDs manufactured by LTI were installed in the main switchboard room and designed to move their respective AC drilling drive motor. They were of type MV3000 liquid cooled.

The set-up of the VFD’s in the power system and their related drilling drive motor is summarized in the table below:

VFD ID	Assignable drilling drive motor
VFD 1	Mud pump 1 motor 1600 HP
VFD 2	Mud pump 2 motor 1600 HP
VFD 3	Drawworks A motor 1500 HP OR Top drive motor 1150 HP
VFD 4	Mud pump 3 motor 1600 HP
VFD 5	Drawworks B motor 1500 HP
VFD 6	Mud pump 4 motor 1600 HP
VFD 7	Drawworks A motor 1500 HP OR Top drive motor 1150 HP

Every mud pump motor had a dedicated VFD (Not assignable to other VFDs)  
The drawworks motors ‘A’ and the Top drive motor were assignable from two VFDs (No. 3 and No. 7) therefore the top drive motor is provided with VFD redundancy in case of one unit failure.

The VFDs could not be tested as the drilling equipment was not connected. They were observed in clean and tidy conditions.

As per other equipment, the VFDs maintenance history was not available at the time of this survey.

ModuResources has a concern related to the last use of the VFD in relation to the pre-charging capacitor units. Generally, converter DC link capacitors need to be reformed (re-aged) if the converter has been non-operational for more than one year. Without reforming, the capacitors may get damaged when the converter starts to operate. It is recommended to reform the capacitors as per manufacturer recommendation.

The specific method to eventually reform the pre-charging VFD capacitors should be advised by the VFD manufacturer and carried out by competent personnel provided with the required tools, instrumentation and reforming time specifications.



C.1.4  
Generator  
VFD – Front view of panel

Spare parts for drilling drive VFDs were available on board (with complete units for converters and rectifiers).

The four anchor winch motors were also respectively driven by a 480 VAC VFD system allocated in the main switchboard room.

Spares for anchor winches VFD were not available on board at the time of the survey and the rig owner should ensure that a complete spare unit is on board before commencing of the contract.

**C.1.4 VFD System Action Items:**

C.1.4#1	High	Verify with the manufacturer whether the VFDs require reforming for the pre-charging capacitors due to prolonged inactivity.
C.1.4#2	High	Provide an anchor winch motor VFD spare unit available on board before commencing of the contract.

**C.1.4.1 Main Switchboards**

The main distribution system was sourced from the six generators connectable on the single 600 V bus bar by automatic breakers rated 2000 Ampere trip / 2500 Ampere frame.

The 600 V bus bar provides direct supply (with properly rated automatic breakers) to all seven VFDs, to the four water makers booster heaters and to the two 600/480 V – 2500 kVA ship transformers supplying the entire 480V distribution / consumers for the installation.

The two above mentioned transformers are respectively supplying, in normal operational condition, the 480 V distribution 'A' and 480 V distribution 'B'; the two 480 V distribution switchboards bus bars are connectable by a bus tie breakers which can be closed in the event of one transformer failure in order to provide power to both bus bar sections with a single transformer only.

The 480V switchboard 'A' section supplies the 480V drilling MCC-2A, the 480V drilling MCC-2B, the 4 X 1000kVA 480/208/120 transformer (for 208/120V distribution board), the laundry panel, the MCC-4A, the Port AFT winch VFD, the MCC-3C and the Port-FWD winch VFD.

The 480 V switchboard 'B' section is feeding, in normal operational condition, the emergency switchboard through two same line automatic breakers (respectively allocated in the main switchboard room 480V section and in the emergency switchboard)

It also supplies: the 4 X 30kVA 480/240V transformer (for the 240V four distribution panels). The STBD-AFT winch VFD, the STBD-FWD winch VFD, the 480V ventilation MCC-3A, the MCC-4B and the 480V 'oil MCC'-3B

The switchboards were visually observed to be tidy and clean.

All of the main breakers on the switchboards and MCCs were tested for primary current injection test in August 2014 by the third party contractor 'Vorscop Monitoring Engineering' ([www.vorscop.com.au](http://www.vorscop.com.au)). This is normally conducted every 5 years so not due until August 2019. Refer to IEEE standard 242-2001 'Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems' sections 16.5.2 and 16.5.4

The circuit breakers were tested for:

- Operation with primary current injection for both instantaneous and delayed operations.
- Insulation and contact resistance measured and recorded.
- Correct operation and serviceability.

The detailed technical report was available on board.

All electrical cubicles and components were properly marked and in compliance with the API standard RP14 FZ 5.5.2.6 (2001)

Access to electrical equipment within the switchboards was sufficient to perform maintenance and trouble-shooting operations. and in compliance with the API standard RP14-F-5.5.1.1 (2001)

At the time of the survey there was no evidence of thermal survey (Infrared inspection) carried out at the switchboards, electrical machineries (motors, transformers and converters) and sub-distribution panels.

The PMS (Power Management System) PLC controller (Based on a Siemens Simatic S7 PLC) was installed in the main switchboard cubicle. The HMI (Human Machine Interface) panel was installed and energized but, at the time of the survey, could not be used and / or visualized for information as username and password (to input at the HMI logging page) were not available to the crew. On 17 August 2018 the username and password were recovered and the PMS monitor display returned to operation. During the RDIT the information provided by the PMS computer will be essential to understand, monitor and troubleshoot the installation.

The following parameters can be visualized in real time:

- Generators active power (kW)
- Generators apparent power (KVA)
- Set up of generator starting sequence
- Mud pumps VFDs values for Rpm motor, Current (A) and kW (power)
- Drawworks VFDs values for Rpm motor, Current (A) and kW (power)
- VFD system cooling values Pressure (psi), Temperature °C, Flow (GPM)
- Alarm page
- Digital Input / Output status
- Analogue data page with current values and temperatures for main transformers, emergency generator main parameters, emergency switchboard current, and main 480V switchboards currents.
- Profibus diagnostic page.

The PMS system will be widely tested and the HMI unit used as one of the data collection reference for the RDIT.



C.1.4.1  
Main 600V switchboard - View



C.1.4.1  
Main breakers being primary current injection tested on August 2014



C.1.4.1  
PMS (Power Management System) PLC controller



C.1.4.1  
PMS (Power Management System) HMI unit operational after the 17<sup>th</sup> of August

**C.1.4.1**

**Main Switchboards Action Items:**

C.1.4.1#1	Low	Conduct a thermographic survey (to be performed by certified third party contractor) at all electrical switchboards when the rig is operational and reasonable amounts of load are available to get the best possible results.
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**C.1.5 Transformer Systems**

The four main transformers were located in the 'main transformer room'  
 They were of dry type, air cooled, the 2500 kVA models were provided with controlled forced air cooling system and temperature monitoring control device.

Transformers models and specifications:

Transformer ID	Manufacturer, Model Serial Number	Specifications
600 V step-down to 480 Volts transformer "A"	MGM Transformer Company Model AC370-70104 Serial N. 08-10-07-11650B-1	Power rated 2500 kVA Three phases 60 Hertz Primary voltage: 600 V Secondary voltage: 480 V Insulation Class H Forced air ventilation cooling Total weight 12100 lbs.
600 V step-down to 480 Volts transformer "B"	MGM Transformer Company Model AC370-70104 Serial N. 08-10-07-11650B-2	Power rated 2500 kVA Three phases 60 Hertz Primary voltage: 600 V Secondary voltage: 480 V Insulation Class H Forced air ventilation cooling Total weight 12100 lbs.
480 V step-down to 208/120 V transformer	MGM Transformer Company Model AC270-E0154 Serial N. 08-10-07-11650C (1 -2 -3)	Power rated 4 X 30 kVA Single phase X 3 ; 60 Hertz Primary voltage: 480 V Secondary voltage: 240V Insulation Class H Air cooling Total weight 3 X 330 lbs.
480 V step-down to 240 V transformer	MGM Transformer Company Model AC270-KO137 Serial N. 08-10-07-11650A (1 - 2 - 3)	Power rated 3 X 100 kVA Single phase X 3 ; 60 Hertz Primary voltage: 480 V Secondary voltage: 240/120 V Insulation Class H Air cooling Total weight 3 X 715 lbs.

At the time of the survey all transformer were operational under limited load with no over-temperature alarm being revealed.

The 600/480 V main step-down transformers were provided with temperature monitoring system which was automatically turning on the transformer ventilation fans once a set pre-established temperature value was revealed at the transformer windings.

There were no tags or documentation explaining the temperature set values for turning the air forced cooling on; neither temperature warning and alarm values for the alarm set point.

The transformers were observed to be clean.

Automatic circuit breakers, installed at the primary and secondary circuitries, were protecting all transformers from the effects of over-currents as per API RP 14FZ Section 8.5.2.1 (2001)

An inspection, service and testing of transformers aboard the WEST VENCEDOR was carried out by the third party contractor 'Vorscop Monitoring Engineering' ([www.vorscop.com.au](http://www.vorscop.com.au)) between the 23<sup>rd</sup> August and the 1<sup>st</sup> of September 2014. Deep cleaning, torque settings of bus bars / cable connections and electrical test did not show signs of overheating, unbalance windings or potential electrical problems.



C.1.5  
Transformer room - View



C.1.5  
Transformer temperature monitoring device  
(for the two 600/480 V transformers)

**C.1.5 Transformer Systems Action Items:**

C.1.5#1	Low	Describe on tag / label (next to temperature monitoring instruments) temperature alarm set point for the main 600 / 480 V step-down transformers.
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### C.1.6 Emergency Shutdown System

The Emergency Shut Down System was tested on 14 August 2018.

The ESD station is located in the ballast control room, integrated within the fire & gas rack panel and includes shut-down push buttons for ventilation, fuel pump, main engines and emergency generator.

The ESD was tested by activating the push buttons at the ballast control room.

#### ESD test

Initial condition: Rig energized by one generator on line (No.2); Emergency generator in 'ready to start mode' (as per normal operation requirements); No fire or gas alarms active.

- Pressed the Ventilation shut-down push button in ballast control room.
  - Effects: Ventilation shut-down engine room exhaust fan.
  - Ventilation shut down engine room supply fan.
  - Ventilation MCC-3A shut-down.
  - Ventilation MCC-3C shut-down.
  - Ventilation MCC-3AA (drilling ventilation) shut-down.
  - All effects as per the 'Cause & Effects' table.
  
- Pressed the 'main engines' shut down push button in the ballast control room.
  - Effects: Shut down of man engines (1 engine on line)
  - Auto start of emergency generator 3 seconds after main power loss.
  - Connection on line of the emergency switchboard 26 seconds after main power loss.

Tested the emergency generator under substantial load (Refer to section C.2 of this report). Tested the main fire water and helideck fire-fighting.

The emergency generator shut-down test was not activated due to the main UPS and communication system UPS being out of service and requiring replacement.

The total rig shut-down test and rig recovery should be verified once the UPSs have return functional and before commencing the travel to next drilling location. (Refer to section C.1.14 of this report)



C.1.6 ESD panel in ballast control room (Included within the fire & gas rack enclosure)

#### C.1.6 Emergency Shutdown System Action Items:

C.1.6#1	High	Test the ESD for emergency generator shut-down, essential users under UPS supply and rig recovery before departing to drilling location.
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**C.1.7 DC/AC Drilling System Main Motors**

The drilling motors were of AC type, VFD driven. Maintenance activities and records were reported in the programmed maintenance system database. At the time of this survey the drilling drive motors and related VFD drives could not be tested as the equipment was not rigged up. The RDIT will demonstrate (with the analysis of engineering data recorded during the endurance test) functionality, endurance features and eventual weaknesses of the drilling machinery. Spare drilling drive motors for drawworks and top drive were available and enclosed in a metal cage. Spare motors for mud pumps were not seen available.

**C.1.7.1 Insulation Resistance Readings**

Top Drive main motor was noted (on 28 April 2018) with an insulation value of 1.4 MΩ and requires attention / investigation in order to determine first whether the low insulation value is due to inactivity and consequent formation of moisture within the motor stator/rotor enclosure. All drilling drive motors should be insulation tested to determine if there are any low insulation readings and timely rectify potential issues (motor cleaning on site or motor to be sent for overhaul or replacement) before commencing of the RDIT

**C.1.7.1 Insulation Resistance Readings Action Items:**

C.1.7.1#1	Medium	Conduct general maintenance / cleaning at all drilling drive motors and report insulation values before commencing of the RDIT. Any motors with low resistance need to be investigated and rectified.
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**C.1.8 AC Motors (Auxiliary)**

The electrical AC motors were generally observed in good conditions and appeared to be properly maintained. The motor drives for the anchor winches (four 480V motors, VFD driven) were run during the winches function test and noted to be operating satisfactorily within the nominal parameters. Routine checks were carried out and recorded as per programmed maintenance until June 2018 and insulation tested were still part of the warm stacked maintenance plan. Insulation test results were kept in a log book at the electrical workshop.

Spare motors (one unit each) were available on the rig for

- HPU package.
- Agitator
- Mud charge pump
- Shale shakers
- Trip tank pump
- Liner wash
- Degasser/
- Engine cooling fan
- Storage anchor winch motor.

Spare motors for the main anchor winch, blower for the top drive and Koomey BOP pump were not available on the rig site at the time of this survey.

The client should develop a list of critical spare motors and integrate it within the criticality priority system of the maintenance program database. Motors with the potential to fail and cause the drilling operation to come to a complete halt should have replacements available.

**C.1.8.1 Insulation Resistance Readings**

Insulation tests were carried out during this warm-stacked period and recorded in the electrical equipment log book kept by the electricians.

All insulation resistance readings were well above the minimum acceptable value.

**C.1.9 Motor Control (MCCs and Motor Starters)**

The MCCs were located in the main switchboard room and all fed from the 600/480 V transformers. (Refer to section C.1.4.1 of this report). They were noted in good visual condition with main the breakers primary injection tested on August 2014

Main MCC "1" feeding the following MCCs

- MCC drilling 2A in switchboard room.
- MCC drilling 2B in switchboard room.
- MCC ventilation 3C in switchboard room.
- MCC 4A below bow platform.

Main MCC "2" feeding the following MCCs

- MCC 3A in switchboard room.
- MCC 3B in switchboard room.
- MCC 4B below bow platform.

The electrical schematics were reviewed against the actual situation on the field and no additional loads or unapproved modifications were revealed.

All electrical starters, cubicle identifications, and circuit breakers were properly identified with engraved labels.

**C.1.10 Lighting System (Main)**

The main lighting system was sourced from the 480/208/120 V transformer and distributed throughout the nine lighting sub-distribution panels.

The lights were distributed as per schematic drawings, illumination was still efficient although they require a general overhaul and several lamp replacements before commencing of the next contract.

The distribution panels were observed in acceptable condition with properly rated circuit breakers protecting each circuitry and no unauthorized modifications or additional equipment were added; (in compliance with the API RP 14 FZ 9.4.4.2.3 (2001).

The luminaries fitted in hazardous zones were certified for use in the appropriate installation zone.

**C.1.10 Lighting System (Main) Action Items:**

C.1.10#1	Medium	Conduct a general overhaul at the lighting system with replacement of depleted lamps.
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**C.1.11 Lighting System (Emergency)**

The emergency luminaries were connected to the 208/120 V emergency distribution circuit. Emergency lamps connected to the emergency distribution line were marked with an “E” engraved tag fitted on each unit.

The battery back-up luminaries were primarily fed from the emergency line were distinguished with an “E” engraved tag and the battery symbol displayed on the lamp frame.

The ESD test gave the opportunity to test the functionality for the emergency lighting. The emergency luminaries were found energized once the emergency generator had started and the emergency switchboard energized although, several fluorescent tubes should be replaced.

The emergency battery back-up luminaries were tested by turning off the power at each emergency lighting distribution panel and verifying the functionality of the battery back-up whether capable to energize the lamp for 30 minutes.

Several area were found insufficiently covered or left in total darkness in the event of a rig total power loss.

The area requiring attention (but not limited to) are:

- Compressor room (no emergency luminaries operational)
- Fuel purifiers room (no emergency luminaries operational)
- Central Port column (no emergency luminaries operational)
- Central STBD column (no emergency luminaries operational)
- Workshop (no emergency luminaries operational)
- Sack store (no emergency luminaries operational)
- Mess room (no emergency luminaries operational)
- All exits from accommodations to open deck (80% not operational)
- Engine room (FWD side in darkness)
- Transformer room (exit to main deck)
- Mud pump room N. 3 and N. 4 area (no emergency luminaries operational)
- Mud pit room (20% not operational)

All the above mentioned areas require immediate attention.

The rig owner should ensure that sufficient spares are available on board in order to complete a general overhaul / maintenance of the battery backup luminaries (i.e. spare battery packs, spare reactors and spare fluorescent tubes)

**C.1.11 Lighting System (Emergency) Action Items:**

C.1.11#1	High	Conduct overhaul / maintenance at the emergency back-up luminaries in order to restore full functionality in case of total loss of power (Main and emergency)
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**C.1.12 Electrical Outlets**

The WEST VENCEDOR was provided with a 480/208/120 V transformer and the 120 V power distribution was sourced between each phase and the neutral wire of the transformer secondary which was obtained from the transformer central-star connection.

The use of the neutral wire (which breaks the IT distribution philosophy used for the 600V and 480V distribution systems) can give the opportunity to effectively use RCCB (Residual Current Circuit Breakers) at the 120V distribution to protect personnel against the effects of earth currents.

RCCBs were not seen installed aboard the rig, anyhow consideration should be given for use of portable RCCBs devices with portable tools rated for 120V supply.

The receptacles in the galley (wet area) were not bearing any IP rating and not complying with the minimum classification society required standard (Refer to ABS TABLE 1 Minimum Degree of Protection 4-3-3/3.1.1 - 2006). Power sockets in galley and laundry should be rated at least IP44

Two extension sockets (British shaped model) were installed in the galley as permanent installation and connected to the power distribution line. The sockets were not sufficiently IP rated for use in the area and not bearing any voltage or circuitry identification. The two portable (but permanently fitted) extension cords/sockets should be removed and replaced by properly IP rated / current rated electrical socket.



C.1.12  
Portable extension socket/cord fitted as permanent installation in the galley. Replace by properly IP/Current rated power outlet socket.



C.1.12  
Portable extension socket/cord fitted as permanent installation in the galley. Replace by properly IP/Current rated power outlet socket.

Sockets installed in hazardous rated area were verified as certified for use. The rig owner has to ensure that only 'double insulated' certified portable electrical tools are used on the installation. Refer to API RP 54 section 6.8.7 and NFPA 70 section 215.9

**C.1.12 Electrical Outlets Action Items:**

C.1.12#1	Medium	Ensure that a policy to prevent use of NON 'double insulated' certified portable electrical tools on the rig is in place. Refer to API RP 54 section 6.8.7 and NFPA 70 section 215.9
C.1.12#2	Medium	Replace the two portable extension sockets/cord fitted in the galley by properly IP rated / current rated power sockets.
C.1.12#3	Low	Consider purchasing portable extensions provided with RCCB in order to connect hand portable electrical tools. Refer to API RP 54 section 6.8.7 and NFPA 70 section 215.9

**C.1.13 Cables and Cable Trays**

The general installation for the cables complied with the NFPA 70 392.56. No splices or taps were noted. The bulkhead penetrations were installed and fabricated at the shipyards in Singapore but no documentation for specifically approved rubber block was seen on board. The cable trays were generally well supported and not overwhelmed with cables. Correct type of cable glands were generally used for equipment application for both hazardous and non-hazardous areas.

**C.1.14 Batteries, Battery Chargers, and UPS**

The main ship UPS (rated 10kVA) and installed in the main switchboard room was not operational. The communication system UPS, installed in the emergency switchboard room, was also damaged and out of service.

The rig owner was evaluating the purchase of new UPSs.

The UPS rectifier control module was removed and kept in the electrical workshop store. It was visually noted to have a damaged / burnt control circuitry transformer which may have led to further component damage. This is a critical issue that has to be rectified with new UPSs installed and commissioned as soon as possible.

An emergency situation, due to power loss, would leave the rig without essential equipment such as the radio room, anchor winches control panels, lifeboat platform illumination and helideck lighting.

The batteries for the generator control system were noted at 22.1 volts and require attention as explained in section C.1.3 of this report.

The batteries for the main engines (ECM modules) were noted being last replaced as per table below:

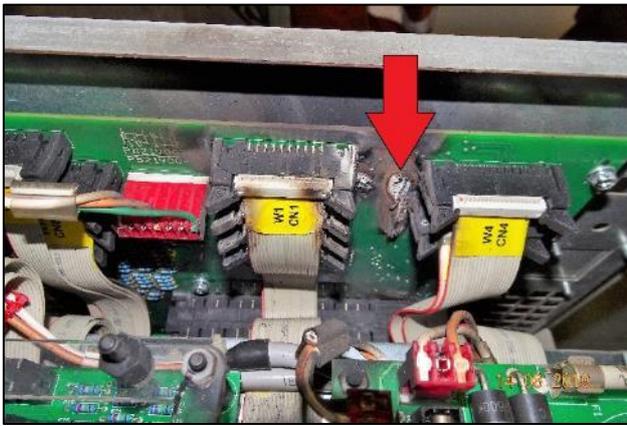
<b>Engine batteries ID</b>	<b>Batteries Last replaced on</b>
Engine N. 1	31 Oct 2017
Engine N. 2	31 Oct 2017
Engine N. 3	31 Oct 2017
Engine N. 4	18 Mar 2018
Engine N. 5	11 Jan 2018
Engine N. 6	21 Sep 2017

The two battery racks for the emergency generator were noted being last replaced on 21 September 2017

There was a dedicated battery room at main deck level where the battery racks for the obstruction lights / fog horns, UPS communication system and GDMSS radio equipment were installed. Batteries for the GDMSS as well the batteries for the fog horn and obstruction lights were last replaced on October 2015.



C.1.14#1  
Removed (damaged) rectifier module at 10kVA ship UPS -



C.1.14#1  
Damaged rectifier module at 10kVA ship UPS

**C.1.14 Batteries, Battery Chargers, and UPS Action Items:**

C.1.14#1	High	Replace / repair main ship UPS
C.1.14#2	High	Replace / repair communication UPS

**C.1.15 Alarm Systems: Fire, Gas, General, Flooding**

The general and abandon rig alarm were sufficiently audible at rig locations as proved during the fire drill conducted on 13 August 2018.

The fire alarm (throughout the PA system) was audible and tested on 14 August 2018 while surveying the fire detection system.

The fire and gas alarms were integrated into the PA system.

**C.1.16 Navigation Lights and Fog Horn**

The navigation light panel was located in the Ballast control room and fed from the main and emergency power. Was operational and tested on 15 August 2018. Several lamps required bulb replacement.

The obstruction light and fog horn panel was located in the emergency generator room. They were not battery back-up tested due to limited time available and will be included within the

RDIT test for the abandon rig shut-down. The obstruction lights function test under normal power demonstrated the lamps operational functionality.

**C.1.17 Power Supply for Third Party Equipment**

Spare cubicles were available in the 480 and 230V distribution boards and MCCs. At the time of the survey third party contractors (or equipment) were not on board. ModuResources was shown the power receptacle used for third party connections.



C.1.17  
Power receptacles for third party container / work-stations

**C.1.18 Electric Welding**

Three electrical welding machines were fitted in the welding workshop. They were manufactured by 'Lincoln Electric' and of model R3R 500-I and observed well maintained. The welding stations were distributed at various rig location. At the time of the survey the welder was not on-board and the electric welding machines were not in use. A policy for use of the welding machines in a gas situation scenario was not seen.

**C.1.18 Electric Welding Action Items:**

C.1.18#1	Low	Ensure that a procedure for disconnecting the electrical welding machines from the income power source in case of gas presence is in place.
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**C.1.19 Earthing and Earth Bonding**

The equipment on the WEST VENCEDOR was generally properly grounded with green/yellow colour code and wire dimensions followed the IEC 61892-6 section 4.7.2 standards. The 600 and 480V switchboards were provided with earth monitoring system as per IEC 60364-4-41 standards. At the time of the survey no earth faults were indicated at the distribution switchboard.

### **C.1.20 Hazardous Areas**

The rig owner should ensure that the equipment rated for use in potentially explosive atmosphere has been properly maintained and in compliance with the IEC 60079-17 (Specific inspection requirements tables 1 to 4)

At the time of the survey a specific maintenance record for hazardous area rated equipment was available in the 'SAM' programmed maintenance system with scheduled checks at the various items.

The hazardous area plan drawings were made available to ModuResources (KFELS DWG N. E100). The area classification was based on MODU Code ABS rules 2001 part 4, chapter 1, section 3 and IEC 61892-7.

Due to time constrain the visual inspection was superficial and limited to items observed during the survey and not specifically inspected for a close or detailed hazardous area inspection which would require an extended time period and human resources. The equipment rated for use in potentially explosive atmosphere was generally found correctly installed.

## **C.2 EMERGENCY GENERATOR SET**

### **C.2.1 Emergency Engine**

The emergency generator set was located at main deck level in the 'emergency generator and switchboard room' and automatically connectable to the emergency switchboard 26 seconds after a rig black-out.

It was readily accessible from two hinged watertight door from deck level as per MODU Code 5.3.2.

The structural bulkhead fire protection for the emergency generator/ switchboard room was of A-60 class except for the bulkhead separating from the open deck area.

The emergency generator was provided with two means of start to bring the machinery into operation, as per ABS MODU requirements.

Two electric start systems consisted of two electric starter motors directly fit to the engine and fed from the respective battery rack with charger. The two battery racks were properly enclosed and located next to the emergency generator set.

The emergency diesel engine (shaft connected to the generator) specifications were:

Manufacturer:	Caterpillar
Model:	3512BTA
Serial N.	S2G00198
Power:	1030 kW
Speed:	1200 rpm
Rotation	CCW

The emergency engine generator was observed in good condition and started by the rig crew on a weekly basis.

During the time of the inspection it was tested on 14 August 2018 for 60 minutes with substantial load on the emergency switchboard; no alarms or anomalies were detected, refer to section C.2.2 of this report.

The emergency engine generator automatically started 3 seconds after main power loss with auto-connection on line of the emergency switchboard 26 seconds after power loss.

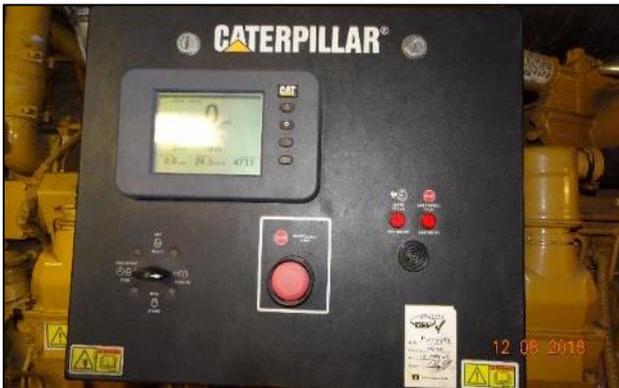
At the time of the survey the emergency generator set had a total of 4,733 running hours.

The emergency engine was furnished with a local cranking panel designed to reveal all main alarms and produce audible/visual notification throughout the lamp/sounder device installed above the panel.

The local control panel was the typical ECM (Electronic Control Module) unit used on the Caterpillar engines and was used to read all engine parameters during the load test. (See table section C.2.1 below of this report)



C.2.1  
Emergency generator set - View



C.2.1  
Emergency diesel generator – ECM control panel (Engine parameters revealed from this unit during the emergency generator load test)



C.2.1  
Emergency diesel generator – Cranking alarm panel.

## C.2.2 Emergency Generator

The emergency generator was observed in acceptable visual condition.

### Emergency Generator Specifications

Manufacturer: Kato Engineering  
Model: AA27535003  
Serial N.: 21232

Rated power: 1020 kW – 1275 kVA  
 Power factor: 0.8  
 Frequency: 60 Hz.  
 Speed: 1200 rpm  
 Voltage: 480 V  
 Current: 1534 Ampere  
 Insulation Class: F  
 Ambient Temp: 50 °C  
 Temp. rise: 90 °C  
 Enclosure IP23  
 MFR year: 2008

The emergency generator set was load tested on 14 August 2018 (at 45% of load capability)  
 The test results are summarized in the table below:

Time	Engine speed	Oil press.	Coolant Temp.	Fuel press.	Exhaust Temp. L/R	After cooler Temp	Oil diff. Press.	Fuel diff. Press.	Gen. Power	Max. Gen. winding temp	Gen. Ampere per phase
Hrs.min	rpm	psi	F	psi	F	F	psi	psi	kW	C	A
10.00	1200	78	135	70	426/420	95	4	6	50	56	65/57/51
10.15	1203	70	167	64	867/862	102	6	5	483	68	482/487/477
10.30	1200	67	167	66	837/834	102	5	5	480	72	480/560/386
11.00	1200	66	167	65	845/856	101	5	5	470	72	470/550/380

The major essential users running from the emergency switchboard were:

- Compressor N. 3
- Fire pump and/or foam pump.
- Sea water cooling pump (Main engines cooling)
- Fresh water cooling pump (Cooling compressor)
- Emergency lighting distribution.

No abnormal engineering values or alarms were detected during the hourly test of the generator.

### C.2.2.1 Emergency Switchboards

The emergency switchboard was noted in good visual condition with all components properly tagged.

The emergency generator control panel was provided with sufficient instruments to monitor Voltage, Current, Active power, Reactive power and Generator winding temperature.

The generator controller (Woodward) was also located at the emergency switchboard generator panel.

The following users were connected to the emergency switchboard

<b>480 V Emergency switchboard user</b>	<b>Power rating</b>
Air compressor N. 1	112 kW
Sea chest valve WB76 outboard	5 kW
Sea chest valve WB75 inboard	5 kW
Emergency transformer 480/208/120V feeding 208/120V distribution board	95 kW
Welding machine N. 1	35 kW
Helideck foam concentrate pump	5 kW
Sea chest valve WB71 outboard	5 kW
Sea chest valve WB72 outboard	5 kW
BOP pump	35 kW
Ship UPS	10 kVA
Life boat N. 1	15 kW
Life boat N. 2	15 kW
Life boat N. 3	15 kW
Life boat N. 4	15 kW
Deck crane 50 T	35 kW
Deck crane 250 T	35 kW
Rescue boat davit	15 kW
Water mist system	93 kW
Helideck foam pump	85 kW
Main storage Winch motor Port-AFT	75 kW
Aux. storage Winch motor Port-AFT	75 kW
Main storage Winch motor STBD-AFT	75 kW
Aux. storage Winch motor STBD-AFT	75 kW
Winch cooling water booster Port-AFT	15 kW
Winch cooling water booster STBD-AFT	15 kW
Fresh water cooling pump N. 1	64 kW
Engine room STBD supply fan	75 kW
Engine room STBD exhaust fan	75 kW
Fuel oil transfer pump N. 1	2.5 kW
Ballast pump P1	49 kW
Ballast pump S1	49 kW
Bilge pump N. 2	9.8 kW
Bilge pump N. 1	9.8 kW
Hot water circulating pump	0.5 kW
Bow fire monitor pump	225 kW
Emergency fire pump	140 kW
Engine cooling sea water pump N. 1	86 kW
<b>208/120 V Emergency switchboard user</b>	<b>Power rating</b>
Emergency lighting panel N. 1, N. 2, N. 3, N. 4, N. 5, N. 6, N. 7 & N. 8	
Communication system UPS	
24VDC distribution panel (in EGR)	



C.2.2.1  
Emergency generator – switchboard control panel.



C.2.1  
Emergency generator – Power monitoring instrument. (Use for data collection while testing the emergency generator set under load)

The RDIT should also include testing of the emergency generator with the load provided by the bow fire monitor pump and effects of starting currents.

**C.2.2.1**

**Emergency Switchboards Action Items:**

C.2.2.1#1	Medium	Test the emergency generator-switchboard for ESD abandon rig level (As part of the RDIT)
C.2.2.1#2	Medium	Test emergency generator on line with Bow fire monitor pump as part of the RDIT

**C.2.5 Electricity to be provided for at least 0.5 hrs**

Refer to section C.2.2 of this report.

**D: DRILL STRING EQUIPMENT**

**D.1 TUBULARS**

**D.1.1 Kellys**

Not applicable

**D.1.2 Top Drive Saver Subs**

Not inspected.

**D.1.3 Drill Pipe**

The MR surveyor was informed that all of the rigs drill pipe was being inspected and stored in Singapore at the time of the survey.

**D.1.3 Drill Pipe Action Items:**

D.1.3#1	High	Verify that all drilling tubulars (OCTG inventory) is available as per the contractual requirements prior to the commencement of operations.
D.1.3#2	Low	Produce documentation of inspection and testing with a register for identification

**D.1.4 Drill Pipe Pup Joints**

The MR surveyor was informed that the inventory was not complete and that some items had been moved to other rigs.

Documentation with serial numbers was requested but not received.

**D.1.4 Drill Pipe Pup Joints Action Items:**

D.1.4#1	High	Verify that all drill pipe pup joints are available as per the contractual requirements prior to the commencement of operations.
D.1.4#2	Low	Produce certification documentation of all joints to be used on board.

**D.1.5 Drill Pipe Casing Protectors**

Not on board

**D.1.6 Hevi-Wate Drill Pipe**

Not on board

**D.1.7 Drill Collars**

Not on board

**D.1.8 Short Drill Collars**

Not on board

**D.1.9 Drilling Subs**

Not inspected

**D.1.10 Others**

Not inspected

**D.2 PIPE-HANDLING EQUIPMENT**

**D.2.1 Drill Pipe Elevators**



D.2.1  
Storage of pipe handling equipment

The elevators on board were visually inspected and found to be well stored and corrosion free. The MR surveyors were shown MPI inspection reports for the elevators but no serial numbers were used to identify the equipment. Testing carried out on 24-01-17 by Uniclumb.

**D.2.1 Drill Pipe Elevators Action Items:**

D.2.1#1	Low	Produce inspection, testing documentation with serial numbers and an inventory of all elevators to be used in upcoming operations.
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**D.2.2 Drill Collar Elevators**



D.2.2  
Drill collar elevators stored on board

The elevators on board were visually inspected and found to be well stored and corrosion free.

The MR surveyors were shown MPI inspection reports for the elevators but no serial numbers were used to identify the equipment. Testing carried out on 24-01-17 by Uniclomb.

**D.2.2 Drill Collar Elevators Action Items:**

D.2.2#1	Low	Produce inspection, testing documentation with serial numbers and an inventory of all elevators to be used in upcoming operations.
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**D.2.3 Tubing Elevators**

Not on board

**D.2.4 Drill Pipe Hand Slips**



D.2.4  
Slips stored on board

The manual slips on board were visually inspected and found to be well stored and corrosion free.

The MR surveyors were shown MPI inspection reports for the slips but no serial numbers were used to identify the equipment. Testing carried out on 24-01-17 by Uniclomb.

**D.2.4 Drill Pipe Hand Slips Action Items:**

D.2.4#1	Low	Produce inspection, testing documentation and an inventory of all slips to be used in upcoming operations.
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**D.2.5 Semi-Automatic DP Slips (Varco PS-21 and PS-30)**

Not inspected.

**D.2.6 Drill Collar Slips**

See D.2.4

**D.2.7 Drill Collar Safety Clamps**

Not inspected.

**D.2.8 Tubing Slips**

Not applicable

**D.2.9 Tubing Spiders**

Not applicable

**D.2.10 Lifting Subs, Lifting Caps**



The subs seen during the survey were well stored and visual satisfactory.

The MR surveyors were shown MPI inspection reports for the lifting subs and caps but no serial numbers were used to identify the equipment. Testing carried out on 24-01-17 by Uniclomb.

**D2.11 DC Lifting Plugs**

See section D.2.10

**D.2.12 Bit Breakers**

Not on board- client provided.

**D.2.13 Elevator Links**



The links were in storage during the inspection and were found to be corrosion free and well stored.

The MR surveyors were shown MPI inspection reports for the elevator links but no serial numbers were used to identify the equipment. Testing carried out on 24-01-17 by Uniclomb.

Elevator links available on the rig:

Quantity	Manufacturer	Size	Length	Rated Capacity
One set	B&V	2 ¾ ins	180 INS	350 T
One set	B&V	2 ¾ ins	240 ins	350 T
One set	B&V	3 ½ ins	180 ins	500 T
One set	B&V	3 ½ ins	240 ins	500 T

**D.2.14 Kelly Spinner**

Not applicable

**D.2.15 Drill Pipe Spinner**

Not applicable

**D.2.16 Mud Saver Bucket**

Make Sub-Drill  
Mode MS-V3A



The mud bucket in storage

The bucket was stored in the sack store at the time of the survey with no visual issues noted. The MR surveys were shown MPI testing documentation as carried out by UNICLIB

**D.2.17 Ezy-Torq**

Not installed on the rig.

**D.2.18 Rig Tongs (Manual)**

Make B&V  
Model BV-100  
Number Four (4) sets  
Range 4ins-17ins.  
Rated 100,000 ft/lbs



D.2.18  
Rig tongs in storage.

The four sets of rig tongs seen were in storage during the survey with no visual abnormalities noted.

The MR Surveyors were shown MPI documentation as carried out by Uniclumb July 2017

**D.2.19     Tubing Tongs (Manual)**

Not applicable

**D.2.20     Tubing Tongs (Power)**

Not applicable

**D.2.21     Iron Roughneck**

See D.2.32

**D.2.22     Hydraulic Power Unit**



D.2.22  
HPU pump array.

The three hydraulic pumps that supply all drill floor hydraulic power were in a fair visual condition at the time of the survey. The equipment was not in use and had some of the hoses disconnected.

**D.2.23 Knuckle Boom Crane. (General purpose crane)**

Make Forum  
 SN 07-149B  
 Man 2009



The general purpose crane was for use under the drill floor area and was not in use during the survey, it was visually inspected and found to be satisfactory.

**D.2.23 Knuckle Boom Crane Action Items:**

D.2.23#1	Low	Produce documentation/ certification of load testing, NDT, wire certification and maintenance history.
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**D.2.24 Tubular Shuttle (Catwalk Machine)**

Not applicable

**D.2.25 Casing Stabbing Arm**

Not applicable

**D.2.26 Cherry Picker**

Not applicable

**D.2.27 Pipe-Racking System**

Not applicable

**D.2.28 Drill Floor Manipulator Arm**

Not applicable

**D.2.29 Tubular Feeding Machine**

Not applicable

**D.2.30 Lower Guiding Arm**

Not applicable

**D.2.31 Stand Builder**



The DES offline stand builder was disassembled during the survey and was not inspected due to lack of safe access.

The MR surveyors were shown documentation of base weldment inspection carried out 3/2/2017 by Uniclumb.

**D.2.31 Stand Builder Action Items:**

D.2.31#1	Low	Produce documentation of load testing and wire certification.
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**D.2.32 Make-Up and Break-Out Machine/ Iron roughneck**

Make Hawk Industries  
 Model HawkJaw M100K-2GSR- Three units  
 Range 4ins- 91/2 ins



Two of the three make up/ breakout machines in storage on board at the time of the survey

The three Hawk Jaws on board were stored in the sack store at the time of the survey. They were all dressed for different size connections but not seen in use during the survey. They were in a visually satisfactory condition. The MR surveyors were shown MPI testing documentation as carried out by UNICLIB in February 2017

**D.2.33 Rotating Mousehole**

Not applicable

**D.3 FISHING TOOLS**



The various fishing tools on board were well stored and preserved at the time of the survey.

**D.3 Fishing Tools Action Items:**

D.3#1	Low	Produce documentation of inspection with serial numbers used for identification
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**E: WELL CONTROL**

**E.1 DIVERTER**

The Diverter was assembled on a testing stand using the 21-1/4" 2K annular mounted onto 2 different spool pieces. The diverter spool piece with 3 x 12" flanges outlets, had a 12" actuated valve installed on one of the side outlets.

Documentation found in the Toolpushers office, provided evidence that there may be CoC's for the diverter spool pieces but as there were no markings on the spool pieces currently used and inspected, it could not be verified that these CoC's were relevant.

A CoC for the 21-1/4" annular was sighted and identified for the particular 21-1/4" annular in use on the diverter assembly. This CoC is dated September 2014 and issued by the OEM after conducting field repairs on the annular assembly.

As there were no further documentation and testing reports presented to prove this 21-1/4" annular has been maintained as per OEM recommendations since 2014, the unknown maintenance history combined with the lack of records showing that the hydraulic operating chambers had been tested, makes the probability of failure high and thus an unacceptable level of risk for operational use as a diverter unit.



The Diverter assembly with the 21-1/4" Hydril MSP annular installed on top of the diverter flow line spool piece.

Diverter description: 21-1/4" Hydril 'MSP', 2K ABOP  
 Part No: 3127845-05  
 Serial No: 155041  
 COC dated: 08/2009 & 09/2014

Packing Unit MSP 21-2M NBR  
 Part No: 1003273-02  
 Serial No:  
 COC dated:

**E.1 Diverter Action Items:**

E.1#1	High	<p>Unless there are Planned Maintenance records to show that this annular has been maintained and tested as per OEM recommendations, this Annular should not be used as a Diverter. The assumed age of the Annular of 9 years based on the Specification Name plate, unknown maintenance history combined with the lack of records showing that the hydraulic operating chambers have been tested, makes the probability of failure high and thus at an unacceptable level of risk.</p> <p>API RP64, section 9</p>
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### E.1.1 Diverter Flow Lines

The 2 x flow spool pieces installed under the 21-1/4" 2K annular used as the diverter, did not have any identification marks or specification name plates on them. This made it impossible to identify the correct related CoC documentation to this equipment.

A 12" actuated ball valve had been installed on one of the 12" flanged outlets on the lower spool piece and this valve had a specification name plate attached to the valve body which had a serial number of 0808-383 stated but no manufacture date. A CoC for this valve was been sighted which was dated 28 Dec 2015.

Another new 12" actuated ball valve was sighted stored in the sack stock. The specification name plate attached to the valve body stated a serial no of 0828-382 but had no manufacture date. A CoC for this valve was sighted which was dated 28 Dec 2015.

The Port and Stbd Diverter flow lines were not sighted or identified as there was was no time to search for this equipment stored somewhere on the rig during the short period of this 3 day survey.

Description: 1 x Diverter spool, 21-1/4" 2M, RX 73 Top and Bottom flanges with 3 x 12" Class 600, RX 57 flange outlets @ 0, 90 & 180 degrees orientation.  
 Serial No: Unable to identify the serial number on the physical equipment.  
 CoC dated: Unknown

Description: 1 x Diverter spool, 21-1/4" 2M, RX 73 Top and Bottom flanges with 2 x 3" outlets @ 0 & 180 degrees orientation.  
 Serial No: Unable to identify the serial number on the physical equipment  
 CoC dated: Unknown



The diverter flow spools under the Diverter 21-1/4" Annular, showing the 1 x 12" overboard discharge ball valve installed on the bottom flow spool.

Description: 2 x 12" ANSI 600 Diverter valve with failsafe OPEN hydraulic actuator.  
 Manufacturer: Piper  
 Part No: D1260-50491  
 Working pressure: 1480 psi  
 Valve operator (air/hydraulic): Hydraulic  
 Serial Nos: 0808-383 & 0808-382 (New valve)  
 COC dated: 28 Dec 2015 (New valve PO dated 24/12/15)



E.1.1  
The hydraulically operated ball valves - spare valve was in the sack store.

**E.1.1 Diverter Flow Lines Action Items:**

E.1.1#1	Low	All CoC's and related documentation must be produced for all the Diverter equipment in use. Specifically, NDT and thickness testing reports must be provided as evidence to prove that the required Annual thickness tests have been conducted on all the diverter overboard discharge lines.
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**E.1.2 Diverter Control Panel**

The Diverter control panel was part of the 2 x BOP control panels which were located in the Toolpushers office and the other as the Drillers control panel mounted between the MGS and Choke and Kill manifold assemblies on the rig floor.

As the entire drilling package and related BOP HPU control systems had been dismantled and stored as various separate units on deck, the BOP / Diverter control panels were not powered up and functional.

A certificate dated the 22<sup>nd</sup> Dec 2015, was sighted that was issued by Electro-Flow Controls Ltd, stating that the BOP and Diverter control system meets all the API Specification 16D requirements. No original OEM data manufacturing books or documentation for the BOP control system were sighted.



The diverter controls on the BOP control panel in the Toolpushers office.

Primary make/type: Pemac PTE  
Location: Drill Floor and Tool pusher's Office

**E.1.2**

**Diverter Control Panel Action Items:**

E.1.2#1	Low	Provide evidence that copies of the relevant OEM manufacture CoC's for these control panels have been kept on the rig.
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**E.2 LOW-PRESSURE BLOW-OUT PREVENTERS**

**E.2.1 Ram Type Preventer**

Not available on the rig for inspection at the time of our survey. The 21-1/4" 2K rated ram BOP's were taken off the rig and stored onshore in Singapore at the Seadrill warehouse facilities.

**E.2.2 Available Rams (Installed and Spares)**

The ram blocks for the 21-1/4" ram BOP's were stored on the rig on storage racks in the sack store area. Although it appears that they had been adequately prepared for long term storage, a set of fixed pipe ram blocks were dressed with rubbers. This did not meet the OEM recommended practices for long term storage of ram blocks.

An itemized list of the ram blocks in storage on the rig and elsewhere, which have been assigned to the WEST VENCEDOR rig was not issued to the surveyor. This list should not only contain the description of the ram blocks, it must also include the serial number and current CoC issue date or manufactured date of each ram block assembly.

Additionally, information regarding the dimension checks of all the ram blocks was not issued to the surveyor. OEM planned maintenance recommendations, and API Std 53 sections 6.5.7.1.2 & 6.5.7.3.



E.2.2#3  
The 21-1/4" fixed pipe ram blocks stored in the storage boxes in the sack store showing the rubbers still fitted onto the ram block.

**E.2.2**

**Available Rams (Installed and Spares) Action Items:**

E.2.2#1	Low	Provide an itemized list of all 21-1/4" 2K BOP ram blocks, showing the serial numbers and CoC issue date or manufactured date as required per API Std 53 sections 6.5.10.4.2 & 6.5.10.5.1
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E.2.2#2	Low	Provide evidence that the PM tasks of conducting dimensional checks on all the 21-1/4" 2K BOP Ram blocks in use have been conducted. (If still new original documentation (Data books) will have the measurements as manufactured dimensional checks.) . API std 53 sections 6.5.7.1.2 & 6.5.7.3.
E.2.2#3	Low	Although it appears that most of the ram blocks for the 21-1/4" Ram BOPs have been adequately prepared for long term storage, a set of fixed pipe ram blocks are dressed in rubbers. This does not meet the OEM recommended practices for long term storage of ram blocks which requires that all seals and rubbers are removed prior to applying preservation coating on the ram blocks. API std 53 section 6.5.8.4.3

**E.2.3 BOP Ram Configuration (Normal)**

The low pressure 21-1/4" BOP's were not available on the rig for inspection as they had been kept in storage onshore in Singapore.

**E.2.4 Annular Type Preventers**

There was only the 2K, 21-1/4" annular connected to the diverter available on board at the time of our survey. It was not ascertained whether the low pressure BOP stack utilized this annular in conjunction with the ram BOP or whether it was exclusively for the diverter function.

**E.2.5 Kill Line Valves**



The Kill line valves associated with the Low-Pressure BOP's, were stored in the rigs sack store. No documentation was issued or sighted by the MS surveyor to relation to these valves

Valve No.1	
Size:	3-1/8"
Pressure rating:	5,000 psi
Serial number:	Unknown
Manufacturer:	NOV
Type:	HPT - Hydraulic failsafe actuated
API spec. 6A mentioned?	Yes
H2S service:	Yes
Manufactured date	Unknown

Valve No.2	
Size:	3-1/8"
Pressure rating:	5,000 psi
Serial number:	Unknown
Manufacturer:	NOV
Type:	HPT - Manual operated
API spec. 6A mentioned?	Yes
H2S service:	Yes
Manufactured date	Unknown

### E.2.5

### Kill Line Valves Action Items:

E.2.5#1	Low	No QA documentation and maintenance documentation was issued to the surveyor. All OEM manufacturing Data documentation and related certification must be presented, and copies stored on the rig as per API Std 53, section 6.5.10.4
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### E.2.6 Choke Line Valves

Not available for inspection

The choke line valves associated with the low-pressure BOP's, may have been taken off the rig and stored onshore in Singapore at the Seadrill warehouse facilities.

**E.3 HIGH-PRESSURE BLOW-OUT PREVENTERS**

**E.3.1 Ram Type Preventer**

Conducted a visual inspection of the well bore of the 13-5/8” double BOP ram preventer which was stored on the pipe deck of the rig on its test stump. All the ram blocks had been removed and all the internal surfaces of the well bore and the ram cavities were coated with grease as a corrosion preventative.

Externally the BOP appeared to be in an acceptable condition with the manual locks on both upper and lower ram operators screwed fully in to protect the exposed ram locking shaft threads. The ram locking shaft sealing surfaces which were exposed to the elements had been coated with grease and appeared to be in good condition. All the side outlets were covered, and the top flange had an old seal ring installed in its seal ring groove with a metal protective cover placed over the entire well bore and flange seal area.



The 13-5/8” double BOP ram preventer stored on the main deck.

Double 13-5/8” x 10,000 psi	
Manufacturer/model:	Cameron Type U with FXT Bonnet
Assembly part No:	2396230-07 Rev01
Rams locks:	Manual
H2S service:	Yes
Side outlets:	4
Size:	3.1/16" 10K Flanged side outlets with BX-154 ring groove
WP side outlets:	10,000
Bottom connection:	13.5/8" 10K Studded connection with BX 159 ring groove
Top connection:	13.5/8" 10K Studded connection with BX 159 ring groove
Shear ram boosters:	Yes, Tandem Booster on Lower Cavity
Serial Number:	400271872
Manufactured date:	02/2017

Conducted a visual internal inspection of the well bore of the 13-5/8” single BOP ram preventer which was stored in the sack store of the rig. All the ram blocks had been removed and all the internal surfaces of the well bore and the ram cavities, coated with grease as a corrosion preventative.

Externally the BOP appeared to be in an acceptable condition with the exposed ram locking shaft threads on its manual locks covered with grease and grease tape for corrosion protection. The ram locking shaft sealing surfaces which were exposed to the element had been coated with grease and appeared to be in good condition. All the side outlets were covered, and the top flange had an old seal ring installed in its seal ring groove with a metal protective cover placed over the entire well bore and flange seal area.



The 13-5/8" single BOP ram preventer stored in the sack store.

Single 13-5/8" x 10,000 psi	
Manufacturer/model:	Cameron Type U with FXT Bonnet
Assembly part No:	2254072-23-01 Rev05
Rams locks:	Manual
H2S service:	Yes
Side outlets:	2
Size:	3.1/16" 10K Flanged side outlets with BX-154 ring groove
WP side outlets:	10,000
Bottom connection:	13.5/8" 10K Studded connection with BX 159 ring groove
Top connection:	13.5/8" 10K Studded connection with BX 159 ring groove
Shear ram boosters:	No
Serial No:	112283242-1
Manufacture date:	12/2016

Neither cavity measurement records nor QA documentation for either of the ram BOPs were issued to the surveyor

**E.3.1**

**Ram Type Preventer Action Items:**

E.3.1#1	Low	No QA documentation and maintenance documentation (Past cavity measurements & PM history) has been issued to the surveyor. All OEM manufacturing Data documentation and related certification must be presented and copies stored on the rig as per API Std 53, section 6.5.10.4
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**E.3.2 Available Rams (Installed and Spares)**

The ram blocks for the 13-3/8” 10K ram BOP’s were stored on the rig on storage racks in the sack store area. Although it appeared that they have been adequately prepared for long term storage, several sets of ram blocks were dressed in rubber seals. This does not meet the OEM recommended practices for long term storage of ram blocks.

An itemized list of the ram blocks in storage on the rig and elsewhere, which were assigned to the WEST VENCEDOR rig was not issued to the surveyor. This list should not only contain the description of the ram blocks, it must also include the serial number and current CoC issue date or manufactured date of each ram block assembly.

Additionally, information regarding the dimension checks of all the ram blocks was not issued to the surveyor. OEM planned maintenance recommendations, and API Std 53 sections 6.5.7.1.2 & 6.5.7.3.

- Quantity/type/size: 1 set fixed 4"
- Quantity/type/size: 1 set fixed 5"
- Quantity/type/size: 2 SETS, 5 7/8" FIXED RAMS
- Quantity/type/size: 1 SET, 7"CASING RAMS
- Quantity/type/size: 1 set 9 5/8"csg rams
- Quantity/type/size: 1 set Var 2 7/8" -5"
- Quantity/type/size: 2 SETS, 3 1/2"-5 7/8"VBR'S
- Quantity/type/size: 1 set VBR 4 1/2" - 7"

**E.3.2 Available Rams (Installed and Spares) Action Items:**

E.3.2#1	Low	Provide an itemized list of all 13-5/8” 10K BOP ram blocks, showing the Serial numbers and CoC issue date or manufactured date as required per API Std 53 sections 6.5.10.4.2 & 6.5.10.5.1
E.3.2#2	Low	Provide evidence that the Annual PM tasks of conducting dimensional checks on all the 13-5/8” BOP Ram blocks in use have been conducted. (If still new original documentation (Data books) will have the measurements as manufactured dimensional checks.) API std 53 sections 6.5.7.1.2 & 6.5.7.3.
E.3.2#3	Low	Although it appears that most of the ram blocks for the 13-5/8” Ram BOPs have been adequately prepared for long term storage, a set of fixed pipe ram blocks are dressed in rubbers. This does not meet the OEM recommended practices for long term storage of ram blocks which requires that all seals and rubbers are removed prior to applying preservation coating on the ram blocks. API std 53 section 6.5.8.4.3

**E.3.3 BOP Ram Configuration (Normal)**

Not applicable as the BOP’s had no ram blocks installed  
 Lower ram operators on the double BOP are equipped with shear ram booster’s.

**E.3.4 Annular Type Preventers**

Conducted a visual inspection of the internal well bore of the 13-5/8" 5K annular stored on the pipe deck. The packer element had been removed and the internal surfaces of the well bore coated in grease as a corrosion inhibitor. All the external ports were covered and the assembly partially covered with a tarpaulin cover.



The 13-5/8" 5K Hydril GK annular stored on the main deck.

Quantity no.: 1  
 Make/type: Hydril GK  
 Size: 13-5/8"  
 Working pressure: 5000 psi  
 Bottom connection: BX-159  
 Top connection: BX-160  
 Serial No: 143535  
 Manufacture date: June 2015

**E.3.4 Annular Type Preventers Action Items:**

E.3.4#1	Low	No QA documentation and maintenance documentation has been issued to the surveyor. All OEM manufacturing Data documentation and related certification must be presented, and copies stored on the rig as per API Std 53, section 6.5.10.4
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**E.3.5 Kill Line Valves**



The BOP HP Choke and Kill valve assemblies stored in the sack store.

Valve No.1	
Size:	3-1/16"
Pressure rating:	10,000 psi
Serial number:	Unknown
Manufacturer:	NOV
Type:	HPT - Hydraulic failsafe actuated
API spec. 6A mentioned?	Yes
H2S service:	Yes
Manufactured date	Unknown

Valve No.2	
Size:	3-1/16"
Pressure rating:	10,000 psi
Serial number:	Unknown
Manufacturer:	NOV
Type:	HPT - Manual operated
API spec. 6A mentioned?	Yes
H2S service:	Yes
Manufactured date	Unknown

**E.3.5**

**Kill Line Valves Action Items:**

E.3.5#1	Medium	There are no protective covers over the ring groove seal areas on the BOP Choke and Kill valve end flanges and other gate valves stored in the Sack store. Protective covers need to be fitted over all these valve end flanges to prevent inadvertent damage to the rig groove seal areas occurring
E.3.5#2	Low	No QA documentation and maintenance documentation has been issued to the surveyor. All OEM manufacturing Data documentation and related certification must be presented, and copies stored on the rig as per API Std 53, section 6.5.10.4

### E.3.6 Choke Line Valves

Valve No.1	
Size:	3-1/16"
Pressure rating:	10,000 psi
Serial number:	Unknown
Manufacturer:	NOV
Type:	HPT - Hydraulic failsafe actuated
API spec. 6A mentioned?	Yes
H2S service:	Yes
Manufactured date	Unknown

Valve No.2	
Size:	3-1/16"
Pressure rating:	10,000 psi
Serial number:	Unknown
Manufacturer:	NOV
Type:	HPT - Manual operated
API spec. 6A mentioned?	Yes
H2S service:	Yes
Manufactured date	Unknown

#### E.3.6 Choke Line Valves Action Items:

E.3.6#1	Low	No QA documentation and maintenance documentation has been issued to the surveyor. All OEM manufacturing Data documentation and related certification must be presented, and copies stored on the rig as per API Std 53, section 6.5.10.4
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## E.5 BOP CONTROL SYSTEM

### E.5.1 Accumulator Unit

The complete BOP /Diverter accumulator unit and package had been stored on the pipe deck and was not connected to any electrical or pneumatic power source and remote-control panels so could not be operated or function checked.

Additionally, no OEM QC manufacture data documentation was presented to the surveyor. An overall visual inspection was conducted on the unit which noted that the unit was built and equipped to meet API specification 16D and appeared to be in a satisfactory condition.



The BOP / Diverter accumulator unit.  
 Make/model: CPC  
 Location: Rig Floor  
 Fluid reservoir capacity: 400 U.S. gal  
 Accumulator size: 15gal  
 No of accumulators: 23  
 System working pressure: 3000 psi  
 Control manifold model: TF364-15BT3

**E.5.1 Accumulator Unit Action Items:**

E.5.1#1	Medium	All the analogue pressure gauges on the BOP HPU control & accumulator unit do not have any calibration tags on them. As per API Std 53, section 6.3.10.6 all these gauges must be calibrated every 3years.
E.5.1#2	Low	No OEM QA documentation and maintenance documentation on the BOP/Diverter accumulator unit has been issued to the surveyor. All OEM manufacturing Data documentation and related certification must be presented, and copies stored on the rig as per API Std 53, section 6.5.10.4

**E.5.2 Accumulator Hydraulic Pumps**



The electric driven hydraulic pump installed on the BOP / Diverter accumulator unit.

**Electric motor driven**

Quantity: 1  
 Make/model: UET40-HT460  
 Each driven by motor of power: 40 hp  
 Flow rate of each pump: 24.5GPM  
 At operating pressure: 3000 psi  
 Operable off emergency generator yes/no: Yes

**Air driven**

Quantity: 4  
 Make/model: UA6336-HO  
 Ratio: 20 GPM  
 Operating pressure: 3000 psi

### E.5.3 Primary Control Panel

Panel controls for the following functions

All annular BOP's yes/no:	yes
All ram BOP's yes/no:	yes
Lock for ram BOP's yes/no:	no
Diverter System yes/no:	yes
Kill and choke line valves yes/no:	yes
Low accumulator pressure warning yes/no:	yes
Low reservoir level warning yes/no:	yes
Low rig air pressure warning yes/no:	yes
System pressure regulator yes/no:	yes
Pressure regulator for annular yes/no:	yes
Flowmeter yes/no:	Yes

### E.5.4 Remote Control Panels



#### E.5.4

The Toolpushers BOP / Diverter remote control panel in the OIM's office in the accommodation block.



The Drillers BOP / Diverter remote control panel on one of the drilling the packages mounted between the MGS and Choke and Kill manifold.

Make/model: 9S-HW-SSXP-PB-TYP1WD-8AZ  
 Location: Drill floor & Tool pushers office  
 Ability to operate main closing unit valve directly yes/no: Yes  
 System routing (direct or through panel): through panel  
 Remote control of system pressure regulator yes/no: yes  
 Remote control of annular pressure regulator yes/no: yes

**E.5.4 Remote Control Panels Action Items:**

E.5.4#1	Low	Provide evidence that copies of the relevant BOP & Diverter control system OEM manufacture CoC's and Maintenance / Operations manuals for these control panels have been kept on the rig as per API Std 53, section 6.5.10.4
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**E.6 CHOKE MANIFOLD SYSTEM**

**E.6.1 Choke Manifold**

A visual inspection was conducted on the Choke and Kill manifold assembly. Generally the C & K manifold appeared to be in an acceptable condition. It was mounted on a drilling package assembly which contained its Auto Choke control panel, BOP remote control panel and the MGS. The overall work and access platforms to gain access to all the C & K valves was clean, in a good condition and well maintained. The C & K manifold chokes, valves and spools were well secured and appeared to have been recently painted.

The condition of the internals of the C & K manifold spools and valves could not be assessed as there were not enough personnel assigned to the WEST VENCEDOR as the time of the survey to remove a sample of valve bonnets off the C & K valves to conduct an inspection. It was noted that the grease covers on all the grease nipples had markings of fresh paint on them which would indicate that these valves were not being greased regularly since the rig was stacked.

The surveyor was informed that the C & K manifold had been flushed through and filled with preservation fluid at completion of the last drilling operations. The type of preservation fluid used was unknown and possibly water based soluble oil was used.

The following findings were noted during the visual inspection:

- It was noted that the C & K remotely mounted gauges had calibration tags displayed which were dated 27/02/2017. These gauges should be tested and calibrated annually.
- A damaged cable going to one of the pressure transducers on the C & K manifold was noted.



The Choke and Kill manifold assembly.

Nominal size: 3-1/16"  
 Minimum ID: 2-1/6"  
 Maximum WP: 10 000psi  
 Quantity of manual chokes: 1  
 Make/model: Carpenter Ceramics 'APV'  
 Size (ID): 3-1/16"  
 Quantity of power chokes: 2  
 Make/model: Type 'E-S'  
 Size (ID): 3-1/16"  
 Glycol injection yes/no: No

Choke & Kill Manifold valve data:

No QA documentation or maintenance and operational manuals or information was issued to the surveyor during the period of the survey.



E.6.1#2

It was noted that the C & K remotely mounted gauges had calibration tags displayed which were dated 27/02/2017. These gauges should be tested and calibrated annually.



E.6.1#3

A damaged cable going to one of the pressure transducers on the C & K manifold was noted.

**E.6.1**

**Choke Manifold Action Items:**

E.6.1#1	Low	No QA documentation, Maintenance & Operational documentation on the HP BOP Choke valves has been issued to the surveyor. All OEM manufacturing Data documentation and related certification including Maintenance and operational manuals must be presented and copies stored on the rig as per API Std 53, section 6.5.10.4
E.6.1#2	Medium	The 2 x C & K remotely mounted gauges have calibration tags displayed which are dated 27/02/2017. These gauges must be tested and calibrated annually as per API 53 Section 6.2.2.16
E.6.1#3	High	A damaged cable going to one of the pressure transducers on the C & K manifold was noted. Repair this cable as per OEM maintenance recommendations.

### E.6.3 Choke Control Units General

Conducted a visual inspection of the control panel for the hydraulically operated Auto Chokes. The name plate on the unit stated a manufacture year of 2015 and the unit appeared to be relatively new.

On inspection of the unit the following findings were noted:

- The doors to access the internal of the unit were damaged as the latch/lock on 1 door was broken.
- All the gauges on the control panel were in good condition but did not have calibration tags displayed on them.
- Inspection of the internals of the unit revealed that it was very dirty with old mud caked in the floor. It appeared that this unit had not received much maintenance and service attention during its operational life.



E.6.3#1

The Auto-chokes control panel unit showing no calibration tags on the gauges.

Manufacturer: Electro-Flo Controls (EFC)

Serial No: 00477-001

Manufacture date: 2015

Location: Rig Floor



E.6.3#2

The internals of the Auto choke panel showing the mud and dirt caked on the floor of the unit.



E.6.3#3

The damaged lock/latches on the doors of the Auto choke control panel.

**E.6.3 Choke Control Units (Swaco and General) Action Items:**

E.6.3#1	Medium	No calibration tags are displayed on any of the gauges of the Auto Choke panel. All gauges must be tested and calibrated annually as required by API 53 Section 6.2.2.16
E.6.3#2	Low	The internals of the Auto Choke panel is very dirty appears to not have been serviced in a long while. Clean and service the Auto-choke panel as per the OEM maintenance recommendations.
E.6.3#3	Low	The access to the Auto Choke control panel unit is damaged and needs to be repaired. Repair the unit as per the OEM maintenance recommendations.
E.6.3#4	Low	Provide the QA documentation and Maintenance and Operational manuals and historical evidence that the OEM maintenance recommendations have been followed. API Std 53 sections 6.5.10.4 and 6.5.10.5

**E.6.4 Mud/Gas Separator - Atmospheric (Poor Boy)**

A visual inspection of the Mud Gas Separator was conducted and overall the MGS and its associated pipe work appeared in an acceptable condition. The general construction of the MGS vessel and its pipe work appeared to meet all the requirements set out in API RP 64 and AOI Std 53.

It was noted that the gauge used to monitor and measure the pressure inside the MGS, which was mounted next to the BOP/Diverter control panel, was not in a serviceable state.

No QA documentation or maintenance records were issued to the surveyor during the period of the survey and as there were limited personnel on the rig at the time, access hatches were not opened for an internal inspection to be conducted. The surveyor was informed that the MGS and its associated pipe work had been flushed through at the end of the drilling program in Indonesia, prior to dismantling and storing the drilling packages.



Mud-Gas Separator with minimum 30" OD vessel, minimum mud seal of 12 feet and one of the outlets connected to 8" OD gas vent line.

Dimensions (height x OD) ft x in: 30ft x 12"  
Gas discharge line ID: 8"



**E.6.4#2**

The damaged pressure gauge used to monitor and measure the pressure inside the MGS, which was mounted next to the BOP/Diverter control panel.

**E.6.4**

**Mud/Gas Separator - Atmospheric (Poor Boy) Action Items:**

E.6.4#1	Low	Provide the QA documentation and Maintenance and Operational manuals and historical evidence that the OEM maintenance recommendations have been followed. API Std 53 sections 6.5.10.4 and 6.5.10.5
E.6.4#2	Medium	Replace the damaged MGS pressure gauge mounted next to the BOP/Diverter control panel.

**E.7 FLEXIBLE CHOKE AND KILL LINES (BOP TO MANIFOLD)**

The flexible choke and kill lines were stored on the deck under the drilling packages stored on the pipe deck and had their exposed ends covered and protected. It was noted that several new lengths of HP Coflexip hoses were stored in the sack store. No inventory of flexible HP hoses and their corresponding QA documentation and maintenance history were issued to the surveyor during the period of the survey.

The surveyor was informed that the required OEM inspections would be conducted on all used flexible HP mud hoses prior to the commencement to the next drilling operations.



The lengths of flexible Choke and Kill lines stored under the drilling packages on the pipe deck.



The new flexible HP Coflexip mud hoses stored in the sack store.

Make/type: Copper State  
 ID: 3" and 4"  
 Working pressure: 10,000psi  
 H2S service yes/no: yes

**E.7 Flexible Choke and Kill Lines (BOP to Manifold) Action Items:**

E.7#1	Low	Provide the QA documentation and Maintenance and Operational manuals and historical evidence that the OEM maintenance recommendations have been followed. (Register of all flexible HP mud hoses in use) API Std 53 sections 6.5.10.4 and 6.5.10.5
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**E.8 FLEXIBLE BOP CONTROL HOSES**

During the inspection of the BOP/Diverter controls & HPU accumulator unit, it was noted that all the BOP control hoses were still connected to the control unit. The hoses had been routed and stored under the package which contained the BOP/Diverter controls & HPU accumulator unit and had all their open-ended sides wrapped up and protected. The surveyor was informed that these hoses would be inspected and tested along with the flexible HP mud hoses prior to the start of the new contract.



The BOP control hoses still connected to the control unit and stored under the BOP accumulator unit.

Quantity no.: 16  
 Make/type: Copper State  
 ID: 1"  
 Working pressure: 3000 psi  
 Fire resistant yes/no: yes

**E.8 Flexible BOP Control Hoses Action Items:**

E.8#1	Low	Provide the QA documentation and Maintenance and Operational manuals and historical evidence that the OEM maintenance recommendations have been followed. (Register of all flexible BOP control hoses in use) API Std 53 sections 6.5.10.4 and 6.5.10.5
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**E.9 BOP TESTING EQUIPMENT**

**E.9.1 Hydraulic BOP Test Pump**

Visually sighted a BOP test pump assembly stored in the sack store. Noted that there were no calibration tags on the pressure gauge mounted on the unit. The pressure chart recorder used for BOP pressure testing was not sighted. No QA documentation for the BOP test pump, associated hoses and fittings and the pressure chart recorder was not provided to the surveyor during the period of the survey.



The BOP test pump assembly stored in the sack store.

Drilling Controls, Inc. Model S15G-M, 15,000 psi WP with two air-operated hydraulic pumps c/w Model SSR-15 Separate Skid Mounted Chart Recorder

**E.9.1 Hydraulic BOP Test Pump Action Items:**

E.9.1#1	Low	Provide the QA documentation and Maintenance and Operational manuals for the BOP test pump and associated HP hoses and fittings. API Std 53 sections 6.5.10.4 and 6.5.10.5
E.9.1#2	Low	Provide the records the test pressure gauge on the BOP test pump and the Pressure Chart recorder has been tested and calibrated annually as per API Std 53 section 6.5.3.6.4

**E.9.2 BOP Test Stump**

The 13-5/8" 10K Double BOP ram assembly was mounted on its associated test stump on the pipe deck. The diverter assembly was made up with the 21-1/4" annular on the other test stump used with the 21-1/4" 2k Annular and BOP's rams.

No QA documentation relating to the test stumps were issued to the surveyor during the period of the survey.



The 13-5/8" double BOP mounted on its test stump.



The diverter flow line spools mounted on to the test stump used for the 21-1/4" Annular and ram BOP's.

**E.9.2 BOP Test Stump Action Items:**

E.9.2#1	Low	Provide the QA documentation and OEM maintenance and operating manuals relating to the test stumps
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**E.10 BOP HANDLING**

**E.10.1 BOP Hoist System**

Sighted the 2 x 25ton rated chain hoists used for handling the BOP stored in the sack store. Visually inspected the four I-beam trolleys which were mounted on the I-beams under the drill floor package. All BOP hoist I-beam trolleys appeared to be in a reasonable condition but noted that they did not have their safe working load clearly stated on them.

No QA documentation was issued to the surveyor during the period of the survey. It was noted there was evidence that an NDT inspection had been conducted on the load bearing parts of the BOP cranes stored in the sack store. No records of the required annual inspection of the load bearing parts of the BOP crane and the I-beam trolleys it is hung on were issued to the surveyor although the surveyor was informed that all lifting equipment would be inspected prior to the start of the next drilling program.



The 2 x 25 ton rated BOP hoists stored in the sack store.



The 4 x I-beam trolleys that are used to hang the BOP hoist off. No SWL is visibly displayed on these I-beam hoists.

Documentation for the last 5 yearly disassembly and NDE inspection of all load bearing parts was not available.

**E.10.1 BOP Hoist System Action Items:**

E.10.1#1	Low	Provide all the QA documentation and OEM maintenance and operating manuals relating to the BOP hoists and the I-beam trolleys they are suspended from.
E.10.1#2	Low	Provide evidence of the last 5 yearly API RP7L Cat IV disassembly and inspection of all load bearing parts in the BOP hoisting system critical load path. (Ref API RP7L Addendum 1)
E.10.1#3	Low	Provide evidence that all the load bearing parts of the BOP hoists and the I-beam trolleys they are suspended from are part of the rigs annual lifting gear inspections.
E.10.1#3	Low	Ensure that the rated SWL of the I-beam Trolleys utilized to suspend the 25ton rated BOP hoist off are visibly displayed on each I-beam trolley.

**E.10.3 Conductor Pipe Tensioning System**

This equipment was not sighted on the rig

**F-G: MUD AND CEMENT SYSTEM**

**F.1 HIGH-PRESSURE MUD SYSTEM**

**F.1.1 Mud Pumps**

Make Lewco  
 Model W-1712  
 No4 SN SW172-116  
 No3 SN SW172-115  
 No2 SN SW172-114  
 No1 SN SW172-113  
 Pulsation dampener LEWCO L20-7500 Bladder-type, rated 7,500 psi WP, two dampeners per pump  
 Relief valve 'CX' Model X8000 series II,



Mud pump discharge manifold view



Fluid end parts in storage (greased)

The four (4) belt driven mud pumps were in a satisfactory visual condition and not in use at the time of the survey. The fluid ends had been stripped out and all parts greased and stored. The MR surveyor was informed that the mud pumps were run briefly on a weekly basis, as part of the owner’s warm stacking procedure. The MR surveyors were shown documentation of a 5 yearly inspection carried out by PT Offshore hydraulics’ Indonesia dated 01-12-17 on mud pumps No.2 and No.4

The MR surveyors were shown wall thickness testing documentation but the documentation was not adequate in that no original wall thickness with acceptable wear limits was shown, only the actual reading.

Bearings and Crosshead Slide Clearances Tables (from records):

**Mud pump No.4**

Bearing Deflection	Readings (inches)	Date last recorded
Pinion shaft bearing	Right 0.006" left 0.007"	27/08/2017
Wrist pin bearing	Right 0.004; center 0.005; left 0.004	27/08/2017
Left eccentric bearing	0.007"	27/08/2017
Middle eccentric bearing	0.005"	27/08/2017
Right eccentric bearing	0.006"	27/08/2017
Main bearing	Right 0.008" left 0.007"	27/08/2017

Crosshead Slide Clearances (inches)		
Crosshead	Fluid End Side	Power End Side
No.1	0.026	0.025
No.2	0.020	0.030
No.3	<b>0.006</b>	<b>0.007</b>

**Mud pump No 2**

Bearing Deflection	Readings (inches)	Date last recorded
Pinion shaft bearing	Right 0.006" left 0.007"	23/09/2017
Wrist pin bearing	Right 0.004; center 0.005; left 0.004	23/09/2017
Left eccentric bearing	0.008"	23/09/2017
Middle eccentric bearing	0.006"	23/09/2017
Right eccentric bearing	0.009"	23/09/2017
Main bearing	No info	

Crosshead Slide Clearances (inches)		
Crosshead	No info	23/09/2017
No.1	0.025"	23/09/2017
No.2	0.025"	23/09/2017
No.3	0.025"	23/09/2017

**F.1.1**

**Mud Pumps Action Items:**

F.1.1#1	Low	Produce wall thickness documentation with allowable tolerances.
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F.1.1#2	Low	Produce 5 yearly inspection documentation on pumps No1 and No3
F.1.1#3	Medium	Recheck the crosshead clearances for mud pump No.4 due to the low reading on crosshead No. 3 (recorded as 0,006" & 0.007"). Ensure that the clearances are within the recommended range as stipulated by the OEM.

**F.1.2 Transfer Pumps/Mixing Pumps**

Make Baker  
 Model SPD 2.5 Mud Hog  
 Size 6x8x14



F.1.2

The four mixing pumps were visually inspected and were in a satisfactory condition.

**F.1.3 Booster Pump**

Not inspected

**F.1.4 Standpipe Manifold**

A visual inspection was conducted on the standpipe manifold assembly and it was in an acceptable condition. The standpipe manifold valves and spools were well secured and appeared to have been recently painted.

The condition of the internals of the standpipe manifold spools and valves could not be assessed as there were not enough personnel assigned to the WEST VENCEDOR as the time of the survey to remove a sample of valve bonnets off the manifold valves to conduct an internal inspection. It was noted that the grease covers on all the grease nipples had markings of fresh paint on them which would indicate that these valves were not being greased regularly since the rig was stacked.

The surveyor was informed that the standpipe manifold had been flushed through and filled with preservation fluid at completion of the last drilling operations. The type of preservation fluid used was unknown and possibly a water based soluble oil was used



The Standpipe and Cement manifolds mounted on the package which made up the drill floor.

Quantity of standpipes no.: 3  
 Standpipes ID: 5", 3", 2"  
 H-Type Standpipe manifold yes/no: yes  
 Kill line outlet yes/no: yes  
 Fill-up/bleed-off line outlet yes/no: yes  
 Third Party Outlets yes/no: yes

**Standpipe Manifold valve data:**

No QA documentation, maintenance and operational manuals or information about the standpipe manifold was issued to the surveyor during the period of the survey

**F.1.4**

**Standpipe Manifold Action Items:**

F.1.4#1	Low	No QA documentation, Maintenance & Operational documentation on the Standpipe manifold valves has been issued to the surveyor. All OEM manufacturing Data documentation and related certification including Maintenance and operational manuals must be presented and copies stored on the rig as per API Std 53, section 6.5.10.4
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**F.1.5 Rotary Hoses**

See section F.1.6

**F.1.6 Cementing Hose and all other HP mud hoses, armoured and unarmoured**



F.1.6 Some of the many high pressure hoses in 'storage'.

At the time of the survey all of the HP hoses had been removed from the equipment and were stored in several locations on the rig, making identification impossible at this time.

The MR surveyor was informed that all hoses were to be recertified and or replaced then entered into a register with permanent identification before the next contract.

**F.1.6 Cementing Hose Action Items:**

F.1.6#1	Low	Produce documentation recertification and a hose register using permanent ID for hose identification
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**F.2 LOW-PRESSURE MUD SYSTEM**

**2.1 Mud Processing Tanks (Degasser, Desander, Desilter, etc.)**

**Mud Mixing System:**



Access to the processing tanks was limited and the degasser Desander and desilter were not installed during the survey. A visual inspection of the tanks internal was limited due to equipment storage.

**F.2.1 Mud Processing Tanks Action Items:**

F.2.1#1	Low	Produce documentation of tank inspections.
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**F.2.2 Mud Tanks**



The mud tanks were empty during the survey condition, well cleaned out and in a satisfactory visual condition. No corrosion was noted on tank surfaces (viewed from above)

	Active Mud Pits	Reserve Mud Pits	Pill/Slug Tank
Capacity No.7p	579 Bbls		44 bbls
Capacity No.8s		424 Bbls	
Capacity No.9s	579 Bbls		
Capacity No.12s		424 Bbls	
Capacity No.13s	579 Bbls		
Capacity No.14s		756 Bbls	
Capacity No.15s	602 Bbls		
Capacity No.16s	745 Bbls		

**F.2.2 Mud Tanks Action Items:**

F.2.2#1	Low	Provide inspection report for all mud pits.
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**F.2.3 Pill/Slug Tank**

Not inspected.

**F.2.4 Trip/Stripping Tank System**

Make of pumps      Baker  
 Model                Mud Hog  
 Quantity            two  
 Tank capacity      30 bbl



F.2.4  
Trip tank pumps

The trip was in a satisfactory condition with no signs of corrosion externally or internally. The two pumps installed were not seen in use. Inspection of the coupling on the out board pump was ongoing during the survey.

**F.2.4 Trip/Stripping Tank System Action Items:**

F.2.4#1	Low	Produce documentation of tank inspection.
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**F.2.5 Chemical Mixing Tank**

Not applicable

**F.2.6 Shale Shaker**

Make Brandt.  
Model VSM300



The five shakers were seen to be freshly painted and were in a satisfactory condition. All associated manual valves were found to be free to operate and the whole system free of any serious corrosion.

The five (5) Shale shakers were test run during the inspection period with no issues noted.

**F.2.7 Desander**

Not on board – The MR surveyor was verbally informed that this equipment is Client provided

**F.2.8 Desilter**

Not on board – The MR surveyor was verbally informed that this equipment is Client provided

**F.2.9 Mud Cleaner**

Not on board – The MR surveyor was verbally informed that this equipment is Client provided

**F.2.10 Mud/Gas Separator - Atmospheric**

Refer to section E.6.4 of this report for details.

**F.2.11 Degasser (Vacuum)**

Make Swaco  
Model Model CD-1400  
Flow 1400 gpm



The degasser was in a satisfactory visual condition, it was not in use during the survey period nor available for testing.

**F.2.12 Mud Agitators**

Make Lightning x fourteen.  
 Model 98Q-25 25 HP (for the active and reserve pits)

Make Lightning x2  
 Model 98Q-10 10 HP (for the slug pit)



None of the sixteen (16) agitators installed were in use during the survey and were in a fair condition during the survey however the corrosion issue's seen on all of the mud pit agitators should be addressed before becoming a serious problem.

**F.2.12 Mud Agitators Action Items:**

F.2.12#1	Medium	Remove and treat corrosion.
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**F.2.13 Mud Centrifuge**

Not on board – The MR surveyor was verbally informed that this equipment is Client provided

**F.2.14 Mud Laboratory and Facilities**



F.2.14  
The mud lab

The large mud lab was in a clean satisfactory condition. No mud testing equipment was installed during the survey period as this is supplied by the third party company

### **F.2.15 Flow Line System**

The flow line was not inspected due it being totally disassembled and stored in various locations.

### **F.2.16 Casing Fill-Up Line**

Not inspected as the drill floor not assembled at the time of the survey with the fill line in storage.

### **F.2.17 Base Oil System**

The pump in the lower pump room was visually inspected and found to be satisfactory; it was well installed with no signs of leakage.

The base oil tanks or DMA as it was called by the rig owner had recently been cleaned out (documentation seen by the surveyor).

### **F.2.18 Reverse Circulating System**

Not inspected due to its being disassembled and in storage

### **F.2.19 High Rate Mixers**

Not applicable

## **F.3 BULK SYSTEM**

### **F.3.1 Barite/Bentonite Silos**



F.3.1  
Cap 2600 ft<sup>3</sup>

The two bulk mud silos were well located in the stb-fwd column and were visually satisfactory with all surfaces and pipe work valves corrosion free. Good access was possible at both upper and lower portions of the silos.

The MR surveyors were shown documentation of the PRV, s being tested Feb 07-02-2017

**F.3.1 Barite/Bentonite Silos Action Items:**

F.3.1#1	Low	Produce internal inspection reports
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**F.3.2 Cement Silos**



The four cement silos were well located in the Port fwd column were satisfactory with all surfaces and pipe work valves corrosion free. Good access was possible at both upper and lower portions of the silos.

The MR surveyors were shown documentation of the PRV, s being tested Feb 07-02-2017

**F.3.2 Cement Silos Action Items:**

F.3.2#1	Low	Produce internal inspection reports
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**F.3.3 Surge Tank for Barite/Bentonite**

Make Chip Ngai Engineering Works Sdn Bhd  
Capacity 106 ft<sup>3</sup>



Both surge tanks were in a satisfactory condition, well painted with no signs of corrosion. The surfaces were undamaged and free of hammering marks.

**F.3.3 Surge Tank for Barite/Bentonite Action Items:**

F.3.3#1	Medium	Inspect tank internals.
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**F.3.4 Mud Hopper**

The manual mud mixing hopper was not in use during the survey and in a satisfactory visual condition with no damage seen and all valves free to operate.

**F.3.5 Surge Tank for Cement**

Not inspected.

**F.3.6 Bulk Transfer (see also section A.11.5)**

No bulk products were available to transfer to function test this system.

**G.2 CEMENTING EQUIPMENT**

**G.2.1 Cementing Unit**



The Baker Hughes cement unit on board was in a satisfactory visual condition. The MR surveyors was verbally informed the unit will possibly to be changed out for the next operation.

**G.2.2 Cement Manifold**



G.2.2  
The 10K cement manifold on the rig floor.

The cement manifold was visually inspected and in a satisfactory condition, well painted with no signs of corrosion.

The MR surveyors were shown wall thickness testing documentation but the documentation was not adequate in that no original wall thickness with acceptable wear limits was shown, only the actual reading

**G.2.2 Cement Manifold Action Items:**

G.2.2#1	Low	Produce wall thickness documentation with allowable tolerances.
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**G.2.3 Cement Standpipe**

Not applicable as a hose was used from the manifold (the hose was not inspected) see section F-16.

## H: INSTRUMENTATION AND COMMUNICATION

### H.1 DRILLING INSTRUMENTATION AT DRILLER'S POSITION

The analogue type drilling instrumentation has to be calibrated and recertified before commencing of the RDIT which will prove the efficiency of the drilling instrumentation and controls.

The driller console was disassembled at the time of our survey, and tests could not be performed.



H.1  
Drillers console – View while disassembled from package.



H.1  
Drillers console – View while disassembled from package.



H.1  
Drillers console – View while disassembled from package.

**H.1 Drilling Instrumentation at drillers position  
Action Items:**

H.1#1	Low	Provide calibration certificate for all drilling instrumentation.
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**H.2 DRILLING PARAMETER RECORDER**

This instrumentation was not available for testing and will need to be set up prior to the commencement of the RDIT.

**H.3 INSTRUMENTATION AT CHOKE MANIFOLD**

This instrumentation was not available for testing and will need to be set up prior to the commencement of the RDIT.

**H.4 INSTRUMENTATION AT STANDPIPE**

This instrumentation was not available for testing and will need to be set up prior to the commencement of the RDIT.

**H.5 DEVIATION EQUIPMENT**

Not inspected.

**H.6 RIG COMMUNICATION SYSTEMS**

**H.6.1 Rig Telephone System**

The rig was not provided with an internal automatic telephone system but with a Gaitronic PA station-call system

**H.6.2 Public Address System**

The rig was not provided with an internal automatic telephone system but with a P.A. 'Gaitronic' station-call system. Call stations were allocated at all rig critical areas and offices, and once a general call was made the called person can pick-up from the closest station. General calls were activated by pressing the buttons on the call stations horn. Audibility was sufficient to be heard in all areas at the time of the survey, but should be re-tested in the noisy working areas with all equipment running.

The PA central station was allocated in the ballast control room.

The P.A. system will be tested during the RDIT while operational after the abandon rig ESD level. (As also required being functional by the Class Society rules)

**H.6.3 Drill Floor Talkback System**

Not tested as the mast was not rigged up.

**H.6.4 Hand Held VHF Radios**

Not inspected.

**H.6.5 Crane Communication System**

The cranes were fitted with a hands-free radio as well as a Gaitronics PA station for communicating with the crew and supply boats.

**H.7 ENVIRONMENTAL INSTRUMENTATION**

The environmental instrumentation was integrated within the 'WLS-8000' 'Weather Station Instrument' installed in the radio room and designed to monitor and display information regarding the following:

- o Wind speed
- o Wind direction
- o Time/data
- o Temperature indoor and outdoor
- o Barometer
- o Air humidity
- o Rainfall average
- o Lunar tide cycles

It was not operational at the time of our survey (suspect power turned off at field station unit).



H.7 Weather station in radio room

**H.7.1 Environmental Instrumentation Action Items:**

H.7.1#1	Medium	Restore full functionality for the weather station instrument in the radio room.
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**H.8 NAVIGATION INSTRUMENTATION**

**H.8.1 Gyro Compass**

Not applicable

**H.8.2 Depth Sounder**

The depth sounder was not sighted by the surveyor and the crew could not assist with finding it due to their unfamiliarity with the rig and her systems.

**H.8.3 Radar**

Not applicable

**H.9 EXTERNAL COMMUNICATION**

**H.9.1 SSB Transceiver**

The long range SSB radio equipment in the radio room was not inspected. There was no radio operator on board at the time of the survey to demonstrate the use of this equipment.

**H.9.2 E.P.I.R.B's**

There was an EPIRB installed above the accommodation deck roof. The MS Surveyor did not review any certificate or validity documentation. The call signal code was '3FLT6'  
The MMSI (Maritime Mobile Service Identities) was 371 515 000



H.9.2  
E.P.I.R.B. (Emergency Position Indicator Radio Beacon) above accommodation block.

**H.9.2 E.P.I.R.B Action Items:**

H.9.1#1	Low	Verify validity and certificate
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**H.9.3 Marine VHF Radio**

One Icom model IC-M504 VHF radio transceiver was installed in the radio room. It was operational.



H.9.3  
Marine VHF radio in radio room

**H.9.4 Aircraft Radio Beacon Transmitter**

The Aircraft Radio Beacon Transmitter (NDB – Non Directional Beacon) was installed in the radio room.

It has to be tested up to the satisfaction of the helicopter operational company before commencing of helicopter flights.



H.9.4  
NDB (Non Directional Beacon) for helicopter.

**H.9.4 Aircraft Radio Beacon Transmitter Action Items:**

H.9.4#1	Medium	Test NDB system before commencing of helicopter flights.
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**H.9.5 Aeronautical VHF Transceiver**

An Icom model IC-M710 MF/HF radio transceiver and an Icom model IC-A110 VHF air band transceiver were in place for communication with the helicopter.



H.9.5  
Aeronautical radios in radio room

### H.9.7 Satellite Communication System

The satellite communication system was noted to be provided by a third party contractor (RigNet)

## **I-J: PRODUCTION TEST EQUIPMENT AND WORKOVER TOOLS**

No well test equipment was available for inspection.

## **K: ACCOMMODATION**

### **K.1 OFFICES**

#### **K.1.1a Company Representative's Office**

The company representative office was located at top accommodation deck and provided with two working desks and monitors.



K.1.1a  
Company man's office - View

#### **K.1.1b Third Party Offices**

Located at accommodation top deck.

The working desk can comfortably accommodate six working persons at desks.



K.1.1b  
Third party office.

#### **K.1.2 Contractor Representative's Offices**

Located at accommodation top deck.

Referred to as O.I.M office. It was spacious and can hold small meetings.



K.1.1b  
OIM office.

### K.1.3 Control Room

The control room was located at the accommodation top deck.

The following equipment was located in the control room (referred to as ballast control room).

- Fire and gas panel.
- ESD panel.
- VMS (Vessel Management System)
- Navigation lighting panel.
- Hi-Fog fire-fighting system control panel.
- Anchor release control panel.

A working desk was available in the ballast control room.



K.1.3  
Ballast control room.

### K.1.4 Radio Room

The radio room is positioned at the accommodation top level deck. Non GDMSS radio equipment was allocated in the radio room:

- Weather monitoring display
- IC-M504 VHF transceiver
- NX-700B Navtex display unit
- IC-M710 MF/HF transceiver
- IC-A110 air band transceiver
- Helicopter Non Directional Beacon transmitter.
- GPS monitor

The entertainment system satellite control rack was also located in the radio room.



K.1.4  
Radio room. - View

The radio room was enclosed from the internal side by A-60 rated bulkheads. At the time of the survey there was no Radio Operator on board.

#### **K.1.5 Helicopter Ready Room**

There was no specific helicopter room but the meeting room at 3<sup>rd</sup> accommodation deck, and referred as 'Crew Meeting Room', was used as helicopter briefing room. It was provided with video facilities for briefings and trainings. Refer to section K.2.4 of this report.

#### **K.1.6 Hospital Room**

At the time of this survey there was no medic on board the WEST VENCEDOR. The hospital was located at the upper deck accommodation deck, provided with 2 access doors (internal and external from open deck). It was equipped with two patient beds, one examination table, dedicated bathroom and three stretchers. The hospital room needed to be cleaned and restored to operational conditions prior to commencement of next drilling contract.



K.1.6  
Hospital room. - View



K.1.6  
Hospital room. - View



K.1.6  
Hospital room. - View

**K.1.6 Hospital Room Action Items:**

K.1.6#1	Medium	Clean and restore the hospital to full operational condition before commencing of the next contract.
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**K.2 LIVING QUARTERS**

**K.2.1 Accommodations**

At the time of the survey there were only two persons from the catering crew. (Camp boss and steward) and a total of eleven person on board.

The cabins were left in an acceptable standard although they required general cleaning before commencing of the up-manning.

The accommodation comprised of 160 bunks split up into 1 and 2 man cabins.

The galley was well laid out and the mess was capable of seating half of the maximum allowable POB.

The accommodation was protected from the environment, properly heated and cooled, located outside hazardous areas and not seriously affected by noise or vibration.

Change rooms were located on the port and starboard sides on main deck level.

There was one recreation room, two meeting rooms and a gym.

The stairway floor for the accommodation block were noted with several areas of broken coating at the inner step corners.



K.2.1  
2 men cabin - View



K.2.1#1  
Broken floor coating at stairways



K.2.1#1  
Broken floor coating at stairways – Close up

**K.2.1 Accommodations Items:**

K.2.1#1	Medium	Repair broken floor coating at stairways inner corners.
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**K.2.2 Galleys**

Generally, the galley was noted to be in good condition.

The freezer and chiller were inspected. It was noted that the freezer was maintaining an average temperature of minus 15°C. The chiller was recorded at average temperature of 8°C. The contents of the food storage areas were neat and generally clean.

There was no cross-contamination of various foods evident.

The ovens and baking areas were clean, and the range-hood was protected by the water mist fixed fire extinguishing system.



K.2.2  
Galley - View

### K.2.3 Mess Rooms

The mess room was observed cleaned and tidy, provided with all basic amenities. (drink dispensers, urn, toaster and refrigerator for beverages)

It was divided from the galley (at the serving hatch bay-marie) by steel roller blind and a fire resistant door. It was designed in two open sections (Western and local) each provided with its own steel roller blind and food dispenser.



K.2.2  
Mess room - Western



K.2.2  
Mess room - Local

#### K.2.4 Meeting Rooms

One meeting room was located at the top floor accommodation deck and provided with a table (for accommodating 10 persons), one projector and conference call facility.



K.2.4  
Meeting room - View

Another bigger meeting room was located at 3<sup>rd</sup> accommodation deck and referred as 'Crew Meeting Room' It was used as helicopter briefing room and provided with video training facilities.



K.2.4  
Crew meeting room - View

#### K.2.5 Recreation Rooms

A smoking area was set at the top floor accommodation deck external area AFT side. Sign postings indicating that smoking is not allowed during helicopter landing / take off operations was not in place. A recreation room referred to as TV room was located at the 2nd floor accommodation deck.



K.2.5  
Crew recreation room - View

**K.2.5**

**Recreation Rooms Action Items:**

K.2.5#1	Low	Consider installing sign postings (around the dedicated smoking area) indicating that smoking is not allowed during helicopter landing / take off operations.
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**L: SAFETY EQUIPMENT**

**L.1 GENERAL SAFETY EQUIPMENT**

The warm stacked status of the rig with the equipment stored in various locations around the rig made the inspection of the normal operations safety equipment impossible and this section will be re-visited at the RDIT.

**L.2 GAS/FIRE/SMOKE DETECTION**

**L.2.1 H<sub>2</sub>S Monitoring System**

The H<sub>2</sub>S gas monitoring system was enclosed within the fire & gas rack cubicle (In the ballast control room) and consisted of seven-teen detection points strategically allocated in the most potentially H<sub>2</sub>S gas affected areas.

Five electronic boards were each receiving four inputs from a respective H<sub>2</sub>S chemical cell detector located on the field.

The H<sub>2</sub>S gas detection system was configured as per table below:

H <sub>2</sub> S Gas detection electronic board	Electronic board channel Detector Identification	Detector location
Electronic board N. 1	Ch. 1 H <sub>2</sub> S 01	Port FWD column supply fan
	Ch. 2 H <sub>2</sub> S 02	Centrifuge area
	Ch. 3 H <sub>2</sub> S 03	STBD FWD column supply fan
	Ch. 4 H <sub>2</sub> S 04	Vent. Supply duct Engine room (pipe rack deck Port)
Electronic board N. 2	Ch. 1 H <sub>2</sub> S 05	AHU inlet accommodation "0" level
	Ch. 2 H <sub>2</sub> S 06	Vent. Supply duct Engine room (pipe rack deck STBD)
	Ch. 3 H <sub>2</sub> S 07	Mud pit room
	Ch. 4 H <sub>2</sub> S 08	Mud pit room
Electronic board N. 3	Ch. 1 H <sub>2</sub> S 09	Mud pit room
	Ch. 2 H <sub>2</sub> S 10	Mud pit room
	Ch. 3 H <sub>2</sub> S 11	Mud pump room
	Ch. 4 H <sub>2</sub> S 12	Mud pump room
Electronic board N. 4	Ch. 1 H <sub>2</sub> S 13	AHU inlet AFT pipe deck
	Ch. 2 H <sub>2</sub> S 14	AHU inlet main deck Port
	Ch. 3 H <sub>2</sub> S 15	AHU inlet main deck AFT
	Ch. 4 H <sub>2</sub> S 16	AHU inlet main deck STBD
Electronic board N. 5	Ch. 1 H <sub>2</sub> S 17	'01' level AHU intake AFT

The gas detectors were last calibrated more than three months ago. H<sub>2</sub>S chemical cells tends to die or become less sensitive when not properly tested at regular intervals.



L.2.1  
H<sub>2</sub>S detector control unit electronic boards  
(Within the fire & gas enclosure rack)

**L.2.1 H<sub>2</sub>S Monitoring System Action Items:**

L.2.1#1	Medium	Test and calibrate all H <sub>2</sub> S detectors before commencing of next drilling contract.
L.2.1#2	Medium	Ensure H <sub>2</sub> S gas test is not expired and available for conducting a full calibration at all detectors.

**L.2.2 Combustible Gas Monitoring System**

The combustible gas monitoring system was enclosed within the fire & gas rack cubicle (In the ballast control room) and consisted of seven-teen detection points strategically allocated in the most potentially combustible gas affected areas.  
Five electronic boards were each receiving four inputs from a respective combustible gas detector located on the field.

Combustible Gas detection electronic board	Electronic board channel Detector Identification	Detector location
Electronic board N. 1	Ch. 1 HC 01	Port FWD column supply fan
	Ch. 2 HC 02	Centrifuge area
	Ch. 3 HC 03	STBD FWD column supply fan
	Ch. 4 HC 04	Vent. Supply duct Engine room (pipe rack deck Port)
Electronic board N. 2	Ch. 1 HC 05	AHU inlet accommodation "0" level
	Ch. 2 HC 06	Vent. Supply duct Engine room (pipe rack deck STBD)
	Ch. 3 HC 07	Mud pit room
	Ch. 4 HC 08	Mud pit room
Electronic board N. 3	Ch. 1 HC 09	Mud pit room
	Ch. 2 HC 10	Mud pit room
	Ch. 3 HC 11	Mud pump room
	Ch. 4 HC 12	Mud pump room
Electronic board N. 4	Ch. 1 HC 13	AHU inlet AFT pipe deck
	Ch. 2 HC 14	AHU inlet main deck Port
	Ch. 3 HC 15	AHU inlet main deck AFT
	Ch. 4 HC 16	AHU inlet main deck STBD
Electronic board N. 5	Ch. 1 HC 17	'01' level AHU intake AFT

The combustible gas detectors have to be tested and calibrated. The rig owner has to ensure that sufficient test gas is available for testing all detectors before commencing of the next drilling operations.



L.2.1  
Combustible detector control unit electronic boards (Within the fire & gas enclosure rack) - View

**L.2.2 Combustible Gas Monitoring System Action Items:**

L.2.2#1	Medium	Test and calibrate all combustible gas detectors before commencing of next drilling contract.
L.2.2#2	Medium	Ensure combustible gas test is not expired and available for conducting a full calibration at all detectors

**L.2.7 Fire/Smoke Detection System**

The fire detection system reads inputs from detectors and manual call points. The type of detectors in the fire system were smoke, heat, flame and manual fire alarms from manual call points.

Each section of the fire system was defined and divided into fire zones. The purpose of the fire zone was to limit fire escalation through the zones placement. The fire zones were arranged according to logical units, process areas/accommodation, etc.

Each fire zone included fire detection and fire protection equipment.

Heat and smoke detectors and manual call points were addressable units connected to fire central loops.

The fire central unit was manufactured by 'Thorn Security' of model "Minerva T2000" of addressable type.

An alarm from any of the system sensors activates the local audible alarm and a location identity on the fire is displayed on the Minerva T2000 fire panel monitor display unit.

The fire alarm philosophy was set as:

- Activation of a single smoke / heat detector in a zone causes local alarm at the control panel and, if remained unacknowledged for 120 seconds, the alarm is automatically triggered throughout the PAGA system (confirmed alarm)
- Simultaneous activation of two or more smoke / heat detectors in the same zone causes alarm at the control panel and an immediate direct confirmed fire with the activation of the PAGA system.
- Activation of a manual call point is a direct confirmed fire and activation of the PAGA system with no delay.
- Activation of an infrared detector activates a confirmed fire and the PAGA system without delay.

ModuResources tested the fire alarm with a fire simulation in the laundry. Once activated the alarm was immediately revealed and sounded at the fire panel. After 120 seconds the alarm was propagated throughout the PAGA system.

As per the 'Cause & Effect' chart of emergency shut-down system document "KFELS-B305 – WEST VENCEDOR PJS71343-AD-CE-1002 page 2 of 2" the fire dampers FD-26 and FD-27 at the accommodation deck '0' level shall close for confirmed fire alarm in the area.

The confirmed fire (due to activation of two smoke detectors simultaneously activated) did not produce any auto closure of the fire dampers. This issue should be investigated and other 'effects' verified whether operational as per the 'Cause & Effect' document.

ModuResources had a concern regarding the audibility of the fire alarm in the control room (where the main fire panel was located)

- The activation of a single fire detector should be audibly and visibly noticeable from the fire panel before the activation of the PA/GA system in order to allow the operator to acknowledge the alarm and undertake actions and avoid unnecessary false alarms.
- The central fire panel should provide a clear distinguishable and audible alarm sound while all systems are operational (HVAC, alarms from radio equipment and other alarms) even when the fire control panel enclosure cabinet door has been closed.

Refer to IEC 60092-504 section 11.3.4 and IEC 60092.504 section 9.1.3.3.8

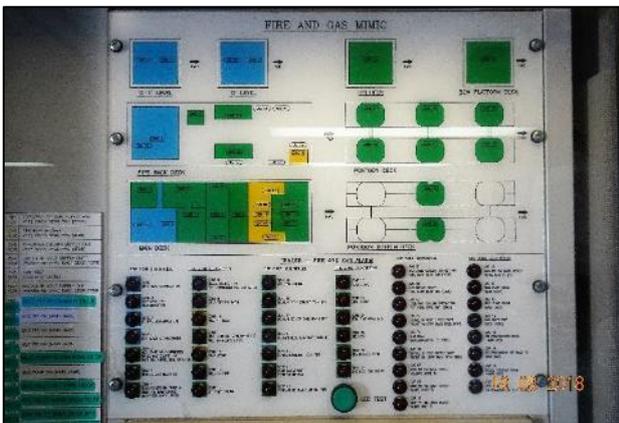
Testing of other smoke detectors at 3<sup>rd</sup> level accommodation deck, main switchboard room and engine room confirmed the fire alarm logic as per above.

A mimic panel was fitted (within the same rack enclosure) above the fire panel displaying fire / gas zones description and location (as well as providing a common red alarm light for each zone)

As per other equipment the programmed maintenance at the fire detection system had been paused since June 2018, moreover the low personnel availability (during the warm stacked period lasting from February 2018) did not give the opportunity to properly maintain and test fire detectors as per normal schedule.

The rig owner should ensure that all detectors are tested before departing from the warm stacked location.

The fire alarm panel will also be monitored during the RDIT after activation of the 'abandon rig' ESD level to verify whether it remains energized and fully operational as required by the Class standards.



#### L.2.7

Fire mimic panel in fire detection system rack (Ballast control room). - View

Fire Alarm Zones			
Zone	Area	Zone	Area
1	Main deck accommodation	15	AFT STBD Column
2	Pipe rack deck accommodation	16	Column deck (Cement tank N. 3)
3	"0" level accommodation	17	Column deck P-Tank room STBD
4	"1" level accommodation	18	Column deck (Bentonite tank N. 1)
5	Water mist equipment room, battery room, emergency generator, switchboard room.	19	Pontoon / Column deck STBD
6	Service equipment room	20	Pump room port, Pontoon bottom
7	Transformer room, switchboard room, workshop, mechanic office	21	Pontoon bottom, Pump room STBD
8	Diesel purifier room, air compressor room, engine room	22	Port Crane
9	Sack storage room	23	STBD Crane
10	Mud pit room	24	Bow platform deck
11	Mud pump room, company store, mud engineer office	25	Helideck
12	Paint store	26	Koomey room
13	Welding shop	27	Dog house
14	AFT-Port column		



L.2.7  
Fire detection control panel

**L.2.7 Fire/Smoke Detection System Action Items:**

L.2.7#1	Medium	Replace the fire panel sounder by a louder distinguishable sounder unit. Refer to IEC 60092-504 section 11.3.4 and IEC 60092.504 section 9.1.3.3.8
L.2.7#2	High	Test all fire detectors and verify efficiency before departure to the next drilling location.
L.2.7#3	High	Test the 'Cause and Effect' against the matrix document and verify whether other effects (apart from the one tested during this survey) are not reflecting the chart. Consult with the Class society for approval.

### L.3 FIRE-FIGHTING EQUIPMENT

#### L.3.1 Fire Pumps and Fire Main

Two equally sized fire pumps rated for 307 m<sup>3</sup>/hrs. output were respectively located in the STBD (Main) and Port (Emergency) pontoon.

There was a specific fire pump for the two bow monitors allocated at pipe deck level AFT side referred as to 'Bow Monitor Pump'. The pump was installed in the Port pontoon, fed (via soft-starter panel) from the emergency switchboard and primarily moved by an electric motor of 225 kW, rated with a capacity of 545 m<sup>3</sup>/h and a water head of 116 m at the speed of 1,785 rpm. The 'Bow Monitor' fire-fighting system was tested on 16 August 2018 by ModuResources with the barge master.

The 'Bow Monitor pump' was run and the two monitors open to direct the water overboard. The two monitors operated satisfactorily (Refer to picture below) although there were no pressure gauges installed next to the monitors and the STBD monitor required repairing of the hydraulic pump / mechanism which keeps the monitoring rotating for 180° back and forward when engaged (engaged by valve opening the water flow to the mechanism)

The pump motor current was recorded at 345 Ampere



L.3.1  
Bow Monitor Port



L.3.1  
Bow Monitor STBD



L.3.1#2  
Bow Monitor STBD missing rotating mechanism.

**L.3.1 Fire Pumps and Fire Main Action Items:**

L.3.1#1	Low	Install pressure gauges at the bow monitors fire-fighting system.
L.3.1#2	Low	Bow monitor STBD: Install the hydraulic pump / mechanism which keeps the monitoring rotating for 180° back and forward when engaged (engaged by valve opening the water flow to the mechanism)

**L.3.1a Emergency Fire Pump**

The emergency fire-pump was fed from the emergency switchboard, located in the Port pontoon and observed in good visual condition. It was rated for an output of 307 m<sup>3</sup>/hr. and tested under the emergency switchboard during the load test of the emergency generator and helideck foam-water extinguishing system. It operated satisfactorily.

**L.3.2 Hydrants and Hoses**

An adequate number of fire hose stations, as indicated on the safety plan, were seen available around the rig and all were seen to be in good condition. Each station was numbered for maintenance purposes. The hoses and nozzles were suitable for marine use and maintained in good condition. The fire hydrants were positioned in such a manner that it was possible to reach any point on the vessel by a single hose length from two separate hydrants.

**L.3.3 Portable Fire Extinguishers and Fire-Fighting Equipment**

Portable fire extinguishers used on the rig were adequate and approved by the maritime authorities in the area of operation. They were clearly labelled as to purpose. The fire extinguishers were securely mounted in frames, numbered for ease of maintenance and inspected on a regular basis. The third party "PT Global Segara Permai" carried out the last annual inspection at all portable fire extinguishers on January 2018 therefore another annual check is due to expire by January 2019

### L.3.4 Fire Blankets

Fire blankets were noted positioned in the galley next to the cooking plates. They were fitted in proper enclosure ready for use.

### L.3.5a Fixed Low Expansion Foam System

The only fixed low expansion foam system aboard the WEST VENCEDOR was the helideck firefighting monitoring system. Refer to section L.3.6

### L.3.6 Helideck Foam System

The helideck fire extinguishing system was provided with three monitors. The system was satisfactorily tested without using foam while running the fire pump under the emergency generator load. The rig owner verbally informed ModuResources that the system was tested every month as part of the warm stacked program. The outlet water pressure from the fire monitor was of 90 psi while the foam pump was operational and of 100 psi while the emergency fire pump was operational. The water jet from each monitor could reach the entire helideck perimeter. The foam last test and report was made on 15<sup>th</sup> February 2017 by 'Asiatic Fire system – Singapore' with certification valid until 1<sup>st</sup> March 2019.



L.3.6  
Helideck fire monitor



L.3.6  
Helideck fire monitor



L.3.6  
Helideck fire monitor

### L.3.7 Fixed Fire-Extinguishing Systems

The WEST VENCEDOR was provided with a Hi-Fog water mist fire protection system that covered the working, machinery and accommodation areas. The majority of the rig areas were covered by the Hi-fog system.

The last inspection was conducted on January 2018 by third party "PT Global Segara Permai "with certification valid until 19 January 2019.

There is programmed maintenance for the water mist system which was included in the maintenance database system.

Monthly checks include valve test on any of the section valves, so in one year all valves will be tested at least once.

The six monthly check includes inspection at water filter and separator.

The yearly check includes a full flow test for machinery section.

The system requires being re-inspected and tested for annual check before commencing of the next contract.

The hi-fog central control unit was located at main deck level. The system was engineered to be operational in case of total rig power loss and provided with nitrogen back-up for release in an emergency scenario.



L.3.7  
Hi-Fog control panel mimic in ballast control room.



L.3.7  
Hi-Fog control panel in ballast control room.

### **L.3.9 Water Sprinkler System in Accommodation**

The fixed fire-fighting system in the accommodation was covered by the Hi-Fog water mist. Refer to section L.3.7 of this report.

### **L.3.10 Extinguishing Arrangements in Machinery Spaces**

The Hi-Fog water mist system was providing fire protection in the main engine-generator room and in the emergency generator room. Foam portable fire extinguishers were located in the engine room. One 45 kg. foam extinguisher wheel trolley unit was positioned in the main engine room. Location of fire extinguishers reflected the fire plan.

### **L.3.11 Fire-Fighting Equipment Plans**

There were fire plans posted on all levels of the rig accommodation. The plans were ABS-approved and sufficiently detailed without being cluttered.

## **L.6 HELIDECK OPERATIONS AND SAFETY**

### **L.6.1 Helicopter Operations**

No helicopter landings took place during the survey period.

### **L.6.2 Helicopter Landing Area Rescue Equipment**

Not inspected.

## L.7 EMERGENCY WARNING ALARMS

There were numerous strobe/flashing lights strategically allocated at noisy rig locations (main engine room, emergency engine room, air compressor room, transformer room, mud pump room, mud pit room, sack store and the crane pedestals (Port and STBD)).

There was one power supply for the PAGA from the 208/120 emergency lighting power panel EL2 (thus sourced from the emergency switchboard) and another supply from the communication UPS which, at the time of the survey, was by-passed as out of service (refer to section C.1.14). As per the schematic drawings, the UPS should energize the PAGA system during the transition time from main to emergency generator power and supply the system for 30 minutes (at least) in case of abandon rig shut-down. At present this will not occur as the communication UPS is out of service.

## L.8 SURVIVAL EQUIPMENT

### L.8.1 Lifeboats

Manufacturer: Jiangyin Norsafe FRP, Co Ltd  
 Model: JYN 85 F  
 Manufactured: 2009

Externally the lifeboats were in good cosmetic condition showing no signs of deterioration. The door latches and seals were inspected and found satisfactory. ModuResources reviewed the last inspection document (inspection carried out by the third party contractor 'PT Segara Permai' on January 2018 with certificate valid until 19<sup>th</sup> January 2019)

Lifeboat ID Location	Serial Number	Capacity	Last annual inspection
Lifeboat N. 1 Port side	S/N: 22270	80 persons	January 2018
Lifeboat N. 2 STBD side	S/N: 22272	80 persons	January 2018
Lifeboat N. 3 Port side	S/N: 22271	80 persons	January 2018
Lifeboat N. 4 STBD side	S/N: 22273	80 persons	January 2018

### L.8.2a Life Rafts

There were eight survival life-rafts located in their launching stations on the rig located at AFT side. Each raft was capable of carrying 20 persons. The life rafts were last inspected by the third party "RFD Service Group Limited" in November 2017 with certificates released.

The hydrostatic release certificate could not be found on board at the time of the inspection.

**L.8.2b Life Raft Launching Stations**

Not applicable

**L.8.3 Fast Rescue Boat**

Manufacturer: FR Fassmer GmbH & Co.KG  
Type: D-27804 / FRR-6.1  
Serial number: 08/02/4255  
Capacity: 10 persons.  
Manufactured: August 2009

The fast rescue boat was located at AFT side and ready for use.  
It was last inspected by 'PT Segara Permai' on January 2018 with certificate valid until 19<sup>th</sup> January 2019.

**M: POLLUTION PREVENTION EQUIPMENT**

**M.1 SEWAGE TREATMENT**

Maker: Hamann AG  
 Model: HL-Cont  
 Type: 07m<sup>3</sup>/Norway Frame + Discharge Pump.

The Sewage Treatment Plant consists of the following:-

- o Hamman Mixing and Draining Pump
- o Hamman Macerator
- o Hamman Dosing Pump
- o Chlorine Deficiency Switch
- o Dry running Protection
- o Hamman Discharge/Sludge Pump

**M.2 GARBAGE COMPACTION**

Not applicable

**M.3 GARBAGE DISPOSAL/GRINDER**

There were two macerators on board the WEST VENCEDOR. One macerator was installed in the galley below the main sink, the other was incorrectly fitted at AFT deck right below the safety shower and needed to be moved to an appropriate position.



M.3#1  
 Move macerator away from safety shower area.

**M.3 Garbage Disposal/Grinder Action Items:**

M.3#1	Medium	Move the macerator, located at AFT deck level, away from the safety shower area to an appropriate position.
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**M.4 INCINERATOR**

Not installed

**M.5 OILY WATER SEPARATOR**

Manufacturer: RWO  
 Type: SKIT/S-DEB 5.0  
 Serial N. 10710  
 Capacity 5 m<sup>3</sup>/h  
 Operating pressure -1 / 3 Bar  
 Year of construction 2008  
 Analyzer model RWO OMD-2005

At the time of the survey this unit was not in operation. It required being reactivated, the analyzing cell re-calibrated and tested against 14 ppm oily water solution.



M.5  
Oily water separator - View.

**M.5 Oily Water Separator Action Items:**

M.5#1	Medium	Restore the oily water separator to full functionality
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**O: MAINTENANCE SYSTEM**

**O.1 PREVENTIVE MAINTENANCE**

The rig owner used a programmed maintenance computerized system known as 'SAM'. At the time of this survey the SAM system had been de-activated from the base shore support office since July 2018 and maintenance work orders were not generated. ModuResources was verbally informed that the 'SAM' data base system will be replaced by the industry well known 'MAXIMO' data base processing system, but this will not occur within a short period of time and the next drilling contract will be conducted while the 'SAM' system is still running and used by the crew as coordination for all maintenance activities.

When the 'SAM' system is operational work orders are generated and distributed on to the responsible department.

SAMs is a comprehensive database system that was able to cover repairs (unplanned maintenance) as well as time scheduled maintenance. Work history can be retrieved although was noted that it was not the most user-friendly and requiring specific operator skills to get the best from it.

While the ModuResources surveyors were requesting information to be extracted from the SAM historical maintenance records it was noted that our requests created some challenges at times to the Seadrill personnel and, in several cases, it was not possible to retrieve specific information within our limited time window.

At the time of this survey, basic maintenance was covered by the rig crew throughout a 'warm stacked maintenance' plan developed on board and recorded on hard copies where required.

Once the SAM programmed maintenance system has been re-activated, attention should be paid to the 6 monthly and yearly planned activities which may have been jumped during the de-activation period and not included until the next re-call on the work order database. The Seadrill maintenance department has to ensure that these items can be highlighted as 'Overdue' by the SAM system or determining them in respect to the last related periodic maintenance recorded and interval of maintenance settings input in the database.

**O.1 Preventive Maintenance Action Items:**

O.1#1	Medium	Ensure that 6 monthly and yearly maintenance work orders, that may have been jumped during the SAM system de-activation period, are recovered as 'overdue' or manually highlighted and accomplished by the maintenance crew.
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**O.2 MAINTENANCE ORGANISATION AND ADMINISTRATION**

Maintenance manual and technical documentation was available on board. The equipment was catalogued (within the 'SAM' database) by an identification asset number but searchable by inputting any related parameters as per typical data base computerized systems. Pictures, third party reports and manufacturer service alerts were not included within the programmed maintenance system. ModuResources noted that several work order maintenance reports (compiled in the past after checks performed by the rig crew as per work order description) were very superficial and not reporting all those engineering parameters required to understand the equipment/machineries reliability and integrity.

All of the rig crew should be trained to properly report the work orders result within the computerized maintenance system.

### **O.3 MAINTENANCE PLANNING AND SCHEDULING**

The system was not operational at the time of this survey, however the analysis of the historical data revealed that the work-orders were timely distributed and priority was given to overdue work orders based to equipment priority.

### **O.4 MAINTENANCE EXECUTION**

The system was not in use at the time of the survey and paused until commencing of activities. Relevant information such as pressure charts, trends, certificates, NDT reports, etc. should be scanned and stored in the 'SAM' system. At the time of the survey it was difficult to find any documentation on the rig due to a combination of limited resources availability and challenges accessing the SAM system.

### **O.5 MAINTENANCE HISTORY AND ANALYSIS**

Equipment failures were reported as unplanned maintenance work orders. It was general opinion that the SAM data base maintenance system was not user-friendly to use and required lengthy search to individuate specific items in the historical data.

### **O.6 DEVELOPMENT MAINTENANCE ORGANISATION**

ModuResources was informed that the rig will be manned up during the next weeks following this survey therefore was not possible to evaluate whether there was a minimum required level of competence to professionally carry out the maintenance activities.

**P: SPARE PARTS**

**P.1 STOCK CONTROL PHILOSOPHY**

The stock control management was managed with the interface to the 'SAM' maintenance system.

The general store was spacious and noted to have all spares catalogued on shelves.

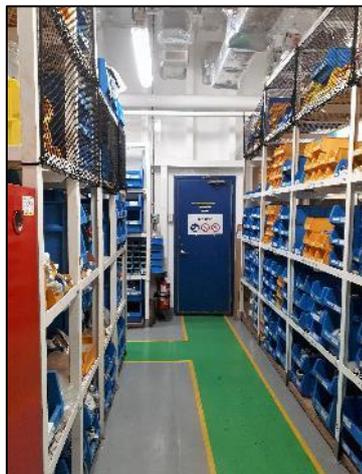
At the time of our survey the storekeeper was not on-board and the management software could not be tested for functionality.

The rig owner should ensure that a critical spare part list is available and treated as high priority within the computerized system.

The ModuResources surveyors noted that the single point failures equipment (single equipment whose failure may led to a complete stop of operations) aboard the WEST VENCEDOR were:

Top drive motor	On board – Test insulation and report.
Top drive gear	Verify the spare’s integrity and whether is suitable for the installation.
Top drive loop	Verify the spare’s integrity and whether is suitable for the installation.
Anchor winch motor	Not available on board
VFD for drilling drives	Available and seen on board
VFD for anchor winches	Not available on board
Power Management System PLC	Verify / confirm whether all required components and updated copy of software are available on board.

A dark, air conditioned store for rubber components was not seen aboard the WEST VENCEDOR. The rig owner should evaluate the construction of a dark store or properly protect (against UV) rubber perishable components in UV shielded packs. (Generally used for O-rings and BOP rubber goods).



Store – Overview



Store office - View

**P.1 Stock Control Philosophy Action Items:**

P.1#1	High	Ensure a Critical / Single Point Failure spare part list has been produced and integrated within the store management program.
P.1#2	High	Verify / confirm integrity of available spares as motors, top drive loop and Software Management.
P.1#3	Low	Consider building a 'dark store' for rubber UV perishable items or ensure that all rubber goods are protected in UV shielded packs.(Generally used for O-rings and BOP rubber goods)

## **Appendix D - Material Safety Data Sheets for Drilling Chemicals**

## Safety Data Sheet BARITE (All Grades)

### 1. Identification of the Substance/Preparation and of the Company/Undertaking

#### 1.1 Product identifier

**Product name** BARITE (All Grades)  
**Product code** PID2049  
**REACH Registration Name** Exempt Annex V ENTRY 7.

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Weighting agent.

**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

##### Supplier

M-I Drilling Fluids UK Limited  
Westhill Business Park  
Westhill AB32 6JL Aberdeenshire  
Scotland United Kingdom

+47 51577424

SDS@slb.com

#### 1.4 Emergency Telephone Number

**Emergency telephone** - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

<b>Denmark</b>	Poison Control Hotline (DK): +45 82 12 12 12
<b>Germany</b>	+49 69 222 25285
<b>Norway</b>	Poison information centre: +47 22 59 13 00

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP] Commission Regulation (EU) No 2015/830 of 28 May 2015

**Health hazards** Not classified

**Environmental hazards** Not classified

**Physical Hazards** Not classified

## 2.2 Label elements

### Signal word

None

### Hazard Statements

This product is not classified as hazardous therefore no (H) hazard statements assigned.

### Precautionary Statements

This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

### Contains

Crystalline silica (impurity)

## 2.3 Other hazards

Thermal decomposition can lead to release of irritating gases and vapours

Not classified as PBT/vPvB by current EU criteria

## **3. Composition/information on Ingredients**

### 3.1 Substances

Chemical Name	EC No	CAS No	Weight-%	Component information	REACH registration number
Crystalline silica (impurity)	238-878-4	14808-60-7	1-5	STOT RE. 2 (H373)	Not applicable

### 3.2 Mixtures

Not applicable

### Comments

The product contains other ingredients which do not contribute to the overall classification.

This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis. IARC Monographs, Vol. 68, 1997, concludes that there is sufficient evidence that inhaled crystalline silica in the form of quartz or cristobalite from occupational sources causes cancer in humans. IARC Classification Group I.

## **4. First Aid Measures**

### 4.1 First aid measures

#### **Inhalation**

If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

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<b>Ingestion</b>	Rinse mouth. Drink 1 or 2 glasses of water. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
<b>Skin contact</b>	Wash skin thoroughly with soap and water. Get medical attention if irritation persists.
<b>Eye Contact</b>	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if any discomfort continues.

**4.2. Most important symptoms and effects, both acute and delayed**

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

**Symptoms**

**Inhalation** Please see Section 11. Toxicological Information for further information.

**Ingestion** Please see Section 11. Toxicological Information for further information.

**Skin contact** Please see Section 11. Toxicological Information for further information.

**Eye contact** Please see Section 11. Toxicological Information for further information.

**4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician** Treat symptomatically.

**5. Firefighting Measures**

**5.1 Extinguishing media**

**Suitable extinguishing media**

Use extinguishing media appropriate for surrounding material.

**Extinguishing media which must not be used for safety reasons**

None known.

**5.2. Special hazards arising from the substance or mixture**

**Unusual fire and explosion hazards**

None known.

**Hazardous combustion products**

Thermal decomposition can lead to release of irritating gases and vapours

**5.3 Advice for firefighters**

**Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

### Special Fire-Fighting Procedures

Containers close to fire should be removed immediately or cooled with water.

## 6. Accidental Release Measures

### 6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8. Do not breathe dust. Material becomes slippery when wet. Use caution if wet.

### 6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

### Environmental exposure controls

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

### 6.3 Methods and material for containment and cleaning up

#### Methods for containment

Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimise spreading.

#### Methods for cleaning up

Sweep up and shovel into suitable containers for disposal. Avoid dust formation. After cleaning, flush away traces with water.

### 6.4 Reference to other sections

See section 13 for more information.

## 7. Handling and Storage

### 7.1 Precautions for safe handling

#### Handling

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Do not breathe dust. Material becomes slippery when wet. Use caution if wet.

#### Hygiene Measures

Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product. Remove contaminated clothing.

### 7.2 Conditions for safe storage, including any incompatibilities

<b>Technical measures/precautions</b>	Ensure adequate ventilation. Keep airborne concentrations below exposure limits.
<b>Storage precautions</b>	Keep containers tightly closed in a dry, cool and well-ventilated place. Avoid wet and humid conditions.
<b>Storage class</b>	Chemical storage.
<b>Storage class, TRGS 510, Germany</b>	Storage class 9: no classification
<b>Packaging materials</b>	Use specially constructed containers only

**7.3 Specific end uses**

See Section 1.2.

**8. Exposure Controls/Personal Protection**

**8.1 Control parameters**

**Exposure Limits** No biological limit allocated

**Component Information**

Chemical Name	EU OEL - Third List	Austria	Denmark
Crystalline silica (impurity)	Not determined	0.15 mg/m <sup>3</sup> TWA alveolar dust, respirable fraction	0.1mg/m <sup>3</sup>
Chemical Name	France	Germany	Hungary
Crystalline silica (impurity)	0.1 mg/m <sup>3</sup> TWA	Not determined	0.15mg/m <sup>3</sup> TWA
Chemical Name	Italy	Netherlands	Norway
Crystalline silica (impurity)	Not determined	0.075 mg/m <sup>3</sup>	0.3 mg/m <sup>3</sup> TWA total dust 0.1 mg/m <sup>3</sup> TWA respirable dust 0.9 mg/m <sup>3</sup> STEL total dust 0.3 mg/m <sup>3</sup> STEL respirable dust Carcinogen
Chemical Name	Poland	Portugal	Romania
Crystalline silica (impurity)	2 mg/m <sup>3</sup> TWA NDS >50% free crystalline silica 0.3 mg/m <sup>3</sup> TWA NDS >50% free crystalline silica 4.0 mg/m <sup>3</sup> TWA NDS 2% to 50% free crystalline silica 1.0 mg/m <sup>3</sup> TWA NDS 2% to 50% free crystalline silica	0.025 mg/m <sup>3</sup> TWA respirable fraction	0.1mg/m <sup>3</sup> TWAdust, respirable fraction
Chemical Name	Spain	Switzerland	UK
Crystalline silica (impurity)	0.05 mg/m <sup>3</sup> TWA VLA-ED	0.15 mg/m <sup>3</sup> TWA MAK	Not determined

**8.2 Exposure controls**

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

**Engineering Controls**

Ensure adequate ventilation. Mechanical ventilation or local exhaust ventilation is required.

**Personal protective equipment**

**Eye protection**

Use eye protection according to EN 166, designed to protect against powders and dusts. Tightly fitting safety goggles. Safety glasses with side-shields.

**Hand protection**

Wear gloves according to EN 374 to protect against skin effects from powders Use protective gloves made of: Neoprene PVC Nitrile Frequent change is advisable

**Respiratory protection**

In case of insufficient ventilation wear suitable respiratory equipment, Suitable mask with particle filter P3 (European Norm 143), At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

**Skin and body protection**

Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.

**Hygiene Measures**

Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.



**8.2.3 Environmental exposure controls**

**Environmental exposure**

Use appropriate containment to avoid environmental contamination See section 6 for more information

**9. Physical and Chemical Properties**

**9.1 Information on basic physical and chemical properties**

<b>Physical state</b>	Solid
<b>Appearance</b>	Powder Dust
<b>Odour</b>	Odourless
<b>Colour</b>	Tan - Grey
<b>Odour threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
pH	No information available	
pH @ dilution	No information available	
Melting / freezing point	1580 °C / 2876 °F	
Boiling point/range	No information available	
Flash point	Not applicable	
Evaporation rate	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapour pressure	No information available	
Vapour density	No information available	
Specific gravity	No information available	
Bulk density	1920 - 2400 kg/m <sup>3</sup>	
Relative density	4.10 - 4.25	@ 20 °C.
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	
<b>Explosive properties</b>	Not applicable	
<b>Oxidising properties</b>	None known	

**9.2 Other information**

<b>Pour point</b>	No information available
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<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	None
<b>Density</b>	No information available

**Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

## 10. Stability and Reactivity

### 10.1 Reactivity

No specific reactivity hazards associated with this product.

### 10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

### 10.3 Possibility of Hazardous Reactions

#### **Hazardous polymerisation**

Hazardous polymerisation does not occur.

### 10.4 Conditions to avoid

Avoid dust formation. Avoid wet and humid conditions.

### 10.5 Incompatible materials

No materials to be especially mentioned.

### 10.6 Hazardous decomposition products

See Section 5.2.

## 11. Toxicological Information

### 11.1 Information on toxicological effects

#### **Acute toxicity**

#### **Product information**

This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis.

Respirable quartz <0.3% . Report number: N0600517.

#### **Inhalation**

Inhalation of dust in high concentration may cause irritation of respiratory system.

#### **Eye contact**

Dust may cause mechanical irritation.

#### **Skin contact**

Prolonged contact may cause redness and irritation.

#### **Ingestion**

Ingestion may cause stomach discomfort.

**Unknown acute toxicity** Not applicable.

**Toxicology data for the components**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Crystalline silica (impurity)	= 500 mg/kg ( Rat )	No data available	No data available

**Sensitisation** This product does not contain any components suspected to be sensitizing.

**Mutagenic effects** This product does not contain any known or suspected mutagens.

**Carcinogenicity** Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled.

**Reproductive toxicity** This product does not contain any known or suspected reproductive hazards.

**Routes of exposure** Inhalation.

**Routes of entry** Inhalation.

**Specific target organ toxicity - Single exposure** Not classified

**Specific target organ toxicity - Repeated exposure** Not classified.

**Aspiration hazard** Not applicable.

**Other information** Key literature references and sources for data. See Section 16 for more information.

**12. Ecological Information**

**12.1 Toxicity**

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Listed on PLONOR list of OSPAR

**Toxicity to algae**  
 This product is not considered toxic to algae.

**Toxicity to fish**  
 This product is not considered toxic to fish.

**Toxicity to daphnia and other aquatic invertebrates**  
 This product is not considered toxic to invertebrates.

**Toxicology data for the components**

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other

Crystalline silica (impurity)	LC50 Danio rerio (zebra fish) : > 10000 mg/l 96h	EC50: > 1000 mg/l 72h	<b>aquatic invertebrates</b>
			LC50 Daphnia magna (Water flea): > 10000 mg/l 24h

**12.2 Persistence and degradability**

The product is not biodegradable.

**12.3 Bioaccumulative potential**

Does not bioaccumulate.

**12.4 Mobility**

**Mobility**

Insoluble in water.

**Mobility in soil**

No information available.

**12.5 Results of PBT and vPvB assessment**

Not classified as PBT/vPvB by current EU criteria.

**12.6 Other adverse effects.**

None known.

**12.7 Other information**

Key literature references and sources for data. See Section 16 for more information.

**13. Disposal Considerations**

**13.1 Waste treatment methods**

**Waste from residues/unused products**

Dispose of in accordance with local regulations.

**Contaminated packaging**

Empty containers should be taken to an approved waste handling site for recycling or disposal.

**EWC Waste Disposal No**

According to the European Waste Catalogue, Waste Codes are not product specific, but application specific Waste codes should be assigned by the user based on the application for which the product was used. The following Waste Codes are only suggestions: EWC waste disposal No: 01 05 07

**14. Transport information**

**14.1. UN number**

Not regulated

**14.2. UN proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

**14.3. Hazard class(es)**

**ADR/RID/ADN/ADG Hazard class** Not regulated

**IMDG Hazard class** Not regulated

**ICAO Hazard class/division** Not regulated

**14.4 Packing group**

**ADR/RID/ADN/ADG Packing Group** Not regulated

**IMDG Packing group** Not regulated

**ICAO Packing group** Not regulated

**14.5 Environmental hazard**

No

**14.6 Special precautions**

Not applicable

**14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code**

Please contact SDS@slb.com for info regarding transport in Bulk.

## 15. Regulatory Information

### 15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

**Germany, Water Endangering Classes (VwVwS)** Water endangering class = nwg

**Technical Rules for Hazardous Substances (TRGS)** TRGS 220 National aspects when compiling safety data sheets  
TRGS 900 Occupational exposure limits  
TRGS 510 Storage of hazardous substances in non stationary containers

#### Germany

Regulations governing systems for handling substances hazardous to waters  
Hazardous substances ordinance

Commission Regulation (EU) 2015/830 of 28 May 2015 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC, 2000/21/EC and 453/2010 including amendments.

This safety data sheet complies with the requirements of Regulation (EC) No. 1272/2008.

Dutch Mining Regulations: In accordance with Mining Regulations 9.2 and Chapter 4 of the Working Conditions Decree.

#### International inventories

USA, Toxic Substances Control Act inventory (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Inventory - Japan - Existing and New Chemicals list	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korea (KECL)	Complies
Inventory - New Zealand - Inventory of Chemicals (NZIoC)	Complies

#### Europe - REACH

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

Denmark Pr. no. 1154758

### 15.2 Chemical Safety Report

No information available

## 16. Other Information

<b>Prepared by</b>	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
<b>Supercedes Date:</b>	19/Mar/2015
<b>Revision date</b>	26/Feb/2018
<b>Version</b>	11
<b>This SDS has been revised in the following section(s)</b>	All sections Product Code change No changes with regard to classification have been made.

### Key literature references and sources for data

www.ChemADVISOR.com

Supplier

National Chemical Inventories

National regulatory information

National occupational exposure limits

### Training Advice

Follow general hygiene considerations recognised as common good workplace practices

Do not handle until all safety precautions have been read and understood

### HMIS classification

Health	1*
Flammability	0
Physical hazard	0
PPE	E

### Full text of H-Statements referred to under sections 2 and 3

This product is not classified as hazardous therefore no (H) hazard statements assigned.

H373 - May cause damage to organs through prolonged or repeated exposure if inhaled

### Disclaimer

The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

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## Safety Data Sheet BaSOL 2000 HP (50%)

### 1. Identification of the substance/preparation and of the Company/undertaking

#### 1.1 Product identifier

Product name BaSOL 2000 HP (50%)  
Product code PID15785

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Scale dissolver

Uses advised against Consumer use

#### 1.3 Details of the supplier of the safety data sheet

##### Supplier

M-I Drilling Fluids UK Limited  
Westhill Business Park  
Westhill AB32 6JL Aberdeenshire  
Scotland United Kingdom

+47 51577424

SDS@slb.com

#### 1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP]

##### Health hazards

Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 2

Environmental hazards Not classified

Physical Hazards Not classified

#### 2.2 Label elements



**Signal word**

WARNING

**Hazard statements**

H315 - Causes skin irritation

H319 - Causes serious eye irritation

**Precautionary Statements - EU (§28, 1272/2008)**

P264 - Wash face, hands and any exposed skin thoroughly after handling

P280 - Wear protective gloves/protective clothing/eye protection/face protection

P302 + P352 - IF ON SKIN: Wash with plenty of soap and water

P332 + P313 - If skin irritation occurs: Get medical advice/attention

P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing

P337 + P313 - If eye irritation persists: Get medical advice/attention

**Supplementary precautionary statements**

P332 + P313 - If skin irritation occurs: Get medical advice/attention

P362 - Take off contaminated clothing and wash before reuse

P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

**Contains**

Glycine, N,N-1,2-ethanediylbis[N-(carboxymethyl)-, tetrapotassium salt

Carbonic acid, dipotassium salt

Glycine, N,N-bis[2-[bis(carboxymethyl)amino]ethyl]-, pentapotassium salt

**2.3 Other hazards**

Not classified as PBT/vPvB by current EU criteria

**3. Composition/information on ingredients**

**3.1 Substances**

Not applicable

**3.2 Mixtures**

Chemical Name	EC No	CAS No	Weight-%	Regulation (EC) No	REACH
---------------	-------	--------	----------	--------------------	-------

				1272/2008	registration number
Glycine, N,N-1,2-ethanediy[bis[N-(carboxymethyl)-, tetrapotassium salt	227-743-5	5964-35-2	5-10	Skin Irrit. 2 (H315) Eye Irrit. 2 (H319)	No data available
Carbonic acid, dipotassium salt	209-529-3	584-08-7	1-5	Eye Irrit. 2 (H319) Skin Irrit. 2 (H315) STOT SE 3 (H335)	01-2119532646-3 6-xxxx
Glycine, N,N-bis[2-[bis(carboxymethyl)amino]ethyl]-, pentapotassium salt	404-290-3	7216-95-7	1-<3	Skin Corr. 1B(H314)	Exempt

**Comments**

The product contains other ingredients which do not contribute to the overall classification.

**4. First aid measures**

**4.1 First aid measures**

- Inhalation** If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
- Ingestion** Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.
- Skin contact** Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention if irritation persists.
- Eye Contact** Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

**4.2. Most important symptoms and effects, both acute and delayed**

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

**Symptoms**

- Inhalation** Please see Section 11. Toxicological Information for further information.
- Ingestion** Please see Section 11. Toxicological Information for further information.
- Skin contact** Please see Section 11. Toxicological Information for further information.
- Eye contact** Please see Section 11. Toxicological Information for further information.

**4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician** Treat symptomatically.

**5. Fire-fighting measures**

### **5.1 Extinguishing media**

**Suitable extinguishing media**

Alcohol Foam, CO<sub>2</sub>, Dry Chemical.

**Extinguishing media which must not be used for safety reasons**

None known.

### **5.2. Special hazards arising from the substance or mixture**

**Unusual fire and explosion hazards**

None known.

**Hazardous combustion products**

Fire or high temperatures create: Carbon oxides (CO<sub>x</sub>), Nitrogen oxides (NO<sub>x</sub>).

### **5.3 Advice for firefighters**

**Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

**Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

## **6. Accidental release measures**

### **6.1. Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. See also section 8.

### **6.2 Environmental precautions**

The product should not be allowed to enter drains, water courses or the soil.

**Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

### **6.3 Methods and material for containment and cleaning up**

**Methods for containment**

Prevent further leakage or spillage if safe to do so. Dyke far ahead of liquid spill for later disposal.

**Methods for cleaning up**

Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

### **6.4 Reference to other sections**

See section 13 for more information.

## **7. Handling and storage**

## 7.1 Precautions for safe handling

### Handling

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

### Hygiene Measures

Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product. Remove contaminated clothing.

## 7.2 Conditions for safe storage, including any incompatibilities

<b>Technical measures/precautions</b>	Ensure adequate ventilation. Keep airborne concentrations below exposure limits.
<b>Storage precautions</b>	Keep containers tightly closed in a dry, cool and well-ventilated place. Store above freezing temperature. Avoid contact with: Strong oxidising agents.
<b>Storage class</b>	Chemical storage.
<b>Packaging materials</b>	Use specially constructed containers only.

## 7.3 Specific end uses

See Section 1.2.

## 8. Exposure controls/personal protection

### 8.1 Control parameters

#### Component Information

Chemical Name	EU OEL - Third List	Austria	Australia	Denmark
Glycine, N,N-1,2-ethanediylbis[N-(carboxymethyl)-, tetrapotassium salt	Not determined	Not determined	Not determined	Not determined
Carbonic acid, dipotassium salt	Not determined	Not determined	Not determined	Not determined
Glycine, N,N-bis[2-[bis(carboxymethyl)amino]ethyl]-, pentapotassium salt	Not determined	Not determined	Not determined	Not determined
Chemical Name	Malaysia	France	Germany	Hungary
Glycine, N,N-1,2-ethanediylbis[N-(carboxymethyl)-, tetrapotassium salt	Not determined	Not determined	Not determined	Not determined
Carbonic acid, dipotassium salt	Not determined	Not determined	Not determined	Not determined
Glycine, N,N-bis[2-[bis(carboxymethyl)amino]ethyl]-, pentapotassium salt	Not determined	Not determined	Not determined	Not determined
Chemical Name	New Zealand	Italy	Netherlands	Norway
Glycine, N,N-1,2-ethanediylbis[N-(carboxymethyl)-, tetrapotassium salt	Not determined	Not determined	Not determined	Not determined
Carbonic acid, dipotassium salt	Not determined	Not determined	Not determined	Not determined
Glycine, N,N-bis[2-[bis(carboxymethyl)amino]ethyl]-, pentapotassium salt	Not determined	Not determined	Not determined	Not determined
Chemical Name	Poland	Portugal	Romania	Russia
Glycine,	Not determined	Not determined	Not determined	Not determined

N,N-1,2-ethanediyibis[N-(carboxymethyl)-, tetrapotassium salt				
Carbonic acid, dipotassium salt	Not determined	Not determined	Not determined	2 mg/m <sup>3</sup> MAC
Glycine, N,N-bis[2-[bis(carboxymethyl)amino]ethyl]-, pentapotassium salt	Not determined	Not determined	Not determined	Not determined
<b>Chemical Name</b>	<b>Spain</b>	<b>Switzerland</b>	<b>Turkey</b>	<b>UK</b>
Glycine, N,N-1,2-ethanediyibis[N-(carboxymethyl)-, tetrapotassium salt	Not determined	Not determined	Not determined	Not determined
Carbonic acid, dipotassium salt	Not determined	Not determined	Not determined	Not determined
Glycine, N,N-bis[2-[bis(carboxymethyl)amino]ethyl]-, pentapotassium salt	Not determined	Not determined	Not determined	Not determined

## Derived No Effect Level (DNEL)

### Long term exposure local effects

#### Carbonic acid, dipotassium salt

Inhalation 10 mg/m<sup>3</sup>

### Short term exposure systemic effects

#### Carbonic acid, dipotassium salt

Dermal 16 mg/cm<sup>2</sup>

## 8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

### Engineering Controls

Ensure adequate ventilation.

### Personal protective equipment

#### Eye protection

Eye protection must conform to standard EN 166. Tightly fitting safety goggles. Safety glasses with side-shields.

#### Hand protection

Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training

Impervious gloves made of: Neoprene Nitrile PVC

Be aware that liquid may penetrate the gloves. Frequent change is advisable.

#### Respiratory protection

In case of insufficient ventilation wear suitable respiratory equipment, Respirator with a vapor filter (EN 141), Full face piece respirator with organic vapor/acid gas cartridge or canister, At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

#### Skin and body protection

Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.

### Hygiene Measures

Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.



**9. Physical and chemical properties**

**9.1 Information on basic physical and chemical properties**

<b>Physical state</b>	Liquid
<b>Appearance</b>	Clear
<b>Odour</b>	No information available
<b>Colour</b>	Colourless
<b>Odour threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
pH	10.0 - 11.5	
pH @ dilution		
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapour pressure	No information available	
Vapour density	No information available	
Specific gravity	No information available	
Bulk density	No information available	
Relative density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	> 100°C / 212°F	
Kinematic viscosity	No information available	
Dynamic viscosity	< 10 cPs	@ 20 °C
log Pow	No information available	
<b>Explosive properties</b>	Not applicable	
<b>Oxidising properties</b>	None known	

**9.2 Other information**

<b>Pour point</b>	No information available
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	None
<b>Density</b>	1.095 ± 0.03 g/ml @ 20°C

**Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

**10. Stability and reactivity**

**10.1 Reactivity**

No specific reactivity hazards associated with this product.

**10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerisation**

Not known.

**10.4 Conditions to avoid**

Store above freezing temperature.

**10.5 Incompatible materials**

Strong oxidising agents.

**10.6 Hazardous decomposition products**

See Section 5.2.

**11. Toxicological information**

**11.1 Information on toxicological effects**

**Acute toxicity**

<b>Inhalation</b>	Vapors may irritate throat and respiratory system.
<b>Eye contact</b>	Causes serious eye irritation.
<b>Skin contact</b>	Causes skin irritation.
<b>Ingestion</b>	Ingestion may cause stomach discomfort.
<b>Unknown acute toxicity</b>	Not applicable.

**Toxicology data for the components**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Glycine, N,N-1,2-ethanediylbis[N-(carboxymethyl)-, tetrapotassium salt	No data available	No data available	No data available
Carbonic acid, dipotassium salt	= 1870 mg/kg ( Rat )	No data available	No data available
Glycine, N,N-bis[2-[bis(carboxymethyl)amino]ethyl]-, pentapotassium salt	No data available	No data available	No data available

<b>Sensitisation</b>	This product does not contain any components suspected to be sensitizing.
<b>Mutagenic effects</b>	This product does not contain any known or suspected mutagens.
<b>Carcinogenicity</b>	This product does not contain any known or suspected carcinogens.

<b>Reproductive toxicity</b>	This product does not contain any known or suspected reproductive hazards.
<b>Routes of exposure</b>	Skin contact. Eye contact.
<b>Routes of entry</b>	Skin contact. Eye contact.
<b>Specific target organ toxicity - Single exposure</b>	Not classified
<b>Specific target organ toxicity - Repeated exposure</b>	Not classified.
<b>Aspiration hazard</b>	Not applicable.

## 12. Ecological information

### 12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment. The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.

#### **Toxicity to algae**

This product is not considered toxic to algae.

#### **Toxicity to fish**

This product is not considered toxic to fish.

#### **Toxicity to daphnia and other aquatic invertebrates**

This product is not considered toxic to invertebrates.

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Glycine, N,N-1,2-ethanediylbis[N-(carboxymethyl)-, tetrapotassium salt	No information available	No information available	No information available
Carbonic acid, dipotassium salt	No information available	No information available	No information available
Glycine, N,N-bis[2-[bis(carboxymethyl)amino]ethyl]-, pentapotassium salt	No information available	No information available	No information available

### 12.2 Persistence and degradability

The product is not biodegradable.

### 12.3 Bioaccumulative potential

The product does not contain any substances expected to be bioaccumulating.

#### **12.4 Mobility in soil**

**Mobility**

Soluble in water.

#### **12.5 Results of PBT and vPvB assessment**

Not classified as PBT/vPvB by current EU criteria.

#### **12.6 Other adverse effects.**

None known.

### **13. Disposal considerations**

#### **13.1 Waste treatment methods**

**Waste from residues / unused products**

Dispose of in accordance with local regulations.

**Contaminated packaging**

Empty containers should be transported/delivered using a registered waste carrier for local recycling or waste disposal.

**EWC Waste Disposal No**

According to the European Waste Catalogue, Waste Codes are not product specific, but application specific Waste codes should be assigned by the user based on the application for which the product was used The following Waste Codes are only suggestions: EWC waste disposal No: 07 01 04

### **14. Transport information**

#### **14.1. UN number**

Not regulated

#### **14.2. UN proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

#### **14.3. Hazard class(es)**

**ADR/RID/ADN/ADG Hazard class** Not regulated

**IMDG Hazard class** Not regulated  
**ICAO Hazard class/division** Not regulated

**14.4 Packing group**

**ADR/RID/ADN/ADG Packing Group** Not regulated  
**IMDG Packing group** Not regulated  
**ICAO Packing group** Not regulated

**14.5 Environmental hazard**

No

**14.6 Special precautions**

Not applicable

**14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code**

Please contact SDS@slb.com for info regarding transport in Bulk.

## 15. Regulatory information

**15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture**

**Australian Standard for the Uniform Scheduling of Drugs and Poisons**

Carbonic acid, dipotassium salt  
Schedule 6  
Schedule 5

**Commission Regulation (EU) No 453/2010 of 20 May 2010 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH). Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC, including amendments.**

This safety data sheet complies with the requirements of Regulation (EC) No. 1272/2008.

**International inventories**

<b>USA, Toxic Substances Control Act inventory (TSCA)</b>	Complies
<b>European Union - EINECS and ELINCS</b>	Complies
<b>Canada (DSL)</b>	Complies
<b>Philippines (PICCS)</b>	Complies
<b>Inventory - Japan - Existing and New Chemicals list</b>	Does not Comply
<b>China (IECSC)</b>	Complies
<b>Australia (AICS)</b>	Does not Comply
<b>Korea (KECL)</b>	Does not Comply
<b>Inventory - New Zealand - Inventory of Chemicals (NZIoC)</b>	Complies

**15.2 Chemical Safety Report**

No information available

## 16. Other information

<b>Prepared by</b>	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Sandra McWilliam
<b>Supersedes date</b>	13/Feb/2013
<b>Revision date</b>	07/Jul/2017
<b>Version</b>	4
<b>This SDS has been revised in the following section(s)</b>	This SDS have been made in a new database and therefore a new layout. No changes with regard to classification have been made.

### Full text of H-Statements referred to under sections 2 and 3

H315 - Causes skin irritation  
H319 - Causes serious eye irritation  
H335 - May cause respiratory irritation  
H314 - Causes severe skin burns and eye damage

### Disclaimer

The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.



## Safety Data Sheet BENTONITE

### 1. Identification of the Substance/Preparation and of the Company/Undertaking

#### 1.1 Product identifier

**Product name** BENTONITE  
**Product code** PID211

**Synonyms** API BENTONITE, OCMA BENTONITE, WYOMING BENTONITE  
**REACH Registration Name** Exempt Annex V ENTRY 7.

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Viscosifier.

**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

##### Supplier

M-I Drilling Fluids UK Limited  
Westhill Business Park  
Westhill AB32 6JL Aberdeenshire  
Scotland United Kingdom

+47 51577424

SDS@slb.com

#### 1.4 Emergency Telephone Number

**Emergency telephone** - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

<b>Denmark</b>	Poison Control Hotline (DK): +45 82 12 12 12
<b>Germany</b>	+49 69 222 25285
<b>Norway</b>	Poison information centre: +47 22 59 13 00

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP] Commission Regulation (EU) No 2015/830 of 28 May 2015

**Health hazards** Not classified

**Environmental hazards** Not classified

**Physical Hazards** Not classified

## 2.2 Label elements

### Signal word

None

### Hazard Statements

This product is not classified as hazardous therefore no (H) hazard statements assigned.

### Precautionary Statements

This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

### Contains

Crystalline silica (impurity)

## 2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria  
Product dust may be irritating to eyes, skin and respiratory system

## 3. Composition/information on Ingredients

### 3.1 Substances

Chemical Name	EC No	CAS No	Weight-%	Component information	REACH registration number
Crystalline silica (impurity)	238-878-4	14808-60-7	1-5	STOT RE. 2 (H373)	Not applicable

### 3.2 Mixtures

Not applicable

### Comments

Naturally occurring mineral.

This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis. IARC Monographs, Vol. 68, 1997, concludes that there is sufficient evidence that inhaled crystalline silica in the form of quartz or cristobalite from occupational sources causes cancer in humans. IARC Classification Group I.

The product contains other ingredients which do not contribute to the overall classification.

## 4. First Aid Measures

### 4.1 First aid measures

**Inhalation** If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation

develops or if breathing becomes difficult.

<b>Ingestion</b>	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
<b>Skin contact</b>	Wash skin thoroughly with soap and water. Get medical attention if irritation persists.
<b>Eye Contact</b>	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if any discomfort continues.

#### **4.2. Most important symptoms and effects, both acute and delayed**

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

#### **Symptoms**

**Inhalation** Please see Section 11. Toxicological Information for further information.

**Ingestion** Please see Section 11. Toxicological Information for further information.

**Skin contact** Please see Section 11. Toxicological Information for further information.

**Eye contact** Please see Section 11. Toxicological Information for further information.

#### **4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician** Treat symptomatically.

## **5. Firefighting Measures**

### **5.1 Extinguishing media**

#### **Suitable extinguishing media**

Use extinguishing media appropriate for surrounding material.

#### **Extinguishing media which must not be used for safety reasons**

Do not use water jet.

### **5.2. Special hazards arising from the substance or mixture**

#### **Unusual fire and explosion hazards**

None known.

#### **Hazardous combustion products**

Thermal decomposition can lead to release of irritating gases and vapours Nitrogen oxides (NOx).

### **5.3 Advice for firefighters**

#### **Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

**Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

## 6. Accidental Release Measures

### 6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8. Material becomes slippery when wet. Use caution if wet.

### 6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

**Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

### 6.3 Methods and material for containment and cleaning up

**Methods for containment**

Cover powder spill with plastic sheet or tarp to minimise spreading. Prevent further leakage or spillage if safe to do so.

**Methods for cleaning up**

Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

### 6.4 Reference to other sections

See section 13 for more information.

## 7. Handling and Storage

### 7.1 Precautions for safe handling

**Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Material becomes slippery when wet. Use caution if wet.

**Hygiene Measures**

Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product. Remove contaminated clothing.

### 7.2 Conditions for safe storage, including any incompatibilities

<b>Technical measures/precautions</b>	Ensure adequate ventilation. Keep airborne concentrations below exposure limits.
<b>Storage precautions</b>	Keep containers tightly closed in a dry, cool and well-ventilated place. Avoid wet and humid conditions.
<b>Storage class</b>	Chemical storage.
<b>Storage class, TRGS 510, Germany</b>	Storage class 9: no classification
<b>Packaging materials</b>	Use specially constructed containers only

**7.3 Specific end uses**

See Section 1.2.

**8. Exposure Controls/Personal Protection**

**8.1 Control parameters**

**Exposure Limits** No biological limit allocated

**Component Information**

Chemical Name	EU OEL - Third List	Austria	Denmark
Crystalline silica (impurity)	Not determined	0.15 mg/m <sup>3</sup> TWA alveolar dust, respirable fraction	0.1mg/m <sup>3</sup>
Chemical Name	France	Germany	Hungary
Crystalline silica (impurity)	0.1 mg/m <sup>3</sup> TWA	Not determined	0.15mg/m <sup>3</sup> TWA
Chemical Name	Italy	Netherlands	Norway
Crystalline silica (impurity)	Not determined	0.075 mg/m <sup>3</sup>	0.3 mg/m <sup>3</sup> TWA total dust 0.1 mg/m <sup>3</sup> TWA respirable dust 0.9 mg/m <sup>3</sup> STEL total dust 0.3 mg/m <sup>3</sup> STEL respirable dust Carcinogen
Chemical Name	Poland	Portugal	Romania
Crystalline silica (impurity)	2 mg/m <sup>3</sup> TWA NDS >50% free crystalline silica 0.3 mg/m <sup>3</sup> TWA NDS >50% free crystalline silica 4.0 mg/m <sup>3</sup> TWA NDS 2% to 50% free crystalline silica 1.0 mg/m <sup>3</sup> TWA NDS 2% to 50% free crystalline silica	0.025 mg/m <sup>3</sup> TWA respirable fraction	0.1mg/m <sup>3</sup> TWAdust, respirable fraction
Chemical Name	Spain	Switzerland	UK
Crystalline silica (impurity)	0.05 mg/m <sup>3</sup> TWA VLA-ED	0.15 mg/m <sup>3</sup> TWA MAK	Not determined

**8.2 Exposure controls**

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

**Engineering Controls**

Ensure adequate ventilation.

**Personal protective equipment**

**Eye protection**

Use eye protection according to EN 166, designed to protect against powders and dusts. Tightly fitting safety goggles. Safety glasses with side-shields.

**Hand protection**

Wear gloves according to EN 374 to protect against skin effects from powders  
 Use protective gloves made of: Neoprene Nitrile  
 Frequent change is advisable

**Respiratory protection**

In case of insufficient ventilation wear suitable respiratory equipment, Suitable mask with

**Skin and body protection**

particle filter P3 (European Norm 143), At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used. Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.

**Hygiene Measures**

Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.



**8.2.3 Environmental exposure controls**

**Environmental exposure**

Use appropriate containment to avoid environmental contamination See section 6 for more information

**9. Physical and Chemical Properties**

**9.1 Information on basic physical and chemical properties**

<b>Physical state</b>	Solid
<b>Appearance</b>	Powder
<b>Odour</b>	Odourless
<b>Colour</b>	Cream - Grey
<b>Odour threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
pH	No information available	
pH @ dilution	9-10	
Melting / freezing point	> 450 °C / 842 °F	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate	Not applicable	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapour pressure	No information available	
Vapour density	No information available	
Specific gravity	2.3 - 2.6	20 °C
Bulk density	750 – 950 kg/m <sup>3</sup>	
Relative density	No information available	
Water solubility	Negligible	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	> 500 °C / 932°F	
Kinematic viscosity	Not applicable	
Dynamic viscosity	. Not applicable	
log Pow	No information available	

**Explosive properties** Not applicable

**Oxidising properties** None known

**9.2 Other information**

**Pour point** No information available  
**Molecular weight** No information available  
**VOC content(%)** None  
**Density** No information available

**Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

## 10. Stability and Reactivity

### 10.1 Reactivity

No specific reactivity hazards associated with this product.

### 10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

### 10.3 Possibility of Hazardous Reactions

#### Hazardous polymerisation

Hazardous polymerisation does not occur.

### 10.4 Conditions to avoid

Avoid wet and humid conditions. Avoid dust formation.

### 10.5 Incompatible materials

No materials to be especially mentioned.

### 10.6 Hazardous decomposition products

See Section 5.

## 11. Toxicological Information

### 11.1 Information on toxicological effects

#### Acute toxicity

#### Product information

This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis.

#### Inhalation

Inhalation of dust in high concentration may cause irritation of respiratory system.

#### Eye contact

Dust may cause mechanical irritation.

#### Skin contact

Prolonged contact may cause redness and irritation.

**Ingestion** Ingestion may cause stomach discomfort.

**Toxicology data for the components**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Crystalline silica (impurity)	= 500 mg/kg ( Rat )	No data available	No data available

**Sensitisation** This product does not contain any components suspected to be sensitizing.

**Mutagenic effects** This product does not contain any known or suspected mutagens.

**Carcinogenicity** Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled.

**Reproductive toxicity** This product does not contain any known or suspected reproductive hazards.

**Routes of exposure** Inhalation.

**Routes of entry** Inhalation.

**Specific target organ toxicity - Single exposure** Not classified

**Specific target organ toxicity - Repeated exposure** Not classified.

**Aspiration hazard** Not applicable.

**Other information** Key literature references and sources for data. See Section 16 for more information.

**12. Ecological Information**

**12.1 Toxicity**

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.  
 The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.  
 Listed on PLONOR list of OSPAR

**Toxicity to algae**  
 This product is not considered toxic to algae.

**Toxicity to fish**  
 This product is not considered toxic to fish.

**Toxicity to daphnia and other aquatic invertebrates**  
 This product is not considered toxic to invertebrates.

**Toxicology data for the components**

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other

Crystalline silica (impurity)	LC50 Danio rerio (zebra fish) : > 10000 mg/l 96h	EC50: > 1000 mg/l 72h	<b>aquatic invertebrates</b>
			LC50 Daphnia magna (Water flea): > 10000 mg/l 24h

**12.2 Persistence and degradability**

Not Applicable - Inorganic chemical.

**12.3 Bioaccumulative potential**

Not Applicable - Inorganic chemical.

**12.4 Mobility**

**Mobility**

Insoluble in water.

**Mobility in soil**

No information available.

**12.5 Results of PBT and vPvB assessment**

Not classified as PBT/vPvB by current EU criteria.

**12.6 Other adverse effects.**

None known.

**12.7 Other information**

Key literature references and sources for data. See Section 16 for more information.

**13. Disposal Considerations**

**13.1 Waste treatment methods**

**Waste from residues/unused products**

Dispose of in accordance with local regulations.

**Contaminated packaging**

Empty containers should be taken to an approved waste handling site for recycling or disposal.

**EWC Waste Disposal No**

According to the European Waste Catalogue, Waste Codes are not product specific, but application specific Waste codes should be assigned by the user based on the application for which the product was used. The following Waste Codes are only suggestions: EWC waste disposal No: 01 05 99

## 14. Transport information

**14.1. UN number**

Not regulated

**14.2. UN proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

**14.3. Hazard class(es)**

**ADR/RID/ADN/ADG Hazard class** Not regulated

**IMDG Hazard class** Not regulated

**ICAO Hazard class/division** Not regulated

**14.4 Packing group**

**ADR/RID/ADN/ADG Packing Group** Not regulated

**IMDG Packing group** Not regulated

**ICAO Packing group** Not regulated

**14.5 Environmental hazard**

No

**14.6 Special precautions**

Not applicable

**14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code**

Please contact SDS@slb.com for info regarding transport in Bulk.

## 15. Regulatory Information

### 15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

**Germany, Water Endangering Classes (VwVwS)** Water endangering class = nwg

**Technical Rules for Hazardous Substances (TRGS)** TRGS 220 National aspects when compiling safety data sheets  
 TRGS 510 Storage of hazardous substances in non stationary containers  
 TRGS 900 Occupational exposure limits

**Germany**  
**Regulations governing systems for handling substances hazardous to waters**  
**Chemicals act**

Commission Regulation (EU) 2015/830 of 28 May 2015 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC, 2000/21/EC and 453/2010 including amendments.

This safety data sheet complies with the requirements of Regulation (EC) No. 1272/2008.

Dutch Mining Regulations: In accordance with Mining Regulations 9.2 and Chapter 4 of the Working Conditions Decree.

#### International inventories

<b>USA, Toxic Substances Control Act inventory (TSCA)</b>	Complies
<b>Canada (DSL)</b>	Complies
<b>Philippines (PICCS)</b>	Complies
<b>Inventory - Japan - Existing and New Chemicals list</b>	Does not comply
<b>China (IECSC)</b>	Complies
<b>Australia (AICS)</b>	Complies
<b>Korea (KECL)</b>	Complies
<b>Inventory - New Zealand - Inventory of Chemicals (NZIoC)</b>	Complies

#### Europe - REACH

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

**Denmark Pr. no.** OCMA Bentonite: PR.No.: 1900124

### 15.2 Chemical Safety Report

No information available

## 16. Other Information

<b>Prepared by</b>	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
<b>Supercedes Date:</b>	02/Jan/2017
<b>Revision date</b>	07/Jul/2018
<b>Version</b>	9
<b>This SDS has been revised in the following section(s)</b>	2, 4, 5, 6, 7, 8, 15, 16 No changes with regard to classification have been made. Updated according to GHS/CLP.

### Key literature references and sources for data

www.ChemADVISOR.com

Supplier

National Chemical Inventories

National regulatory information

National occupational exposure limits

### Training Advice

Do not handle until all safety precautions have been read and understood

Follow general hygiene considerations recognised as common good workplace practices

### Full text of H-Statements referred to under sections 2 and 3

This product is not classified as hazardous therefore no (H) hazard statements assigned.

H373 - May cause damage to organs through prolonged or repeated exposure if inhaled

### Disclaimer

The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

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Safety data sheet number PID15471  
Version 2  
Revision date 26/Jan/2017  
Supercedes date 21/Jun/2010



## Safety Data Sheet CALCIUM CARBONATE SYSTEM

### 1. Identification of the substance/preparation and of the Company/undertaking

#### 1.1 Product identifier

Product name CALCIUM CARBONATE SYSTEM  
Product code PID15471

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Water based system.

Uses advised against Consumer use

#### 1.3 Details of the supplier of the safety data sheet

Supplier  
M-I Drilling Fluids UK Limited  
C/O Schlumberger  
Enterprise Drive  
Westhill Industrial Estate  
Westhill, AB32 6TQ  
Scotland UK  
+47 51577424

MISDS@slb.com

#### 1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

Germany	+49 69 222 25285
---------	------------------

### 2. Hazards identification

#### 2.1 Classification of the substance or mixture

Regulation (EC) No. 1272/2008

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

#### 2.2 Label elements

##### Signal word

None

**Hazard statements**

This product is not classified as hazardous therefore no (H) hazard statements assigned.

**Precautionary Statements - EU (§28, 1272/2008)**

This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

-

**Contains**

Calcium carbonate

Starch

**2.3 Other hazards**

Not classified as PBT/vPvB by current EU criteria

**3. Composition/information on ingredients**

**3.1 Substances**

Not applicable

**3.2 Mixtures**

Chemical Name	EC-No.	CAS No	Weight-%	Classification (67/548)	Classification (Reg. 1272/2008)	REACH registration number
Calcium carbonate	207-439-9	471-34-1	10-30	-	Not classified	Exempt
Starch	232-679-6	9005-25-8	1-5	-	Not classified	Exempt

**Comments**

Drilling fluid is a highly complex and variable blend of several proprietary products. Each drilling fluid is designed to meet the drilling requirements of a specific well. During the drilling process the composition and physical properties of the drilling fluid are constantly changing; therefore, a complete disclosure of a particular fluid's composition is impractical.

The product contains other ingredients which do not contribute to the overall classification.

**4. First aid measures**

**4.1 First Aid**

**Inhalation**

If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

---

<b>Ingestion</b>	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.
<b>Skin contact</b>	Wash skin thoroughly with soap and water. Get medical attention if irritation persists.
<b>Eye contact</b>	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses. Get medical attention if any discomfort continues.

#### **4.2 Most important symptoms and effects, both acute and delayed**

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

#### **Main symptoms**

**Inhalation** Please see Section 11. Toxicological Information for further information.

**Ingestion** Please see Section 11. Toxicological Information for further information.

**Skin contact** Please see Section 11. Toxicological Information for further information.

**Eye contact** Please see Section 11. Toxicological Information for further information.

#### **4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician** Treat symptomatically.

## **5. Fire-fighting measures**

### **5.1 Extinguishing media**

#### **Suitable extinguishing media**

Use extinguishing agent suitable for type of surrounding fire.

#### **Extinguishing media which must not be used for safety reasons**

None known.

### **5.2 Special hazards arising from the substance or mixture**

#### **Unusual fire and explosion hazards**

None known.

#### **Hazardous combustion products**

Fire or high temperatures create: Carbon oxides (COx).

### **5.3 Advice for firefighters**

#### **Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

### **Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

## **6. Accidental release measures**

### **6.1 Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. See also section 8.

### **6.2 Environmental precautions**

The product should not be allowed to enter drains, water courses or the soil.

### **Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

### **6.3 Methods and material for containment and cleaning up**

#### **Methods for containment**

Prevent further leakage or spillage if safe to do so. Dyke far ahead of liquid spill for later disposal.

#### **Methods for cleaning up**

Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

### **6.4 Reference to other sections**

See section 13 for more information.

## **7. Handling and storage**

### **7.1 Precautions for safe handling**

#### **Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

#### **Hygiene measures**

Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product. Remove contaminated clothing.

### **7.2 Conditions for safe storage, including any incompatibilities**

<b>Technical measures/precautions</b>	Ensure adequate ventilation.
<b>Storage precautions</b>	Keep containers tightly closed in a dry, cool and well-ventilated place
<b>Storage class</b>	Chemical storage.
<b>Packaging materials</b>	Use specially constructed containers only

### **7.3 Specific end uses**

See Section 1.2.

## 8. Exposure controls/personal protection

### 8.1 Control parameters

#### Exposure Limits

Because this product is a liquid, the dust-related Workplace Exposure Limits for the components do not apply.

Chemical Name	EU OEL - Third List	Austria	Australia	Denmark
Calcium carbonate	Not determined	Not determined	10mg/m <sup>3</sup> TWainhalable dust	Not determined
Starch	Not determined	Not determined	10mg/m <sup>3</sup> TWainhalable dust	Not determined
Chemical Name	Malaysia	France	Germany	Hungary
Calcium carbonate	Not determined	10 mg/m <sup>3</sup> TWA	Not determined	Not determined
Starch	10 mg/m <sup>3</sup> TWA	Not determined	Not determined	Not determined
Chemical Name	New Zealand	Italy	Netherlands	Norway
Calcium carbonate	10 mg/m <sup>3</sup> TWA	Not determined	Not determined	Not determined
Starch	10 mg/m <sup>3</sup> TWA	Not determined	Not determined	Not determined
Chemical Name	Poland	Portugal	Romania	Russia
Calcium carbonate	10 mg/m <sup>3</sup> TWA NDS <2% free crystalline silica	10 mg/m <sup>3</sup> TWA particulate matter containing no Asbestos and <1% Crystalline silica	Not determined	Not determined
Starch	Not determined	10 mg/m <sup>3</sup> TWA	Not determined	10 mg/m <sup>3</sup> MAC
Chemical Name	Spain	Switzerland	Turkey	UK
Calcium carbonate	Not determined	3 mg/m <sup>3</sup> TWA MAK	Not determined	Not determined
Starch	10 mg/m <sup>3</sup> TWA VLA-ED	3 mg/m <sup>3</sup> TWA MAK	Not determined	30 mg/m <sup>3</sup> STEL calculated total inhalable 12 mg/m <sup>3</sup> STEL calculated respirable 10 mg/m <sup>3</sup> TWA total inhalable 4 mg/m <sup>3</sup> TWA respirable

### 8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

#### Engineering measures to reduce exposure

Ensure adequate ventilation. Mechanical ventilation or local exhaust ventilation is required.

#### Personal protective equipment

##### Eye protection

Safety glasses with side-shields. Tightly fitting safety goggles.

##### Hand protection

Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee

**Respiratory protection** training  
 Impervious gloves made of: Nitrile Neoprene  
 Break through time >480 minutes  
 Glove thickness 0.5 mm  
 Be aware that liquid may penetrate the gloves. Frequent change is advisable.  
 In case of insufficient ventilation wear suitable respiratory equipment, Respirator with combination filter for vapor/particulate, Type A/P2, At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

**Skin and body protection** Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.

**Hygiene measures** Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.



## 9. Physical and chemical properties

### 9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	No information available
Odour	Odourless
Colour	Grey
Odour threshold	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
pH	8.5	Conc. solution
pH @ dilution		
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapour pressure	No information available	
Vapour density	No information available	
Specific gravity	No information available	
Bulk density	No information available	
Relative density	1.05 - 1.3 sg	
Water solubility	Miscible with water.	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

**Explosive properties** No information available  
**Oxidising properties** No information available

**9.2 Other information**

**Pour point** No information available  
**Molecular weight** No information available  
**VOC content(%)** No information available  
**Density** No information available

## 10. Stability and reactivity

### 10.1 Reactivity

No specific reactivity hazards associated with this product.

### 10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

### 10.3 Possibility of Hazardous Reactions

#### Hazardous polymerisation

Hazardous polymerisation does not occur.

### 10.4 Conditions to avoid

None known.

### 10.5 Incompatible materials

No materials to be especially mentioned.

### 10.6 Hazardous decomposition products

See Section 5.2.

## 11. Toxicological information

### 11.1 Information on toxicological effects

#### Acute toxicity

**Inhalation** Inhalation of vapours in high concentration may cause irritation of respiratory system.  
**Eye contact** May cause slight irritation.  
**Skin contact** Prolonged contact may cause redness and irritation.  
**Ingestion** Ingestion may cause stomach discomfort.  
**Unknown acute toxicity** Not applicable.

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Calcium carbonate	= 6450 mg/kg ( Rat )	No data available	No data available
Starch	No data available	No data available	No data available

**Sensitisation** This product does not contain any components suspected to be sensitizing.

**Mutagenic effects** This product does not contain any known or suspected mutagens.

**Carcinogenicity** This product does not contain any known or suspected carcinogens.

**Reproductive toxicity** This product does not contain any known or suspected reproductive hazards.

**Routes of exposure** None known.

**Routes of entry** No route of entry noted.

**Specific target organ toxicity (single exposure)** Not classified

**Specific target organ toxicity (repeated exposure)** Not classified.

**Aspiration hazard** Not applicable.

## 12. Ecological information

### 12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment. The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.

#### Toxicity to algae

This product is not considered toxic to algae.

#### Toxicity to fish

This product is not considered toxic to fish.

#### Toxicity to daphnia and other aquatic invertebrates

This product is not considered toxic to invertebrates.

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Calcium carbonate	No information available	No information available	No information available

Starch	No information available	No information available	No information available
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**12.2 Persistence and degradability**

No product level data available.

**12.3 Bioaccumulative potential**

No product level data available.

**12.4 Mobility in soil**

**Mobility**

The product is miscible with water. May spread in water systems.

**12.5 Results of PBT and vPvB assessment**

Not classified as PBT/vPvB by current EU criteria.

**12.6 Other adverse effects.**

None known.

**13. Disposal considerations**

**13.1 Waste treatment methods**

<b>Waste from residues / unused products</b>	Dispose of in accordance with local regulations.
<b>Contaminated packaging</b>	Empty containers should be transported/delivered using a registered waste carrier for local recycling or waste disposal.
<b>EWC Waste Disposal No</b>	According to the European Waste Catalogue, Waste Codes are not product specific, but application specific Waste codes should be assigned by the user based on the application for which the product was used The following Waste Codes are only suggestions: EWC waste disposal No: 01 05 99 - wastes not otherwise specified

**14. Transport information**

**14.1. UN number**

Not regulated

**14.2. UN proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

**14.3. Hazard class(es)**

<b>ADR/RID/ADN/ADG Hazard class</b>	Not regulated
<b>IMDG Hazard class</b>	Not regulated
<b>ICAO Hazard class/division</b>	Not regulated

**14.4 Packing group**

<b>ADR/RID/ADN/ADG Packing Group</b>	Not regulated
<b>IMDG Packing group</b>	Not regulated
<b>ICAO Packing group</b>	Not regulated

**14.5 Environmental hazard**

No

**14.6 Special precautions**

Not applicable

**14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code**

Water-based muds containing mixtures of products listed in Chapters 17 and/or 18 of the IBC Code and the latest MEPC.2/Circular and is permitted to be carried under Annex II of MARPOL and resolution A.673 (16) Offshore Supply Vessel Code. Ship Type:- 3. Pollution Category:- Z.

Please contact MISDS@slb.com for info regarding transport in Bulk.

## 15. Regulatory information

**15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture**

<b>Germany, Water Endangering Classes (VwVwS)</b>	Water endangering class = 1 (self classification)
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Commission Regulation (EU) No 453/2010 of 20 May 2010 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH). Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC, including amendments.

This safety data sheet complies with the requirements of Regulation (EC) No. 1272/2008.

**International inventories**

<b>USA, Toxic Substances Control Act inventory (TSCA)</b>	Complies
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European Union - EINECS and ELINCS	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Inventory - Japan - Existing and New Chemicals list	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korea (KECL)	Complies
Inventory - New Zealand - Inventory of Chemicals (NZIoC)	Complies

#### 15.2 Chemical Safety Report

No information available

### 16. Other information

<b>Prepared by</b>	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
<b>Supersedes date</b>	21/Jun/2010
<b>Revision date</b>	26/Jan/2017
<b>Version</b>	2
<b>This SDS has been revised in the following section(s)</b>	This SDS have been made in a new database and therefore a new layout. No changes with regard to classification have been made. Updated according to GHS/CLP.

#### **Full text of H-Statements referred to under sections 2 and 3**

This product is not classified as hazardous therefore no (H) hazard statements assigned.

#### **Disclaimer**

The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.



## Safety Data Sheet CALCIUM CHLORIDE (All Grades)

### 1. Identification of the Substance/Preparation and of the Company/Undertaking

#### 1.1 Product identifier

**Product name** CALCIUM CHLORIDE (All Grades)  
**Product code** PID204  
**Country Limitations** For use only in North Sea countries (NSG)  
**Molecular weight** 111

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Weighting agent.

**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

##### Supplier

M-I Drilling Fluids UK Limited  
Westhill Business Park  
Westhill AB32 6JL Aberdeenshire  
Scotland United Kingdom

+47 51577424

SDS@slb.com

#### 1.4 Emergency Telephone Number

**Emergency telephone** - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

<b>Denmark</b>	Poison Control Hotline (DK): +45 82 12 12 12
<b>Netherlands</b>	National Poisons Information Centre (NL): +31 30 274 88 88 (NB: this service is only available to health professionals)
<b>Norway</b>	Poison information centre: +47 22 59 13 00

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP] Commission Regulation (EU) No 2015/830 of 28 May 2015

##### Health hazards

Serious eye damage/eye irritation	Category 2
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Environmental hazards Not classified

Physical Hazards Not classified

## 2.2 Label elements



**Signal word**  
WARNING

### Hazard Statements

H319 - Causes serious eye irritation

### Precautionary Statements

P264 - Wash face, hands and any exposed skin thoroughly after handling

P280 - Wear protective gloves/protective clothing/eye protection/face protection

P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing

P337 + P313 - If eye irritation persists: Get medical advice/attention

P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

### Contains

Calcium chloride

## 2.3 Other hazards

May release hydrogen gas (explosive) on contact with metals

Not classified as PBT/vPvB by current EU criteria

## **3. Composition/information on Ingredients**

### 3.1 Substances

Chemical Name	EC No	CAS No	Weight-%	Component information	REACH registration number
Calcium chloride	233-140-8	10043-52-4	60-100	Eye Irrit. 2 (H319)	01-2119494219-2 8-xxxx

### 3.2 Mixtures

Not applicable

## 4. First Aid Measures

### 4.1 First aid measures

<b>Inhalation</b>	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
<b>Ingestion</b>	Rinse mouth. Drink 1 or 2 glasses of water. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.
<b>Skin contact</b>	Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention if irritation persists.
<b>Eye Contact</b>	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if any discomfort continues.

### 4.2. Most important symptoms and effects, both acute and delayed

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

#### **Symptoms**

<b>Inhalation</b>	Please see Section 11. Toxicological Information for further information.
<b>Ingestion</b>	Please see Section 11. Toxicological Information for further information.
<b>Skin contact</b>	Please see Section 11. Toxicological Information for further information.
<b>Eye contact</b>	Please see Section 11. Toxicological Information for further information.

### 4.3 Indication of any immediate medical attention and special treatment needed

**Notes to physician** Treat symptomatically.

## 5. Firefighting Measures

### 5.1 Extinguishing media

#### **Suitable extinguishing media**

Use extinguishing media appropriate for surrounding material.

#### **Extinguishing media which must not be used for safety reasons**

None known.

### 5.2. Special hazards arising from the substance or mixture

#### **Unusual fire and explosion hazards**

None known.

**Hazardous combustion products**

Fire or high temperatures create: Chlorine, May release hydrogen gas (explosive) on contact with metals.

**5.3 Advice for firefighters**

**Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

**Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

**6. Accidental Release Measures**

**6.1. Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. See also section 8.

**6.2 Environmental precautions**

The product should not be allowed to enter drains, water courses or the soil.

**Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

**6.3 Methods and material for containment and cleaning up**

**Methods for containment**

Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimise spreading.

**Methods for cleaning up**

Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

**6.4 Reference to other sections**

See section 13 for more information.

**7. Handling and Storage**

**7.1 Precautions for safe handling**

**Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation.

**Hygiene Measures**

Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product. Remove contaminated clothing.

**7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions**

Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

**Storage precautions** Keep containers tightly closed in a dry, cool and well-ventilated place Protect from moisture Avoid contact with: Metals Strong oxidising agents Strong acids

**Storage class** Chemical storage.

**Packaging materials** Use specially constructed containers only

**7.3 Specific end uses**

See Section 1.2.

**8. Exposure Controls/Personal Protection**

**8.1 Control parameters**

**Exposure Limits** NUI = Nuisance dust, TWA 4mg/m<sup>3</sup> Respirable Dust, 10mg/m<sup>3</sup> Total Dust.

**Component Information**

Chemical Name	EU OEL - Third List	Austria	Denmark
Calcium chloride	Not determined	Not determined	Not determined
Chemical Name	France	Germany	Hungary
Calcium chloride	Not determined	Not determined	Not determined
Chemical Name	Italy	Netherlands	Norway
Calcium chloride	Not determined	Not determined	Not determined
Chemical Name	Poland	Portugal	Romania
Calcium chloride	Not determined	Not determined	Not determined
Chemical Name	Spain	Switzerland	UK
Calcium chloride	Not determined	Not determined	Not determined

**Derived No Effect Level (DNEL)**

**Short term exposure local effects**

**Calcium chloride**  
 Inhalation 10 mg/m<sup>3</sup>

**Long term exposure local effects**

**Calcium chloride**  
 Inhalation 5 mg/m<sup>3</sup>

**8.2 Exposure controls**

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

**Engineering Controls**

Ensure adequate ventilation. See section 7 for more information.

**Personal protective equipment**

**Eye protection** Use eye protection according to EN 166, designed to protect against powders and dusts. Tightly fitting safety goggles. Safety glasses with side-shields.

**Hand protection** Wear gloves according to EN 374 to protect against skin effects from powders Use protective gloves made of: Neoprene Nitrile Rubber Break through time >480 minutes

**Respiratory protection** Glove thickness 0.5 mm  
 Frequent change is advisable  
 No personal respiratory protective equipment normally required, In case of insufficient ventilation wear suitable respiratory equipment, Half mask with a particle filter P2 (BS EN 143), At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

**Skin and body protection** Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.

**Hygiene Measures** Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.



**8.2.3 Environmental exposure controls**

**Environmental exposure** Use appropriate containment to avoid environmental contamination See section 6 for more information

**9. Physical and Chemical Properties**

**9.1 Information on basic physical and chemical properties**

**Physical state** Solid  
**Appearance** Powder Dust  
**Odour** Odourless  
**Colour** Off-white  
**Odour threshold** Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
pH	Not applicable	
pH @ dilution	7 - 10	5% sol
Melting / freezing point	772 °C / 1421.6 °F	
Boiling point/range	> 1600 °C / >2912 °F	
Flash point	No information available	
Evaporation rate	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapour pressure	No information available	
Vapour density	No information available	
Specific gravity	No information available	
Bulk density	No information available	
Relative density	2.1 g/cm <sup>3</sup>	@ 20 °C.
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	

**Dynamic viscosity** No information available  
**log Pow** No information available

**Explosive properties** Not applicable  
**Oxidising properties** None known

**9.2 Other information**

**Pour point** No information available  
**Molecular weight** 111  
**VOC content(%)** None  
**Density** No information available

**Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

## 10. Stability and Reactivity

**10.1 Reactivity**

No specific reactivity hazards associated with this product.

**10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerisation**

Hazardous polymerisation does not occur.

**10.4 Conditions to avoid**

Avoid contact with water and moist air - product is hygroscopic.

**10.5 Incompatible materials**

Metals. Strong oxidising agents. Strong acids.

**10.6 Hazardous decomposition products**

See Section 5.2.

## 11. Toxicological Information

**11.1 Information on toxicological effects**

**Acute toxicity**

**Inhalation** Inhalation of dust may cause shortness of breath, tightness of the chest, a sore throat and cough.

**Eye contact** Causes serious eye irritation.

**Skin contact** Prolonged contact may cause redness and irritation.

**Ingestion** Ingestion may cause stomach discomfort.

**Unknown acute toxicity** Not applicable.

**Toxicology data for the components**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Calcium chloride	= 1000 mg/kg ( Rat )	> 5000 mg/kg ( Rabbit )	No data available

**Sensitisation** This product does not contain any components suspected to be sensitizing.

**Mutagenic effects** This product does not contain any known or suspected mutagens.

**Carcinogenicity** This product does not contain any known or suspected carcinogens.

**Reproductive toxicity** This product does not contain any known or suspected reproductive hazards.

**Routes of exposure** Eye contact. Inhalation.

**Routes of entry** Inhalation.

**Specific target organ toxicity - Single exposure** Not classified

**Specific target organ toxicity - Repeated exposure** Not classified.

**Aspiration hazard** Not applicable.

**Other information** Key literature references and sources for data. See Section 16 for more information.

**12. Ecological Information**

**12.1 Toxicity**

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment. Listed on PLONOR list of OSPAR

**Toxicity to algae**  
 See component information below.

**Toxicity to fish**  
 See component information below.

**Toxicity to daphnia and other aquatic invertebrates**  
 See component information below.

**Toxicology data for the components**

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other

Calcium chloride	= 10650 mg/L LC50 Lepomis macrochirus 96 h	No information available	<b>aquatic invertebrates</b> 2,400 mg/L EC50 (Daphnia magna) = 48 h
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### 12.2 Persistence and degradability

See component information below.

Chemical Name	Persistence and degradability
Calcium chloride	Inorganic compound

### 12.3 Bioaccumulative potential

See component information below.

Chemical Name	Bioaccumulation
Calcium chloride	Product/Substance is inorganic

### 12.4 Mobility

#### **Mobility**

See component information below.

Chemical Name	Mobility
Calcium chloride	Soluble in water

#### **Mobility in soil**

See component information below.

Chemical Name	Mobility in soil
Calcium chloride	After release, disperses through ground water

### 12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

### 12.6 Other adverse effects.

None known.

### 12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

## 13. Disposal Considerations

### 13.1 Waste treatment methods

<b>Waste from residues/unused products</b>	Dispose of in accordance with local regulations.
<b>Contaminated packaging</b>	Empty containers should be taken to an approved waste handling site for recycling or disposal.
<b>EWC Waste Disposal No</b>	According to the European Waste Catalogue, Waste Codes are not product specific, but application specific Waste codes should be assigned by the user based on the application for which the product was used The following Waste Codes are only suggestions: EWC waste disposal No: 06 03 14 - solid salts and solutions other than those mentioned in 06 03 11 and 06 03 13 Waste Code: 7091 Inorganic salts and other solids.

## 14. Transport information

### 14.1. UN number

Not regulated

### 14.2. UN proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

### 14.3. Hazard class(es)

<b>ADR/RID/ADN/ADG Hazard class</b>	Not regulated
<b>IMDG Hazard class</b>	Not regulated
<b>ICAO Hazard class/division</b>	Not regulated

### 14.4 Packing group

<b>ADR/RID/ADN/ADG Packing Group</b>	Not regulated
<b>IMDG Packing group</b>	Not regulated
<b>ICAO Packing group</b>	Not regulated

### 14.5 Environmental hazard

No

### 14.6 Special precautions

Not applicable

### 14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code

Please contact SDS@slb.com for info regarding transport in Bulk.

## 15. Regulatory Information

### 15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

Commission Regulation (EU) 2015/830 of 28 May 2015 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC, 2000/21/EC and 453/2010 including amendments.

This safety data sheet complies with the requirements of Regulation (EC) No. 1272/2008.

Dutch Mining Regulations: In accordance with Mining Regulations 9.2 and Chapter 4 of the Working Conditions Decree.

#### International inventories

USA, Toxic Substances Control Act inventory (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Inventory - Japan - Existing and New Chemicals list	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korea (KECL)	Complies
Inventory - New Zealand - Inventory of Chemicals (NZIoC)	Complies

#### Europe - REACH

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

Norway Pr. no.	46238
Denmark Pr. no.	988590

For use only in North Sea countries (NSG)

### 15.2 Chemical Safety Report

No information available

## 16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	23/Jan/2018
Revision date	02/Oct/2018

**Version** 8

**This SDS has been revised in the following section(s)** 1, 12, 15, 16 For use only in North Sea countries (NSG)  
No changes with regard to classification have been made.

**Key literature references and sources for data**

www.ChemADVISOR.com

Supplier

National Chemical Inventories

National regulatory information

National occupational exposure limits

**Training Advice**

Do not handle until all safety precautions have been read and understood

Follow general hygiene considerations recognised as common good workplace practices

**Full text of H-Statements referred to under sections 2 and 3**

H319 - Causes serious eye irritation

**Disclaimer**

The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

**This Document is Confidential and Proprietary. Unless Otherwise Marked, It is an Uncontrolled Copy.**

## Safety Data Sheet CAUSTIC SODA M2

### 1. Identification of the Substance/Preparation and of the Company/Undertaking

#### 1.1 Product identifier

**Product name** CAUSTIC SODA M2  
**Product code** M002  
**CAS No** 1310-73-2  
**EC No** 215-185-5  
**REACH registration number** 01-2119457892-27-xxxx

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Industrial uses Professional uses

**Uses advised against** Further information concerning recommended uses and uses advised against: see annex of this safety data sheet (exposure scenarios)

#### 1.3 Details of the supplier of the safety data sheet

##### Supplier

Schlumberger Oilfield UK PLC  
Schlumberger House, Buckingham Gate  
Gatwick Airport  
West Sussex RH6 0NZ

+ 47 51577424

SDS@slb.com

#### 1.4 Emergency Telephone Number

**Emergency telephone** (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

#### National Poison Center Numbers

<b>Denmark</b>	Poison Control Hotline (DK): +45 82 12 12 12
<b>Germany</b>	+49 69 222 25285
<b>Italy</b>	Centro Antiveleni Ospedale Niguarda Milan: +39 02 6610 1029
<b>Norway</b>	Poison information centre: +47 22 59 13 00

**2. Hazards Identification**

**2.1 Classification of the substance or mixture**

Classification according to Regulation (EC) No. 1272/2008 [CLP] Commission Regulation (EU) No 2015/830 of 28 May 2015

**Health hazards**

Skin corrosion/irritation	Category 1 Subcategory 1A
Serious eye damage/eye irritation	Category 1

**Environmental hazards** Not classified

**Physical Hazards**

Substances/mixtures corrosive to metal	Category 1
--	------------

**2.2 Label elements**



**Signal word**

DANGER

**Hazard Statements**

H314 - Causes severe skin burns and eye damage  
H290 - May be corrosive to metals

**Precautionary Statements**

P260 - Do not breathe dust/fume/gas/mist/vapours/spray  
P280 - Wear protective gloves/protective clothing/eye protection/face protection  
P303 + P361 + P353 - IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower  
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing  
P310 - Immediately call a POISON CENTER or doctor/physician  
P406 - Store in corrosion resistant container with a resistant inner liner

**Supplementary precautionary statements**

P234 - Keep only in original container  
P264 - Wash face, hands and any exposed skin thoroughly after handling  
P301 + P310 - IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician  
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing  
P363 - Wash contaminated clothing before reuse  
P390 - Absorb spillage to prevent material damage  
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

**Contains**

Sodium hydroxide

**2.3 Other hazards**

Not classified as PBT/vPvB by current EU criteria

### 3. Composition/information on Ingredients

#### 3.1 Substances

Chemical Name	EC No	CAS No	Weight-%	Component information	REACH registration number
Sodium hydroxide	215-185-5	1310-73-2	60-100	Met. Corr. 1 (H290) Skin Corr. 1A (H314) Eye Dam. 1(H318)	01-2119457892-2 7-xxxx

#### 3.2 Mixtures

Not applicable

### 4. First Aid Measures

#### 4.1 First aid measures

<b>Inhalation</b>	Move the exposed person to fresh air at once. If breathing is difficult, (trained personnel should) give oxygen. If not breathing, give artificial respiration. Seek medical attention at once.
<b>Ingestion</b>	Do NOT induce vomiting. Get immediate medical attention. Rinse mouth. Risk of product entering the lungs on vomiting after ingestion. Never give anything by mouth to an unconscious person. Call a doctor or poison control centre immediately.
<b>Skin contact</b>	Promptly wash contaminated skin with soap or mild detergent and water. Promptly remove clothing if soaked through and wash as above. Burns: Flush with water immediately. While flushing, remove clothes which do not adhere to affected area. Call an ambulance. Continue flushing during transport to hospital. Chemical burns must be treated by a physician.
<b>Eye Contact</b>	Remove contact lenses, if worn. Immediately flush eyes with water for 15 minutes while holding eyelids open. Immediate medical attention is required.

#### 4.2. Most important symptoms and effects, both acute and delayed

<b>General advice</b>	Seek medical attention for all burns, regardless how minor they may seem. The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.
<b>Symptoms</b>	
<b>Inhalation</b>	Please see Section 11. Toxicological Information for further information.
<b>Ingestion</b>	Please see Section 11. Toxicological Information for further information.
<b>Skin contact</b>	Please see Section 11. Toxicological Information for further information.

**Eye contact** Please see Section 11. Toxicological Information for further information.

#### **4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician** Treat symptomatically.

## **5. Firefighting Measures**

### **5.1 Extinguishing media**

#### **Suitable extinguishing media**

Water Fog, Alcohol Foam, CO<sub>2</sub>, Dry Chemical.

#### **Extinguishing media which must not be used for safety reasons**

Do not use a solid water stream as it may scatter and spread fire.

### **5.2. Special hazards arising from the substance or mixture**

#### **Unusual fire and explosion hazards**

Contact with metals may evolve flammable hydrogen gas. React vigorously and/or explosively with water.

#### **Hazardous combustion products**

Thermal decomposition can lead to release of toxic and corrosive gases/vapours Sodium oxides.

### **5.3 Advice for firefighters**

#### **Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

#### **Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

## **6. Accidental Release Measures**

### **6.1. Personal precautions, protective equipment and emergency procedures**

Do not get on skin or clothing. Wash thoroughly after handling. Avoid breathing dust; if exposed to high dust concentration, leave area immediately. Use personal protective equipment. See also section 8.

### **6.2 Environmental precautions**

The product should not be allowed to enter drains, water courses or the soil.

#### **Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

### **6.3 Methods and material for containment and cleaning up**

#### **Methods for containment**

Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimise spreading.

**Methods for cleaning up**

Avoid dust formation. Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

**6.4 Reference to other sections**

See section 13 for more information.

**7. Handling and Storage**

**7.1 Precautions for safe handling**

**Handling**

Handle in accordance with good industrial hygiene and safety practice. Do not get in eyes, on skin or on clothing. Avoid dust formation. Do not breathe dust. Never add water directly to this product - may cause vigorous reaction/boiling. Always dilute by carefully pouring the product into the water.

**Hygiene Measures**

Use good work and personal hygiene practices to avoid exposure When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

**7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions** Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

**Storage precautions** Keep containers tightly closed in a dry, cool and well-ventilated place Store in original container Protect from moisture High temperatures. Avoid contact with: Acids Water Oxidizing agents Metals Halogenated hydrocarbons Ammonium salts

**Storage class** Corrosive storage.

**Storage class, TRGS 510, Germany** LGK8B - Non-combustible corrosive substances

**Packaging materials** Use specially constructed containers only

**7.3 Specific end uses**

See Section 1.2.

**8. Exposure Controls/Personal Protection**

**8.1 Control parameters**

**Component Information**

Chemical Name	EU OEL - Third List	Austria	Denmark
Sodium hydroxide	Not determined	4 mg/m <sup>3</sup> STEL inhalable fraction, 8x5 min 2 mg/m <sup>3</sup> TWA inhalable fraction	2 mg/m <sup>3</sup> Ceiling
Chemical Name	France	Germany	Hungary
Sodium hydroxide	2 mg/m <sup>3</sup> TWA	Not determined	2 mg/m <sup>3</sup> STEL 2 mg/m <sup>3</sup> TWA
Chemical Name	Italy	Netherlands	Norway
Sodium hydroxide	2 mg/m <sup>3</sup> Ceiling	Not determined	2 mg/m <sup>3</sup> Ceiling
Chemical Name	Poland	Portugal	Romania
Sodium hydroxide	1 mg/m <sup>3</sup> STEL NDSCh 0.5 mg/m <sup>3</sup> TWA NDS	2 mg/m <sup>3</sup> Ceiling	Not determined

Chemical Name	Spain	Switzerland	UK
Sodium hydroxide	2 mg/m <sup>3</sup> STEL	2 mg/m <sup>3</sup> STEL inhalable dust 2 mg/m <sup>3</sup> TWA MAK	2 mg/m <sup>3</sup> STEL

### Derived No Effect Level (DNEL)

#### Long term exposure local effects

##### Sodium hydroxide

Inhalation 1 mg/m<sup>3</sup>

### 8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

#### Engineering Controls

Ensure adequate ventilation. Provide appropriate exhaust ventilation at places where dust is formed. Keep airborne concentrations below exposure limits.

#### Personal protective equipment

##### Eye protection

Use eye protection according to EN 166, designed to protect against dusts. Chemical splash goggles and face shield.

##### Hand protection

Wear gloves according to EN 374 to protect against skin effects from powders

Impervious gloves made of: Nitrile Rubber

Break through time >480 minutes

Glove thickness 0.35-0.4 mm

PVC Butyl rubber Break through time >480 minutes

Glove thickness >0.5 mm

Frequent change is advisable

##### Respiratory protection

In case of insufficient ventilation wear suitable respiratory equipment, Respirator with combination filter for vapour/particulate (EN 141), Type B/P2, Suitable mask with particle filter P3 (European Norm 143), At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

##### Skin and body protection

Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.

#### Hygiene Measures

Wash hands before breaks and immediately after handling the product, Remove and wash contaminated clothing before re-use.



### 8.2.3 Environmental exposure controls

#### Environmental exposure

Use appropriate containment to avoid environmental contamination See section 6 for more information

## 9. Physical and Chemical Properties

### 9.1 Information on basic physical and chemical properties

<b>Physical state</b>	Solid
<b>Appearance</b>	Flakes
<b>Odour</b>	Odourless
<b>Colour</b>	White
<b>Odour threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
<b>pH</b>	Not applicable	
<b>pH @ dilution</b>	>14	10 g/ 100ml
<b>Melting / freezing point</b>	323 °C / 613.4 °F	
<b>Boiling point/range</b>	1388 °C / 2530.4 °F	
<b>Flash point</b>	Not applicable	
<b>Evaporation rate</b>	No information available	
<b>Flammability (solid, gas)</b>	Not applicable	
<b>Flammability Limit in Air</b>		
<b>Upper flammability limit</b>	Not applicable	
<b>Lower flammability limit</b>	Not applicable	
<b>Vapour pressure</b>	0.1 kPa	@ 739 °C
<b>Vapour density</b>	>1 (air = 1)	
<b>Specific gravity</b>	2.1	@ 20 °C
<b>Bulk density</b>	1.1 - 2.13 g/cm <sup>3</sup>	
<b>Relative density</b>	2.1	@ 20 °C.
<b>Water solubility</b>	Soluble in water 42g/ 100ml	
<b>Solubility in other solvents</b>	Ethanol Methanol	
<b>Autoignition temperature</b>	No information available	
<b>Decomposition temperature</b>	No information available	
<b>Kinematic viscosity</b>	No information available	
<b>Dynamic viscosity</b>	0.997 - 2.228 mPa.s	
<b>log Pow</b>	No information available	

<b>Explosive properties</b>	Not applicable
<b>Oxidising properties</b>	Not applicable

## 9.2 Other information

<b>Pour point</b>	No information available
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	None
<b>Density</b>	No information available

## **Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

## 10. Stability and Reactivity

### 10.1 Reactivity

Corrosive to Metals. Contact with metals may evolve flammable hydrogen gas. Reacts violently with water.

### 10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

### 10.3 Possibility of Hazardous Reactions

#### **Hazardous polymerisation**

Hazardous polymerisation does not occur.

**10.4 Conditions to avoid**

Protect from moisture. High temperatures.

**10.5 Incompatible materials**

Acids. Metals. Water. Oxidizing agents. Halogenated hydrocarbons. Ammonium salts.

**10.6 Hazardous decomposition products**

See Section 5.2.

**11. Toxicological Information**

**11.1 Information on toxicological effects**

**Acute toxicity**

<b>Inhalation</b>	Contact with moist mucous membranes of the respiratory system can cause caustic condition resulting in burns. Inhaled corrosive substances can lead to a toxic edema of the lungs.
<b>Eye contact</b>	Causes serious eye damage.
<b>Skin contact</b>	Causes severe skin burns.
<b>Ingestion</b>	Ingestion causes burns of the upper digestive and respiratory tracts.
<b>Unknown acute toxicity</b>	Not applicable.

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Sodium hydroxide	No data available	1350 mg/kg ( Rabbit )	No data available

<b>Sensitisation</b>	This product does not contain any components suspected to be sensitizing.
<b>Mutagenic effects</b>	This product does not contain any known or suspected mutagens.
<b>Carcinogenicity</b>	This product does not contain any known or suspected carcinogens.
<b>Reproductive toxicity</b>	This product does not contain any known or suspected reproductive hazards.
<b>Routes of exposure</b>	Skin contact. Eye contact. Inhalation. Ingestion.
<b>Routes of entry</b>	Inhalation. Skin contact. Eye contact.
<b>Specific target organ toxicity - Single exposure</b>	Not classified
<b>Specific target organ toxicity - Repeated exposure</b>	Not classified.

**Aspiration hazard** Not applicable.

**Other information** Key literature references and sources for data. See Section 16 for more information.

## 12. Ecological Information

### 12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment. Large amounts will affect pH and harm aquatic organisms

#### **Toxicity to algae**

This product is not considered toxic to algae.

#### **Toxicity to fish**

This product is not considered toxic to fish.

#### **Toxicity to daphnia and other aquatic invertebrates**

This product is not considered toxic to invertebrates.

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Sodium hydroxide	= 45.4 mg/L LC50 Oncorhynchus mykiss 96 h	No information available	No information available

### 12.2 Persistence and degradability

Not Applicable - Inorganic chemical.

Chemical Name	Persistence and degradability
Sodium hydroxide	Inorganic compound

### 12.3 Bioaccumulative potential

Not Applicable - Inorganic chemical.

Chemical Name	Bioaccumulation
Sodium hydroxide	Product/Substance is inorganic

### 12.4 Mobility

#### **Mobility**

Soluble in water.

Chemical Name	Mobility
Sodium hydroxide	Soluble in water

#### **Mobility in soil**

No information available.

Chemical Name	Mobility in soil
Sodium hydroxide	Not expected to adsorb on soil

### 12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

### 12.6 Other adverse effects.

None known.

### 12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

## 13. Disposal Considerations

### 13.1 Waste treatment methods

**Waste from residues/unused products**

Dispose of in accordance with local regulations.

**Contaminated packaging**

Empty containers should be taken to an approved waste handling site for recycling or disposal.

**EWC Waste Disposal No**

According to the European Waste Catalogue, Waste Codes are not product specific, but application specific Waste codes should be assigned by the user based on the application for which the product was used The following Waste Codes are only suggestions: EWC waste disposal No: 16 03 03 - inorganic wastes containing dangerous substances 7091 Inorganic salts and other solids.

## 14. Transport information

### 14.1. UN number

UN/ID No. (ADR/RID/ADN/ADG)	UN1823
UN No. (IMDG)	UN1823
UN No. (ICAO/ANAC)	UN1823

### 14.2. UN proper shipping name

SODIUM HYDROXIDE, SOLID,

### 14.3. Hazard class(es)

ADR/RID/ADN/ADG Hazard class	8
IMDG Hazard class	8
ICAO Hazard class/division	8

### 14.4 Packing group

ADR/RID/ADN/ADG Packing Group	II
IMDG Packing group	II

ICAO Packing group

II



**14.5 Environmental hazard**

No

**14.6 Special precautions**

Hazard ID	80
EmS (IMDG)	F-A, S-B
Emergency Action Code (EAC)	2W
Tunnel restriction code	(E)

**14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code**

Please contact [SDS@slb.com](mailto:SDS@slb.com) for info regarding transport in Bulk.

## 15. Regulatory Information

### 15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

<b>Germany, Water Endangering Classes (VwVwS)</b>	Hazardous to water/Class 1
<b>Technical Rules for Hazardous Substances (TRGS)</b>	TRGS 220 National aspects when compiling safety data sheets TRGS 510 Storage of hazardous substances in non stationary containers TRGS 900 Occupational exposure limits

**Commission Regulation (EU) 2015/830 of 28 May 2015 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC, 2000/21/EC and 453/2010 including amendments.**

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#### International inventories

<b>USA, Toxic Substances Control Act inventory (TSCA)</b>	Complies
<b>Canada (DSL)</b>	Complies
<b>Philippines (PICCS)</b>	Complies
<b>Inventory - Japan - Existing and New Chemicals list</b>	Complies
<b>China (IECSC)</b>	Complies
<b>Australia (AICS)</b>	Complies
<b>Korea (KECL)</b>	Complies
<b>Inventory - New Zealand - Inventory of Chemicals (NZIoC)</b>	Complies

#### Europe - REACH

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

**Denmark Pr. no.** 1114430

### 15.2 Chemical Safety Report

A Chemical Safety Assessment has been carried out for this substance

## 16. Other Information

<b>Prepared by</b>	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Muriel Martin Beurel
<b>Supersedes Date:</b>	06/Jun/2018

**Revision date** 11/Oct/2018

**Version** 3

**This SDS has been revised in the following section(s)** 3, 7, 12, 15, Updated according to GHS/CLP.

**Key literature references and sources for data**

www.ChemADVISOR.com

Supplier

National Chemical Inventories

National regulatory information

National occupational exposure limits

**Training Advice**

Do not handle until all safety precautions have been read and understood

Follow general hygiene considerations recognised as common good workplace practices

**HMIS classification**

Health 3

Flammability 0

Physical hazard 1

PPE X

**Full text of H-Statements referred to under sections 2 and 3**

H314 - Causes severe skin burns and eye damage

H290 - May be corrosive to metals

**Disclaimer**

The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

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# Exposure scenario

## ES1 Industrial use

### Section 1 Title

#### 1.1 Title exposure scenario (ES)

**Title** SU3 - Industrial uses: Uses of substances as such or in preparations at industrial sites

#### 1.2 Scope of exposure scenario (ES)

#### Process categories

PROC1 - Use in closed process, no likelihood of exposure  
 PROC2 - Use in closed, continuous process with occasional controlled exposure  
 PROC3 - Use in closed batch process (synthesis or formulation)  
 PROC4 - Use in batch and other process (synthesis) where opportunity for exposure arises  
 PROC5 - Mixing or blending in batch processes for formulation of preparations and articles (multi-stage and/or significant contact)  
 PROC7 - Industrial spraying  
 PROC8a - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities  
 PROC8b - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities  
 PROC9 - Transfer of substance or preparation into small containers (dedicated filling line, including weighing)  
 PROC10 - Roller application or brushing  
 PROC13 - Treatment of articles by dipping and pouring  
 PROC15 - Use as laboratory reagent

#### Environmental release categories

ERC2 - Formulation of preparations (mixtures)  
 ERC4 - Industrial use of processing aids in processes and products, not becoming part of articles  
 ERC6a - Industrial use resulting in manufacture of another substance (use of intermediates)  
 ERC6b - Industrial use of reactive processing aids  
 ERC7 - Industrial use of substances in closed systems

### Section 2 Operational conditions and risk management measures

#### 2.1 Control of environmental exposure

#### Environmental release categories

ERC2 - Formulation of preparations (mixtures)  
 ERC4 - Industrial use of processing aids in processes and products, not becoming part of articles  
 ERC6a - Industrial use resulting in manufacture of another substance (use of intermediates)  
 ERC6b - Industrial use of reactive processing aids  
 ERC7 - Industrial use of substances in closed systems

## Exposure scenario ES1 Industrial use

### Product characteristics

Concentration of the substance in the product Covers percentage substance in the product up to 100 % (unless stated differently)

### Other operational conditions of use affecting environmental exposure

Continuous use/release

### Technical onsite conditions and measures to reduce or limit discharges, air emissions

Water : Risk management measures related to the environment aim to avoid discharging NaOH solution into municipal wastewater or to surface water, in case such discharges are expected to cause significant pH changes. Regular control of the pH value during introduction into open waters is required. In general discharges should be carried out such that pH changes in receiving surfaces waters are minimized. In general most aquatic organisms can tolerate pH values in the range of 6-9. This is also reflected in the standard OECD tests with aquatic organisms.

### Conditions and measures related to external treatment of waste for disposal

There is no solid waste of NaOH. Liquid NaOH waste should be reused or discharged to the industrial wastewater and further neutralized if needed.

### 2.2 Control of worker exposure

Control of worker exposure	
Process categories	PROC1 PROC2 PROC3 PROC4 PROC5 PROC7 PROC8a PROC8b PROC9 PROC10 PROC13 PROC15
Covers concentrations up to	Covers percentage substance in the product up to 100 % (unless stated differently)
Physical form of product	Liquid / Solid, low dustiness
Exposure duration	8 hours / day
Use frequency	200 days per year
Technical conditions and measures to control dispersion from source towards the worker	Handle substance within a predominantly closed system provided with extract ventilation Transfer substance using enclosed system e.g. using drum pump Sample via a closed loop or other system to avoid exposure Avoid splashing Ensure that splashes and spills are avoided by product design
Conditions and measures related to personal protection, hygiene and health evaluation	Avoid generation of dust and aerosols Wear a half mask respirator with type P2L filter or better Use suitable eye protection and gloves Butyl rubber Polyvinyl chloride (PVC) Break through time: >480 minutes Glove thickness 0.5 mm Nitrile rubber Break through time: > 480 minutes Glove thickness 0.35-0.4 mm Chemical resistant apron Wear chemical splash goggles and face shield For further specification, refer to section 8 of the SDS
Organisational measures to prevent /limit releases, dispersion and exposure	Follow advice on use, storage, maintenance and replacement Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately. Provide basic employee training to prevent / minimize exposures and to report any skin problems that may develop

## Section 3 - Exposure estimation

## Exposure scenario ES1 Industrial use

### 3.1 Advice

### 3.2 Exposure estimation - Environment

#### Environmental exposure

The aquatic effect and the risk assessment only deals with the effect on organisms/ecosystems due to possible pH changes related to OH<sup>-</sup> discharges, as the toxicity on the Na<sup>+</sup> ion is expected to be insignificant compared to the potential pH effect. The high water solubility and very low vapor pressure indicate that NaOH will be found predominantly in water. When the risk management measures related to the environments are implemented, there is no exposure to the activated sludge of a sewage treatment plant and there is not exposure of the receiving surface water.

The sediment compartment is not considered, because it is not considered relevant for NaOH. If emitted to the aquatic compartment, absorption to sediment particles will be negligible.

Significant emissions to air are not expected due to the very low vapour pressure of NaOH. If emitted to air as an aerosol in water, NaOH will be rapidly neutralized as a result of its reaction with CO<sub>2</sub> (or other acids).

Significant emissions to the terrestrial environment are not expected either. The sludge application route is not relevant for the emission to agricultural soil, as no absorption of NaOH to particulate matter will occur in STP/WWTPs. If emitted to soil, absorption to soil particles will be negligible. Depending on the buffer capacity of the soil, OH<sup>-</sup> will be neutralized in the soil pore water or the pH may increase.

Bioaccumulation will not occur.

### 3.3 Exposure estimation - Worker

Exposure estimation				
Process categories	Exposure route	Predicted Exposure Level	Risk characterisation ratio (RCR)	Combined for all exposure routes
PROC1 PROC2 PROC3 PROC4 PROC5 PROC7 PROC8a PROC8b PROC9 PROC10 PROC13 PROC14 PROC15 PROC19 PROC23 PROC24	Worker - inhalative, short-term - local Liquid No LEV , No Respiratory protection	0.17 mg/m <sup>3</sup>	-	-
PROC1	Worker - inhalative,	0.01 mg/m <sup>3</sup>	-	-

## Exposure scenario ES1 Industrial use

PROC2	short-term - local Solid No LEV , No Respiratory protection			
PROC3 PROC15	Worker - inhalative, short-term - local Solid No LEV , No Respiratory protection	0.1 mg/m <sup>3</sup>	-	-
PROC4 PROC5 PROC14	Worker - inhalative, short-term - local Solid No LEV , No Respiratory protection	0.2 mg/m <sup>3</sup>	-	-
PROC8a PROC8b PROC9 PROC10 PROC13 PROC19	Worker - inhalative, short-term - local Solid No LEV , No Respiratory protection	0.5 mg/m <sup>3</sup>	-	-
PROC23	Worker - inhalative Acute effects, local Solid Respiratory protection - efficiency of at least [%]: 90	0.4 mg/m <sup>3</sup>	-	-
PROC24	Worker - inhalative Acute effects, local Solid Respiratory protection - efficiency of at least [%]: 90	0.5 mg/m <sup>3</sup>	-	-

**Calculation method** Used ECETOC TRA model

**See specific operational conditions below** This substance is corrosive. For the handling of corrosive substances and formulations, immediate dermal contacts occur only occasionally and it is assumed that repeated daily dermal exposure can be neglected. Dermal exposure to the substance was not quantified. The substance is not expected to be systemically available in the body under normal handling and use conditions Systemic effects of NaOH after dermal or inhalation exposure are not expected to occur. Based on workplace measurements and following the proposed risk management measures controlling worker and professional exposure, the inhalation exposure is below the DNEL.

### Section 4 - Guidance to check compliance with the exposure scenario

The DU works inside the boundaries set by the ES if either the proposed risk management measures as described are met or the downstream user can demonstrate on his own that his operational conditions and implemented risk management measures are adequate. This has to be done by showing that they limit the inhalation and dermal exposure to a level below the respective DNEL (given that the process and activities in question are covered by the PROCs listed) as provided.

**Recommendations and advice** Assumes a good basic standard of occupational hygiene is implemented



## Safety Data Sheet DEEPCLEAN\* NS

### 1. Identification of the Substance/Preparation and of the Company/Undertaking

#### 1.1 Product identifier

Product name DEEPCLEAN\* NS  
Product code PID17252

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Completion fluid additive.

Uses advised against Consumer use

#### 1.3 Details of the supplier of the safety data sheet

##### Supplier

M-I Drilling Fluids UK Limited  
Westhill Business Park  
Westhill AB32 6JL, Aberdeenshire  
Scotland United Kingdom

+47 51577424

SDS@slb.com

#### 1.4 Emergency Telephone Number

Emergency telephone (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

#### National Poison Center Numbers

Netherlands	National Poisons Information Centre (NL): +31 30 274 88 88 (NB: this service is only available to health professionals)
Norway	Poison information centre: +47 22 59 13 00

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP] Commission Regulation (EU) No 2015/830 of 28 May 2015

**Health hazards**

Aspiration toxicity	Category 1
Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 1

**Environmental hazards** Not classified

**Physical Hazards** Not classified

**2.2 Label elements**



**Signal word**  
 DANGER

**Hazard Statements**

- H304 - May be fatal if swallowed and enters airways
- H315 - Causes skin irritation
- H318 - Causes serious eye damage

**EU Specific Hazard Statements**

- EUH066 - Repeated exposure may cause skin dryness or cracking

**Precautionary Statements**

- P280 - Wear protective gloves/protective clothing/eye protection/face protection
- P301 + P310 - IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
- P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
- P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
- P310 - Immediately call a POISON CENTER or doctor/physician
- P331 - Do NOT induce vomiting

**Supplementary precautionary statements**

- P264 - Wash face, hands and any exposed skin thoroughly after handling
- P332 + P313 - If skin irritation occurs: Get medical advice/attention
- P337 + P313 - If eye irritation persists: Get medical advice/attention
- P362 + P364 - Take off contaminated clothing and wash it before reuse
- P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

**Contains**

2-Butoxyethanol

Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics\*

D-Glucopyranose, oligomeric, C8-10 glycosides

Orange, sweet, extract

### 2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria  
 Thermal decomposition can lead to release of irritating gases and vapours

## 3. Composition/information on Ingredients

### 3.1 Substances

Not applicable

### 3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%	Component information	REACH registration number
2-Butoxyethanol	203-905-0	111-76-2	10-30	Acute Tox. 4 (H302) Acute Tox. 4 (H312) Acute Tox. 4 (H332) Skin Irrit. 2 (H315) Eye Irrit. 2 (H319)	01-2119475108-3 6-xxxx
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	926-141-6	RM1004246	10-30	Asp. Tox. 1 (H304) EUH066	01-2119456620-4 3-xxxx
D-Glucopyranose, oligomeric, C8-10 glycosides	500-220-1	68515-73-1	10-30	Eye Dam.1 (H318)	01-2119488530-3 6-xxxx
Orange, sweet, extract	232-433-8	8028-48-6	< 25	Flam. Liquid 3 (H226) Skin Irrit. 2 (H315) Skin Sens. 1 (H317) Asp. Tox. 1 (H304) Aquatic Chronic 2 (H411)	01-2119493353-3 5-XXXX

### Comments

\*Substances which have an EC Number that begins with the number "9" is a Provisional List Number. The list numbers published by ECHA do not have any legal significance. The EC substance definition and related classification & labelling has been developed in the framework of the Regulation (EC) No 1907/2006 (REACH). For information about the related CAS number see section 15 of this SDS.

Based on test data - H317, H302, H411 does not apply.

## 4. First Aid Measures

### 4.1 First aid measures

#### Inhalation

Move the exposed person to fresh air at once. Aspiration may cause pulmonary oedema and pneumonitis. If breathing is difficult, (trained personnel should) give oxygen. Seek medical attention at once.

#### Ingestion

Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. If vomiting occurs spontaneously, minimize the risk of aspiration

by properly positioning the affected person. Seek medical attention.

**Skin contact** Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Seek medical attention if irritation occurs.

**Eye Contact** Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Continue to rinse for at least 15 minutes. Seek medical attention.

#### **4.2. Most important symptoms and effects, both acute and delayed**

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

#### **Symptoms**

**Inhalation** Please see Section 11. Toxicological Information for further information.

**Ingestion** Please see Section 11. Toxicological Information for further information.

**Skin contact** Please see Section 11. Toxicological Information for further information.

**Eye contact** Please see Section 11. Toxicological Information for further information.

#### **4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician** Treat symptomatically.

## **5. Firefighting Measures**

### **5.1 Extinguishing media**

#### **Suitable extinguishing media**

Use extinguishing media appropriate for surrounding material.

#### **Extinguishing media which must not be used for safety reasons**

None known.

### **5.2. Special hazards arising from the substance or mixture**

#### **Unusual fire and explosion hazards**

None known.

#### **Hazardous combustion products**

Fire or high temperatures create: Carbon oxides (COx).

### **5.3 Advice for firefighters**

#### **Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

### Special Fire-Fighting Procedures

Containers close to fire should be removed immediately or cooled with water.

## 6. Accidental Release Measures

### 6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

### 6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

#### Environmental exposure controls

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

### 6.3 Methods and material for containment and cleaning up

#### Methods for containment

Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

#### Methods for cleaning up

Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

### 6.4 Reference to other sections

See section 13 for more information.

## 7. Handling and Storage

### 7.1 Precautions for safe handling

#### Handling

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use. Persons susceptible to allergic reactions should not handle this product.

#### Hygiene Measures

Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product. Remove contaminated clothing.

### 7.2 Conditions for safe storage, including any incompatibilities

<b>Technical measures/precautions</b>	Ensure adequate ventilation. Keep airborne concentrations below exposure limits.
<b>Storage precautions</b>	Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from open flames, hot surfaces and sources of ignition. Avoid contact with: Strong alkalis. Strong oxidising agents.
<b>Storage class</b>	Chemical storage.
<b>Packaging materials</b>	Use specially constructed containers only.

### 7.3 Specific end uses

See Section 1.2.

## 8. Exposure Controls/Personal Protection

### 8.1 Control parameters

**Exposure Limits** No biological limit allocated

#### Component Information

Chemical Name	EU OEL - Third List	Austria	Denmark
2-Butoxyethanol	50 ppm STEL 246 mg/m <sup>3</sup> STEL 20 ppm TWA 98 mg/m <sup>3</sup> TWA Possibility of significant uptake through the skin*1)	40 ppm STEL 200 mg/m <sup>3</sup> STEL 20 ppm TWA 98 mg/m <sup>3</sup> TWA	20 ppm 98 mg/m <sup>3</sup>
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	Not determined	Not determined	Not determined
D-Glucopyranose, oligomeric, C8-10 glycosides	Not determined	Not determined	Not determined
Orange, sweet, extract	Not determined	Not determined	Not determined
Chemical Name	France	Germany	Hungary
2-Butoxyethanol	50ppmSTEL 246mg/m <sup>3</sup> STEL 10 ppmTWA 49 mg/m <sup>3</sup> TWA	10 ppm TWA 49 mg/m <sup>3</sup> TWA	98mg/m <sup>3</sup> TWA 246mg/m <sup>3</sup> STEL
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	Not determined	Not determined	Not determined
D-Glucopyranose, oligomeric, C8-10 glycosides	Not determined	Not determined	Not determined
Orange, sweet, extract	Not determined	Not determined	Not determined
Chemical Name	Italy	Netherlands	Norway
2-Butoxyethanol	Not determined	100 mg/m <sup>3</sup> TWA	10 ppm TWA 50 mg/m <sup>3</sup> TWA 15 ppm STEL 75 mg/m <sup>3</sup> STEL Skin
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	Not determined	Not determined	Not determined
D-Glucopyranose, oligomeric, C8-10 glycosides	Not determined	Not determined	Not determined
Orange, sweet, extract	Not determined	Not determined	Not determined
Chemical Name	Poland	Portugal	Romania
2-Butoxyethanol	200 mg/m <sup>3</sup> STEL NDSC 98 mg/m <sup>3</sup> TWA NDS	Skin 50 ppm STEL VLE-CD 246 mg/m <sup>3</sup> STEL VLE-CD 20 ppm TWA indicative limit value 98 mg/m <sup>3</sup> TWA indicative limit value	50ppmSTEL 246mg/m <sup>3</sup> STEL 20ppmTWA 98mg/m <sup>3</sup> TWA
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	Not determined	Not determined	Not determined
D-Glucopyranose, oligomeric, C8-10 glycosides	Not determined	Not determined	Not determined
Orange, sweet, extract	Not determined	Not determined	Not determined
Chemical Name	Spain	Switzerland	UK
2-Butoxyethanol	50 ppm STEL 245 mg/m <sup>3</sup> STEL	20 ppm STEL 98 mg/m <sup>3</sup> STEL	50 ppm STEL 246 mg/m <sup>3</sup> STEL

	Skin*2) 20 ppm TWA VLA-ED 98 mg/m <sup>3</sup> TWA VLA-ED	Skin*2) 10 ppm TWA MAK 49 mg/m <sup>3</sup> TWA MAK	Skin*2) 25 ppm TWA 123 mg/m <sup>3</sup> TWA
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	Not determined	Not determined	Not determined
D-Glucopyranose, oligomeric, C8-10 glycosides	Not determined	Not determined	Not determined
Orange, sweet, extract	Not determined	Not determined	Not determined

**Derived No Effect Level (DNEL)**

**Short term exposure local effects**

<b>2-Butoxyethanol</b>	
Inhalation	246 mg/m <sup>3</sup>
<b>Orange, sweet, extract</b>	
Dermal	185.8 µg/cm <sup>2</sup>

**Short term exposure systemic effects**

<b>2-Butoxyethanol</b>	
Dermal	89 mg/kg
Inhalation	1091 mg/m <sup>3</sup>

**Long term exposure systemic effects**

<b>2-Butoxyethanol</b>	
Dermal	125 mg/kg
Inhalation	98 mg/m <sup>3</sup>
<b>D-Glucopyranose, oligomeric, C8-10 glycosides</b>	
Dermal	595000 mg/kg
Inhalation	420 mg/m <sup>3</sup>
<b>Orange, sweet, extract</b>	
Dermal	8.89 mg/kg
Inhalation	31.1 mg/kg

**Predicted No Effect Concentration (PNEC)**

<b>2-Butoxyethanol</b>	
Fresh Water	8.8 mg/l
Sea Water	0.88 mg/l
Freshwater sediment	34.6 mg/kg
Sea sediment	3.46 mg/kg
Soil	2.33 mg/kg
Impact on sewage treatment	463 mg/l
Intermittent release	9.1 mg/l
<b>D-Glucopyranose, oligomeric, C8-10 glycosides</b>	
Fresh Water	0.176 mg/L
Sea Water	0.018 mg/L
Freshwater sediment	1.516 mg/kg
Sea sediment	0.152 mg/kg
Soil	0.654 mg/kg
Impact on sewage treatment	560 mg/L
Intermittent release	0.27 mg/L
<b>Orange, sweet, extract</b>	
Fresh Water	5.4 µg/L
Sea Water	0.54 µg/L
Freshwater sediment	1.3 mg/kg
Sea sediment	0.13 mg/kg
Soil	0.261 mg/kg
Impact on sewage treatment	2.1 mg/L
Intermittent release	5.77 µg/L

**8.2 Exposure controls**

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

**Engineering Controls**

Ensure adequate ventilation. Provide mechanical general and/or local exhaust ventilation to prevent release of vapor or mist into work environment.

**Personal protective equipment**

- Eye protection** Use eye protection according to EN 166, designed to protect against liquid splashes. Safety glasses with side-shields. Tightly fitting safety goggles.
- Hand protection** Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Nitrile Neoprene  
Break through time >480 minutes  
Glove thickness >=0.4 mm  
Be aware that liquid may penetrate the gloves. Frequent change is advisable.
- Respiratory protection** When workers are facing concentrations above the exposure limit they must use appropriate certified respirators, Respirator with a vapor filter (EN 141), Use respirator with organic vapor protection (A, brown), At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
- Skin and body protection** Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.

**Hygiene Measures**

Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.



**8.2.3 Environmental exposure controls**

**Environmental exposure** Use appropriate containment to avoid environmental contamination See section 6 for more information

**9. Physical and Chemical Properties**

**9.1 Information on basic physical and chemical properties**

**Physical state** Liquid  
**Appearance** No information available  
**Odour** Solvent  
**Colour** Yellow  
**Odour threshold** Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
pH	4.5 - 6.0	
pH @ dilution	No information available	
Melting / freezing point	No information available	

<b>Boiling point/range</b>	No information available	
<b>Flash point</b>	> 105 °C / > 221 °F	
<b>Evaporation rate</b>	No information available	
<b>Flammability (solid, gas)</b>	Not applicable	
<b>Flammability Limit in Air</b>		
<b>Upper flammability limit</b>	Not applicable	
<b>Lower flammability limit</b>	Not applicable	
<b>Vapour pressure</b>	No information available	
<b>Vapour density</b>	No information available	
<b>Specific gravity</b>	No information available	
<b>Bulk density</b>	No information available	
<b>Relative density</b>	0.915 - 0.935	@ 20 °C.
<b>Water solubility</b>	Soluble in water	
<b>Solubility in other solvents</b>	No information available	
<b>Autoignition temperature</b>	No information available	
<b>Decomposition temperature</b>	No information available	
<b>Kinematic viscosity</b>	No information available	
<b>Dynamic viscosity</b>	700-1100 cP	@ 25 °C
<b>log Pow</b>	Not determined	

<b>Explosive properties</b>	Not applicable
<b>Oxidising properties</b>	None known

**9.2 Other information**

<b>Pour point</b>	No information available
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	None
<b>Density</b>	No information available

**Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

**10. Stability and Reactivity**

**10.1 Reactivity**

No specific reactivity hazards associated with this product.

**10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerisation**

Hazardous polymerisation does not occur.

**10.4 Conditions to avoid**

Avoid contact with heat, sparks, open flame, and static discharge.

**10.5 Incompatible materials**

Strong alkalies. Strong oxidising agents.

**10.6 Hazardous decomposition products**

See Section 5.2.

**11. Toxicological Information**

**11.1 Information on toxicological effects**

**Acute toxicity**

<b>Inhalation</b>	Vapors may irritate throat and respiratory system. May cause additional affects as listed under "Ingestion".
<b>Eye contact</b>	Causes serious eye damage.
<b>Skin contact</b>	Causes skin irritation. Repeated exposure may cause skin dryness or cracking. Components of the product may be absorbed into the body through the skin.
<b>Ingestion</b>	May be fatal if swallowed and enters airways.
<b>Unknown acute toxicity</b>	Not applicable.

**Toxicology data for the components**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
2-Butoxyethanol	1200 mg/kg (Guinea pigs)	> 2000 mg/kg (Rat)	400 ppm ( Rabbit)
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	> 5000 mg/kg (Rat)	> 2000 mg/kg ( Rabbit )	> 5.2 mg/L ( Rat ) 4 h
D-Glucopyranose, oligomeric, C8-10 glycosides	> 2000 mg/kg bw (Rat) ECHA Data	> 2000 mg/kg (Rabbit) ECHA Data	No data available
Orange, sweet, extract	No data available	No data available	No data available

<b>Sensitisation</b>	Repeated or prolonged contact may cause allergic reactions in very susceptible persons.
<b>Mutagenic effects</b>	This product does not contain any known or suspected mutagens.
<b>Carcinogenicity</b>	This product does not contain any known or suspected carcinogens.
<b>Reproductive toxicity</b>	This product does not contain any known or suspected reproductive hazards.
<b>Routes of exposure</b>	Ingestion. Eye contact. Skin contact.
<b>Routes of entry</b>	Skin absorption.
<b>Specific target organ toxicity - Single exposure</b>	Not classified
<b>Specific target organ toxicity - Repeated exposure</b>	Not classified.
<b>Aspiration hazard</b>	May be fatal if swallowed and enters airways.

**Other information**

Key literature references and sources for data. See Section 16 for more information.

**12. Ecological Information**

**12.1 Toxicity**

This product contains an ingredient that is classified, according to European regulations, as "harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment" However, at the concentration present, this preparation is not expected to present significant adverse environmental effects

**Toxicity to algae**

See component information below.

**Toxicity to fish**

See component information below.

**Toxicity to daphnia and other aquatic invertebrates**

See component information below.

**Toxicology data for the components**

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
2-Butoxyethanol	= 2950 mg/L LC50 Lepomis macrochirus 96 h = 1490 mg/L LC50 Lepomis macrochirus 96 h	No information available	= 1698 - 1940 mg/L (LC50; Daphnia magna) = 1720 mg/L (EC50; water flea)
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	LC50 (Oncorhynchus mykiss (rainbow trout)): 2 - 5 mg/l Exposure time: 96 h Test Type: semi-static test Test substance: WAF Method: OECD Test Guideline 203 Remarks: Information given is based on data obtained from similar substances.	EL50 (Pseudokirchneriella subcapitata (green algae)): > 1 - 3 mg/l Exposure time: 72 h Test Type: static test Test substance: WAF Method: OECD Test Guideline 201 Remarks: Information given is based on data obtained from similar substances.	EL50 (Water flea (Daphnia magna)): 1,4 mg/l Exposure time: 48 h Test Type: static test Test substance: WAF Method: OECD Test Guideline 202 Remarks: Information given is based on data obtained from similar substances.
D-Glucopyranose, oligomeric, C8-10 glycosides	170 mg/l LC50 Zebra fish	37 mg/L (= 21 mg a.i./L) EC50 to the freshwater algae Scenedesmus subspicatus 72h	> 100 mg/l EC50 Daphnia magna 48h
Orange, sweet, extract	> 1000 mg/l (Scophthalmus Maximus), 96h	No information available	451 mg/l (Acartia Tonsa), 48h

**12.2 Persistence and degradability**

No product level data available. See component information below.

Chemical Name	Persistence and degradability
2-Butoxyethanol	Readily biodegradable
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	Inherently biodegradable OECD 301F : 58.6% Duration 28 days
D-Glucopyranose, oligomeric, C8-10 glycosides	OECD 301 Readily biodegradable

**12.3 Bioaccumulative potential**

Bioaccumulative potential. See component information below.

Chemical Name	Bioaccumulation
2-Butoxyethanol	Not likely to bioaccumulate
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	Does not bioaccumulate
D-Glucopyranose, oligomeric, C8-10 glycosides	Not likely to bioaccumulate

#### **12.4 Mobility**

##### **Mobility**

Soluble in water. See component information below.

Chemical Name	Mobility
2-Butoxyethanol	Soluble in water
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	Insoluble in water
D-Glucopyranose, oligomeric, C8-10 glycosides	Partially soluble

##### **Mobility in soil**

See component information below.

Chemical Name	Mobility in soil
2-Butoxyethanol	No information available
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	No information available
D-Glucopyranose, oligomeric, C8-10 glycosides	No information available

#### **12.5 Results of PBT and vPvB assessment**

Not classified as PBT/vPvB by current EU criteria.

#### **12.6 Other adverse effects.**

None known.

#### **12.7 Other information**

Key literature references and sources for data. See Section 16 for more information.

## **13. Disposal Considerations**

### **13.1 Waste treatment methods**

---

<b>Waste from residues/unused products</b>	Dispose of in accordance with local regulations.
<b>Contaminated packaging</b>	Empty containers should be taken to an approved waste handling site for recycling or disposal.
<b>EWC Waste Disposal No</b>	According to the European Waste Catalogue, Waste Codes are not product specific, but application specific Waste codes should be assigned by the user based on the application for which the product was used The following Waste Codes are only suggestions: EWC waste disposal No: 07 01 04 Waste Code: 7152 Organic waste without halogen.

## 14. Transport information

### 14.1. UN number

Not regulated

### 14.2. UN proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

### 14.3. Hazard class(es)

ADR/RID/ADN/ADG Hazard class Not regulated

IMDG Hazard class Not regulated

ICAO Hazard class/division Not regulated

### 14.4 Packing group

ADR/RID/ADN/ADG Packing Group Not regulated

IMDG Packing group Not regulated

ICAO Packing group Not regulated

### 14.5 Environmental hazard

No

### 14.6 Special precautions

Not applicable

### 14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code

Please contact SDS@slb.com for info regarding transport in Bulk.

## 15. Regulatory Information

### 15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

Commission Regulation (EU) 2015/830 of 28 May 2015 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC, 2000/21/EC and 453/2010 including amendments.

This safety data sheet complies with the requirements of Regulation (EC) No. 1272/2008.

Dutch Mining Regulations: In accordance with Mining Regulations 9.2 and Chapter 4 of the Working Conditions Decree.

#### International inventories

USA, Toxic Substances Control Act inventory (TSCA)	Does not comply
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Inventory - Japan - Existing and New Chemicals list	Does not comply
China (IECSC)	Complies
Australia (AICS)	Complies
Korea (KECL)	Complies
Inventory - New Zealand - Inventory of Chemicals (NZIoC)	Complies

#### Europe - REACH

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

CAS Number 64742-47-8 can be used to identify the substance given a list number in section 3 in areas not subject to the REACH regulation.

### 15.2 Chemical Safety Report

No information available

## 16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	27/Apr/2017
Revision date	01/Dec/2018

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**Version** 5

**This SDS has been revised in the following section(s)** 1, 2, 8, 11, 12, 15, 16 No changes with regard to classification have been made.

**Key literature references and sources for data**

www.ChemADVISOR.com

Supplier

National Chemical Inventories

National regulatory information

National occupational exposure limits

**Training Advice**

Do not handle until all safety precautions have been read and understood

Follow general hygiene considerations recognised as common good workplace practices

**Full text of H-Statements referred to under sections 2 and 3**

H304 - May be fatal if swallowed and enters airways

H315 - Causes skin irritation

H318 - Causes serious eye damage

H226 - Flammable liquid and vapour

H302 - Harmful if swallowed

H312 - Harmful in contact with skin

H317 - May cause an allergic skin reaction

H319 - Causes serious eye irritation

H332 - Harmful if inhaled

H411 - Toxic to aquatic life with long lasting effects

EUH066 - Repeated exposure may cause skin dryness or cracking

\*A mark of M-I L.L.C., a Schlumberger Company

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Safety data sheet number PID150  
Version 7  
Revision date 20/Apr/2016  
Supercedes date 07/Apr/2015



## Safety Data Sheet DEFOAM\*-A

### 1. Identification of the substance/preparation and of the Company/undertaking

#### 1.1 Product identifier

Product name DEFOAM\*-A  
Product code PID150

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended use Defoamer  
Uses advised against Consumer use

#### 1.3 Details of the supplier of the safety data sheet

**Supplier**  
M-I Drilling Fluids UK Limited  
C/O Schlumberger  
Enterprise Drive  
Westhill Industrial Estate  
Westhill, AB32 6TQ  
Scotland UK  
+47 51577424

MISDS@slb.com

#### 1.4 Emergency Telephone Number

**Emergency telephone** - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

### 2. Hazards identification

#### 2.1 Classification of the substance or mixture

Regulation (EC) No. 1272/2008

##### Health hazards

Serious eye damage/eye irritation	Category 2
-----------------------------------	------------

Environmental hazards Not classified

Physical Hazards Not classified

#### 2.2 Label Elements



**Signal word**  
WARNING

**Hazard statements**

H319 - Causes serious eye irritation

**Precautionary Statements - EU (§28, 1272/2008)**

P264 - Wash face, hands and any exposed skin thoroughly after handling

P280 - Wear protective gloves/ protective clothing/ eye protection/ face protection

P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing

P337 + P313 - If eye irritation persists: Get medical advice/ attention

P501 - Dispose of contents/container in accordance with local regulations.

-

-

**Contains**

2,2,4-trimethylpentane-1,3-diol

**2.3 Other data**

Not classified as PBT/vPvB by current EU criteria

**Australian statement of hazardous/dangerous nature**

Classified as Hazardous according to the criteria of NOHSC.

HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

**3. Composition/information on ingredients**

**3.1 Substances**

Not Applicable

**3.2 Mixtures**

Component	EC-No.	CAS-No	Weight % - range	Classification (67/548)	Classification (Reg. 1272/2008)	REACH registration number
2,2,4-trimethylpentane-1,3-diol	205-619-1	144-19-4	10-30	Xi; R36	Eye Irrit. 2 (H319)	No data available

#### Comments

The product contains other ingredients which do not contribute to the overall classification.

## 4. First aid measures

### 4.1 First Aid

<b>Inhalation</b>	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
<b>Ingestion</b>	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.
<b>Skin contact</b>	Wash off immediately with soap and plenty of water removing all contaminated clothes and shoes. Get medical attention if irritation persists.
<b>Eye contact</b>	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

### 4.2 Most important symptoms and effects, both acute and delayed

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

#### Main symptoms

<b>Inhalation</b>	Please see Section 11. Toxicological Information for further information.
<b>Ingestion</b>	Please see Section 11. Toxicological Information for further information.
<b>Skin contact</b>	Please see Section 11. Toxicological Information for further information.
<b>Eye contact</b>	Please see Section 11. Toxicological Information for further information.

### 4.3 Indication of any immediate medical attention and special treatment needed

**Notes to physician** Treat symptomatically.

## 5. Fire-fighting measures

### 5.1 Extinguishing media

#### Suitable extinguishing media

Use extinguishing media appropriate for surrounding material.

#### Extinguishing media which shall not be used for safety reasons

None known.

### 5.2 Special hazards arising from the substance or mixture

#### Unusual fire and explosion hazards

None known.

**Hazardous combustion products**

Thermal decomposition can lead to release of irritating gases and vapours.

**5.3 Advice for firefighters**

**Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

**Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

## 6. Accidental release measures

**6.1 Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. See also section 8.

**6.2 Environmental precautions**

The product should not be allowed to enter drains, water courses or the soil.

**Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

**6.3 Methods and materials for containment and cleaning up**

**Methods for Containment**

Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

**Methods for cleaning up**

Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

**6.4 Reference to other sections**

See section 13 for more information.

## 7. Handling and storage

**7.1 Precautions for safe handling**

**Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

**Hygiene measures**

Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product. Remove contaminated clothing.

**7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions**      Ensure adequate ventilation.

**Storage precautions** Keep containers tightly closed in a dry, cool and well-ventilated place. Avoid contact with:  
 Strong oxidising agents

**Storage class** Chemical storage.

**Packaging material** Use specially constructed containers only

**7.3 Specific end uses**

See Section 1.2.

**8. Exposure controls/personal protection**

**8.1 Control parameters**

**Exposure limits** Contains no substances with occupational exposure limit values  
 No biological limit allocated

Component	EU OEL - Third List	Austria	Australia	Denmark
2,2,4-trimethylpentane-1,3-diol	Not determined	Not determined	Not determined	Not determined

Component	Malaysia	France	Germany	Hungary
2,2,4-trimethylpentane-1,3-diol	Not determined	Not determined	Not determined	Not determined

Component	New Zealand	Italy	Netherlands	Norway
2,2,4-trimethylpentane-1,3-diol	Not Determined	Not determined	Not determined	Not determined

Component	Poland	Portugal	Romania	Russia
2,2,4-trimethylpentane-1,3-diol	Not determined	Not determined	Not determined	Not determined

Component	Spain	Switzerland	Turkey	UK
2,2,4-trimethylpentane-1,3-diol	Not determined	Not determined	Not determined	Not determined

**8.2 Exposure controls**

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard

present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

**Engineering measures to reduce exposure**

Ensure adequate ventilation. Mechanical ventilation or local exhaust ventilation is required.

**Personal protective equipment**

- Eye protection** Safety glasses with side-shields. Tightly fitting safety goggles.
- Hand protection** Use protective gloves made of., Nitrile, Neoprene, Be aware that liquid may penetrate the gloves. Frequent change is advisable.
- Respiratory protection** No personal respiratory protective equipment normally required, In case of insufficient ventilation wear suitable respiratory equipment, Use respirator with organic vapor protection (A, brown), At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
- Skin and body protection** Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.

**Hygiene measures**

Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.



**9. Physical and chemical properties**

**9.1 Information on basic physical and chemical properties**

<b>Physical state</b>	Liquid
<b>Appearance</b>	No information available
<b>Odour</b>	Slight
<b>Colour</b>	Colourless
<b>Odor threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
pH	No information available	
pH @ dilution		
Melting/freezing point	-50 °C / -58 °F	
Boiling point/range	255 °C / 491 °F	
Flash Point	110 °C / 230 °F	
Evaporation rate	No information available	
Flammability (solid, gas)	Not Applicable	
Flammability Limits in Air		
Upper flammability Limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	No information available	
Bulk density	No information available	
Relative density	0.95 sg	@ 20 °C.

<b>Water solubility</b>	Insoluble in water
<b>Solubility in other solvents</b>	No information available
<b>Autoignition temperature</b>	No information available
<b>Decomposition temperature</b>	No information available
<b>Kinematic viscosity</b>	No information available
<b>Viscosity, dynamic</b>	No information available
<b>Log Pow</b>	Not determined

<b>Explosive properties</b>	Not Applicable
<b>Oxidizing properties</b>	None known.

#### **9.2 Other information**

<b>Pour point</b>	No information available
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	None
<b>Density VALUE</b>	No information available

## **10. Stability and reactivity**

### **10.1 Reactivity**

No specific reactivity hazards associated with this product.

### **10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

### **10.3 Possibility of Hazardous Reactions**

#### **Hazardous polymerization**

Hazardous polymerisation does not occur.

### **10.4 Conditions to avoid**

None known.

### **10.5 Incompatible materials**

Strong oxidising agents.

### **10.6 Hazardous decomposition products**

See Section 5.2.

## **11. Toxicological information**

### **11.1 Information on toxicological effects**

#### **Acute toxicity**

**Inhalation** Inhalation of vapours in high concentration may cause irritation of respiratory system.

**Eye contact** Causes serious eye irritation.

**Skin contact** Prolonged contact may cause redness and irritation.  
**Ingestion** Ingestion may cause stomach discomfort.  
**Unknown acute toxicity** Not Applicable.

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
2,2,4-trimethylpentane-1,3-diol	= 2 g/kg ( Rat )	= 6300 µL/kg ( Rabbit )	No data available

**Sensitisation** This product does not contain any components suspected to be sensitizing.  
**Mutagenic effects** This product does not contain any known or suspected mutagens.  
**Carcinogenicity** This product does not contain any known or suspected carcinogens.

**Reproductive toxicity** This product does not contain any known or suspected reproductive hazards.  
**Routes of exposure** Eye contact.  
**Routes of entry** No route of entry noted.  
**Specific target organ toxicity (single exposure)** Not classified  
**Specific target organ toxicity (repeated exposure)** Not classified.  
**Aspiration hazard** Not Applicable.

## 12. Ecological information

### 12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

**Toxicity to algae**  
 See component information below.

**Toxicity to fish**  
 See component information below.

**Toxicity to daphnia and other aquatic invertebrates**  
 See component information below.

Component	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
2,2,4-trimethylpentane-1,3-diol	Fish LC50 > 700 mg/l - Duration h: 96 - Notes: Literature data.	Algae EC50 > 100 mg/l - Duration h: 72 - Notes: Literature data	Daphnia magna EC50 > 100 mg/l - Duration h: 48 - Notes: Literature data.

**12.2 Persistence and degradability**

No product level data available.

**12.3 Bioaccumulative potential**

No product level data available.

**12.4 Mobility in soil**

**Mobility**

Insoluble in water.

**12.5 Results of PBT and vPvB assessment**

Not classified as PBT/vPvB by current EU criteria.

**12.6 Other adverse effects.**

None known.

**13. Disposal considerations**

**13.1 Waste treatment methods**

**Waste from residues / unused products**

Dispose of in accordance with local regulations.

**Contaminated packaging**

Empty containers should be transported/delivered using a registered waste carrier for local recycling or waste disposal.

**EWC waste disposal No.**

According to the European Waste Catalogue, Waste Codes are not product specific, but application specific. Waste codes should be assigned by the user based on the application for which the product was used. The following Waste Codes are only suggestions: EWC waste disposal No: 07 01 04

## 14. Transport information

### 14.1 UN number

Not regulated

### 14.2 Proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

### 14.3. Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG Hazard class	Not regulated
ICAO Hazard class/division	Not regulated

### 14.4 Packing group

ADR/RID/ADN/ADG Packing Group	Not regulated
IMDG Packing group	Not regulated
ICAO Packing group	Not regulated

### 14.5 Environmental hazard

No

### 14.6 Special precautions

Not Applicable

### Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Please contact MISDS@slb.com for info regarding transport in Bulk.

## 15. Regulatory information

### 15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

#### **Australian Standard for the Uniform Scheduling of Drugs and Poisons**

No Poisons Schedule number allocated

**New Zealand hazard classification** Classified

**HSNO approval no.** HSR002503

**Group number** 6.3A

Commission Regulation (EU) No 453/2010 of 20 May 2010 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH). Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC, including amendments.

This safety data sheet complies with the requirements of Regulation (EC) No. 1272/2008.

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as Dangerous Goods by the criteria of the Australian Dangerous Goods Code (ADG Code) for transport by road or rail.

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)

The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP) International inventories

USA, Toxic Substances Control Act inventory (TSCA)	Complies
European Union - EINECS and ELINCS	Complies
Canada, Domestic Substance List (DSL)	Complies
Philippines (PICCS)	Complies
Inventory - Japan - Existing and New Chemicals list	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korea (KECL)	Complies
Inventory - New Zealand - Inventory of Chemicals (NZIoC)	Complies

Contact REACH@miswaco.slb.com for REACH information.

### 15.2 Chemical Safety Report

No information available

## 16. Other information

<b>Prepared by</b>	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
<b>Supersedes date</b>	07/Apr/2015
<b>Revision date</b>	20/Apr/2016
<b>Version</b>	7
<b>The following sections have been revised:</b>	2,, 5,, 8,, 9,, 12,, 13,, 14,, No changes with regard to classification have been made.

**Text of R phrases mentioned in Section 3**

R36 - Irritating to eyes

**Full text of H-Statements referred to under sections 2 and 3**

H319 - Causes serious eye irritation

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**Disclaimer**

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## Safety Data Sheet DUO-TEC\* NS

### 1. Identification of the Substance/Preparation and of the Company/Undertaking

#### 1.1 Product identifier

**Product name** DUO-TEC\* NS  
**Product code** PID2113  
**REACH Registration Name** Exempt

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Viscosifier.

**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

##### Supplier

M-I Drilling Fluids UK Limited  
Westhill Business Park  
Westhill AB32 6JL Aberdeenshire  
Scotland United Kingdom

+47 51577424

SDS@slb.com

#### 1.4 Emergency Telephone Number

**Emergency telephone** - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

<b>Denmark</b>	Poison Control Hotline (DK): +45 82 12 12 12
<b>Germany</b>	+49 69 222 25285
<b>Norway</b>	Poison information centre: +47 22 59 13 00

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP]

**Health hazards** Not classified

**Environmental hazards** Not classified

**Physical Hazards** Not classified

## 2.2 Label elements

### Signal word

None

### Hazard Statements

This product is not classified as hazardous therefore no (H) hazard statements assigned.

### Precautionary Statements - EU (§28, 1272/2008)

This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

### Contains

## 2.3 Other hazards

Suspended dust may present a dust explosion hazard  
Not classified as PBT/vPvB by current EU criteria

## **3. Composition/information on Ingredients**

### 3.1 Substances

No classified ingredients, or those having occupational exposure limits, present above the level of disclosure.

### 3.2 Mixtures

Not applicable

## **4. First Aid Measures**

### 4.1 First aid measures

#### **Inhalation**

If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

#### **Ingestion**

Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

#### **Skin contact**

Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

#### **Eye Contact**

Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if any discomfort continues.

### 4.2. Most important symptoms and effects, both acute and delayed

#### **General advice**

The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to

hospital as soon as possible.

**Symptoms**

**Inhalation** Please see Section 11. Toxicological Information for further information.

**Ingestion** Please see Section 11. Toxicological Information for further information.

**Skin contact** Please see Section 11. Toxicological Information for further information.

**Eye contact** Please see Section 11. Toxicological Information for further information.

**4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician** Treat symptomatically.

**5. Firefighting Measures**

**5.1 Extinguishing media**

**Suitable extinguishing media**

Use extinguishing media appropriate for surrounding material.

**Extinguishing media which must not be used for safety reasons**

None known.

**5.2. Special hazards arising from the substance or mixture**

**Unusual fire and explosion hazards**

Dust may form explosive mixture in air.

**Hazardous combustion products**

Fire or high temperatures create: Carbon oxides (CO<sub>x</sub>).

**5.3 Advice for firefighters**

**Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

**Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

**6. Accidental Release Measures**

**6.1. Personal precautions, protective equipment and emergency procedures**

Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. Use personal protective equipment. See also section 8. Material becomes slippery when wet. Use caution if wet.

**6.2 Environmental precautions**

The product should not be allowed to enter drains, water courses or the soil.

**Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

**6.3 Methods and material for containment and cleaning up**

**Methods for containment**

Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimise spreading.

**Methods for cleaning up**

Take precautionary measures against static discharges. Sweep up and shovel into suitable containers for disposal. Avoid dust formation. After cleaning, flush away traces with water.

**6.4 Reference to other sections**

See section 13 for more information.

**7. Handling and Storage**

**7.1 Precautions for safe handling**

**Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Material becomes slippery when wet. Use caution if wet.

**Hygiene Measures**

Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product. Remove contaminated clothing.

**7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions** Ensure adequate ventilation. Take precautionary measures against static discharges. Keep airborne concentrations below exposure limits.

**Storage precautions** Keep containers tightly closed in a dry, cool and well-ventilated place. Suspended dust may present a dust explosion hazard. Protect from moisture. Avoid heat, flames and other sources of ignition. Avoid contact with: Strong oxidising agents.

**Storage class** Chemical storage.

**Storage class, TRGS 510, Germany** LGK11 - Combustible solids

**Packaging materials** Use specially constructed containers only

**7.3 Specific end uses**

See Section 1.2.

**8. Exposure Controls/Personal Protection**

**8.1 Control parameters**

**Exposure Limits** NUI = Nuisance dust, TWA 4mg/m<sup>3</sup> Respirable Dust, 10mg/m<sup>3</sup> Total Dust.

## 8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

### Engineering Controls

Ensure adequate ventilation. Mechanical ventilation or local exhaust ventilation is required.

### Personal protective equipment

<b>Eye protection</b>	Use eye protection according to EN 166, designed to protect against powders and dusts. Tightly fitting safety goggles. Safety glasses with side-shields.
<b>Hand protection</b>	Wear gloves according to EN 374 to protect against skin effects from powders Use protective gloves made of: Nitrile Neoprene Frequent change is advisable
<b>Respiratory protection</b>	No personal respiratory protective equipment normally required, In case of insufficient ventilation wear suitable respiratory equipment, Half mask with a particle filter P2 (BS EN 143), At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
<b>Skin and body protection</b>	Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.

### Hygiene Measures

Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.



### 8.2.3 Environmental exposure controls

<b>Environmental exposure</b>	Use appropriate containment to avoid environmental contamination See section 6 for more information
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## 9. Physical and Chemical Properties

### 9.1 Information on basic physical and chemical properties

<b>Physical state</b>	Solid
<b>Appearance</b>	Powder Dust
<b>Odour</b>	Slight
<b>Colour</b>	Cream - Tan
<b>Odour threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
pH	No information available	
pH @ dilution	No information available	
Melting / freezing point	No information available	

<b>Boiling point/range</b>	No information available	
<b>Flash point</b>	No information available	
<b>Evaporation rate</b>	No information available	
<b>Flammability (solid, gas)</b>	Not applicable	
<b>Flammability Limit in Air</b>		
<b>Upper flammability limit</b>	Not applicable	
<b>Lower flammability limit</b>	Not applicable	
<b>Vapour pressure</b>	No information available	
<b>Vapour density</b>	No information available	
<b>Specific gravity</b>	1.5	20 °C
<b>Bulk density</b>	50 lb/ft <sup>3</sup> (800 kg/m <sup>3</sup> )	
<b>Relative density</b>	No information available	
<b>Water solubility</b>	Soluble in water	
<b>Solubility in other solvents</b>	No information available	
<b>Autoignition temperature</b>	No information available	
<b>Decomposition temperature</b>	No information available	
<b>Kinematic viscosity</b>	No information available	
<b>Dynamic viscosity</b>	No information available	
<b>log Pow</b>	No information available	
<b>Explosive properties</b>	Suspended dust may present a dust explosion hazard	
<b>Oxidising properties</b>	None known	

**9.2 Other information**

<b>Pour point</b>	No information available
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	None
<b>Density</b>	No information available

**Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

**10. Stability and Reactivity**

**10.1 Reactivity**

Dust may form explosive mixture in air.

**10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerisation**

Hazardous polymerisation does not occur.

**10.4 Conditions to avoid**

Avoid heat, flames and other sources of ignition. Take precautionary measures against static charges. Protect from moisture. Avoid dust formation.

**10.5 Incompatible materials**

Strong oxidising agents.

#### **10.6 Hazardous decomposition products**

See Section 5.2.

## **11. Toxicological Information**

### **11.1 Information on toxicological effects**

#### **Acute toxicity**

<b>Inhalation</b>	Inhalation of dust in high concentration may cause irritation of respiratory system.
<b>Eye contact</b>	Dust may cause mechanical irritation.
<b>Skin contact</b>	Prolonged contact may cause redness and irritation.
<b>Ingestion</b>	Ingestion may cause stomach discomfort.
<b>Unknown acute toxicity</b>	Not applicable.

**Sensitisation** This product does not contain any components suspected to be sensitizing.

**Mutagenic effects** This product does not contain any known or suspected mutagens.

**Carcinogenicity** This product does not contain any known or suspected carcinogens.

**Reproductive toxicity** This product does not contain any known or suspected reproductive hazards.

**Routes of exposure** Inhalation.

**Routes of entry** Inhalation.

**Specific target organ toxicity -  
Single exposure** Not classified

**Specific target organ toxicity -  
Repeated exposure** Not classified.

**Aspiration hazard** Not applicable.

**Other information** Key literature references and sources for data. See Section 16 for more information.

## **12. Ecological Information**

### **12.1 Toxicity**

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.  
Listed on PLONOR list of OSPAR

**Toxicity to algae**

This product is not considered toxic to algae.

**Toxicity to fish**

This product is not considered toxic to fish.

**Toxicity to daphnia and other aquatic invertebrates**

This product is not considered toxic to invertebrates.

**12.2 Persistence and degradability**

Product is biodegradable.

**12.3 Bioaccumulative potential**

Does not bioaccumulate.

**12.4 Mobility**

**Mobility**

Soluble in water.

**Mobility in soil**

No information available.

**12.5 Results of PBT and vPvB assessment**

Not classified as PBT/vPvB by current EU criteria.

**12.6 Other adverse effects.**

None known.

**12.7 Other information**

Key literature references and sources for data. See Section 16 for more information.

---

## 13. Disposal Considerations

### 13.1 Waste treatment methods

<b>Waste from residues / unused products</b>	Dispose of in accordance with local regulations.
<b>Contaminated packaging</b>	Empty containers should be taken to an approved waste handling site for recycling or disposal.
<b>EWC Waste Disposal No</b>	According to the European Waste Catalogue, Waste Codes are not product specific, but application specific Waste codes should be assigned by the user based on the application for which the product was used The following Waste Codes are only suggestions: EWC waste disposal No: 07 01 99.

## 14. Transport information

### 14.1. UN number

Not regulated

### 14.2. UN proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

### 14.3. Hazard class(es)

<b>ADR/RID/ADN/ADG Hazard class</b>	Not regulated
<b>IMDG Hazard class</b>	Not regulated
<b>ICAO Hazard class/division</b>	Not regulated

### 14.4 Packing group

<b>ADR/RID/ADN/ADG Packing Group</b>	Not regulated
<b>IMDG Packing group</b>	Not regulated
<b>ICAO Packing group</b>	Not regulated

### 14.5 Environmental hazard

No

### 14.6 Special precautions

Not applicable

### 14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code

Please contact SDS@slb.com for info regarding transport in Bulk.

## 15. Regulatory Information

### 15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

**Germany, Water Endangering Classes (VwVwS)** Water endangering class = 1

**Technical Rules for Hazardous Substances (TRGS)** TRGS 220 National aspects when compiling safety data sheets  
TRGS 510 Storage of hazardous substances in non stationary containers  
TRGS 900 Occupational exposure limits

#### Germany

Regulations governing systems for handling substances hazardous to waters  
Hazardous substances ordinance

Commission Regulation (EU) No 453/2010 of 20 May 2010 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH). Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC, including amendments.

This safety data sheet complies with the requirements of Regulation (EC) No. 1272/2008.

#### International inventories

USA, Toxic Substances Control Act inventory (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Inventory - Japan - Existing and New Chemicals list	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korea (KECL)	Complies
Inventory - New Zealand - Inventory of Chemicals (NZIoC)	Complies

#### Europe - REACH

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

Denmark Pr. no. 1404868

### 15.2 Chemical Safety Report

No information available

## 16. Other Information

Prepared by Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse

**Supersedes Date:** 24/Feb/2015

**Revision date** 13/Mar/2018

**Version** 4

**This SDS has been revised in the following section(s)** All sections Product Code change No changes with regard to classification have been made.

**Key literature references and sources for data**

www.ChemADVISOR.com

Supplier

National Chemical Inventories

National regulatory information

National occupational exposure limits

**Training Advice**

Do not handle until all safety precautions have been read and understood It is a good industrial hygiene practice to minimise skin contact

**Full text of H-Statements referred to under sections 2 and 3**

This product is not classified as hazardous therefore no (H) hazard statements assigned.

\*A mark of M-I L.L.C., a Schlumberger Company

**Disclaimer**

The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

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## SAFETY DATA SHEET

### SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

#### PRODUCT

**Product Name:** ESCAID™ 110 FLUID

**Product Description:** Dearomatised Hydrocarbons

**Recommended Use:** Drilling muds, oil-based

#### COMPANY IDENTIFICATION

**Supplier:** ESSO (THAILAND) PUBLIC COMPANY LIMITED  
3195/17-29 RAMA IV ROAD  
KLONG TON, KLONG TOEY  
BANGKOK 10110 Thailand

**24 Hour Environmental / Health Emergency Telephone** 001-800-13-203-9987

**Supplier General Contact** +662 120 8609 / 1800 010 152 (local toll free)

### SECTION 2 HAZARDS IDENTIFICATION

This material is hazardous according to regulatory guidelines (see (M)SDS Section 15).

#### CLASSIFICATION:

Flammable liquid: Category 4.

Aspiration toxicant: Category 1.

#### LABEL ELEMENTS:

##### Pictograms:



**Signal Word:** Danger

#### Hazard Statements:

H227: Combustible liquid.

H304: May be fatal if swallowed and enters airways.

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**Precautionary Statements:**

P210: Keep away from flames and hot surfaces. No smoking. P280: Wear protective gloves and eye / face protection.  
 P301 + P310: IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. P331: Do NOT induce vomiting. P370 + P378: In case of fire: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish.  
 P403 + P235: Store in a well-ventilated place. Keep cool. P405: Store locked up.  
 P501: Dispose of contents and container in accordance with local regulations.

**Contains:** DISTILLATES (PETROLEUM), HYDROTREATED LIGHT

**Other hazard information:**

**PHYSICAL / CHEMICAL HAZARDS**

Material can accumulate static charges which may cause an ignition. Material can release vapours that readily form flammable mixtures. Vapour accumulation could flash and/or explode if ignited. Combustible.

**HEALTH HAZARDS**

May be irritating to the eyes, nose, throat, and lungs. Repeated exposure may cause skin dryness or cracking.

**ENVIRONMENTAL HAZARDS**

No significant hazards.

**NOTE:** This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

<b>SECTION 3</b>	<b>COMPOSITION / INFORMATION ON INGREDIENTS</b>
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This material is defined as a complex substance.

**Hazardous Substance(s) or Complex Substance(s) required for disclosure**

Name	CAS#	Concentration *	GHS Hazard Codes
DISTILLATES (PETROLEUM), HYDROTREATED LIGHT	64742-47-8	100 %	H227, H304

\* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume. Concentration values may vary.

<b>SECTION 4</b>	<b>FIRST AID MEASURES</b>
------------------	---------------------------

**INHALATION**

Remove from further exposure. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or use

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mouth-to-mouth resuscitation.

## SKIN CONTACT

Wash contact areas with soap and water. Remove contaminated clothing. Launder contaminated clothing before reuse.

## EYE CONTACT

Flush thoroughly with water. If irritation occurs, get medical assistance.

## INGESTION

Seek immediate medical attention. Do not induce vomiting.

## NOTE TO PHYSICIAN

If ingested, material may be aspirated into the lungs and cause chemical pneumonitis. Treat appropriately.

## SECTION 5 FIRE FIGHTING MEASURES

### EXTINGUISHING MEDIA

**Appropriate Extinguishing Media:** Use water fog, foam, dry chemical or carbon dioxide (CO<sub>2</sub>) to extinguish flames.

**Inappropriate Extinguishing Media:** Straight streams of water

### FIRE FIGHTING

**Fire Fighting Instructions:** Evacuate area. Prevent run-off from fire control or dilution from entering streams, sewers or drinking water supply. Fire-fighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

**Unusual Fire Hazards:** FLAMMABLE. Hazardous material. Firefighters should consider protective equipment indicated in Section 8.

**Hazardous Combustion Products:** Incomplete combustion products, Oxides of carbon, Smoke, Fume

### FLAMMABILITY PROPERTIES

**Flash Point [Method]:**  $\geq 70^{\circ}\text{C}$  (158°F) [ASTM D-93]

**Flammable Limits (Approximate volume % in air):** LEL: 0.6 UEL: 5.0

**Autoignition Temperature:** 251°C (484°F) [Approximate]

## SECTION 6 ACCIDENTAL RELEASE MEASURES

### NOTIFICATION PROCEDURES

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations.

### PROTECTIVE MEASURES

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Avoid contact with spilled material. Warn or evacuate occupants in surrounding and downwind areas if required, due to toxicity or flammability of the material. See Section 5 for fire fighting information. See the Hazard Identification Section for Significant Hazards. See Section 4 for First Aid Advice. See Section 8 for advice on the minimum requirements for personal protective equipment. Additional protective measures may be necessary, depending on the specific circumstances and/or the expert judgment of the emergency responders.

For emergency responders: Respiratory protection: half-face or full-face respirator with filter(s) for organic vapor and, when applicable, H<sub>2</sub>S, or Self Contained Breathing Apparatus (SCBA) can be used depending on the size of spill and potential level of exposure. If the exposure cannot be completely characterized or an oxygen deficient atmosphere is possible or anticipated, SCBA is recommended. Work gloves that are resistant to aromatic hydrocarbons are recommended. Note: gloves made of polyvinyl acetate (PVA) are not water-resistant and are not suitable for emergency use. Chemical goggles are recommended if splashes or contact with eyes is possible. Small spills: normal antistatic work clothes are usually adequate. Large spills: full body suit of chemical resistant, antistatic material is recommended.

## SPILL MANAGEMENT

**Land Spill:** Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Stop leak if you can do so without risk. All equipment used when handling the product must be grounded. Do not touch or walk through spilled material. Prevent entry into waterways, sewer, basements or confined areas. A vapour-suppressing foam may be used to reduce vapour. Use clean non-sparking tools to collect absorbed material. For Small Spills: Absorb with sand or other non-combustible absorbent material and place into containers for later disposal. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Large Spills: Water spray may reduce vapour, but may not prevent ignition in enclosed spaces. Recover by pumping or with suitable absorbent.

**Water Spill:** Stop leak if you can do so without risk. Warn other shipping. Remove from the surface by skimming or with suitable absorbents. Seek the advice of a specialist before using dispersants.

Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

## ENVIRONMENTAL PRECAUTIONS

Large Spills: Dyke far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements or confined areas.

## SECTION 7

## HANDLING AND STORAGE

### HANDLING

Avoid contact with skin. Prevent small spills and leakage to avoid slip hazard. Material can accumulate static charges which may cause an electrical spark (ignition source). When the material is handled in bulk, an electrical spark could ignite any flammable vapors from liquids or residues that may be present (e.g., during switch-loading operations). Use proper bonding and/or earthing procedures. However, bonding and earthing may not eliminate the hazard from static accumulation. Consult local applicable standards for guidance. Additional references include American Petroleum Institute 2003 (Protection Against Ignitions Arising out of Static, Lightning and Stray Currents) or National Fire Protection Agency 77 (Recommended Practice on Static Electricity) or CENELEC CLC/TR 50404 (Electrostatics - Code of practice for the avoidance of hazards due to

static electricity).

**Loading/Unloading Temperature:** [Ambient]

**Transport Temperature:** [Ambient]

**Transport Pressure:** [Ambient]

**Static Accumulator:** This material is a static accumulator. A liquid is typically considered a nonconductive, static accumulator if its conductivity is below 100 pS/m (100x10E-12 Siemens per meter) and is considered a semiconductive, static accumulator if its conductivity is below 10,000 pS/m. Whether a liquid is nonconductive or semiconductive, the precautions are the same. A number of factors, for example liquid temperature, presence of contaminants, anti-static additives and filtration can greatly influence the conductivity of a liquid.

## STORAGE

The type of container used to store the material may affect static accumulation and dissipation. Keep container closed. Handle containers with care. Open slowly in order to control possible pressure release. Store in a cool, well-ventilated area. Storage containers should be earthed and bonded. Fixed storage containers, transfer containers and associated equipment should be grounded and bonded to prevent accumulation of static charge.

**Storage Temperature:** [Ambient]

**Storage Pressure:** [Ambient]

**Suitable Containers/Packing:** Drums; Tank Cars; Tank Trucks; Barges

**Suitable Materials and Coatings (Chemical Compatibility):** Carbon Steel; Stainless Steel; Teflon; Polyethylene; Polypropylene

**Unsuitable Materials and Coatings:** Butyl Rubber; Polystyrene; Ethylene-propylene-diene monomer (EPDM); Natural Rubber

<b>SECTION 8</b>	<b>EXPOSURE CONTROLS / PERSONAL PROTECTION</b>
------------------	--

## EXPOSURE LIMIT VALUES

**Exposure limits/standards (Note: Exposure limits are not additive)**

Substance Name	Form	Limit/Standard			Note	Source
DISTILLATES (PETROLEUM), HYDROTREATED LIGHT	Vapour.	RCP - TWA	1200 mg/m3	165 ppm	Total Hydrocarbo ns	ExxonMobil

NOTE: Limits/standards shown for guidance only. Follow applicable regulations.

## ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:

Adequate ventilation should be provided so that exposure limits are not exceeded. Use explosion-proof ventilation equipment.

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## PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

**Respiratory Protection:** If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:

Half-face filter respirator Type A filter material

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapour warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

**Hand Protection:** Any specific glove information provided is based on published literature and glove manufacturer data. Glove suitability and breakthrough time will differ depending on the specific use conditions. Contact the glove manufacturer for specific advice on glove selection and breakthrough times for your use conditions. Inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:

If prolonged or repeated contact is likely, chemical-resistant gloves are recommended. If contact with forearms is likely, wear gauntlet-style gloves. Nitrile

**Eye Protection:** If contact is likely, safety glasses with side shields are recommended.

**Skin and Body Protection:** Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include:

If prolonged or repeated contact is likely, chemical, and oil resistant clothing is recommended.

**Specific Hygiene Measures:** Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practice good housekeeping.

## ENVIRONMENTAL CONTROLS

Comply with applicable environmental regulations limiting discharge to air, water and soil. Protect the environment by applying appropriate control measures to prevent or limit emissions.

<b>SECTION 9</b>	<b>PHYSICAL AND CHEMICAL PROPERTIES</b>
------------------	---

**Note:** Physical and chemical properties are provided for safety, health and environmental considerations only and may not fully represent product specifications. Contact the Supplier for additional information.

## GENERAL INFORMATION

**Physical State:** Liquid

**Form:** Clear

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**Colour:** Colourless  
**Odour:** Mild Petroleum/Solvent  
**Odour Threshold:** N/D

#### IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION

**Relative Density (at 15.6 °C):** 0.798  
**Density:** 798 kg/m<sup>3</sup> (6.66 lbs/gal, 0.8 kg/dm<sup>3</sup>)  
**Flammability (Solid, Gas):** N/A  
**Flash Point [Method]:** ≥70°C (158°F) [ASTM D-93]  
**Flammable Limits (Approximate volume % in air):** LEL: 0.6 UEL: 5.0  
**Autoignition Temperature:** 251°C (484°F) [Approximate]  
**Boiling Point / Range:** 200°C (392°F) - 250°C (482°F)  
**Decomposition Temperature:** N/D  
**Vapour Density (Air = 1):** 6.2 at 101 kPa  
**Vapour Pressure:** 0.023 kPa (0.17 mm Hg) at 20 °C  
**Evaporation Rate (n-butyl acetate = 1):** 0.1  
**pH:** N/A  
**Log Pow (n-Octanol/Water Partition Coefficient):** N/D  
**Solubility in Water:** Negligible  
**Viscosity:** 1.68 cSt (1.68 mm<sup>2</sup>/sec) at 40°C | 2.16 cSt (2.16 mm<sup>2</sup>/sec) at 25°C  
**Oxidizing Properties:** See Hazards Identification Section.

#### OTHER INFORMATION

**Freezing Point:** N/D  
**Melting Point:** N/D  
**Pour Point:** -39°C (-39°F)  
**Molecular Weight:** 171 [Calculated]  
**Hygroscopic:** No  
**Coefficient of Thermal Expansion:** 0.00074 per Deg C

<b>SECTION 10</b>	<b>STABILITY AND REACTIVITY</b>
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**STABILITY:** Material is stable under normal conditions.

**CONDITIONS TO AVOID:** Avoid heat, sparks, open flames and other ignition sources.

**MATERIALS TO AVOID:** Strong oxidisers

**HAZARDOUS DECOMPOSITION PRODUCTS:** Material does not decompose at ambient temperatures.

**POSSIBILITY OF HAZARDOUS REACTIONS:** Hazardous polymerization will not occur.

<b>SECTION 11</b>	<b>TOXICOLOGICAL INFORMATION</b>
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#### ACUTE TOXICITY

<u>Route of Exposure</u>	<u>Conclusion / Remarks</u>
<b>Inhalation</b>	
Toxicity (Rat): LC50 > 5000 mg/m <sup>3</sup>	Minimally Toxic. Based on test data for structurally similar materials.

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Irritation: No end point data for material.	Negligible hazard at ambient/normal handling temperatures.
<b>Ingestion</b>	
Toxicity (Rat): LD50 > 5000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
<b>Skin</b>	
Toxicity (Rabbit): LD50 > 5000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
Irritation: Data available.	May dry the skin leading to discomfort and dermatitis. Based on test data for structurally similar materials.
<b>Eye</b>	
Irritation: Data available.	May cause mild, short-lasting discomfort to eyes. Based on test data for structurally similar materials.

#### OTHER HEALTH EFFECTS FROM SHORT AND LONG TERM EXPOSURE

Anticipated health effects from sub-chronic, chronic, respiratory or skin sensitization, mutagenicity, reproductive toxicity, carcinogenicity, target organ toxicity (single exposure or repeated exposure), aspiration toxicity and other effects based on human experience and/or experimental data.

##### For the product itself:

Vapour/aerosol concentrations above recommended exposure levels are irritating to the eyes and respiratory tract, may cause headaches, dizziness, anaesthesia, drowsiness, unconsciousness and other central nervous system effects including death. Prolonged and/or repeated skin contact with low viscosity materials may defat the skin resulting in possible irritation and dermatitis. Small amounts of liquid aspirated into the lungs during ingestion or from vomiting may cause chemical pneumonitis or pulmonary edema.

#### IARC Classification:

The following ingredients are cited on the lists below: None.

--REGULATORY LISTS SEARCHED--

1 = IARC 1

2 = IARC 2A

3 = IARC 2B

### SECTION 12 ECOLOGICAL INFORMATION

The information given is based on data available for the material, the components of the material, and similar materials.

#### ECOTOXICITY

Material -- Not expected to be harmful to aquatic organisms.

Material -- Not expected to demonstrate chronic toxicity to aquatic organisms

Product Name: ESCAID™ 110 FLUID

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## PERSISTENCE AND DEGRADABILITY

### Biodegradation:

Material -- Expected to be readily biodegradable.

### Hydrolysis:

Material -- Transformation due to hydrolysis not expected to be significant.

### Photolysis:

Material -- Transformation due to photolysis not expected to be significant.

### Atmospheric Oxidation:

Material -- Expected to degrade rapidly in air

## OTHER ECOLOGICAL INFORMATION

VOC: Yes

## SECTION 13

## DISPOSAL CONSIDERATIONS

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

## DISPOSAL RECOMMENDATIONS

Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products.

**Empty Container Warning** Empty Container Warning (where applicable): Empty containers may contain residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be completely drained and safely stored until appropriately reconditioned or disposed. Empty containers should be taken for recycling, recovery, or disposal through suitably qualified or licensed contractor and in accordance with governmental regulations. DO NOT PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.

## SECTION 14

## TRANSPORT INFORMATION

**LAND** : Not Regulated for Land Transport

**SEA (IMDG):** Not Regulated for Sea Transport according to IMDG-Code

**Marine Pollutant:** No

## SEA (MARPOL 73/78 Convention - Annex II)

**Product Name:** NOXIOUS LIQUID, N.F., (7) N.O.S., (ESCAID 110, contains iso- and cycloalkanes (12+))

**Ship type:** 3

**Pollution category:** Y

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**AIR (IATA):** Not Regulated for Air Transport

**SECTION 15**

**REGULATORY INFORMATION**

This material is considered hazardous according to the classification criteria of the Hazard Classification and Communication System for Hazardous Materials BE 2555.

**REGULATORY STATUS AND APPLICABLE LAWS AND REGULATIONS**

**Hazardous Substance Act BE2535:** Not Regulated

**Listed or exempt from listing/notification on the following chemical inventories:** AICS, DSL, ENCS, IECSC, KECI, PICCS, TCSI, TSCA

**SECTION 16**

**OTHER INFORMATION**

**N/D = Not determined, N/A = Not applicable**

**KEY TO THE H-CODES CONTAINED IN SECTION 3 OF THIS DOCUMENT (for information only):**

H227: Combustible liquid; Flammable Liquid, Cat 4

H304: May be fatal if swallowed and enters airways; Aspiration, Cat 1

**THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:**

- Hazard Identification: Physical/Chemical Hazard information was modified.
- Section 01: Company Contact Methods information was modified.
- Section 01: Product Identification Product Name information was modified.
- Section 05: Fire Fighting Measures - Fire Fighting Instruction information was modified.
- Section 06: Protective Measures information was modified.
- Section 07: Handling and Storage - Handling information was modified.
- Section 07: Handling and Storage - Storage Phrases information was modified.
- Section 07: Materials/Coatings - Suitable information was modified.
- Section 07: Materials/Coatings - Unsuitable information was modified.
- Section 07: Suitable Containers information was modified.
- Section 09: Coefficient of Thermal Expansion information was modified.
- Section 14: IMO ANNEX II Ship Type - Header information was modified.

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DGN: 4406090HTH (1015815)

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Safety data sheet number MI14015  
Version 2  
Revision date 12/Feb/2015  
Supercedes date 27/Feb/2014



## Safety Data Sheet FORM-A-BLOK†

### 1. Identification of the substance/preparation and of the Company/undertaking

#### 1.1 Product identifier

Product name	FORM-A-BLOK†
Product code	MI14015
Denmark Pr. no.	2313300

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended use	Lost circulation material.
Uses advised against	Consumer use

#### 1.3 Details of the supplier of the safety data sheet

**Supplier identification**  
M-I SWACO / ALPINE  
C/O Schlumberger  
Enterprise Drive  
Westhill Industrial Estate  
Westhill, AB32 6TQ  
Scotland UK  
+47 51577424  
MISDS@slb.com

#### 1.4 Emergency Telephone Number

**Emergency telephone** - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

### 2. Hazards identification

#### 2.1 Classification of the substance or mixture

Regulation (EC) No. 1272/2008

Health hazards	Not classified
Environmental hazards	Not classified
Physical Hazards	Not classified



FORM-A-BLOK†

Safety data sheet number MI14015  
Revision date 12/Feb/2015

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## **2.2 Label Elements**

### **Signal word**

None

### **Hazard statements**

This product is not classified as hazardous therefore no (H) hazard statements assigned.

-  
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

### **Classification according to EU Directives 67/548/EEC or 1999/45/EC**

### **Indication of danger**

Not classified

### **Contains**

Wollastonite (Ca(SiO<sub>3</sub>))

Cellulose

Kaolin

Polyvinyl alcohol

*For the full text of the R-phrases and H-Statements mentioned in this Section, see Section 16.*

### **2.3 Other data**

Not classified as PBT/vPvB by current EU criteria

### **Australian statement of hazardous/dangerous nature**

Classified as Non-Hazardous according to the criteria of NOHSC.  
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

## **3. Composition/information on ingredients**

### **3.1 Substances**

Not Applicable

### **3.2 Mixtures**



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Component	EC-No.	CAS-No	Weight % - range	Classification (67/548)	Classification (Reg. 1272/2008)	REACH registration number
Wollastonite (Ca(SiO <sub>3</sub> ))	237-772-5	13983-17-0	30-60	-	Not classified	No data available
Cellulose	232-674-9	9004-34-6	10-30	-	Not classified	No data available
Kaolin	310-194-1	1332-58-7	5-10	-	Not classified	No data available
Polyvinyl alcohol	polymer	9002-89-5	5-10	-	Not classified	No data available

#### Comments

The product contains other ingredients which do not contribute to the overall classification.

## 4. First aid measures

### 4.1 First Aid

<b>Inhalation</b>	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
<b>Ingestion</b>	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
<b>Skin contact</b>	Wash off immediately with soap and plenty of water removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.
<b>Eye contact</b>	Remove contact lenses. Promptly wash eyes with lots of water while lifting eye lids. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

### 4.2 Most important symptoms and effects, both acute and delayed

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

#### Main symptoms

<b>Inhalation</b>	Please see Section 11. Toxicological Information for further information.
<b>Ingestion</b>	Please see Section 11. Toxicological Information for further information.
<b>Skin contact</b>	Please see Section 11. Toxicological Information for further information.
<b>Eye contact</b>	Please see Section 11. Toxicological Information for further information.

### 4.3 Indication of any immediate medical attention and special treatment needed

**Notes to physician** Treat symptomatically.



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## 5. Fire-fighting measures

### 5.1 Extinguishing media

#### **Suitable extinguishing media**

Water Fog, Alcohol Foam, CO<sub>2</sub>, Dry Chemical.

#### **Extinguishing media which shall not be used for safety reasons**

None known.

### 5.2 Special hazards arising from the substance or mixture

#### **Unusual fire and explosion hazards**

Dust may form explosive mixture in air.

#### **Hazardous combustion products**

Thermal decomposition can lead to release of irritating gases and vapours.

### 5.3 Advice for firefighters

#### **Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

#### **Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

## 6. Accidental release measures

### 6.1 Personal precautions, protective equipment and emergency procedures

Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. If spilled, take caution, as material can cause surfaces to become very slippery. Use personal protective equipment. See also section 8.

### 6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

#### **Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

### 6.3 Methods and materials for containment and cleaning up

#### **Methods for Containment**

Prevent further leakage or spillage if safe to do so.

#### **Methods for cleaning up**

Sweep up and shovel into suitable containers for disposal. Avoid dust formation. After cleaning, flush away traces with water.

### 6.4 Reference to other sections



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See section 13 for more information.

## 7. Handling and storage

### 7.1 Precautions for safe handling

#### Handling

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. If spilled, take caution, as material can cause surfaces to become very slippery.

#### Hygiene measures

Use good work and personal hygiene practices to avoid exposure. Do not eat, drink or smoke when using this product. Wash hands before eating, drinking or smoking. Remove contaminated clothing.

### 7.2 Conditions for safe storage, including any incompatibilities

<b>Technical measures/precautions</b>	Ensure adequate ventilation. Keep airborne concentrations below exposure limits. Keep away from heat, sparks, and flame.
<b>Storage</b>	Keep containers tightly closed in a dry, cool and well-ventilated place. Protect from moisture Avoid contact with: Strong oxidising agents
<b>Storage class</b>	Chemical storage.
<b>Packaging material</b>	Use specially constructed containers only

### 7.3 Specific end uses

See also Section 1.2.

## 8. Exposure controls/personal protection

### 8.1 Control parameters

**Exposure limits** No biological limit allocated

Component	EU OEL - Third List	Austria	Australia	Denmark
Wollastonite (Ca(SiO <sub>3</sub> ))	Not determined	Not determined	Not determined	1 fiber/cm <sup>3</sup> TWA



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Cellulose	Not determined	Not determined	10 mg/m <sup>3</sup> TWA (containing no asbestos and <1% crystalline silica, inspirable dust)	Not determined
Kaolin	Not determined	Not determined	10 mg/m <sup>3</sup> TWA (containing no asbestos and <1% crystalline silica, inspirable dust)	2 mg/m <sup>3</sup> TWA
Polyvinyl alcohol	Not determined	Not determined	Not determined	Not determined

Component	Finland	France	Germany	Hungary
Wollastonite (Ca(SiO <sub>3</sub> ))	Not determined	Not determined	Not determined	Not determined
Cellulose	Not determined	10 mg/m <sup>3</sup>	Not determined	Not determined
Kaolin	Not determined	10 mg/m <sup>3</sup>	Not determined	Not determined
Polyvinyl alcohol	Not determined	Not determined	Not determined	Not determined

Component	New Zealand	Italy	Netherlands	Norway
Wollastonite (Ca(SiO <sub>3</sub> ))	Not Determined	Not determined	Not determined	Not determined
Cellulose	10 mg/m <sup>3</sup> TWA	Not determined	Not determined	Not determined
Kaolin	10 mg/m <sup>3</sup> TWA 2 mg/m <sup>3</sup> TWA	Not determined	Not determined	Not determined
Polyvinyl alcohol	Not Determined	Not determined	Not determined	Not determined

Component	Poland	Portugal	Romania	Russia
Wollastonite (Ca(SiO <sub>3</sub> ))	Not determined	Not determined	Not determined	Not determined
Cellulose	Not determined	10 mg/m <sup>3</sup> TWA	Not determined	10 mg/m <sup>3</sup> MAC
Kaolin	10.0 mg/m <sup>3</sup> TWA <2% free crystalline silica and containing no asbestos total inhalable dust	2 mg/m <sup>3</sup> TWA respirable fraction, particulate matter containing no Asbestos and < 1% Crystalline silica	Not determined	8 mg/m <sup>3</sup> TWA aerosol Fibrogenic substance
Polyvinyl alcohol	Not determined	Not determined	Not determined	10 mg/m <sup>3</sup> MAC

Component	Spain	Switzerland	Turkey	UK
Wollastonite (Ca(SiO <sub>3</sub> ))	Not determined	Not determined	Not determined	Not determined
Cellulose	10 mg/m <sup>3</sup> VLA-ED	3 mg/m <sup>3</sup> MAK respirable	Not determined	20 mg/m <sup>3</sup> STEL inhalable dust 12 mg/m <sup>3</sup> STEL calculated respirable dust 10 mg/m <sup>3</sup> TWA inhalable dust 4 mg/m <sup>3</sup> TWA respirable dust
Kaolin	2 mg/m <sup>3</sup> VLA-ED this value is for the particulated matter that is free from Asbestos and contains less than 1% of Crystalline silica respirable fraction	3 mg/m <sup>3</sup> MAK respirable	Not determined	6 mg/m <sup>3</sup> STEL calculated respirable dust 2 mg/m <sup>3</sup> TWA respirable dust
Polyvinyl alcohol	Not determined	Not determined	Not determined	Not determined

## **8.2 Exposure controls**

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

### **Engineering measures to reduce exposure**

Ensure adequate ventilation. Mechanical ventilation or local exhaust ventilation is required.

### **Personal protective equipment**

#### **Eye protection**

It is good practice to wear goggles when handling any chemical. Tightly fitting safety goggles.

#### **Hand protection**

Use protective gloves made of:., Nitrile, Neoprene, Frequent change is advisable.

#### **Respiratory protection**

No personal respiratory protective equipment normally required. In case of insufficient ventilation wear suitable respiratory equipment, Half mask with a particle filter P2 (BS EN 143).

#### **Skin and body protection**

Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.

### **Hygiene measures**

Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.



## **9. Physical and chemical properties**

### **9.1 Information on basic physical and chemical properties**

<b>Physical state</b>	Solid
<b>Appearance</b>	Powder Dust
<b>Odour</b>	Odourless
<b>Colour</b>	Light gray
<b>Odor threshold</b>	Not applicable



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<u>Property</u>	<u>Values</u>	<u>Remarks</u>
pH	No information available	
pH @ dilution		
Melting/freezing point		
Boiling point/range	No information available	
Flash Point	No information available	
Evaporation rate		
Flammability (solid, gas)	Not Applicable	
Flammability Limits in Air		
Upper flammability Limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	No information available	
Bulk density	No information available	
Relative density	1.98 sg	@ 20°C.
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity		
Viscosity, dynamic	No information available	
Log Pow	No information available	
Explosive properties	No information available	
Oxidizing properties	No information available	
<b>9.2 Other information</b>		
Pour point	No information available	
Molecular weight	No information available	
VOC content(%)	No information available	
Density VALUE	No information available	

## 10. Stability and reactivity

### 10.1 Reactivity

No specific reactivity hazards associated with this product.

### 10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

### 10.3 Possibility of Hazardous Reactions

#### Hazardous polymerization

Hazardous polymerisation does not occur.

### 10.4 Conditions to avoid



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Protect from moisture. Avoid dust formation. Heat, flames and sparks.

### 10.5 Incompatible materials

Strong oxidising agents.

### 10.6 Hazardous decomposition products

See also section 5.2.

## 11. Toxicological information

### 11.1 Information on toxicological effects

#### Acute toxicity

<b>Inhalation</b>	Inhalation of dust in high concentration may cause irritation of respiratory system.
<b>Eye contact</b>	May cause slight irritation.
<b>Skin contact</b>	Prolonged contact may cause redness and irritation.
<b>Ingestion</b>	Ingestion may cause stomach discomfort.

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Wollastonite (Ca(SiO <sub>3</sub> ))	No data available	No data available	No data available
Cellulose	> 5 g/kg ( Rat )	> 2 g/kg ( Rabbit )	> 5800 mg/m <sup>3</sup> ( Rat ) 4 h
Kaolin	No data available	No data available	No data available
Polyvinyl alcohol	> 20 g/kg ( Rat )	No data available	No data available

**Sensitisation** This product does not contain any components suspected to be sensitizing.

**Mutagenic effects** This product does not contain any known or suspected mutagens.

**Carcinogenicity** This product does not contain any known or suspected carcinogens.

**Reproductive toxicity** This product does not contain any known or suspected reproductive hazards.

**Routes of exposure** None known.

**Routes of entry** No route of entry noted.



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**Specific target organ toxicity (single exposure)** Not classified

**Specific target organ toxicity (repeated exposure)** Not classified.

**Aspiration hazard** No hazard from product as supplied.

## 12. Ecological information

### 12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

#### Toxicity to algae

This product is not considered toxic to algae.

#### Toxicity to fish

This product is not considered toxic to fish.

#### Toxicity to daphnia and other aquatic invertebrates

This product is not considered toxic to invertebrates.

Component	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Wollastonite (Ca(SiO <sub>3</sub> ))	No information available	No information available	No information available
Cellulose	No information available	No information available	No information available
Kaolin	No information available	No information available	No information available
Polyvinyl alcohol	No information available	No information available	No information available

### 12.2 Persistence and degradability

Not readily biodegradable.

### 12.3 Bioaccumulative potential

Does not bioaccumulate.

### 12.4 Mobility in soil



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**Mobility**

Insoluble in water.

**12.5 Results of PBT and vPvB assessment**

Not classified as PBT/vPvB by current EU criteria.

**12.6 Other adverse effects.**

None known.

## 13. Disposal considerations

**13.1 Waste treatment methods**

**Waste from residues / unused products**

Dispose of in accordance with local regulations.

**Contaminated packaging**

Empty containers should be transported/delivered using a registered waste carrier for local recycling or waste disposal.

**EWC waste disposal No.**

According to the European Waste Catalogue, Waste Codes are not product specific, but application specific. Waste codes should be assigned by the user based on the application for which the product was used. The following Waste Codes are only suggestions: EWC waste disposal No: 01 05 99

## 14. Transport information

The product is not covered by international regulation on the transport of dangerous goods (IMDG, IATA,ADR/RID/ADG).

**14.1 UN number**

Not regulated

**14.2 Proper shipping name**

Not regulated

**14.3. Hazard class(es)**

**ADR/RID/ADN Hazard class**

Not regulated

**IMDG Hazard class**

Not regulated

**ICAO Hazard class/division**

Not regulated

**14.4 Packing group**



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<b>ADR/RID/ADN Packing Group</b>	Not regulated
<b>IMDG Packing group</b>	Not regulated
<b>ICAO Packing group</b>	Not regulated

**14.5 Environmental hazard**

No

**14.6 Special precautions**

Not Applicable

**14.7 Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code**

Please contact MISDS@slb.com for info regarding transport in Bulk.

## 15. Regulatory information

**15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture**

**Australian Standard for the Uniform Scheduling of Drugs and Poisons**

No Poisons Schedule number allocated

Commission Regulation (EU) No 453/2010 of 20 May 2010 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH). Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC, including amendments.

This safety data sheet complies with the requirements of Regulation (EC) No. 1272/2008.

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as Dangerous Goods by the criteria of the Australian Dangerous Goods Code (ADG Code) for transport by road or rail.



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**Dutch Mining Regulations: In accordance with Mining Regulations 9.2 and Chapter 4 of the Working Conditions Decree.**

**International inventories**

USA, Toxic Substances Control Act inventory (TSCA)	Complies
European Union - EINECS and ELINCS	Complies
Canada, Domestic Substance List (DSL)	Complies
Philippines (PICCS)	Complies
Inventory - Japan - Existing and New Chemicals list	Does not Comply
China (IECSC)	Complies
Australia (AICS)	Complies
Korea (KECL)	Does not Comply
Inventory - New Zealand - Inventory of Chemicals (NZIoC)	Complies

Contact REACH@miswaco.slb.com for REACH information.

**15.2 Chemical Safety Report**

No information available

**16. Other information**

<b>Prepared by</b>	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
<b>Supersedes date</b>	27/Feb/2014
<b>Revision date</b>	12/Feb/2015
<b>Version</b>	2
<b>The following sections have been revised</b>	This SDS have been made in a new database and therefore a new layout. No changes with regard to classification have been made, Updated according to GHS/CLP.

**Text of R phrases mentioned in Section 3**

Not classified

**Full text of H-Statements referred to under sections 2 and 3**

This product is not classified as hazardous therefore no (H) hazard statements assigned.

†A mark of M-I L.L.C.



FORM-A-BLOK†

Safety data sheet number MI14015  
Revision date 12/Feb/2015

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**Disclaimer**

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

SDS no. PID729 ESDS  
Version 1  
Revision date 05-Jul-2018  
Supersedes Date: None



## Safety Data Sheet GLYDRIL\* MC

### 1. Identification of the Substance/Preparation and of the Company/Undertaking

#### 1.1 Product identifier

**Product name** GLYDRIL\* MC  
**Product code** PID729 ESDS  
**CAS No** 9004-77-7  
**EC No** 500-012-0  
**REACH registration number** 01-2119484615-30-xxxx

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Identified uses** Industrial use :  
Use in oil and gas field drilling and production operations  
Marine and offshore use  
Used on land

**Uses advised against** Further information concerning recommended uses and uses advised against: see annex of this safety data sheet (exposure scenarios)

#### 1.3 Details of the supplier of the safety data sheet

**Supplier**  
M-I Drilling Fluids International B.V.  
Pannekeetweg 17  
1704 PL Heerhugowaard  
Netherlands  
+47 51577424

SDS@slb.com

#### 1.4 Emergency Telephone Number

**Emergency telephone** - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

<b>Netherlands</b>	National Poisons Information Center (NL): +31 30 274 88 88 (NB: this service is only available to health professionals)
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### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP] Commission Regulation (EU) No 2015/830 of 28 May 2015

##### Health hazards

Serious eye damage/eye irritation	Category 1
-----------------------------------	------------

**Environmental hazards** Not classified

**Physical Hazards** Not classified

**2.2 Label elements**



**Signal word**  
DANGER

**Hazard Statements**  
H318 - Causes serious eye damage

**Precautionary Statements**  
P280 - Wear protective gloves/protective clothing/eye protection/face protection  
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing  
P310 - Immediately call a POISON CENTER or doctor/physician  
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

**Contains**  
**2.3 Other hazards**

Not classified as PBT/vPvB by current EU criteria

**3. Composition/information on Ingredients**

**3.1 Substances**

Chemical Name	EC No	CAS No	Weight-%	Component information	REACH registration number
Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy	500-012-0	9004-77-7	60-100	Eye Damage 1 (H318)	01-2119484615-3 0-xxxx

**3.2 Mixtures**

Not applicable

**4. First Aid Measures**

**4.1 First aid measures**

**Inhalation** If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

<b>Ingestion</b>	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.
<b>Skin contact</b>	Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention if irritation persists.
<b>Eye Contact</b>	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if any discomfort continues.

#### **4.2. Most important symptoms and effects, both acute and delayed**

<b>General advice</b>	The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.
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#### **Symptoms**

<b>Inhalation</b>	Please see Section 11. Toxicological Information for further information.
<b>Ingestion</b>	Please see Section 11. Toxicological Information for further information.
<b>Skin contact</b>	Please see Section 11. Toxicological Information for further information.
<b>Eye contact</b>	Please see Section 11. Toxicological Information for further information.

#### **4.3 Indication of any immediate medical attention and special treatment needed**

<b>Notes to physician</b>	Treat symptomatically.
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## **5. Fire-Fighting Measures**

### **5.1 Extinguishing media**

#### **Suitable extinguishing media**

Water Fog, Alcohol Foam, CO<sub>2</sub>, Dry Chemical.

#### **Extinguishing media which must not be used for safety reasons**

None known.

### **5.2. Special hazards arising from the substance or mixture**

#### **Unusual fire and explosion hazards**

None known.

#### **Hazardous combustion products**

Fire or high temperatures create: Carbon oxides (CO<sub>x</sub>).

### **5.3 Advice for firefighters**

#### **Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

#### **Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

## **6. Accidental Release Measures**

**6.1. Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. See also section 8.

**6.2 Environmental precautions**

The product should not be allowed to enter drains, water courses or the soil.

**Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

**6.3 Methods and material for containment and cleaning up**

**Methods for containment**

Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

**Methods for cleaning up**

Take precautionary measures against static discharges. Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

**6.4 Reference to other sections**

See section 13 for more information.

**7. Handling and Storage**

**7.1 Precautions for safe handling**

**Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

**Hygiene Measures**

Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

**7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions** Ensure adequate ventilation. Take precautionary measures against static discharges.

**Storage precautions** Keep containers tightly closed in a dry, cool and well-ventilated place Avoid heat, flames and other sources of ignition. Avoid contact with: Oxidizing agents

**Storage class** Chemical storage.

**Storage class, TRGS 510, Germany** Storage class 9: no classification

**Packaging materials** Use specially constructed containers only.

**7.3 Specific end uses**

See Section 1.2.

**8. Exposure Controls/Personal Protection**

**8.1 Control parameters**

**Exposure limits** Contains no substances with occupational exposure limit values

No biological limit allocated

**Component Information**

**Derived No Effect Level (DNEL)**

**Long term exposure systemic effects  
Predicted No Effect Concentration (PNEC)**

**8.2 Exposure controls**

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

**Engineering Controls**

Ensure adequate ventilation. Provide mechanical general and/or local exhaust ventilation to prevent release of vapor or mist into work environment.

**Personal protective equipment**

**Eye protection**

Use eye protection according to EN 166, designed to protect against liquid splashes. Tightly fitting safety goggles. Safety glasses with side-shields.

**Hand protection**

Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Butyl Neoprene Nitrile  
Break through time >480 minutes  
Glove thickness >=0.4 mm

**Respiratory protection**

Be aware that liquid may penetrate the gloves. Frequent change is advisable.  
No personal respiratory protective equipment normally required, In case of insufficient ventilation wear suitable respiratory equipment, Respirator with a vapor filter (EN 141), Use respirator with organic vapor protection (A, brown), At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

**Skin and body protection**

Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.

**Hygiene Measures**

Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.



**8.2.3 Environmental exposure controls**

**Environmental exposure**

Use appropriate containment to avoid environmental contamination See section 6 for more information

**9. Physical and Chemical Properties**

**9.1 Information on basic physical and chemical properties**

**Physical state** Liquid  
**Appearance** No information available  
**Odor** Mild  
**Color** Straw Yellow - Opaque Brown

**Odor threshold** Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
pH	7	
pH @ dilution	No information available	
Melting / freezing point	-35 °C / -31 °F	
Boiling point/range	270 - 355 °C / 518 - 671 °F	
Flash point	110 °C / 230 °F	PMCC
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	0.0033 hPa	@ 25 °C
Vapor density	No information available	
Specific gravity	1.012	
Bulk density	No information available	
Relative density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	7.3 cSt	@ 40 °C
Dynamic viscosity	9.2 - 9.4 mPa s	@ 20 °C
log Pow	Not determined	

**Explosive properties** Not applicable  
**Oxidizing properties** None known.

**9.2 Other information**

<b>Pour point</b>	No information available
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	None
<b>Density</b>	No information available

**Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

## 10. Stability and Reactivity

**10.1 Reactivity**

No specific reactivity hazards associated with this product.

**10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerization**

Hazardous polymerization does not occur.

**10.4 Conditions to avoid**

Take precautionary measures against static charges. Avoid heat, flames and other sources of ignition.

**10.5 Incompatible materials**

Oxidizing agents.

**10.6 Hazardous decomposition products**

See Section 5.2.

## 11. Toxicological Information

### 11.1 Information on toxicological effects

**Acute toxicity**

<b>Inhalation</b>	Inhalation of vapors in high concentration may cause irritation of respiratory system.
<b>Eye contact</b>	Causes serious eye damage.
<b>Skin contact</b>	Prolonged contact may cause redness and irritation.
<b>Ingestion</b>	Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea. May cause central nervous system depression.
<b>Unknown acute toxicity</b>	Not applicable.

### Toxicology data for the components

<b>Sensitization</b>	This product does not contain any components suspected to be sensitizing.
<b>Mutagenic effects</b>	This product does not contain any known or suspected mutagens.
<b>Carcinogenicity</b>	This product does not contain any known or suspected carcinogens.
<b>Reproductive toxicity</b>	This product does not contain any known or suspected reproductive hazards.
<b>Routes of exposure</b>	Eye contact.
<b>Routes of entry</b>	No route of entry noted.
<b>Specific target organ toxicity - Single exposure</b>	Not classified
<b>Specific target organ toxicity - Repeated exposure</b>	Not classified.
<b>Target organ effects</b>	None known.
<b>Aspiration hazard</b>	Not applicable.
<b>Other information</b>	Key literature references and sources for data. See Section 16 for more information.

## 12. Ecological Information

### 12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

**Toxicity to algae**

This product is not considered toxic to algae.

**Toxicity to fish**

This product is not considered toxic to fish.

**Toxicity to daphnia and other aquatic invertebrates**

This product is not considered toxic to invertebrates.

**Toxicology data for the components**

**12.2 Persistence and degradability**

Readily biodegradable.

**12.3 Bioaccumulative potential**

Does not bioaccumulate.

**12.4 Mobility**

**Mobility**

Soluble in water.

**Mobility in soil**

See component information below.

**12.5 Results of PBT and vPvB assessment**

Not classified as PBT/vPvB by current EU criteria.

**12.6 Other adverse effects.**

None known.

**12.7 Other information**

Key literature references and sources for data. See Section 16 for more information.

**13. Disposal Considerations**

**13.1 Waste treatment methods**

**Waste from residues/unused**

Dispose of in accordance with local regulations.

**products**

**Contaminated packaging** Empty containers should be taken to an approved waste handling site for recycling or disposal.

**EWC Waste Disposal No** According to the European Waste Catalog, Waste Codes are not product specific, but application specific Waste codes should be assigned by the user based on the application for which the product was used The following Waste Codes are only suggestions: EWC waste disposal No: 07 01 04 Waste Code: 7042 - Organic solvents, non-halogenated.

**14. Transport information**

**14.1. UN number**

Not regulated

**14.2. UN proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

**14.3 Hazard class(es)**

<b>ADR/RID/ADN/ADG Hazard class</b>	Not regulated
<b>IMDG/ANTAQ Hazard class</b>	Not regulated
<b>ICAO/ANAC Hazard class/division</b>	Not regulated

**14.4 Packing group**

<b>ADR/RID/ADN/ADG Packing group</b>	Not regulated
<b>IMDG/ANTAQ Packing group</b>	Not regulated
<b>ICAO/ANAC Packing group</b>	Not regulated

**14.5 Environmental hazard**

No

**14.6 Special precautions**

Not applicable

**14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code**

The product has been assessed and contained in Chapters 17/18 of the IBC Code and the latest MEPC.2/Circular and is permitted to be carried under Annex II of MARPOL and resolution A.673 (16) Offshore Supply Vessel Code. Ship Type:- 3. Pollution Category:- Z. Proper Shipping Name: Poly(2-8)alkylene glycol monoalkyl(C1-C6) ether  
Please contact SDS@slb.com for info regarding transport in Bulk.



**Revision date** 05-Jul-2018

**Version** 1

**This SDS has been revised in the following section(s)** New issue. Exposure scenario

**Key literature references and sources for data**

www.ChemADVISOR.com

Supplier

National Chemical Inventories

National regulatory information

National occupational exposure limits

**Training Advice**

Do not handle until all safety precautions have been read and understood

Follow general hygiene considerations recognized as common good workplace practices

**HMIS classification**

Health	3
Flammability	1
Physical hazard	0
PPE	J

**Full text of H-Statements referred to under sections 2 and 3**

H318 - Causes serious eye damage

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## Exposure scenario

### ES1 Industrial use in oil and gas field drilling and production operations Marine and offshore use

#### Section 1 Title

##### 1.1 Title exposure scenario (ES)

**Title** Use in oil and gas field drilling and production operations Marine and offshore use

##### 1.2 Scope of exposure scenario (ES)

**Main user group** Industrial uses

**Sector of use** SU3 - Industrial uses: Uses of substances as such or in preparations at industrial sites  
SU2b - Offshore industries

**Process categories** PROC1 - Use in closed process, no likelihood of exposure  
PROC2 - Use in closed, continuous process with occasional controlled exposure  
PROC3 - Use in closed batch process (synthesis or formulation)  
PROC4 - Use in batch and other process (synthesis) where opportunity for exposure arises  
PROC8a - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities  
PROC8b - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

**Environmental release categories** ERC4 - Industrial use of processing aids in processes and products, not becoming part of articles

**Processes, tasks, activities covered** Oil field well drilling and production operations (including drilling muds and well cleaning) including material transfers, on-site formulation, well head operations, shaker room activities and related maintenance

#### Section 2 Operational conditions and risk management measures

##### 2.1 Control of environmental exposure

**Environmental release categories** ERC4 - Industrial use of processing aids in processes and products, not becoming part of articles

**Amounts used** Annual amount per site :  
80 tonne per year (2670 kg/day)

**Frequency and duration of use** Batch process : 30 days per year

**Product characteristics**  
Physical form of product Liquid  
Vapor pressure < 0.5 kPa at STP

## Exposure scenario

### ES1 Industrial use in oil and gas field drilling and production operations Marine and offshore use

<b>Environmental factors not influenced by risk management</b>	Local freshwater dilution factor : 10 Local marine water dilution factor : 100
<b>Other operational conditions of use affecting environmental exposure</b>	No special environmental precautions required Emission days : 30 days per year Intermittent release
<b>Risk management measures</b>	Prevent environmental discharge consistent with regulatory requirements Limit the substance content in the product to 25 %
<b>Technical onsite conditions and measures to reduce or limit discharges, air emissions</b>	Air emission controls are not applicable as there is no direct release to air Soil emission controls are not applicable as there is no direct release to soil Not Applicable Onsite wastewater treatment plant is not assumed
<b>Conditions and measures related to municipal sewage treatment plant</b>	Not Applicable
<b>Conditions and measures related to external recovery of waste</b>	Not Applicable
<b>Conditions and measures related to external treatment of waste for disposal</b>	Estimated amount entering waste treatment no greater than 10% Type of treatment suitable for waste : Incineration Removal Efficiency (%) 99.98 cement kiln fuels Removal Efficiency (%) 99.98  Treat as hazardous waste Dispose of waste product or used containers according to local regulations External treatment and disposal of waste should comply with applicable local and/or national regulations

#### 2.2 Control of worker exposure

<b>Control of worker exposure</b>	
Process categories	PROC1 - Use in closed process, no likelihood of exposure In line injection of process chemicals by fixed dose pumping
Covers concentrations up to	Covers concentrations up to 25%
Physical form of product	Liquid, vapour pressure < 0.5 kPa at STP
Amounts used	Not applicable
Use frequency	Covers daily exposures up to 8 hours (unless stated differently) Batch process
Technical conditions and measures to control dispersion from source towards the worker	No specific measures identified
Conditions and measures related to personal protection, hygiene and health evaluation	Use suitable eye protection Avoid direct eye contact with product, also via contamination on hands Avoid splashing
Other operational conditions affecting worker exposure	Assumes a good basic standard of occupational hygiene is implemented Assumes activities are at ambient temperature (unless stated differently)
Human factors not influenced by risk management	None

## Exposure scenario

### ES1 Industrial use in oil and gas field drilling and production operations Marine and offshore use

Process categories	PROC2 - Use in closed, continuous process with occasional controlled exposure CS15 - General exposures (closed systems)
Covers concentrations up to	Covers concentrations up to 25%
Physical form of product	Liquid, vapour pressure < 0.5 kPa at STP
Amounts used	Not applicable
Use frequency	Covers daily exposures up to 8 hours (unless stated differently) Batch process
Technical conditions and measures to control dispersion from source towards the worker	No specific measures identified
Conditions and measures related to personal protection, hygiene and health evaluation	Use suitable eye protection Avoid direct eye contact with product, also via contamination on hands Avoid splashing
Other operational conditions affecting worker exposure	Assumes a good basic standard of occupational hygiene is implemented Assumes activities are at ambient temperature (unless stated differently)
Human factors not influenced by risk management	None

Process categories	PROC3 - Use in closed batch process (synthesis or formulation) CS2 - Process sampling CS115 - Drilling mud (re-)formulation CS121 - Treatment and disposal of filtered solids
Covers concentrations up to	Covers concentrations up to 25%
Physical form of product	Liquid, vapour pressure < 0.5 kPa at STP
Amounts used	Not applicable
Use frequency	Covers daily exposures up to 8 hours (unless stated differently)
Technical conditions and measures to control dispersion from source towards the worker	No specific measures identified
Conditions and measures related to personal protection, hygiene and health evaluation	Use suitable eye protection Avoid direct eye contact with product, also via contamination on hands Avoid splashing
Other operational conditions affecting worker exposure	Assumes a good basic standard of occupational hygiene is implemented Assumes activities are at ambient temperature (unless stated differently)
Human factors not influenced by risk management	None

Process categories	PROC4 - Use in batch and other process (synthesis) where opportunity for exposure arises CS116 - Drill floor operations Formulated product CS117 - Operation of solids filtering equipment CS111 - elevated temperature Scale squeeze operations
Covers concentrations up to	Covers concentrations up to 25%
Physical form of product	Liquid, vapour pressure < 0.5 kPa at STP
Amounts used	Not applicable
Use frequency	Covers daily exposures up to 8 hours (unless stated differently)
Technical conditions and measures to control dispersion from source towards the worker	No specific measures identified
Conditions and measures related to personal protection, hygiene and health evaluation	Use suitable eye protection Avoid direct eye contact with product, also via contamination on hands Avoid splashing
Other operational conditions affecting worker exposure	Assumes a good basic standard of occupational hygiene is implemented Assumes activities are at ambient temperature (unless stated differently)
Human factors not influenced by risk management	None

Process categories	PROC8a - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities CS39 - Equipment cleaning and maintenance
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## Exposure scenario

### ES1 Industrial use in oil and gas field drilling and production operations Marine and offshore use

	CS120 - Cleaning of solids filtering equipment Application of process chemicals by pouring from a jug into systems
Covers concentrations up to	Covers concentrations up to 25%
Physical form of product	Liquid, vapour pressure < 0.5 kPa at STP
Amounts used	Not applicable
Use frequency	Covers daily exposures up to 8 hours (unless stated differently)
Technical conditions and measures to control dispersion from source towards the worker	No specific measures identified
Conditions and measures related to personal protection, hygiene and health evaluation	Use suitable eye protection Avoid direct eye contact with product, also via contamination on hands Avoid splashing
Other operational conditions affecting worker exposure	Assumes a good basic standard of occupational hygiene is implemented Assumes activities are at ambient temperature (unless stated differently)
Human factors not influenced by risk management	None

Process categories	PROC8b - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities CS8 - Drum/batch transfers From tote tanks and supply vessels Charging from drums
Covers concentrations up to	Covers concentrations up to 25%
Physical form of product	Liquid, vapour pressure < 0.5 kPa at STP
Amounts used	Not applicable
Use frequency	Covers daily exposures up to 8 hours (unless stated differently)
Technical conditions and measures to control dispersion from source towards the worker	No specific measures identified
Conditions and measures related to personal protection, hygiene and health evaluation	Use suitable eye protection Avoid direct eye contact with product, also via contamination on hands Avoid splashing
Other operational conditions affecting worker exposure	Assumes a good basic standard of occupational hygiene is implemented Assumes activities are at ambient temperature (unless stated differently)
Human factors not influenced by risk management	None

#### Additional information

CS = Contributing Scenarios

## Section 3 - Exposure estimation

### 3.1 Advice

RCR

The exposure concentrations and risk characterization ratios (RCR) are reported below.  
Maximum exposure resulting from contributing scenarios described

### 3.2 Exposure estimation - Environment

#### Calculation method

Used CHARM Model

#### Environmental compartment

Release fraction to air from process (initial release prior to RMM) : 0  
Release fraction to wastewater from process (initial release prior to RMM) : 1  
Release fraction to soil from process (initial release prior to RMM) : 0

## Exposure scenario

### ES1 Industrial use in oil and gas field drilling and production operations Marine and offshore use

**Remarks** Risk from environmental exposure is driven by marine water

Environmental exposure		
Environment	Predicted exposure level	Risk characterization ratio (RCR)
local PEC Surface water :	Not applicable	-
PEC for microorganisms in STP	Not applicable	-
local PEC Freshwater sediment	Not applicable	-
local PEC Sea Water During emission Episode	075E-04mg/l	242E-04
local PEC Marine sediment	043E-08mg/kgdw	065E-08
local PEC Soil	Not applicable	-

**Remarks** Risk from environmental exposure is driven by marine water

#### 3.3 Exposure estimation - Worker

Exposure estimation				
Process categories	Exposure route	Predicted Exposure Level	Risk characterization ratio (RCR)	Combined for all exposure routes
PROC1	Inhalation Vapor 8 hour average	0.006 ppm	<0.001	<0.001
PROC1	Inhalation Vapor (15 minutes)	0.024 ppm	-	<0.001
PROC1	Dermal	0.021 mg/kg/day	<0.001	<0.001
PROC2	Inhalation Vapor 8 hour average	0.6 ppm	0.026	0.03
PROC2	Inhalation Vapor (15 minutes)	2.4 ppm	-	0.03
PROC2	Dermal	0.82 mg/kg/day	0.004	0.03
PROC3 CS2 - Process sampling CS115 - Drilling mud (re-)formulation CS121 - Treatment and disposal of filtered solids	Inhalation Vapor 8 hour average	1.8 ppm	0.077	0.0792
PROC3 CS2 - Process sampling CS115 - Drilling mud (re-)formulation CS121 - Treatment and disposal of filtered solids	Inhalation Vapor (15 minutes)	2.96 ppm	-	0.0792
PROC3 CS2 - Process sampling CS115 - Drilling mud (re-)formulation CS121 - Treatment and disposal of filtered solids	Dermal	0.41 mg/kg/day	0.002	0.0792
PROC4 CS116 - Drill floor operations	Inhalation Vapor 8 hour average	1.8 ppm	0.077	0.0792
PROC4	Inhalation Vapor	2.96 ppm	-	0.0792

Exposure scenario

ES1 Industrial use in oil and gas field drilling and production operations Marine and offshore use

CS116 - Drill floor operations PROC4	(15 minutes) Dermal	0.41 mg/kg/day	0.002	0.0792
CS116 - Drill floor operations PROC4	Inhalation Vapor 8 hour average	3 ppm	0.13	0.15
CS111 - elevated temperature CS117 - Operation of solids filtering equipment PROC4	Inhalation Vapor (15 minutes)	10.4 ppm	-	0.15
CS111 - elevated temperature CS117 - Operation of solids filtering equipment PROC4	Dermal	4.1 mg/kg/day	0.02	0.15
CS111 - elevated temperature CS117 - Operation of solids filtering equipment PROC4	Inhalation Vapor 8 hour average	1.8 ppm	0.077	0.097
Scale squeeze operations PROC4	Inhalation Vapor (15 minutes)	2.96 ppm	-	0.097
Scale squeeze operations PROC4	Dermal	4.1 mg/kg/day	0.02	0.097
Scale squeeze operations PROC8a	Inhalation Vapor 8 hour average	1.8 ppm	0.077	0.117
CS39 - Equipment cleaning and maintenance CS120 - Cleaning of solids filtering equipment Application of process chemicals by pouring from a jug into systems PROC8b CS8 - Drum/batch transfers From tote tanks and supply vessels Charging from drums	Inhalation Vapor (15 minutes)	2.96 ppm	-	0.117
CS39 - Equipment cleaning and maintenance CS120 - Cleaning of solids filtering equipment Application of process chemicals by pouring from a jug into systems PROC8b CS8 - Drum/batch transfers From tote tanks and supply vessels Charging from drums PROC8a	Dermal	8.2 mg/kg/day	0.04	0.117
CS39 - Equipment cleaning and maintenance CS120 - Cleaning of solids filtering equipment Application of process chemicals by pouring from a jug into systems				

## Exposure scenario

### ES1 Industrial use in oil and gas field drilling and production operations Marine and offshore use

PROC8b CS8 - Drum/batch transfers From tote tanks and supply vessels Charging from drums				
--	--	--	--	--

**Calculation method**

Used ECETOC TRA model  
Available hazard data do not enable the derivation of a DNEL for eye irritant effects

**Derived No Effect Level (DNEL)**

**Long term exposure systemic effects**

**Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy**

Dermal 50 mg/kg  
Inhalation 195 mg/m<sup>3</sup>

**Predicted No Effect Concentration (PNEC)**

**Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy**

Fresh Water 4.5 mg/L  
Sea Water 0.31 mg/L  
Freshwater sediment 6.6 mg/kg  
Sea sediment 0.66 mg/kg  
Soil 1.32 mg/kg  
Impact on sewage treatment 500 mg/L  
Intermittent release 24.9 mg/L

**Section 4 - Guidance to check compliance with the exposure scenario**

Msafe : 111000 kg/day

Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures

Inhalation. No corrections required as all exposures are assumed to be for 8 hours (worse case assessment)

Dermal: To scale from a concentration of 5-25% to 100%, multiply by 1.7

**Recommendations and advice**

If scaling reveals a condition of unsafe use (i.e., RCRs > 1), additional RMMs or a site-specific chemical safety assessment is required.

## Exposure scenario

### ES2 Industrial use in oil and gas field drilling and production operations Used on land

#### Section 1 Title

##### 1.1 Title exposure scenario (ES)

**Title** Use in oil and gas field drilling and production operations Used on land

##### 1.2 Scope of exposure scenario (ES)

**Main user group** Industrial uses

**Sector of use** SU3 - Industrial uses: Uses of substances as such or in preparations at industrial sites  
SU2a - Mining (without offshore industries)

**Process categories** PROC1 - Use in closed process, no likelihood of exposure  
PROC2 - Use in closed, continuous process with occasional controlled exposure  
PROC3 - Use in closed batch process (synthesis or formulation)  
PROC4 - Use in batch and other process (synthesis) where opportunity for exposure arises  
PROC8a - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities  
PROC8b - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

**Environmental release categories** ERC4 - Industrial use of processing aids in processes and products, not becoming part of articles

**Processes, tasks, activities covered** Oil field well drilling and production operations (including drilling muds and well cleaning) including material transfers, on-site formulation, well head operations, shaker room activities and related maintenance

#### Section 2 Operational conditions and risk management measures

##### 2.1 Control of environmental exposure

**Environmental release categories** ERC4 - Industrial use of processing aids in processes and products, not becoming part of articles

**Amounts used** Annual amount per site :  
80 tonne per year (2670 kg/day)

**Frequency and duration of use** Batch process : 30 days per year

**Product characteristics**  
Physical form of product Liquid  
Vapor pressure < 0.5 kPa at STP

## Exposure scenario

### ES2 Industrial use in oil and gas field drilling and production operations Used on land

<b>Environmental factors not influenced by risk management</b>	Local freshwater dilution factor : 10 Local marine water dilution factor : 100
<b>Other operational conditions of use affecting environmental exposure</b>	No special environmental precautions required Emission days : 30 days per year Intermittent release
<b>Risk management measures</b>	Bund storage facilities to prevent soil and water pollution in the event of spillage Prevent environmental discharge consistent with regulatory requirements Limit the substance content in the product to 25 %
<b>Technical onsite conditions and measures to reduce or limit discharges, air emissions</b>	No air emission controls required; required removal efficiency is 0% Soil emission controls are not applicable as there is no direct release to soil Do not release wastewater directly into the environment Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of ≥87 % Assumed industrial waste water treatment plant flow (m <sup>3</sup> /d) : 2000
<b>Conditions and measures related to municipal sewage treatment plant</b>	Do not discharge to sewers or drains
<b>Conditions and measures related to external recovery of waste</b>	Not Applicable
<b>Conditions and measures related to external treatment of waste for disposal</b>	Estimated amount entering waste treatment no greater than 93% Type of treatment suitable for waste : Incineration Removal Efficiency (%) 99.98 approved landfill
<b>Conditions and measures related to external treatment of waste for disposal</b>	Treat as hazardous waste Dispose of waste product or used containers according to local regulations External treatment and disposal of waste should comply with applicable local and/or national regulations

#### 2.2 Control of worker exposure

Control of worker exposure	
Process categories	PROC1 - Use in closed process, no likelihood of exposure In line injection of process chemicals by fixed dose pumping
Covers concentrations up to	Covers concentrations up to 25%
Physical form of product	Liquid, vapour pressure < 0.5 kPa at STP
Amounts used	Not applicable
Use frequency	Covers daily exposures up to 8 hours (unless stated differently) Batch process
Technical conditions and measures to control dispersion from source towards the worker	No specific measures identified
Conditions and measures related to personal protection, hygiene and health evaluation	Use suitable eye protection Avoid direct eye contact with product, also via contamination on hands Avoid splashing
Other operational conditions affecting worker exposure	Assumes a good basic standard of occupational hygiene is implemented Assumes activities are at ambient temperature (unless stated differently)

## Exposure scenario

### ES2 Industrial use in oil and gas field drilling and production operations Used on land

Human factors not influenced by risk management	None
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Process categories	PROC2 - Use in closed, continuous process with occasional controlled exposure CS15 - General exposures (closed systems)
Covers concentrations up to	Covers concentrations up to 25%
Physical form of product	Liquid, vapour pressure < 0.5 kPa at STP
Amounts used	Not applicable
Use frequency	Covers daily exposures up to 8 hours (unless stated differently) Batch process
Technical conditions and measures to control dispersion from source towards the worker	No specific measures identified
Conditions and measures related to personal protection, hygiene and health evaluation	Use suitable eye protection Avoid direct eye contact with product, also via contamination on hands Avoid splashing
Other operational conditions affecting worker exposure	Assumes a good basic standard of occupational hygiene is implemented Assumes activities are at ambient temperature (unless stated differently)
Human factors not influenced by risk management	None

Process categories	PROC3 - Use in closed batch process (synthesis or formulation) CS2 - Process sampling CS115 - Drilling mud (re-)formulation CS121 - Treatment and disposal of filtered solids
Covers concentrations up to	Covers concentrations up to 25%
Physical form of product	Liquid, vapour pressure < 0.5 kPa at STP
Amounts used	Not applicable
Use frequency	Covers daily exposures up to 8 hours (unless stated differently)
Technical conditions and measures to control dispersion from source towards the worker	No specific measures identified
Conditions and measures related to personal protection, hygiene and health evaluation	Use suitable eye protection Avoid direct eye contact with product, also via contamination on hands Avoid splashing
Other operational conditions affecting worker exposure	Assumes a good basic standard of occupational hygiene is implemented Assumes activities are at ambient temperature (unless stated differently)
Human factors not influenced by risk management	None

Process categories	PROC4 - Use in batch and other process (synthesis) where opportunity for exposure arises CS116 - Drill floor operations Formulated product CS117 - Operation of solids filtering equipment CS111 - elevated temperature Scale squeeze operations
Covers concentrations up to	Covers concentrations up to 25%
Physical form of product	Liquid, vapour pressure < 0.5 kPa at STP
Amounts used	Not applicable
Use frequency	Covers daily exposures up to 8 hours (unless stated differently)
Technical conditions and measures to control dispersion from source towards the worker	No specific measures identified
Conditions and measures related to personal protection, hygiene and health evaluation	Use suitable eye protection Avoid direct eye contact with product, also via contamination on hands Avoid splashing
Other operational conditions affecting worker exposure	Assumes a good basic standard of occupational hygiene is implemented Assumes activities are at ambient temperature (unless stated differently)
Human factors not influenced by risk management	None

Process categories	PROC8a - Transfer of substance or preparation (charging/discharging) from/to vessels/large
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## Exposure scenario

### ES2 Industrial use in oil and gas field drilling and production operations Used on land

	containers at non dedicated facilities CS39 - Equipment cleaning and maintenance CS120 - Cleaning of solids filtering equipment Application of process chemicals by pouring from a jug into systems
Covers concentrations up to	Covers concentrations up to 25%
Physical form of product	Liquid, vapour pressure < 0.5 kPa at STP
Amounts used	Not applicable
Use frequency	Covers daily exposures up to 8 hours (unless stated differently)
Technical conditions and measures to control dispersion from source towards the worker	No specific measures identified
Conditions and measures related to personal protection, hygiene and health evaluation	Use suitable eye protection Avoid direct eye contact with product, also via contamination on hands Avoid splashing
Other operational conditions affecting worker exposure	Assumes a good basic standard of occupational hygiene is implemented Assumes activities are at ambient temperature (unless stated differently)
Human factors not influenced by risk management	None

Process categories	PROC8b - Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities CS8 - Drum/batch transfers From tote tanks and supply vessels Charging from drums
Covers concentrations up to	Covers concentrations up to 25%
Physical form of product	Liquid, vapour pressure < 0.5 kPa at STP
Amounts used	Not applicable
Use frequency	Covers daily exposures up to 8 hours (unless stated differently)
Technical conditions and measures to control dispersion from source towards the worker	No specific measures identified
Conditions and measures related to personal protection, hygiene and health evaluation	Use suitable eye protection Avoid direct eye contact with product, also via contamination on hands Avoid splashing
Other operational conditions affecting worker exposure	Assumes a good basic standard of occupational hygiene is implemented Assumes activities are at ambient temperature (unless stated differently)
Human factors not influenced by risk management	None

**Additional information** CS = Contributing Scenarios

## Section 3 - Exposure estimation

### **3.1 Advice**

RCR

The exposure concentrations and risk characterization ratios (RCR) are reported below.  
Maximum exposure resulting from contributing scenarios described

### **3.2 Exposure estimation - Environment**

**Calculation method**

Used ECETOC TRA model Used ESVOC SpERCs

**Environmental compartment**

Conditions given in SPERC fact sheet give rise to following release fractions ESVOC

## Exposure scenario

### ES2 Industrial use in oil and gas field drilling and production operations Used on land

SpERC 4.5a.v1

Release fraction to air from process (initial release prior to RMM) : 0.005

Release fraction to wastewater from process (initial release prior to RMM) : 0.07

Release fraction to soil from process (initial release prior to RMM) : 0

**Remarks** Risk from environmental exposure is driven by marine water

Environmental exposure		
Environment	Predicted exposure level	Risk characterization ratio (RCR)
local PEC Surface water :	001E+00 mg/l	2.689E-04
PEC for microorganisms in STP	093E+00 mg/l	1.866E-04
local PEC Freshwater sediment	4.040E-04mg/kgdw	612E-04
local PEC Sea Water During emission Episode	1.210E-04mg/l	3.903E-04
local PEC Marine sediment	404E-04mg/kgdw	612E-04
local PEC Soil	6.050E-08mg/kgdw	5.931E-08

**Remarks** Risk from environmental exposure is driven by marine water

### 3.3 Exposure estimation - Worker

Exposure estimation				
Process categories	Exposure route	Predicted Exposure Level	Risk characterization ratio (RCR)	Combined for all exposure routes
PROC1	Inhalation Vapor 8 hour average	0.006 ppm	<0.001	<0.001
PROC1	Inhalation Vapor (15 minutes)	0.024 ppm	-	<0.001
PROC1	Dermal	0.021 mg/kg/day	<0.001	<0.001
PROC2	Inhalation Vapor 8 hour average	0.6 ppm	0.026	0.03
PROC2	Inhalation Vapor (15 minutes)	2.4 ppm	-	0.03
PROC2	Dermal	0.82 mg/kg/day	0.004	0.03
PROC3 CS2 - Process sampling CS115 - Drilling mud (re-)formulation CS121 - Treatment and disposal of filtered solids	Inhalation Vapor 8 hour average	1.8 ppm	0.077	0.0792
PROC3 CS2 - Process sampling CS115 - Drilling mud (re-)formulation CS121 - Treatment and disposal of filtered solids	Inhalation Vapor (15 minutes)	2.96 ppm	-	0.0792
PROC3 CS2 - Process sampling CS115 - Drilling mud (re-)formulation CS121 - Treatment and disposal of filtered solids	Dermal	0.41 mg/kg/day	0.002	0.0792

## Exposure scenario

### ES2 Industrial use in oil and gas field drilling and production operations Used on land

disposal of filtered solids				
PROC4 CS116 - Drill floor operations	Inhalation Vapor 8 hour average	1.8 ppm	0.077	0.0792
PROC4 CS116 - Drill floor operations	Inhalation Vapor (15 minutes)	2.96 ppm	-	0.0792
PROC4 CS116 - Drill floor operations	Dermal	0.41 mg/kg/day	0.002	0.0792
PROC4 CS111 - elevated temperature CS117 - Operation of solids filtering equipment	Inhalation Vapor 8 hour average	3 ppm	0.13	0.15
PROC4 CS111 - elevated temperature CS117 - Operation of solids filtering equipment	Inhalation Vapor (15 minutes)	10.4 ppm	-	0.15
PROC4 CS111 - elevated temperature CS117 - Operation of solids filtering equipment	Dermal	4.1 mg/kg/day	0.02	0.15
PROC4 Scale squeeze operations	Inhalation Vapor 8 hour average	1.8 ppm	0.077	0.097
PROC4 Scale squeeze operations	Inhalation Vapor (15 minutes)	2.96 ppm	-	0.097
PROC4 Scale squeeze operations	Dermal	4.1 mg/kg/day	0.02	0.097
PROC8a CS39 - Equipment cleaning and maintenance CS120 - Cleaning of solids filtering equipment Application of process chemicals by pouring from a jug into systems PROC8b CS8 - Drum/batch transfers From tote tanks and supply vessels Charging from drums	Inhalation Vapor 8 hour average	1.8 ppm	0.077	0.117
PROC8a CS39 - Equipment cleaning and maintenance CS120 - Cleaning of solids filtering equipment Application of process chemicals by pouring from a jug into systems PROC8b CS8 - Drum/batch transfers From tote tanks and supply vessels Charging from drums	Inhalation Vapor (15 minutes)	2.96 ppm	-	0.117
PROC8a CS39 - Equipment cleaning and maintenance CS120 - Cleaning of solids	Dermal	8.2 mg/kg/day	0.04	0.117

## Exposure scenario

### ES2 Industrial use in oil and gas field drilling and production operations Used on land

filtering equipment Application of process chemicals by pouring from a jug into systems PROC8b CS8 - Drum/batch transfers From tote tanks and supply vessels Charging from drums				
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**Calculation method**

Used ECETOC TRA model  
 Available hazard data do not enable the derivation of a DNEL for eye irritant effects

**Derived No Effect Level (DNEL)**

**Long term exposure systemic effects**

**Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy**

Dermal 50 mg/kg  
 Inhalation 195 mg/m<sup>3</sup>

**Predicted No Effect Concentration (PNEC)**

**Poly(oxy-1,2-ethanediyl), a-butyl-omega-hydroxy**

Fresh Water 4.5 mg/L  
 Sea Water 0.31 mg/L  
 Freshwater sediment 6.6 mg/kg  
 Sea sediment 0.66 mg/kg  
 Soil 1.32 mg/kg  
 Impact on sewage treatment 500 mg/L  
 Intermittent release 24.9 mg/L

**Section 4 - Guidance to check compliance with the exposure scenario**

Msafe : 6840 kg/day

Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures

Inhalation. No corrections required as all exposures are assumed to be for 8 hours (worse case assessment)

Dermal: To scale from a concentration of 5-25% to 100%, multiply by 1.7

**Recommendations and advice**

If scaling reveals a condition of unsafe use (i.e., RCRs > 1), additional RMMs or a site-specific chemical safety assessment is required.

## Safety Data Sheet G-SEAL\* PLUS

### 1. Identification of the Substance/Preparation and of the Company/Undertaking

#### 1.1 Product identifier

**Product name** G-SEAL\* PLUS  
**Product code** PID12351  
**REACH Registration Name** Exempt

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Plugging agent.

**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

##### Supplier

M-I Drilling Fluids UK Limited  
Westhill Business Park  
Westhill AB32 6JL Aberdeenshire  
Scotland United Kingdom

+47 51577424

SDS@slb.com

#### 1.4 Emergency Telephone Number

**Emergency telephone** - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

<b>Denmark</b>	Poison Control Hotline (DK): +45 82 12 12 12
<b>Germany</b>	+49 69 222 25285
<b>Norway</b>	Poison information centre: +47 22 59 13 00

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP] Commission Regulation (EU) No 2015/830 of 28 May 2015

**Health hazards** Not classified

**Environmental hazards** Not classified

**Physical Hazards** Not classified

## 2.2 Label elements

### Signal word

None

### Hazard Statements

This product is not classified as hazardous therefore no (H) hazard statements assigned.

### Precautionary Statements

This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

### Contains

Graphite

Crystalline silica (impurity)

## 2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria  
May cause slight irritation  
Suspended dust may present a dust explosion hazard

## **3. Composition/information on Ingredients**

### 3.1 Substances

Not applicable

### 3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%	Component information	REACH registration number
Graphite	231-955-3	7782-42-5	5-10	Not Classified	Exempt
Crystalline silica (impurity)	238-878-4	14808-60-7	< 1	STOT RE. 2 (H373)	Not applicable

### Comments

This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis. IARC Monographs, Vol. 68, 1997, concludes that there is sufficient evidence that inhaled crystalline silica in the form of quartz or cristobalite from occupational sources causes cancer in humans. IARC Classification Group I.

The product contains other ingredients which do not contribute to the overall classification.

## **4. First Aid Measures**

#### **4.1 First aid measures**

<b>Inhalation</b>	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
<b>Ingestion</b>	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
<b>Skin contact</b>	Wash skin thoroughly with soap and water. Get medical attention if irritation persists.
<b>Eye Contact</b>	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if any discomfort continues.

#### **4.2. Most important symptoms and effects, both acute and delayed**

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

#### **Symptoms**

<b>Inhalation</b>	Please see Section 11. Toxicological Information for further information.
<b>Ingestion</b>	Please see Section 11. Toxicological Information for further information.
<b>Skin contact</b>	Please see Section 11. Toxicological Information for further information.
<b>Eye contact</b>	Please see Section 11. Toxicological Information for further information.

#### **4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician** Treat symptomatically.

## **5. Firefighting Measures**

#### **5.1 Extinguishing media**

##### **Suitable extinguishing media**

Use extinguishing agent suitable for type of surrounding fire.

##### **Extinguishing media which must not be used for safety reasons**

None known.

#### **5.2. Special hazards arising from the substance or mixture**

##### **Unusual fire and explosion hazards**

Dust may form explosive mixture in air.

##### **Hazardous combustion products**

Fire or high temperatures create: Carbon oxides (COx), Sulphur oxides.

### 5.3 Advice for firefighters

#### **Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

#### **Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

## **6. Accidental Release Measures**

### 6.1. Personal precautions, protective equipment and emergency procedures

Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. Use personal protective equipment. See also section 8.

### 6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

#### **Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

### 6.3 Methods and material for containment and cleaning up

#### **Methods for containment**

Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimise spreading.

#### **Methods for cleaning up**

Take precautionary measures against static discharges. Sweep up and shovel into suitable containers for disposal. Avoid dust formation. After cleaning, flush away traces with water.

### 6.4 Reference to other sections

See section 13 for more information.

## **7. Handling and Storage**

### 7.1 Precautions for safe handling

#### **Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation.

#### **Hygiene Measures**

Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands before eating, drinking or smoking. Remove contaminated clothing.

### 7.2 Conditions for safe storage, including any incompatibilities

#### **Technical measures/precautions**

Ensure adequate ventilation. Keep airborne concentrations below exposure limits. Take precautionary measures against static discharges.

#### **Storage precautions**

Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from open flames, hot surfaces and sources of ignition. Suspended dust may present a dust explosion hazard. Avoid contact with: Oxidizing agents.

**Storage class** Chemical storage.

**Storage class, TRGS 510, Germany** LGK11 - Combustible solids

**Packaging materials** Use specially constructed containers only

**7.3 Specific end uses**

See Section 1.2.

**8. Exposure Controls/Personal Protection**

**8.1 Control parameters**

**Exposure Limits** No biological limit allocated

**Component Information**

<b>Chemical Name</b>	<b>EU OEL - Third List</b>	<b>Austria</b>	<b>Denmark</b>
Graphite	Not determined	10 mg/m <sup>3</sup> STEL alveolar dust with <1% Quartz, respirable fraction 5 mg/m <sup>3</sup> TWA alveolar dust with <1% Quartz, respirable fraction	2.5 mg/m <sup>3</sup> TWA
Crystalline silica (impurity)	Not determined	0.15 mg/m <sup>3</sup> TWA alveolar dust, respirable fraction	0.1mg/m <sup>3</sup>
<b>Chemical Name</b>	<b>France</b>	<b>Germany</b>	<b>Hungary</b>
Graphite	2 mg/m <sup>3</sup> TWA	1.5 mg/m <sup>3</sup> TWA 4 mg/m <sup>3</sup> TWA	Not determined
Crystalline silica (impurity)	0.1 mg/m <sup>3</sup> TWA	Not determined	0.15mg/m <sup>3</sup> TWA
<b>Chemical Name</b>	<b>Italy</b>	<b>Netherlands</b>	<b>Norway</b>
Graphite	Not determined	Not determined	5 mg/m <sup>3</sup> TWA total dust 2 mg/m <sup>3</sup> TWA respirable dust 10 mg/m <sup>3</sup> TWA total dust 4 mg/m <sup>3</sup> TWA respirable dust 10 mg/m <sup>3</sup> STEL total dust 4 mg/m <sup>3</sup> STEL respirable dust 15 mg/m <sup>3</sup> STEL total dust 8 mg/m <sup>3</sup> STEL respirable dust
Crystalline silica (impurity)	Not determined	0.075 mg/m <sup>3</sup>	0.3 mg/m <sup>3</sup> TWA total dust 0.1 mg/m <sup>3</sup> TWA respirable dust 0.9 mg/m <sup>3</sup> STEL total dust 0.3 mg/m <sup>3</sup> STEL respirable dust Carcinogen
<b>Chemical Name</b>	<b>Poland</b>	<b>Portugal</b>	<b>Romania</b>
Graphite	4.0 mg/m <sup>3</sup> TWA NDS natural 1.0 mg/m <sup>3</sup> TWA NDS natural 6.0 mg/m <sup>3</sup> TWA NDS synthetic	2 mg/m <sup>3</sup> TWA all forms except Graphite fibers respirable fraction	2mg/m <sup>3</sup> TWAdust, respirable fraction
Crystalline silica (impurity)	2 mg/m <sup>3</sup> TWA NDS >50% free crystalline silica 0.3 mg/m <sup>3</sup> TWA NDS >50% free crystalline silica 4.0 mg/m <sup>3</sup> TWA NDS 2% to 50% free crystalline silica 1.0 mg/m <sup>3</sup> TWA NDS 2% to 50% free crystalline silica	0.025 mg/m <sup>3</sup> TWA respirable fraction	0.1mg/m <sup>3</sup> TWAdust, respirable fraction
<b>Chemical Name</b>	<b>Spain</b>	<b>Switzerland</b>	<b>UK</b>
Graphite	2 mg/m <sup>3</sup> TWA VLA-ED	2.5 mg/m <sup>3</sup> TWA MAK natural 5 mg/m <sup>3</sup> TWA MAK natural	30 mg/m <sup>3</sup> STEL calculated inhalable dust

			12 mg/m <sup>3</sup> STEL calculated respirable dust 10 mg/m <sup>3</sup> TWA inhalable dust 4 mg/m <sup>3</sup> TWA respirable dust
Crystalline silica (impurity)	0.05 mg/m <sup>3</sup> TWA VLA-ED	0.15 mg/m <sup>3</sup> TWA MAK	Not determined

## 8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

### Engineering Controls

Ensure adequate ventilation. Mechanical ventilation or local exhaust ventilation is required.

### Personal protective equipment

#### Eye protection

Use eye protection according to EN 166, designed to protect against powders and dusts. Safety glasses with side-shields. Tightly fitting safety goggles.

#### Hand protection

Wear gloves according to EN 374 to protect against skin effects from powders Use protective gloves made of: Neoprene Nitrile Frequent change is advisable

#### Respiratory protection

In case of insufficient ventilation wear suitable respiratory equipment, Suitable mask with particle filter P3 (European Norm 143), At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

#### Skin and body protection

Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.

### Hygiene Measures

Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.



### 8.2.3 Environmental exposure controls

#### Environmental exposure

Use appropriate containment to avoid environmental contamination See section 6 for more information

## 9. Physical and Chemical Properties

### 9.1 Information on basic physical and chemical properties

<b>Physical state</b>	Solid
<b>Appearance</b>	Powder
<b>Odour</b>	Odourless
<b>Colour</b>	Grey - Black
<b>Odour threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
pH	6 - 8	
pH @ dilution	No information available	

<b>Melting / freezing point</b>	3652 °C / 6605.6 °F	
<b>Boiling point/range</b>	4827 °C / 8720.6 °F	
<b>Flash point</b>	No information available	
<b>Evaporation rate</b>	No information available	
<b>Flammability (solid, gas)</b>	Not applicable	
<b>Flammability Limit in Air</b>		Not applicable
<b>Upper flammability limit</b>	Not applicable	
<b>Lower flammability limit</b>	Not applicable	
<b>Vapour pressure</b>	No information available	
<b>Vapour density</b>	No information available	
<b>Specific gravity</b>	1.9 - 2.1	@ 20 °C
<b>Bulk density</b>	No information available	
<b>Relative density</b>	No information available	
<b>Water solubility</b>	Insoluble in water	
<b>Solubility in other solvents</b>	No information available	
<b>Autoignition temperature</b>	> 500 °C / >932 °F	
<b>Decomposition temperature</b>	> 400°C / >752°F	
<b>Kinematic viscosity</b>	No information available	
<b>Dynamic viscosity</b>	No information available	
<b>log Pow</b>	Not determined	
<b>Explosive properties</b>	Suspended dust may present a dust explosion hazard	
<b>Oxidising properties</b>	None known	

**9.2 Other information**

<b>Pour point</b>	No information available
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	None
<b>Density</b>	No information available

**Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

**10. Stability and Reactivity**

**10.1 Reactivity**

Dust may form explosive mixture in air.

**10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerisation**

Hazardous polymerisation does not occur.

**10.4 Conditions to avoid**

Take precautionary measures against static charges. Avoid dust formation. Heat, flames and sparks.

**10.5 Incompatible materials**

Oxidizing agents.

**10.6 Hazardous decomposition products**

See Section 5.2.

**11. Toxicological Information**

**11.1 Information on toxicological effects**

**Acute toxicity**

<b>Inhalation</b>	Inhalation of dust in high concentration may cause irritation of respiratory system.
<b>Eye contact</b>	Dust may cause mechanical irritation.
<b>Skin contact</b>	Prolonged contact may cause redness and irritation.
<b>Ingestion</b>	Ingestion may cause stomach discomfort.
<b>Unknown acute toxicity</b>	Not applicable.

**Toxicology data for the components**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Graphite	No data available	No data available	No data available
Crystalline silica (impurity)	= 500 mg/kg ( Rat )	No data available	No data available

**Sensitisation** This product does not contain any components suspected to be sensitizing.

**Mutagenic effects** This product does not contain any known or suspected mutagens.

**Carcinogenicity** Contains a known or suspected carcinogen.

**Reproductive toxicity** This product does not contain any known or suspected reproductive hazards.

**Routes of exposure** Inhalation.

**Routes of entry** Inhalation.

**Specific target organ toxicity - Single exposure** Not classified

**Specific target organ toxicity - Repeated exposure** Not classified.

**Aspiration hazard** Not applicable.

**Other information** Key literature references and sources for data. See Section 16 for more information.

**12. Ecological Information**

**12.1 Toxicity**

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

**Toxicity to algae**

This product is not considered toxic to algae.

**Toxicity to fish**

This product is not considered toxic to fish.

**Toxicity to daphnia and other aquatic invertebrates**

This product is not considered toxic to invertebrates.

**Toxicology data for the components**

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Graphite	No information available	No information available	No information available
Crystalline silica (impurity)	LC50 Danio rerio (zebra fish) : > 10000 mg/l 96h	EC50: > 1000 mg/l 72h	LC50 Daphnia magna (Water flea): > 10000 mg/l 24h

**12.2 Persistence and degradability**

Not Applicable - Inorganic chemical.

**12.3 Bioaccumulative potential**

Not Applicable - Inorganic chemical.

**12.4 Mobility**

**Mobility**

Insoluble in water.

**Mobility in soil**

No information available.

**12.5 Results of PBT and vPvB assessment**

Not classified as PBT/vPvB by current EU criteria.

**12.6 Other adverse effects.**

None known.

**12.7 Other information**

Key literature references and sources for data. See Section 16 for more information.

**13. Disposal Considerations**

**13.1 Waste treatment methods**

<b>Waste from residues/unused products</b>	Dispose of in accordance with local regulations.
<b>Contaminated packaging</b>	Empty containers should be taken to an approved waste handling site for recycling or disposal.
<b>EWC Waste Disposal No</b>	According to the European Waste Catalogue, Waste Codes are not product specific, but application specific Waste codes should be assigned by the user based on the application for which the product was used The following Waste Codes are only suggestions: EWC waste disposal No: 01 05 99 - wastes not otherwise specified

**14. Transport information**

**14.1. UN number**

Not regulated

**14.2. UN proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

**14.3. Hazard class(es)**

<b>ADR/RID/ADN/ADG Hazard class</b>	Not regulated
<b>IMDG Hazard class</b>	Not regulated
<b>ICAO Hazard class/division</b>	Not regulated

**14.4 Packing group**

<b>ADR/RID/ADN/ADG Packing Group</b>	Not regulated
<b>IMDG Packing group</b>	Not regulated
<b>ICAO Packing group</b>	Not regulated

**14.5 Environmental hazard**

No

**14.6 Special precautions**

Not applicable

**14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code**

Please contact SDS@slb.com for info regarding transport in Bulk.

## 15. Regulatory Information

### 15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

<b>Germany, Water Endangering Classes (VwVwS)</b>	Water endangering class = nwg
<b>Technical Rules for Hazardous Substances (TRGS)</b>	TRGS 220 National aspects when compiling safety data sheets TRGS 510 Storage of hazardous substances in non stationary containers TRGS 900 Occupational exposure limits

**Germany**  
 Regulations governing systems for handling substances hazardous to waters  
 Hazardous substances ordinance

Commission Regulation (EU) 2015/830 of 28 May 2015 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC, 2000/21/EC and 453/2010 including amendments.

This safety data sheet complies with the requirements of Regulation (EC) No. 1272/2008.

Dutch Mining Regulations: In accordance with Mining Regulations 9.2 and Chapter 4 of the Working Conditions Decree.

#### International inventories

<b>USA, Toxic Substances Control Act inventory (TSCA)</b>	Complies
<b>Canada (DSL)</b>	Complies
<b>Philippines (PICCS)</b>	Does not comply
<b>Inventory - Japan - Existing and New Chemicals list</b>	Does not comply
<b>China (IECSC)</b>	Complies
<b>Australia (AICS)</b>	Complies
<b>Korea (KECL)</b>	Complies
<b>Inventory - New Zealand - Inventory of Chemicals (NZIoC)</b>	Complies

#### Europe - REACH

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

**Denmark Pr. no.** 1950850

### 15.2 Chemical Safety Report

No information available

## 16. Other Information

<b>Prepared by</b>	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
<b>Supersedes Date:</b>	19/Feb/2016
<b>Revision date</b>	08/Jul/2018
<b>Version</b>	5
<b>This SDS has been revised in the following section(s)</b>	All sections No changes with regard to classification have been made. Updated according to GHS/CLP.

### Key literature references and sources for data

www.ChemADVISOR.com

Supplier

National Chemical Inventories

National regulatory information

National occupational exposure limits

### Training Advice

Do not handle until all safety precautions have been read and understood

Follow general hygiene considerations recognised as common good workplace practices

### Full text of H-Statements referred to under sections 2 and 3

This product is not classified as hazardous therefore no (H) hazard statements assigned.

H373 - May cause damage to organs through prolonged or repeated exposure if inhaled

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### Disclaimer

The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

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Safety data sheet number PID763  
Version 6  
Revision date 01/Nov/2018  
Supersedes Date: 09/Oct/2015



## Safety Data Sheet HEC

### 1. Identification of the Substance/Preparation and of the Company/Undertaking

#### 1.1 Product identifier

Product name	HEC
Product code	PID763
Country Limitations	For use only in North Sea countries (NSG)

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use	Viscosifier.
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Uses advised against	Consumer use
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#### 1.3 Details of the supplier of the safety data sheet

##### Supplier

M-I Drilling Fluids UK Limited  
Westhill Business Park  
Westhill AB32 6JL Aberdeenshire  
Scotland United Kingdom

+47 51577424

SDS@slb.com

#### 1.4 Emergency Telephone Number

Emergency telephone	(24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600
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### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP] Commission Regulation (EU) No 2015/830 of 28 May 2015

Health hazards	Not classified
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**Environmental hazards** Not classified

**Physical Hazards** Not classified

## 2.2 Label elements

### Signal word

None

### Hazard Statements

This product is not classified as hazardous therefore no (H) hazard statements assigned.

### Precautionary Statements

This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

**Contains** , No hazardous components

## 2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria  
Suspended dust may present a dust explosion hazard

## **3. Composition/information on Ingredients**

### 3.1 Substances

Not applicable

### 3.2 Mixtures

No classified ingredients, or those having occupational exposure limits, present above the level of disclosure.

## **4. First Aid Measures**

### 4.1 First aid measures

<b>Inhalation</b>	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
<b>Ingestion</b>	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
<b>Skin contact</b>	Wash skin thoroughly with soap and water. Get medical attention if irritation persists.
<b>Eye Contact</b>	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if any discomfort continues.

#### **4.2. Most important symptoms and effects, both acute and delayed**

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

#### **Symptoms**

**Inhalation** Please see Section 11. Toxicological Information for further information.

**Ingestion** Please see Section 11. Toxicological Information for further information.

**Skin contact** Please see Section 11. Toxicological Information for further information.

**Eye contact** Please see Section 11. Toxicological Information for further information.

#### **4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician** Treat symptomatically.

### **5. Firefighting Measures**

#### **5.1 Extinguishing media**

##### **Suitable extinguishing media**

Water Fog, Alcohol Foam, CO<sub>2</sub>, Dry Chemical.

##### **Extinguishing media which must not be used for safety reasons**

None known.

#### **5.2. Special hazards arising from the substance or mixture**

##### **Unusual fire and explosion hazards**

Dust may form explosive mixture in air.

##### **Hazardous combustion products**

Fire or high temperatures create: Carbon oxides (CO<sub>x</sub>), Nitrogen oxides (NO<sub>x</sub>), Oxides of phosphorus, Sodium oxides.

#### **5.3 Advice for firefighters**

##### **Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

##### **Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

### **6. Accidental Release Measures**

#### **6.1. Personal precautions, protective equipment and emergency procedures**

Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. Use personal protective equipment. See also section 8.

Material becomes slippery when wet. Use caution if wet.

## **6.2 Environmental precautions**

The product should not be allowed to enter drains, water courses or the soil.

### **Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

## **6.3 Methods and material for containment and cleaning up**

### **Methods for containment**

Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimise spreading.

### **Methods for cleaning up**

Sweep up and shovel into suitable containers for disposal. Take precautionary measures against static discharges. Avoid dust formation. After cleaning, flush away traces with water.

## **6.4 Reference to other sections**

See section 13 for more information.

# **7. Handling and Storage**

## **7.1 Precautions for safe handling**

### **Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Material becomes slippery when wet. Use caution if wet.

### **Hygiene Measures**

Use good work and personal hygiene practices to avoid exposure. When using do not eat, drink, smoke, sniff. Wash hands and face before breaks and immediately after handling the product. Remove contaminated clothing.

## **7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions** Ensure adequate ventilation. Keep airborne concentrations below exposure limits. Take precautionary measures against static discharges.

**Storage precautions** Keep containers tightly closed in a dry, cool and well-ventilated place. Avoid heat, flames and other sources of ignition. Keep away from direct sunlight. Protect from moisture. Avoid contact with: Acids, Bases, Oxidizing agents, Strong bases.

**Storage class** Chemical storage.

**Packaging materials** Use specially constructed containers only.

## **7.3 Specific end uses**

See Section 1.2.

# **8. Exposure Controls/Personal Protection**

## **8.1 Control parameters**

**Exposure Limits** NUI = Nuisance dust, TWA 4mg/m<sup>3</sup> Respirable Dust, 10mg/m<sup>3</sup> Total Dust.

**8.2 Exposure controls**

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

**Engineering Controls**

Ensure adequate ventilation. Mechanical ventilation or local exhaust ventilation is required.

**Personal protective equipment**

**Eye protection**

Use eye protection according to EN 166, designed to protect against powders and dusts. Safety glasses with side-shields. Tightly fitting safety goggles.

**Hand protection**

Use protective gloves made of: Butyl rubber Frequent change is advisable

**Respiratory protection**

No personal respiratory protective equipment normally required, In case of insufficient ventilation wear suitable respiratory equipment, Half mask with a particle filter P2 (BS EN 143), At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

**Skin and body protection**

Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.

**Hygiene Measures**

Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.



**8.2.3 Environmental exposure controls**

**Environmental exposure**

Use appropriate containment to avoid environmental contamination See section 6 for more information

**9. Physical and Chemical Properties**

**9.1 Information on basic physical and chemical properties**

<b>Physical state</b>	Solid
<b>Appearance</b>	Powder Dust
<b>Odour</b>	Odourless
<b>Colour</b>	Off-white
<b>Odour threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
pH	No information available	
pH @ dilution	6.0-8.5	@ 2%

<b>Melting / freezing point</b>	No information available
<b>Boiling point/range</b>	No information available
<b>Flash point</b>	Not applicable
<b>Evaporation rate</b>	No information available
<b>Flammability (solid, gas)</b>	Not applicable
<b>Flammability Limit in Air</b>	
<b>Upper flammability limit</b>	No information available
<b>Lower flammability limit</b>	30 g/m <sup>3</sup>
<b>Vapour pressure</b>	No information available
<b>Vapour density</b>	No information available
<b>Specific gravity</b>	1.30 - 1.40
<b>Bulk density</b>	No information available
<b>Relative density</b>	No information available
<b>Water solubility</b>	Soluble in water
<b>Solubility in other solvents</b>	No information available
<b>Autoignition temperature</b>	460 °C / 860 °F
<b>Decomposition temperature</b>	> 250 °C / > 482 °F
<b>Kinematic viscosity</b>	
<b>Dynamic viscosity</b>	No information available
<b>log Pow</b>	No information available
<b>Explosive properties</b>	Suspended dust may present a dust explosion hazard
<b>Oxidising properties</b>	No information available

#### **9.2 Other information**

<b>Pour point</b>	No information available
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	No information available
<b>Density</b>	No information available

#### **Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

## **10. Stability and Reactivity**

### **10.1 Reactivity**

Dust may form explosive mixture in air.

### **10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

### **10.3 Possibility of Hazardous Reactions**

#### **Hazardous polymerisation**

Hazardous polymerisation does not occur.

### **10.4 Conditions to avoid**

Take precautionary measures against static charges. Avoid heat, flames and other sources of ignition. Keep away from direct sunlight. Protect from moisture. Avoid dust formation.

### **10.5 Incompatible materials**

Acids. Bases. Oxidizing agents. Strong bases.

#### **10.6 Hazardous decomposition products**

See Section 5.2.

## **11. Toxicological Information**

### **11.1 Information on toxicological effects**

#### **Acute toxicity**

<b>Inhalation</b>	Inhalation of dust in high concentration may cause irritation of respiratory system.
<b>Eye contact</b>	Dust may cause mechanical irritation.
<b>Skin contact</b>	Prolonged contact may cause redness and irritation.
<b>Ingestion</b>	Ingestion may cause stomach discomfort.
<b>Unknown acute toxicity</b>	Not applicable.

**Sensitisation** This product does not contain any components suspected to be sensitizing.

**Mutagenic effects** This product does not contain any known or suspected mutagens.

**Carcinogenicity** This product does not contain any known or suspected carcinogens.

**Reproductive toxicity** This product does not contain any known or suspected reproductive hazards.

**Routes of exposure** Inhalation.

**Routes of entry** Inhalation.

**Specific target organ toxicity -  
Single exposure** Not classified

**Specific target organ toxicity -  
Repeated exposure** Not classified.

**Aspiration hazard** Not applicable.

**Other information** Key literature references and sources for data. See Section 16 for more information.

## **12. Ecological Information**

### **12.1 Toxicity**

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.  
Listed on PLONOR list of OSPAR

#### **Toxicity to algae**

This product is not considered toxic to algae.

#### **Toxicity to fish**

This product is not considered toxic to fish.

#### **Toxicity to daphnia and other aquatic invertebrates**

This product is not considered toxic to invertebrates.

### **12.2 Persistence and degradability**

Inherently biodegradable.

### **12.3 Bioaccumulative potential**

No product level data available.

### **12.4 Mobility**

#### **Mobility**

Soluble in water.

#### **Mobility in soil**

No information available.

### **12.5 Results of PBT and vPvB assessment**

Not classified as PBT/vPvB by current EU criteria.

### **12.6 Other adverse effects.**

None known.

### **12.7 Other information**

---

Key literature references and sources for data. See Section 16 for more information.

## 13. Disposal Considerations

### 13.1 Waste treatment methods

<b>Waste from residues/unused products</b>	Dispose of in accordance with local regulations.
<b>Contaminated packaging</b>	Empty containers should be taken to an approved waste handling site for recycling or disposal.
<b>EWC Waste Disposal No</b>	According to the European Waste Catalogue, Waste Codes are not product specific, but application specific Waste codes should be assigned by the user based on the application for which the product was used The following Waste Codes are only suggestions: EWC waste disposal No: 07 01 99.

## 14. Transport information

### 14.1. UN number

Not regulated

### 14.2. UN proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

### 14.3. Hazard class(es)

<b>ADR/RID/ADN/ADG Hazard class</b>	Not regulated
<b>IMDG Hazard class</b>	Not regulated
<b>ICAO Hazard class/division</b>	Not regulated

### 14.4 Packing group

<b>ADR/RID/ADN/ADG Packing Group</b>	Not regulated
<b>IMDG Packing group</b>	Not regulated
<b>ICAO Packing group</b>	Not regulated

### 14.5 Environmental hazard

No

### 14.6 Special precautions

Not applicable

### 14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code

Please contact SDS@slb.com for info regarding transport in Bulk.

## 15. Regulatory Information

### 15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

Commission Regulation (EU) 2015/830 of 28 May 2015 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC, 2000/21/EC and 453/2010 including amendments.

This safety data sheet complies with the requirements of Regulation (EC) No. 1272/2008.

#### International inventories

USA, Toxic Substances Control Act inventory (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Inventory - Japan - Existing and New Chemicals list	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korea (KECL)	Complies
Inventory - New Zealand - Inventory of Chemicals (NZIoC)	Complies

#### Europe - REACH

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

For use only in North Sea countries (NSG)

### 15.2 Chemical Safety Report

No information available

## 16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	09/Oct/2015
Revision date	01/Nov/2018
Version	6
This SDS has been revised in the	All sections Product Code change No changes with regard to classification have been

following section(s) made. For use only in North Sea countries (NSG)

**Key literature references and sources for data**

www.ChemADVISOR.com

Supplier

National Chemical Inventories

National regulatory information

National occupational exposure limits

**Training Advice**

Do not handle until all safety precautions have been read and understood

Follow general hygiene considerations recognised as common good workplace practices

**Full text of H-Statements referred to under sections 2 and 3**

This product is not classified as hazardous therefore no (H) hazard statements assigned.

\*A mark of M-I L.L.C., a Schlumberger Company

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SDS no. PID2605  
Version 8  
Revision date 28/Oct/2015  
Supersedes date 19/Dec/2014



## Safety Data Sheet KWIK-PLUG † (all grades)

### 1. Identification

#### 1.1 Product identifier

**Product name** KWIK-PLUG † (all grades)  
**Product code** PID2605

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Drilling fluid additive.  
**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

**Supplier**  
M-I L.L.C.

P.O.Box 42842  
Houston, TX 77242  
www.miswaco.slb.com  
Telephone: 1 281-561-1511

M-I SWACO, A Schlumberger Company  
200 - 125, 9th Avenue SE  
Calgary, Alberta T2G 0P6, Canada  
Telephone: 1-780-962-8221

**Prepared by**  
Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Bethicia Prasek

#### 1.4 Emergency Telephone Number

**Emergency telephone** (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

### 2. Hazards identification

#### 2.1 Classification of the substance or mixture

##### GHS - Classification

##### Health hazards

Carcinogenicity	Category 1A
-----------------	-------------

**Environmental hazards** Not classified

**Physical Hazards** Not classified

## 2.2 Label elements



### **Signal word**

DANGER

### **Hazard statements**

H350 - May cause cancer

### **Precautionary statements**

P201 - Obtain special instructions before use

P281 - Use personal protective equipment as required

P308 + P313 - IF exposed or concerned: Get medical advice/ attention

### **Supplementary precautionary statements**

P202 - Do not handle until all safety precautions have been read and understood

P501 - Dispose of contents/ container to an approved waste disposal plant

**Unknown acute toxicity** 0% of the mixture consists of ingredient(s) of unknown toxicity.

## 3. Composition/information on Ingredients

### 3.1 Substances

Component	CAS-No	Weight % - range
Silica, crystalline, quartz	14808-60-7	2 - 15
Silica, crystalline, Tridymite	15468-32-3	0 - 1

### 3.2 Mixtures

Not Applicable

### Comments

The product contains other ingredients which do not contribute to the overall classification.

## 4. First aid measures

### 4.1 First-Aid Measures

#### Inhalation

Move to fresh air. If breathing is difficult, (trained personnel should) give oxygen. Get medical attention immediately if symptoms occur.

#### Ingestion

Drink 1 or 2 glasses of water. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

---

<b>Skin contact</b>	Wash skin thoroughly with soap and water. Remove contaminated clothing and launder before reuse. Get medical attention if irritation persists.
<b>Eye contact</b>	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

**4.2 Most important symptoms and effects, both acute and delayed**

**Main symptoms**

<b>Inhalation</b>	Please see Section 11. Toxicological Information for further information.
<b>Ingestion</b>	Please see Section 11. Toxicological Information for further information.
<b>Skin contact</b>	Please see Section 11. Toxicological Information for further information.
<b>Eye contact</b>	Please see Section 11. Toxicological Information for further information.

**4.3 Indication of any immediate medical attention and special treatment needed**

<b>Notes to physician</b>	Treat symptomatically
---------------------------	-----------------------

**5. Fire-fighting measures**

**5.1 Extinguishing media**

**Suitable extinguishing media**

Water Fog, Alcohol Foam, CO<sub>2</sub>, Dry Chemical.

**Extinguishing media which shall not be used for safety reasons**

None known.

**5.2 Special hazards arising from the substance or mixture**

**Unusual fire and explosion hazards**

None known.

**Hazardous combustion products**

Silicon oxide.

**5.3 Advice for firefighters**

**Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

**6. Accidental release measures**

**6.1 Personal precautions, protective equipment and emergency procedures**

Wear suitable protective equipment. Evacuate personnel to safe areas. Prevent further leakage or spillage if safe to do so. Avoid dust formation.

**6.2 Environmental precautions**

Do not allow material to contaminate ground water system.

**Environmental exposure controls**

No information available.

**6.3 Methods and materials for containment and cleaning up**

**Methods for containment**

Cover powder spill with plastic sheet or tarp to minimize spreading.

**Methods for cleaning up**

Soak up with inert absorbent material (e.g. sand, silica gel, acid binder, universal binder, sawdust).

**6.4 Reference to other sections**

No information available.

**7. Handling and storage**

**7.1 Precautions for safe handling**

**Handling**

Avoid breathing dust; if exposed to high dust concentration, leave area immediately. Avoid contact with skin, eyes and clothing.

**7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions**      Ensure adequate ventilation.

**Storage precautions**                      Protect from moisture

**8. Exposure controls/personal protection**

**8.1 Control parameters**

Component Information

Component	ACGIH TLV	OSHA PEL
Silica, crystalline, quartz 14808-60-7 ( 2 - 15 )	0.025 mg/m <sup>3</sup>	see Table Z-3
Silica, crystalline, Tridymite 15468-32-3 ( 0 - 1 )	0.025 mg/m <sup>3</sup>	see Table Z-3

Silica, crystalline, quartz

OSHA - Final PELs - Table Z-3 Mineral Dusts

(30)/(%SiO<sub>2</sub> + 2) mg/m<sup>3</sup> TWA, total dust; (250)/(%SiO<sub>2</sub> + 5) mppcf TWA, respirable fraction; (10)/(%SiO<sub>2</sub> + 2) mg/m<sup>3</sup> TWA, respirable fraction

Silica, crystalline, Tridymite

OSHA - Final PELs - Table Z-3 Mineral Dusts

(1/2)(30)/(%SiO<sub>2</sub> + 2) mg/m<sup>3</sup> TWA, total dust; (1/2)(250)/(%SiO<sub>2</sub> + 5) mppcf TWA, respirable fraction; (1/2)(10)/(%SiO<sub>2</sub> + 2) mg/m<sup>3</sup> TWA, respirable fraction

**8.2 Exposure controls**

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

**Engineering measures to reduce exposure**

Ensure adequate ventilation, especially in confined areas.

**Personal protective equipment**

**Eye protection**

Tightly fitting safety goggles.

**Hand protection**

Wear chemical resistant gloves such as nitrile or neoprene.

<b>Respiratory protection</b>	All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent. Use NIOSH approved respirator with dust and mist protection (3M 8210). If dust concentration exceeds 5 times the exposure limit, wear an approved HEPA respirator
<b>Skin and body protection</b>	Wear suitable protective clothing and gloves.
<b>Hygiene measures</b>	Wash hands before breaks and immediately after handling the product, Remove and wash contaminated clothing before re-use.

## 9. Physical and chemical properties

### 9.1 Information on basic physical and chemical properties

<b>Physical state</b>	Solid
<b>Appearance</b>	Opaque
<b>Color</b>	Tan - Gray
<b>Odor</b>	Odorless
<b>Odor threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
<b>pH</b>	Not applicable	
<b>pH @ dilution</b>	No information available	
<b>Melting/freezing point</b>	No information available	
<b>Boiling point/range</b>	No information available	
<b>Flash point</b>	Not Applicable	
<b>Evaporation rate (BuAc =1)</b>	No information available	
<b>Flammability (solid, gas)</b>	Not Applicable	
<b>Flammability Limits in Air</b>		
<b>Upper flammability limit</b>	No information available	
<b>Lower flammability limit</b>	No information available	
<b>Vapor pressure</b>	No information available	
<b>Vapor density</b>	No information available	
<b>Specific gravity</b>	2.5 - 2.6 @ 20°C	
<b>Bulk density</b>	No information available	
<b>Water solubility</b>	Negligible	
<b>Solubility in other solvents</b>	Insoluble	
<b>Autoignition temperature</b>	No information available	
<b>Decomposition temperature</b>	No information available	
<b>Kinematic viscosity</b>	No information available	
<b>Dynamic viscosity</b>	No information available	
<b>Log Pow</b>	No information available	
<b>Explosive properties</b>	No information available	
<b>Oxidizing properties</b>	No information available	

### 9.2 Other information

<b>Pour point</b>	No information available
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	No information available
<b>Density</b>	No information available

## 10. Stability and reactivity

### 10.1 Reactivity

No specific reactivity hazards associated with this product.

**10.2 Chemical stability**

Stable. Hazardous polymerization does not occur.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerization**

Hazardous polymerization does not occur.

**Hazardous Reactions**

None known.

**10.4 Conditions to avoid**

None known.

**10.5 Incompatible materials**

No materials to be especially mentioned.

**10.6 Hazardous decomposition products**

See Section 5.2.

**11. Toxicological information**

**11.1 Information on toxicological effects**

**Acute toxicity**

**Inhalation**

Inhalation of dust in high concentration may cause irritation of respiratory system. Repeated or prolonged inhalation of crystalline silica dust can cause delayed lung injury, and other diseases, including silicosis and lung cancer.

**Eye contact**

Dust contact with the eyes can lead to mechanical irritation.

**Skin contact**

Repeated exposure may cause skin dryness or cracking.

**Ingestion**

Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea.

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Silica, crystalline, quartz	= 500 mg/kg ( Rat )	No data available	No data available
Silica, crystalline, Tridymite	No data available	No data available	No data available

Component	IARC Group 1 or 2	ACGIH - Carcinogens	OSHA listed carcinogens	NTP
Silica, crystalline, quartz	Group 1; Monograph 100C [in preparation] Group 1; Monograph 68 [1997] Monograph 100C [in preparation] (listed under Crystalline silica inhaled in the form of quartz or cristobalite from occupational sources); Monograph 68 [1997]	A2 Suspected Human Carcinogen	Present	Known Human Carcinogen

Silica, crystalline, Tridymite	Group 1; Monograph 68 [1997] Monograph 68 [1997] (listed under Crystalline silica)	No data available	Present	No data available
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<b>Sensitization</b>	This product does not contain any components suspected to be sensitizing.
<b>Mutagenic effects</b>	No evidence of mutagenic properties.
<b>Carcinogenicity</b>	Contains a known or suspected carcinogen. Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled.
<b>Reproductive toxicity</b>	No evidence of toxicity to reproduction.
<b>Developmental toxicity</b>	Not known to cause birth defects or have a deleterious effect on a developing fetus.
<b>Routes of exposure</b>	Skin contact. Inhalation. Eye contact.
<b>Routes of entry</b>	Inhalation.
<b>Specific target organ toxicity (single exposure)</b>	Not classified
<b>Specific target organ toxicity (repeated exposure)</b>	Not classified.
<b>Aspiration hazard</b>	Not Applicable.

**12. Ecological information**

**12.1 Toxicity**

**Toxicity to algae**  
See component information below.

**Toxicity to fish**  
See component information below.

**Toxicity to daphnia and other aquatic invertebrates**  
See component information below.

Component	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Silica, crystalline, quartz	No information available	No information available	No information available
Silica, crystalline, Tridymite	No information available	No information available	No information available

**12.2 Persistence and degradability**

No product level data available.

**12.3 Bioaccumulative potential**

No product level data available.

**12.4 Mobility in soil**

No information available.

**12.5 Results of PBT and vPvB assessment**

This preparation contains no substance considered to be persistent, bioaccumulating nor toxic (PBT)  
This preparation contains no substance considered to be very persistent nor very bioaccumulating (vPvB)

**12.6 Other adverse effects.**

None known.

**13. Disposal considerations**

**13.1 Waste treatment methods**

**Disposal Method** Disposal should be made in accordance with federal, state and local regulations.

**Contaminated packaging** Empty containers should be taken for local recycling, recovery or waste disposal.

**14. Transport information**

**14.1 UN Number**

<b>UN No. (DOT)</b>	Not regulated
<b>UN No. (TDG)</b>	Not regulated
<b>UN/ID No. (ADR/RID/ADN/ADG)</b>	Not regulated
<b>UN No. (IMDG)</b>	Not regulated
<b>UN No. (ICAO)</b>	Not regulated

**14.2 Proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

**14.3 Hazard class(es)**

<b>DOT Hazard class</b>	Not regulated
<b>TDG Hazard class</b>	Not regulated
<b>ADR/RID/ADN/ADG Hazard class</b>	Not regulated
<b>IMDG Hazard class</b>	Not regulated
<b>ICAO Hazard class/division</b>	Not regulated

**14.4 Packing group**

<b>DOT Packing group</b>	Not regulated
<b>TDG Packing group</b>	Not regulated
<b>ADR/RID/ADN/ADG Packing group</b>	Not regulated
<b>IMDG Packing group</b>	Not regulated
<b>ICAO Packing group</b>	Not regulated

**14.5 Environmental hazard**

No

**14.6 Special precautions**

Not Applicable

**15. Regulatory information**

**International inventories**

<b>USA (TSCA)</b>	Complies
<b>Canada (DSL)</b>	Complies
<b>European Union (EINECS and ELINCS)</b>	Does not Comply
<b>Philippines (PICCS)</b>	Does not Comply
<b>Japan (ENCS)</b>	Does not Comply
<b>China (IECSC)</b>	Does not Comply
<b>Australia (AICS)</b>	Does not Comply
<b>Korean (KECL)</b>	Does not Comply
<b>New Zealand (NZIoC)</b>	Complies

**U.S. Federal and State Regulations**

**SARA 311/312 Hazard Categories**

Delayed (chronic) health hazard.

<b>Component</b>	<b>SARA 302 / TPQs</b>	<b>SARA 313</b>	<b>CERCLA RQ</b>
Silica, crystalline, quartz	N/A	N/A	N/A
Silica, crystalline, Tridymite	N/A	N/A	N/A

**State Comments**

Proposition 65: This product contains chemical(s) considered by the State of California's Safe Drinking Water and Toxic Enforcement Act of 1986 to cause cancer and/or reproductive toxicity. See table under U.S. Federal and State Regulations for the specific chemicals.

**Silica, crystalline, quartz**  
carcinogen

**Canadian Classification**

This Safety Data Sheet has been prepared in compliance with the Hazardous Products Regulations.

**16. Other information**

<b>Supersedes date</b>	19/Dec/2014
<b>Revision date</b>	28/Oct/2015
<b>Version</b>	8
<b>The following sections have been revised:</b>	1, 2, 5, 9, 10, 11, 14, 15, 16.
<b>HMIS classification</b>	
Health	1*
Flammability	0
Physical hazard	0

N/A - Not Applicable, N/D - Not Determined.

†A mark of M-I L.L.C.

**Disclaimer**

The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

## Safety Data Sheet LIME

### 1. Identification of the Substance/Preparation and of the Company/Undertaking

#### 1.1 Product identifier

**Product name** LIME  
**Product code** PID904  
**Synonyms** CALCIUM HYDROXIDE, HYDRATKALK

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Drilling fluid additive. pH modifier

**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

##### Supplier

M-I Drilling Fluids UK Limited  
Westhill Business Park  
Westhill AB32 6JL Aberdeenshire  
Scotland United Kingdom

+47 51577424

SDS@slb.com

#### 1.4 Emergency Telephone Number

**Emergency telephone** - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

<b>Denmark</b>	Poison Control Hotline (DK): +45 82 12 12 12
<b>Netherlands</b>	National Poisons Information Centre (NL): +31 30 274 88 88 (NB: this service is only available to health professionals)
<b>Norway</b>	Poison information centre: +47 22 59 13 00

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP] Commission Regulation (EU) No 2015/830 of 28 May 2015

##### Health hazards

Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 1

Specific target organ toxicity - Single exposure	Category 3
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**Environmental hazards** Not classified

**Physical Hazards** Not classified

## 2.2 Label elements



### Signal word

DANGER

### Hazard Statements

H315 - Causes skin irritation

H318 - Causes serious eye damage

H335 - May cause respiratory irritation

### Precautionary Statements

P280 - Wear protective gloves/protective clothing/eye protection/face protection

P302 + P352 - IF ON SKIN: Wash with plenty of soap and water

P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing

P301 + P310 - IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician

P332 + P313 - If skin irritation occurs: Get medical advice/attention

P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

### Supplementary precautionary statements

P261 - Avoid breathing dust/fume/gas/mist/vapours/spray

P264 - Wash face, hands and any exposed skin thoroughly after handling

P271 - Use only outdoors or in a well-ventilated area

P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing

P312 - Call a POISON CENTER or doctor/physician if you feel unwell

P362 + P364 - Take off contaminated clothing and wash it before reuse

P403 + P233 - Store in a well-ventilated place. Keep container tightly closed

### Contains

Calcium hydroxide

## 2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

## **3. Composition/information on Ingredients**

### 3.1 Substances



**Suitable extinguishing media**

Alcohol Foam, CO<sub>2</sub>, Dry Chemical.

**Extinguishing media which must not be used for safety reasons**

Water.

**5.2. Special hazards arising from the substance or mixture**

**Unusual fire and explosion hazards**

None known.

**Hazardous combustion products**

Fire or high temperatures create: Calcium oxide.

**5.3 Advice for firefighters**

**Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

**Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

## 6. Accidental Release Measures

**6.1. Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. See also section 8.

**6.2 Environmental precautions**

The product should not be allowed to enter drains, water courses or the soil.

**Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

**6.3 Methods and material for containment and cleaning up**

**Methods for containment**

Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimise spreading and keep powder dry.

**Methods for cleaning up**

Avoid dust formation. Sweep up and shovel into suitable containers for disposal.

**6.4 Reference to other sections**

See section 13 for more information.

## 7. Handling and Storage

**7.1 Precautions for safe handling**

**Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation.

**Hygiene Measures**

Use good work and personal hygiene practices to avoid exposure Do not eat, drink or smoke when using this product Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

**7.2 Conditions for safe storage, including any incompatibilities**

- Technical measures/precautions** Ensure adequate ventilation. Keep airborne concentrations below exposure limits.
- Storage precautions** Keep containers tightly closed in a dry, cool and well-ventilated place Protect from moisture  
Avoid contact with: Acids
- Storage class** Chemical storage.
- Packaging materials** Use specially constructed containers only

**7.3 Specific end uses**

See Section 1.2.

**8. Exposure Controls/Personal Protection**

**8.1 Control parameters**

**Component Information**

Chemical Name	EU OEL - Third List	Austria	Denmark
Calcium hydroxide	Not determined	4 mg/m <sup>3</sup> STEL inhalable fraction 2 mg/m <sup>3</sup> TWA inhalable fraction	5 mg/m <sup>3</sup> TWA
Chemical Name	France	Germany	Hungary
Calcium hydroxide	5 mg/m <sup>3</sup> TWA	1 mg/m <sup>3</sup> TWA	5mg/m <sup>3</sup> TWA
Chemical Name	Italy	Netherlands	Norway
Calcium hydroxide	Not determined	5 mg/m <sup>3</sup>	5 mg/m <sup>3</sup> TWA 10 mg/m <sup>3</sup> STEL
Chemical Name	Poland	Portugal	Romania
Calcium hydroxide	4 mg/m <sup>3</sup> STEL NDSh 6 mg/m <sup>3</sup> STEL NDSh 2 mg/m <sup>3</sup> TWA NDS 1 mg/m <sup>3</sup> TWA NDS	5 mg/m <sup>3</sup> TWA indicative limit value	5mg/m <sup>3</sup> TWA
Chemical Name	Spain	Switzerland	UK
Calcium hydroxide	5 mg/m <sup>3</sup> TWA VLA-ED	5 mg/m <sup>3</sup> TWA MAK	15 mg/m <sup>3</sup> STEL calculated 5 mg/m <sup>3</sup> TWA

**Derived No Effect Level (DNEL)**

**Short term exposure local effects**

Calcium hydroxide  
Inhalation 4 mg/m<sup>3</sup>

**Long term exposure local effects**

Calcium hydroxide  
Inhalation 1 mg/m<sup>3</sup>

**Predicted No Effect Concentration (PNEC)**

Calcium hydroxide  
Fresh Water 0.49 mg/L

Sea Water	0.32 mg/L
Soil	1080 mg/kg
Impact on sewage treatment	3 mg/L
Intermittent release	0.49 mg/L

**8.2 Exposure controls**

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

**Engineering Controls**

Ensure adequate ventilation, especially in confined areas. Provide appropriate exhaust ventilation at places where dust is formed. See section 7 for more information.

**Personal protective equipment**

- Eye protection** Use eye protection according to EN 166, designed to protect against powders and dusts. Tightly fitting safety goggles. Safety glasses with side-shields.
- Hand protection** Wear gloves according to EN 374 to protect against skin effects from powders. Wear protective nitrile rubber gloves. Frequent change is advisable.
- Respiratory protection** No personal respiratory protective equipment normally required, Use the indicated respiratory protection if the occupational exposure limit is exceeded and/or in case of product release (dust), Half mask with a particle filter P2 (BS EN 143), At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
- Skin and body protection** Wear suitable protective clothing and gloves, Eye wash and emergency shower must be available at the work place.

**Hygiene Measures**

Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.



**8.2.3 Environmental exposure controls**

**Environmental exposure** Use appropriate containment to avoid environmental contamination See section 6 for more information

**9. Physical and Chemical Properties**

**9.1 Information on basic physical and chemical properties**

Physical state	Solid
Appearance	Powder
Odour	Odourless
Colour	White - Off-white
Odour threshold	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
pH	12.4	

<b>pH @ dilution</b>	No information available	
<b>Melting / freezing point</b>	> 450 °C / > 842 °F	
<b>Boiling point/range</b>	No information available	
<b>Flash point</b>	No information available	
<b>Evaporation rate</b>	No information available	
<b>Flammability (solid, gas)</b>	Not applicable	
<b>Flammability Limit in Air</b>		
<b>Upper flammability limit</b>	Not applicable	
<b>Lower flammability limit</b>	Not applicable	
<b>Vapour pressure</b>	No information available	
<b>Vapour density</b>	No information available	
<b>Specific gravity</b>	2.24	20 °C
<b>Bulk density</b>	400 Kg/m <sup>3</sup>	
<b>Relative density</b>	No information available	
<b>Water solubility</b>	Soluble in water	
<b>Solubility in other solvents</b>	No information available	
<b>Autoignition temperature</b>	No information available	
<b>Decomposition temperature</b>	No information available	
<b>Kinematic viscosity</b>	No information available	
<b>Dynamic viscosity</b>	No information available	
<b>log Pow</b>	No information available	

**Explosive properties** No information available  
**Oxidising properties** No information available

**9.2 Other information**

**Pour point** No information available  
**Molecular weight** No information available  
**VOC content(%)** No information available  
**Density** No information available  
**Particle Size (Micron)** < 500

**Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

**10. Stability and Reactivity**

**10.1 Reactivity**

No specific reactivity hazards associated with this product.

**10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerisation**

Hazardous polymerisation does not occur.

**10.4 Conditions to avoid**

Avoid dust formation. Protect from moisture.

**10.5 Incompatible materials**

Acids. Water.

**10.6 Hazardous decomposition products**

See Section 5.2.

**11. Toxicological Information**

**11.1 Information on toxicological effects**

**Acute toxicity**

<b>Inhalation</b>	May cause respiratory irritation. Inhalation of dust may cause shortness of breath, tightness of the chest, a sore throat and cough.
<b>Eye contact</b>	Causes serious eye damage.
<b>Skin contact</b>	Causes skin irritation.
<b>Ingestion</b>	Ingestion may cause stomach discomfort. May cause additional affects as listed under "Inhalation".
<b>Unknown acute toxicity</b>	Not applicable.

**Toxicology data for the components**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Calcium hydroxide	= 7340 mg/kg ( Rat )	No data available	No data available

<b>Sensitisation</b>	This product does not contain any components suspected to be sensitizing.
<b>Mutagenic effects</b>	This product does not contain any known or suspected mutagens.
<b>Carcinogenicity</b>	This product does not contain any known or suspected carcinogens.
<b>Reproductive toxicity</b>	This product does not contain any known or suspected reproductive hazards.
<b>Routes of exposure</b>	Eye contact. Skin contact. Inhalation.
<b>Routes of entry</b>	Inhalation.
<b>Specific target organ toxicity - Single exposure</b>	Category 3
<b>Specific target organ toxicity - Repeated exposure</b>	Not classified.
<b>Target organ effects</b>	Respiratory system.

**Aspiration hazard** Not applicable.

**Other information** Key literature references and sources for data. See Section 16 for more information.

**12. Ecological Information**

**12.1 Toxicity**

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.  
 The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.  
 Listed on PLONOR list of OSPAR

**Toxicity to algae**  
 This product is not considered toxic to algae.

**Toxicity to fish**  
 This product is not considered toxic to fish.

**Toxicity to daphnia and other aquatic invertebrates**  
 This product is not considered toxic to invertebrates.

**Toxicology data for the components**

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Calcium hydroxide	= 160 mg/L LC50 Gambusia affinis 96 h	No information available	No information available

**12.2 Persistence and degradability**

Not Applicable - Inorganic chemical.

Chemical Name	Persistence and degradability
Calcium hydroxide	Hydrolyzes

**12.3 Bioaccumulative potential**

Not Applicable - Inorganic chemical.

Chemical Name	Bioaccumulation
Calcium hydroxide	No bioaccumulation potential

**12.4 Mobility**

**Mobility**  
 Soluble in water.

Chemical Name	Mobility

Calcium hydroxide	Easily soluble
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**Mobility in soil**

No information available.

Chemical Name	Mobility in soil
Calcium hydroxide	Not expected to adsorb on soil

**12.5 Results of PBT and vPvB assessment**

Not classified as PBT/vPvB by current EU criteria.

**12.6 Other adverse effects.**

None known.

**12.7 Other information**

Key literature references and sources for data. See Section 16 for more information.

**13. Disposal Considerations**

**13.1 Waste treatment methods**

**Waste from residues/unused products**

Dispose of in accordance with local regulations.

**Contaminated packaging**

Empty containers should be taken to an approved waste handling site for recycling or disposal.

**EWC Waste Disposal No**

According to the European Waste Catalogue, Waste Codes are not product specific, but application specific Waste codes should be assigned by the user based on the application for which the product was used The following Waste Codes are only suggestions: 06 03 14 - solid salts and solutions other than those mentioned in 06 03 11 and 06 03 13 Waste Code: 7132 Inorganic bases.

**14. Transport information**

**14.1. UN number**

Not regulated

**14.2. UN proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

**14.3. Hazard class(es)**

**ADR/RID/ADN/ADG Hazard class** Not regulated

**IMDG Hazard class** Not regulated

**ICAO Hazard class/division** Not regulated

**14.4 Packing group**

<b>ADR/RID/ADN/ADG Packing Group</b>	Not regulated
<b>IMDG Packing group</b>	Not regulated
<b>ICAO Packing group</b>	Not regulated

**14.5 Environmental hazard**

No

**14.6 Special precautions**

Not applicable

**14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code**

Please contact SDS@slb.com for info regarding transport in Bulk.

## 15. Regulatory Information

### 15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

Germany, Water Endangering Classes (VwVwS) Water endangering class = 1

Commission Regulation (EU) 2015/830 of 28 May 2015 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC, 2000/21/EC and 453/2010 including amendments.

This safety data sheet complies with the requirements of Regulation (EC) No. 1272/2008.

Dutch Mining Regulations: In accordance with Mining Regulations 9.2 and Chapter 4 of the Working Conditions Decree.

#### International inventories

USA, Toxic Substances Control Act inventory (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Inventory - Japan - Existing and New Chemicals list	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korea (KECL)	Complies
Inventory - New Zealand - Inventory of Chemicals (NZIoC)	Complies

#### Europe - REACH

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

Norway Pr. no. 46235  
Denmark Pr. no. 342757

### 15.2 Chemical Safety Report

No information available

## 16. Other Information

Prepared by Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Sandra McWilliam  
Supercedes Date: 09/Jul/2015

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Revision date 06/Jul/2018

Version 8

**This SDS has been revised in the following section(s)** All sections No changes with regard to classification have been made.

**Key literature references and sources for data**

www.ChemADVISOR.com

Supplier

National Chemical Inventories

National regulatory information

National occupational exposure limits

**Training Advice**

Do not handle until all safety precautions have been read and understood

Follow general hygiene considerations recognised as common good workplace practices

**HMIS classification**

Health 3

Flammability 0

Physical hazard 0

**Full text of H-Statements referred to under sections 2 and 3**

H315 - Causes skin irritation

H318 - Causes serious eye damage

H335 - May cause respiratory irritation

**Disclaimer**

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## Safety Data Sheet M-I PAC\* UL

### 1. Identification

#### 1.1 Product identifier

**Product name** M-I PAC\* UL

**Product code** PID994

This product may not be distributed or used in Canada.

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Fluid loss reducer.

**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

**Supplier**  
M-I L.L.C.

P.O.Box 42842  
Houston, TX 77242  
www.miswaco.slb.com  
Telephone: 1 281-561-1511

**E-mail address** sdsmi@slb.com

**Prepared by**  
Global Regulatory Compliance - Chemicals (GRC - Chemicals)

#### 1.4 Emergency Telephone Number

**Emergency telephone** (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

### 2. Hazards identification

#### 2.1 Classification of the substance or mixture

##### **GHS - Classification**

**Health hazards** Not classified

**Environmental hazards** Not classified

##### **Physical Hazards**

Combustible dust

#### 2.2 Label elements

**Signal word**

WARNING

**Hazard statements**

H232 - May form combustible dust concentrations in air

**Precautionary statements**

P240 - Ground/bond container and receiving equipment

P241 - Use explosion-proof electrical/ ventilating/ lighting/ equipment

P243 - Take precautionary measures against static discharge

**Unknown acute toxicity**

Not Applicable.

**3. Composition/information on Ingredients**

**3.1 Substances**

Not Applicable

**3.2 Mixtures**

Component	CAS-No	Weight % - range
Polyanionic cellulose	Proprietary	60 - 100

**Comments**

The specific chemical identity and/or exact percentage (concentration) of composition has been withheld as a trade secret

**4. First aid measures**

**4.1 First-Aid Measures**

**Inhalation**

If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

**Ingestion**

Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.

**Skin contact**

Wash off immediately with soap and plenty of water removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.

**Eye contact**

Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

**4.2 Most important symptoms and effects, both acute and delayed**

**General advice**

The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

**Main symptoms**

**Inhalation**

Please see Section 11. Toxicological Information for further information.

**Ingestion**

Please see Section 11. Toxicological Information for further information.

**Skin contact** Please see Section 11. Toxicological Information for further information.

**Eye contact** Please see Section 11. Toxicological Information for further information.

**4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician** Treat symptomatically

**5. Fire-fighting measures**

**5.1 Extinguishing media**

**Suitable extinguishing media**

Water Fog, Alcohol Foam, CO<sub>2</sub>, Dry Chemical.

**Extinguishing media which shall not be used for safety reasons**

None known.

**5.2 Special hazards arising from the substance or mixture**

**Unusual fire and explosion hazards**

Suspended dust may present a dust explosion hazard.

**Hazardous combustion products**

Carbon oxides (COx).

**5.3 Advice for firefighters**

**Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

**Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

**6. Accidental release measures**

**6.1 Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment identified in Section 8. Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. Keep unnecessary personnel away. Prevent further leakage or spillage if safe to do so.

**6.2 Environmental precautions**

The product should not be allowed to enter drains, water courses or the soil.

**Environmental exposure controls**

Avoid release to the environment.

**6.3 Methods and materials for containment and cleaning up**

**Methods for containment**

Cover powder spill with plastic sheet or tarp to minimize spreading and keep powder dry.

**Methods for cleaning up**

Sweep up and shovel into suitable containers for disposal. Take precautionary measures against static discharges. Use non-sparking tools and equipment.

**6.4 Reference to other sections**

See section 13 for more information.

## 7. Handling and storage

### 7.1 Precautions for safe handling

#### Handling

Handle in accordance with good industrial hygiene and safety practice. Take precautionary measures against static discharges. Avoid contact with skin and eyes. Avoid dust formation. Fine dust dispersed in air may ignite. Avoid breathing dust; if exposed to high dust concentration, leave area immediately.

#### Hygiene measures

Use good work and personal hygiene practices to avoid exposure. Do not eat, drink or smoke when using this product.

### 7.2 Conditions for safe storage, including any incompatibilities

**Technical measures/precautions** Ensure adequate ventilation. Provide appropriate exhaust ventilation at places where dust is formed. Keep airborne concentrations below exposure limits.

**Storage precautions** Keep away from open flames, hot surfaces and sources of ignition. Keep containers tightly closed in a dry, cool and well-ventilated place.

## 8. Exposure controls/personal protection

### 8.1 Control parameters

#### Exposure limits

**Control as an ACGIH particulate not otherwise specified (PNOS): 10 mg/m<sup>3</sup> (Inhalable); 3 mg/m<sup>3</sup> (Respirable) and an OSHA particulate not otherwise regulated (PNOR): 15 mg/m<sup>3</sup> (Total); 5 mg/m<sup>3</sup> (Respirable).**

Component	ACGIH TLV	OSHA PEL
Polyanionic cellulose	Not Determined	Not Determined

### 8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

#### Engineering measures to reduce exposure

Ensure adequate ventilation.

#### Personal protective equipment

##### Eye protection

Tightly fitting safety goggles.

##### Hand protection

Wear chemical resistant gloves such as nitrile or neoprene.

##### Respiratory protection

All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent.

If exposed to airborne mist/aerosol of this product, use at least a NIOSH-approved N95 half-mask disposable or re-usable particulate respirator. In work environments containing oil mist/aerosol, use at least a NIOSH-approved P95 half-mask disposable or re-usable particulate respirator. If exposed to vapors from this product use a NIOSH/MSHA-approved respirator with an Organic Vapor cartridge.

##### Skin and body protection

Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.

##### Hygiene measures

Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.

## 9. Physical and chemical properties

### 9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Granules Powder
Color	White
Odor	Odorless
Odor threshold	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
pH	No information available	
pH @ dilution	6.5 - 8.0	@ 1% solution
Melting/freezing point	No information available	
Boiling point/range	No information available	
Flash point	No information available	PMCC
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not Applicable	
Flammability Limits in Air		
Upper flammability limit	No information available	
Lower flammability limit	No information available	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.5 - 1.6	@ 68 °F / 20 °C
Bulk density	400 - 800 kg/m <sup>3</sup>	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	~250 °C / 482 °F	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
Log Pow	No information available	
Explosive properties	Suspended dust may present a dust explosion hazard	
Oxidizing properties	None known.	

### 9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

## 10. Stability and reactivity

### 10.1 Reactivity

No specific reactivity hazards associated with this product.

### 10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

### 10.3 Possibility of Hazardous Reactions

#### Hazardous polymerization

Hazardous polymerization does not occur.

#### Hazardous Reactions

Hazardous polymerization does not occur.

### 10.4 Conditions to avoid

Heat, flames and sparks.

**10.5 Incompatible materials**

Strong oxidizing agents.

**10.6 Hazardous decomposition products**

Carbon oxides (COx).

**11. Toxicological information**

**11.1 Information on toxicological effects**

**Acute toxicity**

<b>Inhalation</b>	Inhalation of dust may cause shortness of breath, tightness of the chest, a sore throat and cough.
<b>Eye contact</b>	Dust may cause mechanical irritation.
<b>Skin contact</b>	Repeated exposure may cause skin dryness or cracking.
<b>Ingestion</b>	Irritant; may cause pain or discomfort to mouth, throat and stomach.

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Polyanionic cellulose	= 27000 mg/kg ( Rat )	> 2 g/kg ( Rabbit )	> 5800 mg/m <sup>3</sup> ( Rat ) 4 h

Component	IARC Group 1 or 2	ACGIH - Carcinogens	OSHA listed carcinogens	NTP
Polyanionic cellulose	No data available	No data available	No data available	No data available

<b>Sensitization</b>	Not classified.
<b>Mutagenic effects</b>	No evidence of mutagenic properties.
<b>Carcinogenicity</b>	No evidence of carcinogenic properties.
<b>Reproductive toxicity</b>	No evidence of toxicity to reproduction.
<b>Developmental toxicity</b>	Not known to cause birth defects or have a deleterious effect on a developing fetus.
<b>Routes of exposure</b>	Inhalation. Skin contact. Eye contact.
<b>Routes of entry</b>	Inhalation.
<b>Specific target organ toxicity (single exposure)</b>	Not classified
<b>Specific target organ toxicity (repeated exposure)</b>	Not classified.
<b>Target organ effects</b>	Respiratory system.
<b>Aspiration hazard</b>	Not Applicable.

**12. Ecological information**

**12.1 Toxicity**

**Toxicity to algae**

No product level data available. See component information below.

**Toxicity to fish**

No product level data available. See component information below.

**Toxicity to daphnia and other aquatic invertebrates**

No product level data available. See component information below.

Component	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Polyanionic cellulose ( 60 - 100 )	No information available	No information available	No information available

**12.2 Persistence and degradability**

No product level data available.

**12.3 Bioaccumulative potential**

No data available.

**12.4 Mobility in soil**

No information available.

**12.5 Results of PBT and vPvB assessment**

This preparation contains no substance considered to be persistent, bioaccumulating nor toxic (PBT)  
This preparation contains no substance considered to be very persistent nor very bioaccumulating (vPvB)

**12.6 Other adverse effects.**

None known.

**13. Disposal considerations**

**13.1 Waste treatment methods**

**Disposal Method** Disposal should be made in accordance with federal, state and local regulations.  
**Contaminated packaging** Empty containers should be taken for local recycling, recovery or waste disposal.

**14. Transport information**

**14.1 UN Number**

**UN No. (DOT)** Not regulated  
**UN No. (TDG)** Not regulated  
**UN/ID No. (ADR/RID/ADN/ADG)** Not regulated  
**UN No. (IMDG)** Not regulated  
**UN No. (ICAO)** Not regulated

**14.2 Proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

**14.3 Hazard class(es)**

**DOT Hazard class** Not regulated  
**TDG Hazard class** Not regulated  
**ADR/RID/ADN/ADG Hazard class** Not regulated  
**IMDG Hazard class** Not regulated  
**ICAO Hazard class/division** Not regulated

**14.4 Packing group**

**DOT Packing group** Not regulated  
**TDG Packing group** Not regulated  
**ADR/RID/ADN/ADG Packing group** Not regulated  
**IMDG Packing group** Not regulated  
**ICAO Packing group** Not regulated

**14.5 Environmental hazard**

Marine pollutant No

**14.6 Special precautions**

None

**15. Regulatory information**

**International inventories**

<b>USA (TSCA)</b>	Complies
<b>Canada (DSL)</b>	Complies.
<b>European Union (EINECS and ELINCS)</b>	Complies
<b>Philippines (PICCS)</b>	Complies
<b>Japan (ENCS)</b>	Complies
<b>China (IECSC)</b>	Complies
<b>Australia (AICS)</b>	Complies
<b>Korean (KECL)</b>	Complies
<b>New Zealand (NZIoC)</b>	Complies

**SARA 311/312 Hazard Categories**

Fire Hazard (Combustible Dust)

Component	SARA 302 / TPQs	SARA 313	CERCLA RQ
Polyanionic cellulose	N/A	N/A	N/A

**State Comments**

Proposition 65: This product is not known to contain chemicals considered by the State of California's Safe Drinking Water and Toxic Enforcement Act of 1986 as causing cancer and/or reproductive toxicity at levels that are expected to pose a significant risk under anticipated use conditions.

This product may not be distributed or used in Canada.

**16. Other information**

**Supersedes date** 13/May/2015

**Revision date** 30/Mar/2016

**Version** 6

**The following sections have been revised:** 1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND THE COMPANY/UNDERTAKING 6. Accidental release measures 7. Handling and storage 8. EXPOSURE CONTROLS / PERSONAL PROTECTION 11. Toxicological information 15. Regulatory Information Section 16: Other information.

**HMIS classification**

Health	1
Flammability	1
Physical hazard	0
PPE	E

N/A - Not Applicable, N/D - Not Determined.

\*A mark of M-I L.L.C., a Schlumberger Company

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## Safety Data Sheet MICA (All Grades)

### 1. Identification of the Substance/Preparation and of the Company/Undertaking

#### 1.1 Product identifier

**Product name** MICA (All Grades)  
**Product code** PID1063

**Synonyms** MICA FINE, MICA MEDIUM, MICA COARSE, MICA 15Z (C), MICA 25Z (M), MICA 40Z (F)

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Lost circulation material.

**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

##### Supplier

M-I Drilling Fluids UK Limited  
Westhill Business Park  
Westhill AB32 6JL Aberdeenshire  
Scotland United Kingdom

+47 51577424

SDS@slb.com

#### 1.4 Emergency Telephone Number

**Emergency telephone** - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

<b>Norway</b>	Poison information centre: +47 22 59 13 00
---------------	--

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP] Commission Regulation (EU) No 2015/830 of 28 May 2015

**Health hazards** Not classified

**Environmental hazards** Not classified

**Physical Hazards** Not classified

## 2.2 Label elements

### Signal word

None

### Hazard Statements

This product is not classified as hazardous therefore no (H) hazard statements assigned.

### Precautionary Statements

This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

### Contains

Mica

Crystalline silica (impurity)

## 2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

## 3. Composition/information on Ingredients

### 3.1 Substances

Chemical Name	EC No	CAS No	Weight-%	Component information	REACH registration number
Mica	310-127-6	12001-26-2	60-100	Not classified	Exempt
Crystalline silica (impurity)	238-878-4	14808-60-7	<5	STOT RE. 2 (H373)	Not applicable

### 3.2 Mixtures

Not applicable

### Comments

Naturally occurring mineral.

This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis. IARC Monographs, Vol. 68, 1997, concludes that there is sufficient evidence that inhaled crystalline silica in the form of quartz or cristobalite from occupational sources causes cancer in humans. IARC Classification Group I.

## 4. First Aid Measures

### 4.1 First aid measures

#### Inhalation

If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

---

<b>Ingestion</b>	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
<b>Skin contact</b>	Wash skin thoroughly with soap and water. Get medical attention if irritation persists.
<b>Eye Contact</b>	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

**4.2. Most important symptoms and effects, both acute and delayed**

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

**Symptoms**

**Inhalation** Please see Section 11. Toxicological Information for further information.

**Ingestion** Please see Section 11. Toxicological Information for further information.

**Skin contact** Please see Section 11. Toxicological Information for further information.

**Eye contact** Please see Section 11. Toxicological Information for further information.

**4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician** Treat symptomatically.

**5. Firefighting Measures**

**5.1 Extinguishing media**

**Suitable extinguishing media**

Use extinguishing media appropriate for surrounding material.

**Extinguishing media which must not be used for safety reasons**

None known.

**5.2. Special hazards arising from the substance or mixture**

**Unusual fire and explosion hazards**

None known.

**Hazardous combustion products**

Thermal decomposition can lead to release of irritating gases and vapours

**5.3 Advice for firefighters**

**Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

**Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

## 6. Accidental Release Measures

### 6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

### 6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

#### **Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

### 6.3 Methods and material for containment and cleaning up

#### **Methods for containment**

Cover powder spill with plastic sheet or tarp to minimise spreading. Prevent further leakage or spillage if safe to do so.

#### **Methods for cleaning up**

Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

### 6.4 Reference to other sections

See section 13 for more information.

## 7. Handling and Storage

### 7.1 Precautions for safe handling

#### **Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation.

#### **Hygiene Measures**

Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product. Remove contaminated clothing.

### 7.2 Conditions for safe storage, including any incompatibilities

**Technical measures/precautions** Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

**Storage precautions** Keep containers tightly closed in a dry, cool and well-ventilated place.

**Storage class** Chemical storage.

**Packaging materials** Use specially constructed containers only.

### 7.3 Specific end uses

See Section 1.2.

## 8. Exposure Controls/Personal Protection

## 8.1 Control parameters

### Component Information

Chemical Name	EU OEL - Third List	Austria	Denmark
Mica	Not determined	10 mg/m <sup>3</sup> TWA inhalable fraction	Not determined
Crystalline silica (impurity)	Not determined	0.15 mg/m <sup>3</sup> TWA alveolar dust, respirable fraction	0.1mg/m <sup>3</sup>
Chemical Name	France	Germany	Hungary
Mica	Not determined	Not determined	Not determined
Crystalline silica (impurity)	0.1 mg/m <sup>3</sup> TWA	Not determined	0.15mg/m <sup>3</sup> TWA
Chemical Name	Italy	Netherlands	Norway
Mica	Not determined	Not determined	6 mg/m <sup>3</sup> TWA total dust 3 mg/m <sup>3</sup> TWA respirable dust 12 mg/m <sup>3</sup> STEL total dust 6 mg/m <sup>3</sup> STEL respirable dust
Crystalline silica (impurity)	Not determined	0.075 mg/m <sup>3</sup>	0.3 mg/m <sup>3</sup> TWA total dust 0.1 mg/m <sup>3</sup> TWA respirable dust 0.9 mg/m <sup>3</sup> STEL total dust 0.3 mg/m <sup>3</sup> STEL respirable dust Carcinogen
Chemical Name	Poland	Portugal	Romania
Mica	Not determined	3 mg/m <sup>3</sup> TWA respirable fraction	3mg/m <sup>3</sup> TWAdust, inhalable fraction
Crystalline silica (impurity)	2 mg/m <sup>3</sup> TWA NDS >50% free crystalline silica 0.3 mg/m <sup>3</sup> TWA NDS >50% free crystalline silica 4.0 mg/m <sup>3</sup> TWA NDS 2% to 50% free crystalline silica 1.0 mg/m <sup>3</sup> TWA NDS 2% to 50% free crystalline silica	0.025 mg/m <sup>3</sup> TWA respirable fraction	0.1mg/m <sup>3</sup> TWAdust, respirable fraction
Chemical Name	Spain	Switzerland	UK
Mica	3 mg/m <sup>3</sup> TWA VLA-ED	3 mg/m <sup>3</sup> TWA MAK	30 mg/m <sup>3</sup> STEL calculated total inhalable 2.4 mg/m <sup>3</sup> STEL calculated respirable 10 mg/m <sup>3</sup> TWA total inhalable 0.8 mg/m <sup>3</sup> TWA respirable
Crystalline silica (impurity)	0.05 mg/m <sup>3</sup> TWA VLA-ED	0.15 mg/m <sup>3</sup> TWA MAK	Not determined

## 8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

### Engineering Controls

Ensure adequate ventilation. Mechanical ventilation or local exhaust ventilation is required. Provide appropriate exhaust ventilation at places where dust is formed.

### Personal protective equipment

#### Eye protection

Use eye protection according to EN 166, designed to protect against powders and dusts.  
Tightly fitting safety goggles. Safety glasses with side-shields.

#### Hand protection

Wear gloves according to EN 374 to protect against skin effects from powders  
Repeated or prolonged contact Use protective gloves made of: PVC Butyl rubber

**Respiratory protection** Frequent change is advisable  
 In case of insufficient ventilation, wear suitable respiratory equipment, Use the indicated respiratory protection if the occupational exposure limit is exceeded and/or in case of product release (dust), Respirator with combination filter for vapour/particulate (EN 141), Suitable mask with particle filter P3 (European Norm 143), At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

**Skin and body protection** Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.

**Hygiene Measures** Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.



**8.2.3 Environmental exposure controls**

**Environmental exposure** Use appropriate containment to avoid environmental contamination See section 6 for more information

**9. Physical and Chemical Properties**

**9.1 Information on basic physical and chemical properties**

**Physical state** Solid  
**Appearance** No information available  
**Odour** Odourless  
**Colour** Grey - Silver  
**Odour threshold** Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
pH	No information available	
pH @ dilution	9.0	@ 10%
Melting / freezing point	1300 °C / 2372 °F	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapour pressure	No information available	
Vapour density	No information available	
Specific gravity	2.7 - 2.8	20 °C
Bulk density	No information available	
Relative density	No information available	
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	

<b>Dynamic viscosity</b>	No information available
<b>log Pow</b>	Not determined
<b>Explosive properties</b>	Not applicable
<b>Oxidising properties</b>	None known
<b>9.2 Other information</b>	
<b>Pour point</b>	No information available
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	None
<b>Density</b>	No information available
<b>Particle Size (Micron)</b>	250 - 4750

**Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

## 10. Stability and Reactivity

### 10.1 Reactivity

No specific reactivity hazards associated with this product.

### 10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

### 10.3 Possibility of Hazardous Reactions

#### **Hazardous polymerisation**

Hazardous polymerisation does not occur.

### 10.4 Conditions to avoid

None known.

### 10.5 Incompatible materials

No materials to be especially mentioned.

### 10.6 Hazardous decomposition products

See Section 5.2.

## 11. Toxicological Information

### 11.1 Information on toxicological effects

#### **Acute toxicity**

#### **Product information**

This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis.

#### **Inhalation**

Inhalation of dust in high concentration may cause irritation of respiratory system.

**Eye contact** Dust may cause mechanical irritation.

**Skin contact** Prolonged contact may cause redness and irritation.

**Ingestion** Ingestion may cause stomach discomfort.

**Unknown acute toxicity** Not applicable.

**Toxicology data for the components**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Mica	No data available	No data available	No data available
Crystalline silica (impurity)	= 500 mg/kg ( Rat )	No data available	No data available

**Sensitisation** This product does not contain any components suspected to be sensitizing.

**Mutagenic effects** This product does not contain any known or suspected mutagens.

**Carcinogenicity** Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled.

**Reproductive toxicity** This product does not contain any known or suspected reproductive hazards.

**Routes of exposure** Inhalation.

**Routes of entry** Inhalation.

**Specific target organ toxicity - Single exposure** Not classified

**Specific target organ toxicity - Repeated exposure** Not classified.

**Aspiration hazard** Not applicable.

**Other information** Key literature references and sources for data. See Section 16 for more information.

**12. Ecological Information**

**12.1 Toxicity**

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.  
 Listed on PLONOR list of OSPAR

**Toxicity to algae**  
 This product is not considered toxic to algae.

**Toxicity to fish**

This product is not considered toxic to fish.

**Toxicity to daphnia and other aquatic invertebrates**

This product is not considered toxic to invertebrates.

**Toxicology data for the components**

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Mica	No information available	No information available	No information available
Crystalline silica (impurity)	LC50 Danio rerio (zebra fish) : > 10000 mg/l 96h	EC50: > 1000 mg/l 72h	LC50 Daphnia magna (Water flea): > 10000 mg/l 24h

**12.2 Persistence and degradability**

Not Applicable - Inorganic chemical.

Chemical Name	Persistence and degradability
Crystalline silica (impurity)	Inorganic compound

**12.3 Bioaccumulative potential**

Not Applicable - Inorganic chemical.

Chemical Name	Bioaccumulation
Crystalline silica (impurity)	Product/Substance is inorganic

**12.4 Mobility**

**Mobility**

Insoluble in water.

Chemical Name	Mobility
Crystalline silica (impurity)	Insoluble in water

**Mobility in soil**

No information available.

Chemical Name	Mobility in soil
Crystalline silica (impurity)	Not expected to adsorb on soil

**12.5 Results of PBT and vPvB assessment**

Not classified as PBT/vPvB by current EU criteria.

**12.6 Other adverse effects.**

None known.

#### 12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

### 13. Disposal Considerations

#### 13.1 Waste treatment methods

<b>Waste from residues/unused products</b>	Dispose of in accordance with local regulations.
<b>Contaminated packaging</b>	Empty containers should be taken to an approved waste handling site for recycling or disposal.
<b>EWC Waste Disposal No</b>	According to the European Waste Catalogue, Waste Codes are not product specific, but application specific Waste codes should be assigned by the user based on the application for which the product was used The following Waste Codes are only suggestions: EWC waste disposal No: Waste Code: 06 03 99

### 14. Transport information

#### 14.1. UN number

Not regulated

#### 14.2. UN proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

#### 14.3. Hazard class(es)

<b>ADR/RID/ADN/ADG Hazard class</b>	Not regulated
<b>IMDG Hazard class</b>	Not regulated
<b>ICAO Hazard class/division</b>	Not regulated

#### 14.4 Packing group

<b>ADR/RID/ADN/ADG Packing Group</b>	Not regulated
<b>IMDG Packing group</b>	Not regulated
<b>ICAO Packing group</b>	Not regulated

#### 14.5 Environmental hazard

No

#### 14.6 Special precautions

Not applicable

#### 14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code

Please contact SDS@slb.com for info regarding transport in Bulk.

## 15. Regulatory Information

### 15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

Commission Regulation (EU) 2015/830 of 28 May 2015 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC, 2000/21/EC and 453/2010 including amendments.

This safety data sheet complies with the requirements of Regulation (EC) No. 1272/2008.

Dutch Mining Regulations: In accordance with Mining Regulations 9.2 and Chapter 4 of the Working Conditions Decree.

SZW list; Crystalline Silica (respirable) is listed in the SZW list of carcinogenic substances and processes

#### International inventories

USA, Toxic Substances Control Act inventory (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Inventory - Japan - Existing and New Chemicals list	Does not comply
China (IECSC)	Complies
Australia (AICS)	Complies
Korea (KECL)	Complies
Inventory - New Zealand - Inventory of Chemicals (NZIoC)	Complies

#### Europe - REACH

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

For use only in North Sea countries (NSG)

### 15.2 Chemical Safety Report

No information available

## 16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	19/Jun/2018
Revision date	04/Oct/2018

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**Version** 9

**This SDS has been revised in the following section(s)** 1, 15, 16 For use only in North Sea countries (NSG)  
No changes with regard to classification have been made.

**Key literature references and sources for data**

www.ChemADVISOR.com

Supplier

National Chemical Inventories

National regulatory information

National occupational exposure limits

**Training Advice**

Do not handle until all safety precautions have been read and understood

Follow general hygiene considerations recognised as common good workplace practices

**Full text of H-Statements referred to under sections 2 and 3**

This product is not classified as hazardous therefore no (H) hazard statements assigned.

H373 - May cause damage to organs through prolonged or repeated exposure if inhaled

**Disclaimer**

The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

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## Safety Data Sheet M-I-X\* II (All Grades)

### 1. Identification of the Substance/Preparation and of the Company/Undertaking

#### 1.1 Product identifier

**Product name** M-I-X\* II (All Grades)  
**Product code** PID11307  
**REACH Registration Name** Exempt

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Lost circulation material.

**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

##### Supplier

M-I Drilling Fluids UK Limited  
Westhill Business Park  
Westhill AB32 6JL Aberdeenshire  
Scotland United Kingdom

+47 51577424

SDS@slb.com

#### 1.4 Emergency Telephone Number

**Emergency telephone** - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

<b>Germany</b>	+49 69 222 25285
<b>Norway</b>	Poison information centre: +47 22 59 13 00

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP] Commission Regulation (EU) No 2015/830 of 28 May 2015

**Health hazards** Not classified

**Environmental hazards** Not classified

**Physical Hazards** Not classified

## 2.2 Label elements

### Signal word

None

### Hazard Statements

This product is not classified as hazardous therefore no (H) hazard statements assigned.

### Precautionary Statements

This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

### Contains

Cellulose fibre

Crystalline silica (impurity)

## 2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria  
 Suspended dust may present a dust explosion hazard  
 Product dust may be irritating to eyes, skin and respiratory system

## 3. Composition/information on Ingredients

### 3.1 Substances

Chemical Name	EC No	CAS No	Weight-%	Component information	REACH registration number
Cellulose fibre	Listed	Proprietary	60-100	Not classified	Exempt
Crystalline silica (impurity)	238-878-4	14808-60-7	<2	STOT RE. 2 (H373)	Not applicable

### 3.2 Mixtures

Not applicable

### Comments

Naturally occurring mineral.

This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis. IARC Monographs, Vol. 68, 1997, concludes that there is sufficient evidence that inhaled crystalline silica in the form of quartz or cristobalite from occupational sources causes cancer in humans. IARC Classification Group I.

## 4. First Aid Measures

### 4.1 First aid measures

#### **Inhalation**

If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation

develops or if breathing becomes difficult.

<b>Ingestion</b>	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
<b>Skin contact</b>	Wash skin thoroughly after handling. Get medical attention immediately if symptoms occur.
<b>Eye Contact</b>	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if any discomfort continues.

#### **4.2. Most important symptoms and effects, both acute and delayed**

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

#### **Symptoms**

**Inhalation** Please see Section 11. Toxicological Information for further information.

**Ingestion** Please see Section 11. Toxicological Information for further information.

**Skin contact** Please see Section 11. Toxicological Information for further information.

**Eye contact** Please see Section 11. Toxicological Information for further information.

#### **4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician** Treat symptomatically.

## **5. Firefighting Measures**

### **5.1 Extinguishing media**

#### **Suitable extinguishing media**

Water Fog, Alcohol Foam, CO<sub>2</sub>, Dry Chemical.

#### **Extinguishing media which must not be used for safety reasons**

None known.

### **5.2. Special hazards arising from the substance or mixture**

#### **Unusual fire and explosion hazards**

Dust may form explosive mixture in air.

#### **Hazardous combustion products**

Thermal decomposition can lead to release of irritating gases and vapours Carbon oxides (CO<sub>x</sub>).

### **5.3 Advice for firefighters**

#### **Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

**Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

## 6. Accidental Release Measures

### 6.1. Personal precautions, protective equipment and emergency procedures

Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. Use personal protective equipment. See also section 8. Material becomes slippery when wet. Use caution if wet.

### 6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

**Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

### 6.3 Methods and material for containment and cleaning up

**Methods for containment**

Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimise spreading and keep powder dry.

**Methods for cleaning up**

Take precautionary measures against static discharges. Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

### 6.4 Reference to other sections

See section 13 for more information.

## 7. Handling and Storage

### 7.1 Precautions for safe handling

**Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation.

**Hygiene Measures**

Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product. Remove contaminated clothing.

### 7.2 Conditions for safe storage, including any incompatibilities

**Technical measures/precautions**

Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

**Storage precautions**

Keep containers tightly closed in a dry, cool and well-ventilated place. Avoid heat, flames and other sources of ignition. Suspended dust may present a dust explosion hazard. Protect from moisture. Avoid contact with: Oxidizing agents.

**Storage class**

Chemical storage.

Storage class, TRGS 510, Germany LGK11 - Combustible solids

Packaging materials Use specially constructed containers only

**7.3 Specific end uses**

See Section 1.2.

**8. Exposure Controls/Personal Protection**

**8.1 Control parameters**

Exposure Limits No biological limit allocated

**Component Information**

Chemical Name	EU OEL - Third List	Austria	Denmark
Cellulose fibre	Not determined	Not determined	Not determined
Crystalline silica (impurity)	Not determined	0.15 mg/m <sup>3</sup> TWA alveolar dust, respirable fraction	0.1mg/m <sup>3</sup>
Chemical Name	France	Germany	Hungary
Cellulose fibre	10 mg/m <sup>3</sup> TWA	Not determined	Not determined
Crystalline silica (impurity)	0.1 mg/m <sup>3</sup> TWA	Not determined	0.15mg/m <sup>3</sup> TWA
Chemical Name	Italy	Netherlands	Norway
Cellulose fibre	Not determined	Not determined	Not determined
Crystalline silica (impurity)	Not determined	0.075 mg/m <sup>3</sup>	0.3 mg/m <sup>3</sup> TWA total dust 0.1 mg/m <sup>3</sup> TWA respirable dust 0.9 mg/m <sup>3</sup> STEL total dust 0.3 mg/m <sup>3</sup> STEL respirable dust Carcinogen
Chemical Name	Poland	Portugal	Romania
Cellulose fibre	Not determined	10 mg/m <sup>3</sup> TWA	10mg/m <sup>3</sup> TWAdust, inhalable fraction
Crystalline silica (impurity)	2 mg/m <sup>3</sup> TWA NDS >50% free crystalline silica 0.3 mg/m <sup>3</sup> TWA NDS >50% free crystalline silica 4.0 mg/m <sup>3</sup> TWA NDS 2% to 50% free crystalline silica 1.0 mg/m <sup>3</sup> TWA NDS 2% to 50% free crystalline silica	0.025 mg/m <sup>3</sup> TWA respirable fraction	0.1mg/m <sup>3</sup> TWAdust, respirable fraction
Chemical Name	Spain	Switzerland	UK
Cellulose fibre	10 mg/m <sup>3</sup> TWA VLA-ED	3 mg/m <sup>3</sup> TWA MAK	20 mg/m <sup>3</sup> STEL inhalable dust 12 mg/m <sup>3</sup> STEL calculated respirable dust 10 mg/m <sup>3</sup> TWA inhalable dust 4 mg/m <sup>3</sup> TWA respirable dust
Crystalline silica (impurity)	0.05 mg/m <sup>3</sup> TWA VLA-ED	0.15 mg/m <sup>3</sup> TWA MAK	Not determined

**8.2 Exposure controls**

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

**Engineering Controls**

Ensure adequate ventilation. Mechanical ventilation or local exhaust ventilation is required.

**Personal protective equipment**

- Eye protection** Use eye protection according to EN 166, designed to protect against powders and dusts. Tightly fitting safety goggles. Safety glasses with side-shields.
- Hand protection** Wear gloves according to EN 374 to protect against skin effects from powders Use protective gloves made of: Nitrile Neoprene Frequent change is advisable
- Respiratory protection** No personal respiratory protective equipment normally required, In case of insufficient ventilation, wear suitable respiratory equipment, Suitable mask with particle filter P3 (European Norm 143), At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
- Skin and body protection** Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.

**Hygiene Measures**

Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.



**8.2.3 Environmental exposure controls**

**Environmental exposure** Use appropriate containment to avoid environmental contamination See section 6 for more information

**9. Physical and Chemical Properties**

**9.1 Information on basic physical and chemical properties**

<b>Physical state</b>	Solid
<b>Appearance</b>	Powder Dust
<b>Odour</b>	Slight
<b>Colour</b>	Tan
<b>Odour threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
pH	No information available	
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapour pressure	No information available	
Vapour density	No information available	
Specific gravity	1.4 - 1.65	20 °C
Bulk density	352-513 kg/m <sup>3</sup> / 22-32 lb/ft <sup>3</sup>	

<b>Relative density</b>	No information available
<b>Water solubility</b>	Insoluble in water
<b>Solubility in other solvents</b>	No information available
<b>Autoignition temperature</b>	No information available
<b>Decomposition temperature</b>	No information available
<b>Kinematic viscosity</b>	No information available
<b>Dynamic viscosity</b>	No information available
<b>log Pow</b>	No information available
<b>Explosive properties</b>	Suspended dust may present a dust explosion hazard
<b>Oxidising properties</b>	No information available

#### **9.2 Other information**

<b>Pour point</b>	No information available
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	None
<b>Density</b>	No information available

#### **Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

## **10. Stability and Reactivity**

### **10.1 Reactivity**

Dust may form explosive mixture in air.

### **10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

### **10.3 Possibility of Hazardous Reactions**

#### **Hazardous polymerisation**

Hazardous polymerisation does not occur.

### **10.4 Conditions to avoid**

Take precautionary measures against static charges. Avoid heat, flames and other sources of ignition. Avoid dust formation. Protect from moisture.

### **10.5 Incompatible materials**

Oxidizing agents.

### **10.6 Hazardous decomposition products**

See Section 5.2.

## **11. Toxicological Information**

### **11.1 Information on toxicological effects**

#### **Acute toxicity**

<b>Product information</b>	This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis.
<b>Inhalation</b>	Inhalation of dust in high concentration may cause irritation of respiratory system.
<b>Eye contact</b>	Dust may cause mechanical irritation.
<b>Skin contact</b>	Prolonged contact may cause redness and irritation.
<b>Ingestion</b>	Ingestion may cause stomach discomfort.
<b>Unknown acute toxicity</b>	Not applicable.

**Toxicology data for the components**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Cellulose fibre	> 5 g/kg ( Rat )	> 2 g/kg ( Rabbit )	> 5800 mg/m <sup>3</sup> ( Rat ) 4 h
Crystalline silica (impurity)	= 500 mg/kg ( Rat )	No data available	No data available

<b>Sensitisation</b>	This product does not contain any components suspected to be sensitizing.
<b>Mutagenic effects</b>	This product does not contain any known or suspected mutagens.
<b>Carcinogenicity</b>	Contains a known or suspected carcinogen.
<b>Reproductive toxicity</b>	This product does not contain any known or suspected reproductive hazards.
<b>Routes of exposure</b>	Inhalation.
<b>Routes of entry</b>	Inhalation.
<b>Specific target organ toxicity - Single exposure</b>	Not classified
<b>Specific target organ toxicity - Repeated exposure</b>	Not classified.
<b>Aspiration hazard</b>	Not applicable.
<b>Other information</b>	Key literature references and sources for data. See Section 16 for more information.

**12. Ecological Information**

**12.1 Toxicity**

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.  
 Listed on PLONOR list of OSPAR

**Toxicity to algae**

This product is not considered toxic to algae.

**Toxicity to fish**

This product is not considered toxic to fish.

**Toxicity to daphnia and other aquatic invertebrates**

This product is not considered toxic to invertebrates.

**Toxicology data for the components**

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Cellulose fibre	No information available	No information available	No information available
Crystalline silica (impurity)	LC50 Danio rerio (zebra fish) : > 10000 mg/l 96h	EC50: > 1000 mg/l 72h	LC50 Daphnia magna (Water flea): > 10000 mg/l 24h

**12.2 Persistence and degradability**

This product is expected to be readily biodegradable.

**12.3 Bioaccumulative potential**

The product does not contain any substances expected to be bioaccumulating.

**12.4 Mobility**

**Mobility**

Insoluble in water.

**Mobility in soil**

No information available.

**12.5 Results of PBT and vPvB assessment**

Not classified as PBT/vPvB by current EU criteria.

**12.6 Other adverse effects.**

None known.

**12.7 Other information**

Key literature references and sources for data. See Section 16 for more information.

## 13. Disposal Considerations

### 13.1 Waste treatment methods

<b>Waste from residues/unused products</b>	Dispose of in accordance with local regulations.
<b>Contaminated packaging</b>	Empty containers should be transported/delivered using a registered waste carrier for local recycling or waste disposal.
<b>EWC Waste Disposal No</b>	According to the European Waste Catalogue, Waste Codes are not product specific, but application specific Waste codes should be assigned by the user based on the application for which the product was used The following Waste Codes are only suggestions: EWC waste disposal No: 01 05 99

## 14. Transport information

### 14.1. UN number

Not regulated

### 14.2. UN proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

### 14.3. Hazard class(es)

<b>ADR/RID/ADN/ADG Hazard class</b>	Not regulated
<b>IMDG Hazard class</b>	Not regulated
<b>ICAO Hazard class/division</b>	Not regulated

### 14.4 Packing group

<b>ADR/RID/ADN/ADG Packing Group</b>	Not regulated
<b>IMDG Packing group</b>	Not regulated
<b>ICAO Packing group</b>	Not regulated

### 14.5 Environmental hazard

No

### 14.6 Special precautions

Not applicable

### 14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code

Please contact SDS@slb.com for info regarding transport in Bulk.

## 15. Regulatory Information

### 15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

**Germany, Water Endangering Classes (VwVwS)** Water endangering class = 1

**Technical Rules for Hazardous Substances (TRGS)** TRGS 220 National aspects when compiling safety data sheets  
TRGS 510 Storage of hazardous substances in non stationary containers  
TRGS 900 Occupational exposure limits

#### Germany

Regulations governing systems for handling substances hazardous to waters  
Hazardous substances ordinance

Commission Regulation (EU) 2015/830 of 28 May 2015 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC, 2000/21/EC and 453/2010 including amendments.

This safety data sheet complies with the requirements of Regulation (EC) No. 1272/2008.

Dutch Mining Regulations: In accordance with Mining Regulations 9.2 and Chapter 4 of the Working Conditions Decree.

#### International inventories

USA, Toxic Substances Control Act inventory (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Inventory - Japan - Existing and New Chemicals list	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korea (KECL)	Complies
Inventory - New Zealand - Inventory of Chemicals (NZIoC)	Complies

#### Europe - REACH

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

### 15.2 Chemical Safety Report

No information available

## 16. Other Information

**Prepared by** Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse  
**Supercedes Date:** 19/Feb/2016  
**Revision date** 08/Jul/2018  
**Version** 9  
**This SDS has been revised in the following section(s)** All sections No changes with regard to classification have been made. Updated according to GHS/CLP.

**Key literature references and sources for data**

www.ChemADVISOR.com  
Supplier  
National Chemical Inventories  
National regulatory information  
National occupational exposure limits

**Training Advice**

Do not handle until all safety precautions have been read and understood  
Follow general hygiene considerations recognised as common good workplace practices

**Full text of H-Statements referred to under sections 2 and 3**

This product is not classified as hazardous therefore no (H) hazard statements assigned.

H373 - May cause damage to organs through prolonged or repeated exposure if inhaled

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**Disclaimer**

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Safety data sheet number PID1130  
Version 7  
Revision date 01/Dec/2017  
Supersedes date 10/Nov/2014



## Safety Data Sheet NOVATEC\* F

### 1. Identification of the substance/preparation and of the Company/undertaking

#### 1.1 Product identifier

Product name NOVATEC\* F  
Product code PID1130

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Fluid loss reducer.

Uses advised against Consumer use

#### 1.3 Details of the supplier of the safety data sheet

##### Supplier

M-I Drilling Fluids UK Limited  
Westhill Business Park  
Westhill AB32 6JL Aberdeenshire  
Scotland United Kingdom

+47 51577424

SDS@slb.com

#### 1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

Norway	Poison information centre: +47 22 59 13 00
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### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP]

##### Health hazards

Skin sensitisation	Category 1
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Environmental hazards Not classified

Physical Hazards Not classified

## 2.2 Label elements



### Signal word

WARNING

### Hazard statements

H317 - May cause an allergic skin reaction

### Precautionary Statements - EU (§28, 1272/2008)

P261 - Avoid breathing dust/fume/gas/mist/vapours/spray

P272 - Contaminated work clothing should not be allowed out of the workplace

P280 - Wear protective gloves and eye/face protection

P302 + P352 - IF ON SKIN: Wash with plenty of soap and water

P333 + P313 - If skin irritation or rash occurs: Get medical advice/attention

P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

### Supplementary precautionary statements

P363 - Wash contaminated clothing before reuse

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### Contains

Tall oil derivative

(2-methoxymethylethoxy)propanol

Rosin (impurity)

## 2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

### Australian statement of hazardous/dangerous nature

Classified as Hazardous according to the criteria of NOHSC.

HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

## 3. Composition/information on ingredients

### 3.1 Substances

Not applicable

### 3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%	Regulation (EC) No 1272/2008	REACH registration number
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Tall oil derivative	Listed	Proprietary	60-100	Not classified	No data available
(2-methoxymethylethoxy)propanol	252-104-2	34590-94-8	>20 - <40	Not classified	01-2119450011-6 0-xxxx
Rosin (impurity)	232-475-7	8050-09-7	<10	Skin Sens. 1 (H317)	No data available

**Comments**

The product contains other ingredients which do not contribute to the overall classification.

**4. First aid measures**

**4.1 First aid measures**

<b>Inhalation</b>	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
<b>Ingestion</b>	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.
<b>Skin contact</b>	Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention if irritation persists.
<b>Eye Contact</b>	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

**4.2. Most important symptoms and effects, both acute and delayed**

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

**Symptoms**

<b>Inhalation</b>	Please see Section 11. Toxicological Information for further information.
<b>Ingestion</b>	Please see Section 11. Toxicological Information for further information.
<b>Skin contact</b>	Please see Section 11. Toxicological Information for further information.
<b>Eye contact</b>	Please see Section 11. Toxicological Information for further information.

**4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician** Treat symptomatically.

**5. Fire-fighting measures**

**5.1 Extinguishing media**

**Suitable extinguishing media**

Water spray, Water Fog, Alcohol Foam, CO<sub>2</sub>, Dry Chemical.

**Extinguishing media which must not be used for safety reasons**

None known.

### **5.2. Special hazards arising from the substance or mixture**

#### **Unusual fire and explosion hazards**

None known.

#### **Hazardous combustion products**

Thermal decomposition can lead to release of irritating gases and vapours

### **5.3 Advice for firefighters**

#### **Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

#### **Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

## **6. Accidental release measures**

### **6.1. Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. See also section 8.

### **6.2 Environmental precautions**

The product should not be allowed to enter drains, water courses or the soil.

#### **Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

### **6.3 Methods and material for containment and cleaning up**

#### **Methods for containment**

Prevent further leakage or spillage if safe to do so. Dyke far ahead of liquid spill for later disposal.

#### **Methods for cleaning up**

Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

### **6.4 Reference to other sections**

See section 13 for more information.

## **7. Handling and storage**

### **7.1 Precautions for safe handling**

#### **Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use. Persons susceptible to allergic reactions should not handle this product.

#### **Hygiene Measures**

Use good work and personal hygiene practices to avoid exposure When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

**7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions** Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

**Storage precautions** Keep containers tightly closed in a dry, cool and well-ventilated place Avoid contact with:  
Strong oxidising agents Strong reducing agents

**Packaging materials** Use specially constructed containers only Stainless steel, Mild steel.

**7.3 Specific end uses**

See Section 1.2.

**8. Exposure controls/personal protection**

**8.1 Control parameters**

**Exposure Limits** No biological limit allocated  
**Component Information**

Chemical Name	EU OEL - Third List	Austria	Australia	Denmark
Tall oil derivative (2-methoxymethylethoxy)propanol	Not determined 50 ppm TWA 308 mg/m <sup>3</sup> TWA Possibility of significant uptake through the skin	Not determined 100 ppm STEL 614 mg/m <sup>3</sup> STEL 50 ppm TWA 307 mg/m <sup>3</sup> TWA	Not determined 50ppmTWA 308mg/m <sup>3</sup> TWA	Not determined 50 ppm TWA 309 mg/m <sup>3</sup> TWA Potential for cutaneous absorption
Rosin (impurity)	Not determined	Not determined	0.1mg/m <sup>3</sup> TWA	Not determined
Chemical Name	Malaysia	France	Germany	Hungary
Tall oil derivative (2-methoxymethylethoxy)propanol	Not determined 100 ppm TWA 606 mg/m <sup>3</sup> TWA Skin notation	Not determined 50 ppmTWA 308 mg/m <sup>3</sup> TWA	Not determined 50 ppm TWA 310 mg/m <sup>3</sup> TWA	Not determined 308mg/m <sup>3</sup> TWA 308mg/m <sup>3</sup> STEL
Rosin (impurity)	Not determined	0.1 mg/m <sup>3</sup> TWA	Not determined	Not determined
Chemical Name	New Zealand	Italy	Netherlands	Norway
Tall oil derivative (2-methoxymethylethoxy)propanol	Not determined 150 ppm STEL 909 mg/m <sup>3</sup> STEL 100 ppm TWA 606 mg/m <sup>3</sup> TWA Possibility of significant uptake through the skin	Not determined Not determined	Not determined 300 mg/m <sup>3</sup>	Not determined 50 ppm TWA 300 mg/m <sup>3</sup> TWA 75 ppm STEL 375 mg/m <sup>3</sup> STEL Skin
Rosin (impurity)	Not determined	Not determined	Not determined	Not determined
Chemical Name	Poland	Portugal	Romania	Russia
Tall oil derivative (2-methoxymethylethoxy)propanol	Not determined 480 mg/m <sup>3</sup> STEL NDSCh mixture of isomers: Propanol, 1(or 2)-(2-methoxymethylethoxy)-, Propanol, 1-(1-methoxymethylethoxy)	Not determined Skin 150 ppm STEL VLE-CD 50 ppm TWA indicative limit value 308 mg/m <sup>3</sup> TWA indicative limit value	Not determined 50ppmTWA 308mg/m <sup>3</sup> TWA	Not determined Not determined
Rosin (impurity)	Not determined	Not determined	Not determined	4 mg/m <sup>3</sup> MAC

Chemical Name	Allergenic substance			
	Spain	Switzerland	Turkey	UK
Tall oil derivative	Not determined	Not determined	Not determined	Not determined
(2-methoxymethylethoxy)propanol	Skin 50 ppm TWA VLA-ED 308 mg/m <sup>3</sup> TWA VLA-ED	50 ppm STEL 300 mg/m <sup>3</sup> STEL 50 ppm TWA MAK 300 mg/m <sup>3</sup> TWA MAK	Skin 50 ppm TWA 308 mg/m <sup>3</sup> TWA	150 ppm STEL calculated 924 mg/m <sup>3</sup> STEL calculated Skin 50 ppm TWA 308 mg/m <sup>3</sup> TWA
Rosin (impurity)	Not determined	Not determined	Not determined	Not determined

### Derived No Effect Level (DNEL)

#### Long term exposure systemic effects

##### (2-methoxymethylethoxy)propanol

Dermal	283 mg/kg
Inhalation	308 mg/m <sup>3</sup>

#### Predicted No Effect Concentration (PNEC)

##### (2-methoxymethylethoxy)propanol

Fresh Water	19 mg/l
Sea Water	1.9 mg/l
Freshwater sediment	70.2 mg/kg
Soil	2.74 mg/kg
Impact on sewage treatment	4168 mg/l
Intermittent release	190 mg/l

### 8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

#### Engineering Controls

Ensure adequate ventilation. Mechanical ventilation or local exhaust ventilation is required.

#### Personal protective equipment

##### Eye protection

Use eye protection according to EN 166, designed to protect against liquid splashes. Tightly fitting safety goggles. Safety glasses with side-shields.

##### Hand protection

Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Neoprene Nitrile PVC  
Break through time >480 minutes  
Glove thickness >=0.4 mm

##### Respiratory protection

Be aware that liquid may penetrate the gloves. Frequent change is advisable.  
In case of insufficient ventilation wear suitable respiratory equipment, Respirator with a vapor filter (EN 141), Use respirator with organic vapor protection (A, brown), At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

##### Skin and body protection

Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.

#### Hygiene Measures

Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.



**8.2.3 Environmental exposure controls**

**Environmental exposure** Local authorities should be advised if significant spillages cannot be contained See section 6 for more information

**9. Physical and chemical properties**

**9.1 Information on basic physical and chemical properties**

**Physical state** Liquid  
**Appearance** No information available  
**Odour** Characteristic  
**Colour** Dark brown  
**Odour threshold** Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
pH	No information available	
pH @ dilution		
Melting / freezing point	-5 °C / 23 °F	
Boiling point/range	180 °C / 365 °F	760 mmHg
Flash point	> 75 °C / > 167 °F	PMCC
Evaporation rate	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapour pressure	No information available	
Vapour density	No information available	
Specific gravity	No information available	
Bulk density	No information available	
Relative density	1.01 sg	
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	29 cP	@ 25 °C
Dynamic viscosity	No information available	
log Pow	No information available	
<b>Explosive properties</b>	Not applicable	
<b>Oxidising properties</b>	None known	

**9.2 Other information**

**Pour point** No information available  
**Molecular weight** No information available  
**VOC content(%)** None  
**Density** No information available

**Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

**10. Stability and reactivity**

**10.1 Reactivity**

No specific reactivity hazards associated with this product.

**10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerisation**

Hazardous polymerisation does not occur.

**10.4 Conditions to avoid**

None known.

**10.5 Incompatible materials**

Strong oxidising agents. Strong reducing agents.

**10.6 Hazardous decomposition products**

See Section 5.2.

**11. Toxicological information**

**11.1 Information on toxicological effects**

**Acute toxicity**

<b>Inhalation</b>	Inhalation of vapours in high concentration may cause irritation of respiratory system.
<b>Eye contact</b>	May cause slight irritation.
<b>Skin contact</b>	May cause an allergic skin reaction. May be absorbed through the skin in harmful amounts.
<b>Ingestion</b>	Ingestion may cause stomach discomfort.
<b>Unknown acute toxicity</b>	Not applicable.

**LD50 Oral** > 2000 mg/kg (rat) (based on components) (PRODUCT)

**Toxicology data for the components**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Tall oil derivative	No data available	No data available	No data available
(2-methoxymethylethoxy)propanol	No data available	No data available	No data available

Rosin (impurity)	No data available	No data available	No data available
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<b>Sensitisation</b>	May cause sensitisation by skin contact.
<b>Mutagenic effects</b>	This product does not contain any known or suspected mutagens.
<b>Carcinogenicity</b>	This product does not contain any known or suspected carcinogens.
<b>Reproductive toxicity</b>	This product does not contain any known or suspected reproductive hazards.
<b>Routes of exposure</b>	Skin contact. Inhalation.
<b>Routes of entry</b>	Skin absorption.
<b>Specific target organ toxicity - Single exposure</b>	Not classified
<b>Specific target organ toxicity - Repeated exposure</b>	Not classified.
<b>Aspiration hazard</b>	Not applicable.

## 12. Ecological information

### 12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

#### Toxicity to algae

This product is not considered toxic to algae.

#### Toxicity to fish

This product is not considered toxic to fish.

#### Toxicity to daphnia and other aquatic invertebrates

This product is not considered toxic to invertebrates.

#### Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Tall oil derivative	No information available	No information available	No information available
(2-methoxymethylethoxy)propanol	No information available	No information available	No information available
Rosin (impurity)	No information available	No information available	No information available

### 12.2 Persistence and degradability

See component information below.

Chemical Name	Persistence and degradability
(2-methoxymethylethoxy)propanol	Readily biodegradable - Test : OECD 301F Duration 28 days 76% (Literature data)

Rosin (impurity)	Readily biodegradable - Test : OECD 301D Duration 28 days 71% (Literature data)
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**12.3 Bioaccumulative potential**

See component information below.

Chemical Name	Bioaccumulation
(2-methoxymethylethoxy)propanol	Does not bioaccumulate - Test : Evaluation Notes: Literature data (estimated)
Rosin (impurity)	Does not bioaccumulate - Test BCF - Bioconcentration factor (BCF) : 56.23 Notes: Calculated data (in silico)

**12.4 Mobility**

**Mobility**

Insoluble in water.

**Mobility in soil**

See component information below.

Chemical Name	Mobility in soil
Tall oil derivative	No information available
(2-methoxymethylethoxy)propanol	Mobile - Notes: Calculated data (in silico)
Rosin (impurity)	Static - Test : Koc:5357 Notes: Calculated data (in silico)

**12.5 Results of PBT and vPvB assessment**

Not classified as PBT/vPvB by current EU criteria.

**12.6 Other adverse effects.**

None known.

**13. Disposal considerations**

**13.1 Waste treatment methods**

**Waste from residues / unused products**

Dispose of in accordance with local regulations.

**Contaminated packaging**

Empty containers should be transported/delivered using a registered waste carrier for local recycling or waste disposal.

**EWC Waste Disposal No**

According to the European Waste Catalogue, Waste Codes are not product specific, but application specific Waste codes should be assigned by the user based on the application

for which the product was used The following Waste Codes are only suggestions: EWC  
waste disposal No: 07 01 04 Waste Code: 7152 Organic waste without halogen.

## 14. Transport information

### 14.1. UN number

Not regulated

### 14.2. UN proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

### 14.3. Hazard class(es)

<b>ADR/RID/ADN/ADG Hazard class</b>	Not regulated
<b>IMDG Hazard class</b>	Not regulated
<b>ICAO Hazard class/division</b>	Not regulated

### 14.4 Packing group

<b>ADR/RID/ADN/ADG Packing Group</b>	Not regulated
<b>IMDG Packing group</b>	Not regulated
<b>ICAO Packing group</b>	Not regulated

### 14.5 Environmental hazard

No

### 14.6 Special precautions

Not applicable

### 14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code

Please contact SDS@slb.com for info regarding transport in Bulk.

## 15. Regulatory information

### 15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

#### **Australian Standard for the Uniform Scheduling of Drugs and Poisons**

Rosin (impurity)  
Schedule 5

**New Zealand hazard classification** Skin Sens. 1

**HSNO approval no.** HSR002503

**Group number** 6.5B

**Commission Regulation (EU) No 453/2010 of 20 May 2010 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH). Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals**

Agency, amending Directive 1999/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC, including amendments.

This safety data sheet complies with the requirements of Regulation (EC) No. 1272/2008.

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].  
 National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].  
 National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG).

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)

The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP)

**International inventories**

USA, Toxic Substances Control Act inventory (TSCA)	Complies
European Union - EINECS and ELINCS	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Does not comply
Inventory - Japan - Existing and New Chemicals list	Does not comply
China (IECSC)	Does not comply
Australia (AICS)	Complies
Korea (KECL)	Complies
Inventory - New Zealand - Inventory of Chemicals (NZIoC)	Complies

**Europe - REACH**

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

Norway Pr. no. 45608

**15.2 Chemical Safety Report**

No information available

**16. Other information**

**Prepared by** Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse

**Supersedes date** 10/Nov/2014

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Revision date 01/Dec/2017

Version 7

**This SDS has been revised in the following section(s)** This SDS have been made in a new database and therefore a new layout. No changes with regard to classification have been made. Updated according to GHS/CLP.

**Full text of H-Statements referred to under sections 2 and 3**

H317 - May cause an allergic skin reaction

\*A mark of M-I L.L.C., a Schlumberger Company

**Disclaimer**

The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

Safety data sheet number PID1236  
Version 6  
Revision date 12/Nov/2018  
Supersedes Date: 30/Oct/2014



## Safety Data Sheet POLY-PLUS\* DRY

### 1. Identification of the Substance/Preparation and of the Company/Undertaking

#### 1.1 Product identifier

Product name POLY-PLUS\* DRY  
Product code PID1236

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Shale stabilizer.

Uses advised against Consumer use

#### 1.3 Details of the supplier of the safety data sheet

##### Supplier

M-I Drilling Fluids UK Limited  
Westhill Business Park  
Westhill AB32 6JL Aberdeenshire  
Scotland United Kingdom

+47 51577424

SDS@slb.com

#### 1.4 Emergency Telephone Number

Emergency telephone (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

#### National Poison Center Numbers

Germany	+49 69 222 25285
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### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP] Commission Regulation (EU) No 2015/830 of 28 May 2015

**Health hazards** Not classified

**Environmental hazards** Not classified

**Physical Hazards** Not classified

## 2.2 Label elements

### Signal word

None

### Hazard Statements

This product is not classified as hazardous therefore no (H) hazard statements assigned.

### Precautionary Statements

This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

**Contains** , No hazardous components

### 2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria  
Suspended dust may present a dust explosion hazard

## 3. Composition/information on Ingredients

### 3.1 Substances

Not applicable

### 3.2 Mixtures

This product does not contain any hazardous ingredients, or ingredients with national workplace exposure limits.

## 4. First Aid Measures

### 4.1 First aid measures

<b>Inhalation</b>	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
<b>Ingestion</b>	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
<b>Skin contact</b>	Wash skin thoroughly with soap and water. Get medical attention if irritation persists.
<b>Eye Contact</b>	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn.

Get medical attention if any discomfort continues.

#### **4.2. Most important symptoms and effects, both acute and delayed**

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

#### **Symptoms**

**Inhalation** Please see Section 11. Toxicological Information for further information.

**Ingestion** Please see Section 11. Toxicological Information for further information.

**Skin contact** Please see Section 11. Toxicological Information for further information.

**Eye contact** Please see Section 11. Toxicological Information for further information.

#### **4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician** Treat symptomatically.

## **5. Firefighting Measures**

### **5.1 Extinguishing media**

#### **Suitable extinguishing media**

Water Fog, Alcohol Foam, CO<sub>2</sub>, Dry Chemical.

#### **Extinguishing media which must not be used for safety reasons**

None known.

### **5.2. Special hazards arising from the substance or mixture**

#### **Unusual fire and explosion hazards**

Dust may form explosive mixture in air.

#### **Hazardous combustion products**

Fire or high temperatures create: Carbon oxides (CO<sub>x</sub>), Nitrogen oxides (NO<sub>x</sub>), Hydrogen cyanide (hydrocyanic acid).

### **5.3 Advice for firefighters**

#### **Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

#### **Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

## **6. Accidental Release Measures**

### **6.1. Personal precautions, protective equipment and emergency procedures**

Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. Use personal protective equipment. See also section 8. Material becomes extremely slippery when wet.

## **6.2 Environmental precautions**

Disposal should be in accordance with applicable regional, national and local laws and regulations. Refer to applicable federal, state and local regulations.

### **Environmental exposure controls**

Local authorities should be advised if significant spillages cannot be contained.

## **6.3 Methods and material for containment and cleaning up**

### **Methods for containment**

Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimise spreading.

### **Methods for cleaning up**

Sweep up and shovel into suitable containers for disposal. Take precautionary measures against static discharges. After cleaning, flush away traces with water.

## **6.4 Reference to other sections**

See section 13 for more information.

# **7. Handling and Storage**

## **7.1 Precautions for safe handling**

### **Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Material becomes extremely slippery when wet.

### **Hygiene Measures**

Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product. Remove contaminated clothing.

## **7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions** Ensure adequate ventilation. Keep airborne concentrations below exposure limits. Take precautionary measures against static discharges.

**Storage precautions** Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from open flames, hot surfaces and sources of ignition. Suspended dust may present a dust explosion hazard. Avoid contact with: Oxidizing agents.

**Storage class** Chemical storage.

**Storage class, TRGS 510, Germany** LGK11 - Combustible solids

**Packaging materials** Use specially constructed containers only

## **7.3 Specific end uses**

See Section 1.2.

## 8. Exposure Controls/Personal Protection

### 8.1 Control parameters

**Exposure Limits** NUI = Nuisance dust, TWA 4mg/m<sup>3</sup> Respirable Dust, 10mg/m<sup>3</sup> Total Dust.  
 No biological limit allocated

### 8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

#### **Engineering Controls**

Ensure adequate ventilation. Mechanical ventilation or local exhaust ventilation is required.

#### **Personal protective equipment**

##### **Eye protection**

Use eye protection according to EN 166, designed to protect against powders and dusts. Tightly fitting safety goggles. Safety glasses with side-shields.

##### **Hand protection**

Wear gloves according to EN 374 to protect against skin effects from powders Repeated or prolonged contact Use protective gloves made of: Nitrile Neoprene PVC Frequent change is advisable

##### **Respiratory protection**

No protective equipment is needed under normal use conditions, In case of insufficient ventilation wear suitable respiratory equipment, Half mask with a particle filter P2 (BS EN 143), At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

##### **Skin and body protection**

Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.

#### **Hygiene Measures**

Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.



### 8.2.3 Environmental exposure controls

**Environmental exposure** Use appropriate containment to avoid environmental contamination See section 6 for more information

## 9. Physical and Chemical Properties

### 9.1 Information on basic physical and chemical properties

**Physical state** Granular  
**Appearance** Powder Dust  
**Odour** Odourless  
**Colour** White  
**Odour threshold** Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
pH	No information available	
pH @ dilution	5-9	@ 5 g/l
Melting / freezing point	> 150 °C / 302 °F	
Boiling point/range	No information available	
Flash point	Not applicable	
Evaporation rate	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapour pressure	No information available	
Vapour density	No information available	
Specific gravity	1.25 - 1.40	20 °C
Bulk density	641-737 kg/m <sup>3</sup> / 40 - 46 lb/ft <sup>3</sup>	
Relative density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	> 150 °C / 302 °F	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

**Explosive properties** Suspended dust may present a dust explosion hazard  
**Oxidising properties** None known

**9.2 Other information**

**Pour point** No information available  
**Molecular weight** No information available  
**VOC content(%)** No information available  
**Density** No information available

**Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

**10. Stability and Reactivity**

**10.1 Reactivity**

Dust may form explosive mixture in air.

**10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerisation**

Hazardous polymerisation does not occur.

**10.4 Conditions to avoid**

Take precautionary measures against static charges. Avoid dust formation. Keep away from open flames, hot surfaces and sources of ignition.

**10.5 Incompatible materials**

Oxidizing agents.

**10.6 Hazardous decomposition products**

See Section 5.2.

**11. Toxicological Information**

**11.1 Information on toxicological effects**

**Acute toxicity**

**Inhalation**

Inhalation of dust in high concentration may cause irritation of respiratory system.

**Eye contact**

Dust may cause mechanical irritation.

**Skin contact**

Prolonged contact may cause redness and irritation.

**Ingestion**

Ingestion may cause stomach discomfort.

**Unknown acute toxicity**

Not applicable.

**LD50 Oral**

> 5000 mg/kg (rat) (PRODUCT)

**LD50 Dermal**

> 5000 mg/kg (rat) (PRODUCT)

**Sensitisation**

This product does not contain any components suspected to be sensitizing.

**Mutagenic effects**

This product does not contain any known or suspected mutagens.

**Carcinogenicity**

This product does not contain any known or suspected carcinogens.

**Reproductive toxicity**

This product does not contain any known or suspected reproductive hazards.

**Routes of exposure**

Inhalation.

**Routes of entry**

Inhalation.

**Specific target organ toxicity -  
Single exposure**

Not classified

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<b>Specific target organ toxicity - Repeated exposure</b>	Not classified.
<b>Aspiration hazard</b>	Not applicable.
<b>Other information</b>	Key literature references and sources for data. See Section 16 for more information.

## 12. Ecological Information

### 12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

#### **Toxicity to algae**

This product is not considered toxic to algae.

#### **Toxicity to fish**

This product is not considered toxic to fish.

#### **Toxicity to daphnia and other aquatic invertebrates**

This product is not considered toxic to invertebrates.

### 12.2 Persistence and degradability

The product is not biodegradable.

### 12.3 Bioaccumulative potential

Does not bioaccumulate.

### 12.4 Mobility

#### **Mobility**

Soluble in water.

#### **Mobility in soil**

No information available.

### 12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

**12.6 Other adverse effects.**

None known.

**12.7 Other information**

Key literature references and sources for data. See Section 16 for more information.

**13. Disposal Considerations**

**13.1 Waste treatment methods**

**Waste from residues/unused products**

Dispose of in accordance with local regulations.

**Contaminated packaging**

Empty containers should be taken to an approved waste handling site for recycling or disposal.

**EWC Waste Disposal No**

According to the European Waste Catalogue, Waste Codes are not product specific, but application specific Waste codes should be assigned by the user based on the application for which the product was used The following Waste Codes are only suggestions: EWC waste disposal No: 01 05 99

**14. Transport information**

**14.1. UN number**

Not regulated

**14.2. UN proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

**14.3. Hazard class(es)**

**ADR/RID/ADN/ADG Hazard class** Not regulated

**IMDG Hazard class** Not regulated

**ICAO Hazard class/division** Not regulated

**14.4 Packing group**

**ADR/RID/ADN/ADG Packing Group** Not regulated

**IMDG Packing group** Not regulated

**ICAO Packing group** Not regulated

**14.5 Environmental hazard**

No

**14.6 Special precautions**

Not applicable

**14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code**

Please contact SDS@slb.com for info regarding transport in Bulk.

**15. Regulatory Information**

**15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture**

**Germany, Water Endangering Classes (VwVwS)** Water endangering class = 2

**Technical Rules for Hazardous Substances (TRGS)** TRGS 220 National aspects when compiling safety data sheets  
 TRGS 510 Storage of hazardous substances in non stationary containers  
 TRGS 900 Occupational exposure limits

**Germany**  
**Regulations governing systems for handling substances hazardous to waters**  
**Chemicals act**

Commission Regulation (EU) 2015/830 of 28 May 2015 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC, 2000/21/EC and 453/2010 including amendments.

This safety data sheet complies with the requirements of Regulation (EC) No. 1272/2008.

**International inventories**

<b>USA, Toxic Substances Control Act inventory (TSCA)</b>	Complies
<b>Canada (DSL)</b>	Complies
<b>Philippines (PICCS)</b>	Complies
<b>Inventory - Japan - Existing and New Chemicals list</b>	Complies
<b>China (IECSC)</b>	Complies
<b>Australia (AICS)</b>	Complies
<b>Korea (KECL)</b>	Complies
<b>Inventory - New Zealand - Inventory of Chemicals (NZIoC)</b>	Complies

**Europe - REACH**

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

**15.2 Chemical Safety Report**

No information available

## 16. Other Information

<b>Prepared by</b>	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
<b>Supersedes Date:</b>	30/Oct/2014
<b>Revision date</b>	12/Nov/2018
<b>Version</b>	6
<b>This SDS has been revised in the following section(s)</b>	All sections Product Code change No changes with regard to classification have been made.

### Key literature references and sources for data

www.ChemADVISOR.com  
Supplier  
National Chemical Inventories  
National regulatory information  
National occupational exposure limits

### Training Advice

Do not handle until all safety precautions have been read and understood  
Follow general hygiene considerations recognised as common good workplace practices

### Full text of H-Statements referred to under sections 2 and 3

This product is not classified as hazardous therefore no (H) hazard statements assigned.

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### Disclaimer

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Safety data sheet number PID170  
Version 5  
Revision date 30/Dec/2015  
Supercedes date 24/Feb/2010



## Safety Data Sheet POLY-SAL\* HT

### 1. Identification of the substance/preparation and of the Company/undertaking

#### 1.1 Product identifier

Product name POLY-SAL\* HT  
Product code PID170

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended use Filtration-control. / Rheology modifier.

Uses advised against Consumer use

#### 1.3 Details of the supplier of the safety data sheet

##### Supplier

M-I Drilling Fluids UK Limited  
C/O Schlumberger  
Enterprise Drive  
Westhill Industrial Estate  
Westhill, AB32 6TQ  
Scotland UK  
+47 51577424

MISDS@slb.com

#### 1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

### 2. Hazards identification

#### 2.1 Classification of the substance or mixture

Regulation (EC) No. 1272/2008

Health hazards Not classified

##### Environmental hazards

Chronic aquatic toxicity	Category 3
--------------------------	------------

Physical Hazards Not classified

#### 2.2 Label Elements

##### Signal word

None

##### Hazard statements

H412 - Harmful to aquatic life with long lasting effects

**Precautionary Statements - EU (§28, 1272/2008)**

P273 - Avoid release to the environment

P501 - Dispose of contents/container in accordance with local regulations.

-  
 -

**Contains**

Starch

Tetrahydro-3,5-dimethyl-1,3,5-thiadiazine-2-thione

**2.3 Other data**

Not classified as PBT/vPvB by current EU criteria

**Australian statement of hazardous/dangerous nature**

Classified as Hazardous according to the criteria of NOHSC.

HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

**3. Composition/information on ingredients**

**3.1 Substances**

Not Applicable

**3.2 Mixtures**

Component	EC-No.	CAS-No	Weight % - range	Classification (67/548)	Classification (Reg. 1272/2008)	REACH registration number
Starch	Listed	Proprietary	60-100	-	Not classified	No data available
Tetrahydro-3,5-dimethyl-1,3,5-thiadiazine-2-thione	208-576-7	533-74-4	< 1	Xn; R22 Xi; R36 N; R50-53	Acute Tox. 4 (H302) Eye Irrit. 2 (H319) Aquatic Acute 1 (H400) Aquatic Chronic 1 (H410)	No data available

**Comments**

The product contains other ingredients which do not contribute to the overall classification.

**4. First aid measures**

**4.1 First Aid**

**Inhalation**

If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation

develops or if breathing becomes difficult.

<b>Ingestion</b>	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
<b>Skin contact</b>	Wash skin thoroughly with soap and water. Get medical attention if irritation persists.
<b>Eye contact</b>	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses. Get medical attention if any discomfort continues.

#### **4.2 Most important symptoms and effects, both acute and delayed**

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

#### **Main symptoms**

**Inhalation** Please see Section 11. Toxicological Information for further information.

**Ingestion** Please see Section 11. Toxicological Information for further information.

**Skin contact** Please see Section 11. Toxicological Information for further information.

**Eye contact** Please see Section 11. Toxicological Information for further information.

#### **4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician** Treat symptomatically.

## **5. Fire-fighting measures**

### **5.1 Extinguishing media**

#### **Suitable extinguishing media**

Water Fog, Alcohol Foam, CO<sub>2</sub>, Dry Chemical.

#### **Extinguishing media which shall not be used for safety reasons**

None known.

### **5.2 Special hazards arising from the substance or mixture**

#### **Unusual fire and explosion hazards**

Dust may form explosive mixture in air.

#### **Hazardous combustion products**

Fire or high temperatures create:, Carbon oxides (COx).

### **5.3 Advice for firefighters**

#### **Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

#### **Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

## 6. Accidental release measures

### 6.1 Personal precautions, protective equipment and emergency procedures

Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. If spilled, take caution, as material can cause surfaces to become very slippery. Use personal protective equipment. See also section 8.

### 6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

#### **Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

### 6.3 Methods and materials for containment and cleaning up

#### **Methods for Containment**

Cover powder spill with plastic sheet or tarp to minimize spreading. Prevent further leakage or spillage if safe to do so.

#### **Methods for cleaning up**

Sweep up and shovel into suitable containers for disposal. Avoid dust formation. After cleaning, flush away traces with water.

### 6.4 Reference to other sections

See section 13 for more information.

## 7. Handling and storage

### 7.1 Precautions for safe handling

#### **Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. If spilled, take caution, as material can cause surfaces to become very slippery.

#### **Hygiene measures**

Use good work and personal hygiene practices to avoid exposure Do not eat, drink or smoke during work. Wash hands and face before breaks and immediately after handling the product. Remove contaminated clothing.

### 7.2 Conditions for safe storage, including any incompatibilities

<b>Technical measures/precautions</b>	Ensure adequate ventilation. Keep airborne concentrations below exposure limits. Keep away from heat, sparks, and flame.
<b>Storage precautions</b>	Keep containers tightly closed in a dry, cool and well-ventilated place. Protect from moisture Avoid contact with: Strong oxidising agents Sulfuric acid.
<b>Storage class</b>	Chemical storage.
<b>Packaging material</b>	Use specially constructed containers only

### 7.3 Specific end uses

See Section 1.2.

## 8. Exposure controls/personal protection

### 8.1 Control parameters

**Exposure limits** No biological limit allocated

Component	EU OEL - Third List	Austria	Australia	Denmark
Starch	Not determined	Not determined	10mg/m <sup>3</sup> TWAINhalable dust	Not determined
Tetrahydro-3,5-dimethyl-1,3,5-thiadiazine-2-thione	Not determined	Not determined	Not determined	Not determined

Component	Malaysia	France	Germany	Hungary
Starch	10 mg/m <sup>3</sup> TWA	Not determined	Not determined	Not determined
Tetrahydro-3,5-dimethyl-1,3,5-thiadiazine-2-thione	Not determined	Not determined	Not determined	Not determined

Component	New Zealand	Italy	Netherlands	Norway
Starch	10 mg/m <sup>3</sup> TWA	Not determined	Not determined	Not determined
Tetrahydro-3,5-dimethyl-1,3,5-thiadiazine-2-thione	Not Determined	Not determined	Not determined	Not determined

Component	Poland	Portugal	Romania	Russia
Starch	Not determined	10 mg/m <sup>3</sup> TWA	Not determined	10 mg/m <sup>3</sup> MAC
Tetrahydro-3,5-dimethyl-1,3,5-thiadiazine-2-thione	Not determined	Not determined	3mg/m <sup>3</sup> STEL	2 mg/m <sup>3</sup> MAC

Component	Spain	Switzerland	Turkey	UK
Starch	10 mg/m <sup>3</sup> VLA-ED	3 mg/m <sup>3</sup> MAK respirable	Not determined	30 mg/m <sup>3</sup> STEL calculated total inhalable 12 mg/m <sup>3</sup> STEL calculated respirable 10 mg/m <sup>3</sup> TWA total inhalable 4 mg/m <sup>3</sup> TWA respirable
Tetrahydro-3,5-dimethyl-1,3,5-thiadiazine-2-thione	Not determined	Not determined	Not determined	Not determined

## 8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

### Engineering measures to reduce exposure

Ensure adequate ventilation. Mechanical ventilation or local exhaust ventilation is required.

### Personal protective equipment

#### Eye protection

Safety glasses with side-shields.

#### Hand protection

Use protective gloves made of: Nitrile, Neoprene, Frequent change is advisable.

#### Respiratory protection

No personal respiratory protective equipment normally required, In case of insufficient ventilation wear suitable respiratory equipment, Half mask with a particle filter P2 (BS EN 143), At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

#### Skin and body protection

Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.

### Hygiene measures

Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.



## 9. Physical and chemical properties

### 9.1 Information on basic physical and chemical properties

<b>Physical state</b>	Solid
<b>Appearance</b>	Powder Dust
<b>Odour</b>	Odourless
<b>Colour</b>	off-white
<b>Odor threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
<b>pH</b>	No information available	
<b>pH @ dilution</b>	4-7	1%
<b>Melting/freezing point</b>	No information available	
<b>Boiling point/range</b>	No information available	
<b>Flash Point</b>	No information available	
<b>Evaporation rate</b>	No information available	
<b>Flammability (solid, gas)</b>	Not Applicable	
<b>Flammability Limits in Air</b>		
<b>Upper flammability Limit</b>	Not applicable	
<b>Lower flammability limit</b>	Not applicable	
<b>Vapor pressure</b>	No information available	
<b>Vapor density</b>	No information available	

<b>Specific gravity</b>	No information available	
<b>Bulk density</b>	300-700 kg/m <sup>3</sup> (19-44 lb/ft <sup>3</sup> )	
<b>Relative density</b>	1.5 sg	@ 20 °C.
<b>Water solubility</b>	Soluble in water	
<b>Solubility in other solvents</b>	No information available	
<b>Autoignition temperature</b>	No information available	
<b>Decomposition temperature</b>	No information available	
<b>Kinematic viscosity</b>		
<b>Viscosity, dynamic</b>	No information available	
<b>Log Pow</b>	No information available	

<b>Explosive properties</b>	No information available
<b>Oxidizing properties</b>	No information available

**9.2 Other information**

<b>Pour point</b>	No information available
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	No information available
<b>Density VALUE</b>	No information available

**10. Stability and reactivity**

**10.1 Reactivity**

Dust may form explosive mixture in air.

**10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerization**

Hazardous polymerisation does not occur.

**10.4 Conditions to avoid**

Protect from moisture. Avoid dust formation. Heat, flames and sparks.

**10.5 Incompatible materials**

Strong oxidising agents. Sulfuric acid.

**10.6 Hazardous decomposition products**

See Section 5.2.

**11. Toxicological information**

**11.1 Information on toxicological effects**

**Acute toxicity**

**Inhalation**

Inhalation of dust in high concentration may cause irritation of respiratory system.

**Eye contact** Dust may cause mechanical irritation.

**Skin contact** Prolonged contact may cause redness and irritation.

**Ingestion** Ingestion may cause stomach discomfort.

**Unknown acute toxicity** Not Applicable.

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Starch	No data available	No data available	No data available
Tetrahydro-3,5-dimethyl-1,3,5-thiadiazine-2-thione	= 550 mg/kg ( Rat )	= 7 g/kg ( Rabbit )	= 8400 mg/m <sup>3</sup> ( Rat ) 4 h

**Sensitisation** This product does not contain any components suspected to be sensitizing.

**Mutagenic effects** This product does not contain any known or suspected mutagens.

**Carcinogenicity** This product does not contain any known or suspected carcinogens.

**Reproductive toxicity** This product does not contain any known or suspected reproductive hazards.

**Routes of exposure** None known.

**Routes of entry** No route of entry noted.

**Specific target organ toxicity (single exposure)** Not classified

**Specific target organ toxicity (repeated exposure)** Not classified.

**Aspiration hazard** Not Applicable.

## 12. Ecological information

### 12.1 Toxicity

Harmful to aquatic life with long lasting effects

**Toxicity to algae**  
 See component information below.

**Toxicity to fish**  
 See component information below.

**Toxicity to daphnia and other aquatic invertebrates**

See component information below.

Component	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Starch	No information available	No information available	No information available
Tetrahydro-3,5-dimethyl-1,3,5-thiadiazine-2-thione	0.12 - 0.21 mg/L LC50 Oncorhynchus mykiss 96 h 0.2 - 0.4 mg/L LC50 Lepomis macrochirus 96 h 10.0 - 22.0 mg/L LC50 Cyprinus carpio 96 h 12 - 31.7 mg/L LC50 Oncorhynchus mykiss 96 h	= 1 mg/L EC50 Desmodesmus subspicatus 96 h	9.5 - 14.8 mg/L EC50 Daphnia magna 48 h 0.26 - 0.37 mg/L EC50 Daphnia magna 48 h = 0.3 mg/L EC50 Daphnia magna 48 h

**12.2 Persistence and degradability**

No product level data available.

**12.3 Bioaccumulative potential**

No product level data available.

**12.4 Mobility in soil**

**Mobility**

Soluble in water.

**12.5 Results of PBT and vPvB assessment**

Not classified as PBT/vPvB by current EU criteria.

**12.6 Other adverse effects.**

None known.

**13. Disposal considerations**

**13.1 Waste treatment methods**

**Waste from residues / unused products**

Dispose of in accordance with local regulations.

<b>Contaminated packaging</b>	Empty containers should be transported/delivered using a registered waste carrier for local recycling or waste disposal.
<b>EWC waste disposal No.</b>	According to the European Waste Catalogue, Waste Codes are not product specific, but application specific. Waste codes should be assigned by the user based on the application for which the product was used. The following Waste Codes are only suggestions: EWC waste disposal No: 07 01 04

## 14. Transport information

### 14.1 UN number

Not regulated

### 14.2 Proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

### 14.3. Hazard class(es)

**ADR/RID/ADN/ADG Hazard class** Not regulated

**IMDG Hazard class** Not regulated

**ICAO Hazard class/division** Not regulated

### 14.4 Packing group

**ADR/RID/ADN/ADG Packing Group** Not regulated

**IMDG Packing group** Not regulated

**ICAO Packing group** Not regulated

### 14.5 Environmental hazard

No

### 14.6 Special precautions

Not Applicable

### Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Please contact MISDS@slb.com for info regarding transport in Bulk.

## 15. Regulatory information

### 15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

**Australian Standard for the Uniform Scheduling of Drugs and Poisons**

Tetrahydro-3,5-dimethyl-1,3,5-thiadiazine-2-thione  
Schedule 6

**Commission Regulation (EU) No 453/2010 of 20 May 2010 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH). Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals**

Agency, amending Directive 1999/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC, including amendments.

This safety data sheet complies with the requirements of Regulation (EC) No. 1272/2008.

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as Dangerous Goods by the criteria of the Australian Dangerous Goods Code (ADG Code) for transport by road or rail.

**International inventories**

USA, Toxic Substances Control Act inventory (TSCA)	Complies
European Union - EINECS and ELINCS	Complies
Canada, Domestic Substance List (DSL)	Complies
Philippines (PICCS)	Complies
Inventory - Japan - Existing and New Chemicals list	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korea (KECL)	Complies
Inventory - New Zealand - Inventory of Chemicals (NZIoC)	Complies

Contact REACH@miswaco.slb.com for REACH information.

**15.2 Chemical Safety Report**

No information available

**16. Other information**

<b>Prepared by</b>	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
<b>Supersedes date</b>	24/Feb/2010
<b>Revision date</b>	30/Dec/2015
<b>Version</b>	5
<b>The following sections have been revised:</b>	SDS fully updated in the new database, No changes with regard to classification have been made, Updated according to GHS/CLP.

**Text of R phrases mentioned in Section 3**

R22 - Harmful if swallowed  
R36 - Irritating to eyes

R50/53 - Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment

**Full text of H-Statements referred to under sections 2 and 3**

H412 - Harmful to aquatic life with long lasting effects

H302 - Harmful if swallowed  
H319 - Causes serious eye irritation  
H400 - Very toxic to aquatic life  
H410 - Very toxic to aquatic life with long lasting effects

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**Disclaimer**

The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

## Safety Data Sheet Potassium Chloride M117

### 1. Identification of the Substance/Preparation and of the Company/Undertaking

#### 1.1 Product identifier

Product name Potassium Chloride M117  
Product code M117

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Clay control agent in oilfield applications

Uses advised against Consumer use

#### 1.3 Details of the supplier of the safety data sheet

##### Supplier

Schlumberger Oilfield UK PLC  
Schlumberger House, Buckingham Gate  
Gatwick Airport  
West Sussex RH6 0NZ

+ 47 51577424

SDS@slb.com

#### 1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

Denmark	Poison Control Hotline (DK): +45 82 12 12 12
Germany	+49 69 222 25285
Italy	Centro Antiveleni Ospedale Niguarda Milan: +39 02 6610 1029
Norway	Poison information centre: +47 22 59 13 00

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP]

Health hazards Not classified

Environmental hazards Not classified

**Physical Hazards** Not classified

## **2.2 Label elements**

### **Signal word**

None

### **Hazard Statements**

This product is not classified as hazardous therefore no (H) hazard statements assigned.

### **Precautionary Statements**

This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

## **2.3 Other hazards**

Not classified as PBT/vPvB by current EU criteria

## **3. Composition/information on Ingredients**

### **3.1 Substances**

This product does not contain any hazardous ingredients, or ingredients with national workplace exposure limits.

### **3.2 Mixtures**

Not applicable

## **4. First Aid Measures**

### **4.1 First aid measures**

<b>Inhalation</b>	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
<b>Ingestion</b>	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
<b>Skin contact</b>	Wash skin thoroughly with soap and water. Get medical attention if irritation persists.
<b>Eye Contact</b>	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

### **4.2. Most important symptoms and effects, both acute and delayed**

<b>General advice</b>	The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.
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## Symptoms

<b>Inhalation</b>	Please see Section 11. Toxicological Information for further information.
<b>Ingestion</b>	Please see Section 11. Toxicological Information for further information.
<b>Skin contact</b>	Please see Section 11. Toxicological Information for further information.
<b>Eye contact</b>	Please see Section 11. Toxicological Information for further information.

### **4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician** Treat symptomatically.

## **5. Firefighting Measures**

### **5.1 Extinguishing media**

#### **Suitable extinguishing media**

Use extinguishing media appropriate for surrounding material.

#### **Extinguishing media which must not be used for safety reasons**

None known.

### **5.2. Special hazards arising from the substance or mixture**

#### **Unusual fire and explosion hazards**

None known.

#### **Hazardous combustion products**

Thermal decomposition can lead to release of irritating and toxic gases and vapours

### **5.3 Advice for firefighters**

#### **Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

#### **Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

## **6. Accidental Release Measures**

### **6.1. Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. See also section 8.

### **6.2 Environmental precautions**

The product should not be allowed to enter drains, water courses or the soil.

#### **Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

### **6.3 Methods and material for containment and cleaning up**

#### **Methods for containment**

Cover powder spill with plastic sheet or tarp to minimise spreading. Prevent further leakage or spillage if safe to do so.

#### **Methods for cleaning up**

Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

### **6.4 Reference to other sections**

See section 13 for more information.

## **7. Handling and Storage**

### **7.1 Precautions for safe handling**

#### **Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation.

#### **Hygiene Measures**

Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product. Remove contaminated clothing.

### **7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions**      Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

**Storage precautions**                      Keep containers tightly closed in a dry, cool and well-ventilated place

**Storage class**                                Chemical storage.

**Packaging materials**                      Use specially constructed containers only

### **7.3 Specific end uses**

See Section 1.2.

## **8. Exposure Controls/Personal Protection**

### **8.1 Control parameters**

**Exposure Limits**                              NUI = Nuisance dust, TWA 4mg/m<sup>3</sup> Respirable Dust, 10mg/m<sup>3</sup> Total Dust.

### **8.2 Exposure controls**

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

#### **Engineering Controls**

Ensure adequate ventilation. Provide appropriate exhaust ventilation at places where dust is formed.

## Personal protective equipment

<b>Eye protection</b>	Eye protection must conform to standard EN 166. Tightly fitting safety goggles. Safety glasses with side-shields.
<b>Hand protection</b>	Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training. Wear gloves according to EN 374 to protect against skin effects from powders. Use protective gloves made of: Neoprene Nitrile Rubber. Frequent change is advisable.
<b>Respiratory protection</b>	In case of insufficient ventilation wear suitable respiratory equipment, Half mask with a particle filter P2 (BS EN 143), At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
<b>Skin and body protection</b>	Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.

## Hygiene Measures

Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.



### 8.2.3 Environmental exposure controls

<b>Environmental exposure</b>	Use appropriate containment to avoid environmental contamination. See section 6 for more information.
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## 9. Physical and Chemical Properties

### 9.1 Information on basic physical and chemical properties

<b>Physical state</b>	Solid
<b>Appearance</b>	Crystalline
<b>Odour</b>	Very faint
<b>Colour</b>	White
<b>Odour threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
<b>pH</b>	Not applicable	
<b>pH @ dilution</b>	8-11	H2O soln
<b>Melting / freezing point</b>	770 °C / 1418 °F	
<b>Boiling point/range</b>	Not applicable	
<b>Flash point</b>	Not applicable	
<b>Evaporation rate</b>	No information available	
<b>Flammability (solid, gas)</b>	Not applicable	
<b>Flammability Limit in Air</b>		
<b>Upper flammability limit</b>	Not applicable	
<b>Lower flammability limit</b>	Not applicable	
<b>Vapour pressure</b>	Not applicable	
<b>Vapour density</b>	No information available	
<b>Specific gravity</b>	No information available	
<b>Bulk density</b>	1.100 kg/m <sup>3</sup>	
<b>Relative density</b>	1.989 g/cm <sup>3</sup>	
<b>Water solubility</b>	300 g/l	@ 20 °C
<b>Solubility in other solvents</b>	No information available	
<b>Autoignition temperature</b>	No information available	

<b>Decomposition temperature</b>	No information available
<b>Kinematic viscosity</b>	No information available
<b>Dynamic viscosity</b>	No information available
<b>log Pow</b>	No information available

<b>Explosive properties</b>	Not applicable
<b>Oxidising properties</b>	None known

## **9.2 Other information**

<b>Pour point</b>	No information available
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	No information available
<b>Density</b>	No information available

### **Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

## **10. Stability and Reactivity**

### **10.1 Reactivity**

No specific reactivity hazards associated with this product.

### **10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

### **10.3 Possibility of Hazardous Reactions**

#### **Hazardous polymerisation**

Hazardous polymerisation does not occur.

### **10.4 Conditions to avoid**

Avoid dust formation.

### **10.5 Incompatible materials**

No information available.

### **10.6 Hazardous decomposition products**

See Section 5.2.

## **11. Toxicological Information**

### **11.1 Information on toxicological effects**

#### **Acute toxicity**

<b>Inhalation</b>	Inhalation of dust in high concentration may cause irritation of respiratory system.
<b>Eye contact</b>	Dust may cause mechanical irritation.
<b>Skin contact</b>	Repeated exposure may cause skin dryness or cracking.

<b>Ingestion</b>	Ingestion may cause stomach discomfort.
<b>Unknown acute toxicity</b>	Not applicable.
<b>Sensitisation</b>	This product does not contain any components suspected to be sensitizing.
<b>Mutagenic effects</b>	This product does not contain any known or suspected mutagens.
<b>Carcinogenicity</b>	This product does not contain any known or suspected carcinogens.
<b>Reproductive toxicity</b>	This product does not contain any known or suspected reproductive hazards.
<b>Routes of exposure</b>	Inhalation. Skin contact. Eye contact.
<b>Routes of entry</b>	Inhalation.
<b>Specific target organ toxicity - Single exposure</b>	Not classified
<b>Specific target organ toxicity - Repeated exposure</b>	Not classified.
<b>Aspiration hazard</b>	Not applicable.
<b>Other information</b>	Key literature references and sources for data. See Section 16 for more information.

## 12. Ecological Information

### 12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment. Large amounts will affect pH and harm aquatic organisms

#### **Toxicity to algae**

This product is not considered toxic to algae.

#### **Toxicity to fish**

This product is not considered toxic to fish.

#### **Toxicity to daphnia and other aquatic invertebrates**

This product is not considered toxic to invertebrates.

### 12.2 Persistence and degradability

Not Applicable - Inorganic chemical.

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### **12.3 Bioaccumulative potential**

Not Applicable - Inorganic chemical.

### **12.4 Mobility**

#### **Mobility**

Soluble in water.

#### **Mobility in soil**

No information available.

### **12.5 Results of PBT and vPvB assessment**

Not classified as PBT/vPvB by current EU criteria.

### **12.6 Other adverse effects.**

None known.

### **12.7 Other information**

Key literature references and sources for data. See Section 16 for more information.

## **13. Disposal Considerations**

### **13.1 Waste treatment methods**

#### **Waste from residues/unused products**

Dispose of in accordance with local regulations.

#### **Contaminated packaging**

Empty containers should be taken to an approved waste handling site for recycling or disposal.

#### **EWC Waste Disposal No**

According to the European Waste Catalogue, Waste Codes are not product specific, but application specific Waste codes should be assigned by the user based on the application for which the product was used The following Waste Codes are only suggestions: EWC waste disposal No: 16 03 04 - inorganic wastes other than those mentioned in 16 03 03 01 04 10 – dusty and powdery wastes other than those mentioned in 01 04 07,

## **14. Transport information**

**14.1. UN number**

Not regulated

**14.2. UN proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

**14.3. Hazard class(es)**

**ADR/RID/ADN/ADG Hazard class** Not regulated

**IMDG Hazard class** Not regulated

**ICAO Hazard class/division** Not regulated

**14.4 Packing group**

**ADR/RID/ADN/ADG Packing Group** Not regulated

**IMDG Packing group** Not regulated

**ICAO Packing group** Not regulated

**14.5 Environmental hazard**

No

**14.6 Special precautions**

Not applicable

**14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code**

Please contact SDS@slb.com for info regarding transport in Bulk.

## 15. Regulatory Information

### 15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

Germany, Water Endangering Classes (VwVwS) Hazardous to water/Class 1

Technical Rules for Hazardous Substances (TRGS) TRGS 220 National aspects when compiling safety data sheets

Commission Regulation (EU) No 453/2010 of 20 May 2010 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH). Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC, including amendments.

This safety data sheet complies with the requirements of Regulation (EC) No. 1272/2008.

Dutch Mining Regulations: In accordance with Mining Regulations 9.2 and Chapter 4 of the Working Conditions Decree.

#### International inventories

USA, Toxic Substances Control Act inventory (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Inventory - Japan - Existing and New Chemicals list	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korea (KECL)	Complies
Inventory - New Zealand - Inventory of Chemicals (NZIoC)	Complies

#### Europe - REACH

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

Denmark Pr. no. 1008953

### 15.2 Chemical Safety Report

No information available

## 16. Other Information

Prepared by Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Muriel Martin Beurel

Supersedes Date: 14/May/2015

**Revision date** 20/Jun/2018

**Version** 4

**This SDS has been revised in the following section(s)** All sections No changes with regard to classification have been made.

**Key literature references and sources for data**

www.ChemADVISOR.com

Supplier

National Chemical Inventories

National regulatory information

National occupational exposure limits

**Training Advice**

Do not handle until all safety precautions have been read and understood

Follow general hygiene considerations recognised as common good workplace practices

**HMIS classification**

Health	1
Flammability	0
Physical hazard	0
PPE	E

**Full text of H-Statements referred to under sections 2 and 3**

This product is not classified as hazardous therefore no (H) hazard statements assigned.

**Disclaimer**

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Safety data sheet number PID1290A  
Version 3  
Revision date 25/Oct/2018  
Supercedes Date: 21/Jul/2015



## Safety Data Sheet Potassium Chloride Solution

### 1. Identification of the Substance/Preparation and of the Company/Undertaking

#### 1.1 Product identifier

Product name Potassium Chloride Solution  
Product code PID1290A

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Commercial chemical

Uses advised against Consumer use

#### 1.3 Details of the supplier of the safety data sheet

##### Supplier

M-I Drilling Fluids UK Limited  
Westhill Business Park  
Westhill AB32 6JL Aberdeenshire  
Scotland United Kingdom

+47 51577424

SDS@slb.com

#### 1.4 Emergency Telephone Number

Emergency telephone (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

#### National Poison Center Numbers

Norway	Poison information centre: +47 22 59 13 00
--------	--

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP] Commission Regulation (EU) No 2015/830 of 28 May 2015

<b>Health hazards</b>	Not classified
<b>Environmental hazards</b>	Not classified
<b>Physical Hazards</b>	Not classified

## 2.2 Label elements

### Signal word

None

### Hazard Statements

This product is not classified as hazardous therefore no (H) hazard statements assigned.

### Precautionary Statements

This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

### **Contains**

Potassium chloride

## 2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

## 3. Composition/information on Ingredients

### 3.1 Substances

Not applicable

### 3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%	Component information	REACH registration number
Potassium chloride	231-211-8	7447-40-7	1-30	Not Classified	Exempt

### **Comments**

The product contains other ingredients which do not contribute to the overall classification.

## 4. First Aid Measures

### 4.1 First aid measures

#### **Inhalation**

If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

#### **Ingestion**

Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

---

<b>Skin contact</b>	Wash skin thoroughly with soap and water. Get medical attention if irritation persists.
<b>Eye Contact</b>	Remove contact lenses, if worn. Promptly wash eyes with lots of water while lifting eye lids. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

#### **4.2. Most important symptoms and effects, both acute and delayed**

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

#### **Symptoms**

**Inhalation** Please see Section 11. Toxicological Information for further information.

**Ingestion** Please see Section 11. Toxicological Information for further information.

**Skin contact** Please see Section 11. Toxicological Information for further information.

**Eye contact** Please see Section 11. Toxicological Information for further information.

#### **4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician** Treat symptomatically.

## **5. Firefighting Measures**

### **5.1 Extinguishing media**

#### **Suitable extinguishing media**

Water spray, dry chemical, carbon dioxide (CO<sub>2</sub>), or foam.

#### **Extinguishing media which must not be used for safety reasons**

None known.

### **5.2. Special hazards arising from the substance or mixture**

#### **Unusual fire and explosion hazards**

None known.

#### **Hazardous combustion products**

Fire or high temperatures create: Chlorides.

### **5.3 Advice for firefighters**

#### **Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

#### **Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

## **6. Accidental Release Measures**

**6.1. Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. See also section 8.

**6.2 Environmental precautions**

The product should not be allowed to enter drains, water courses or the soil.

**Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

**6.3 Methods and material for containment and cleaning up****Methods for containment**

Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

**Methods for cleaning up**

Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

**6.4 Reference to other sections**

See section 13 for more information.

**7. Handling and Storage****7.1 Precautions for safe handling****Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

**Hygiene Measures**

Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product. Remove contaminated clothing.

**7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions**      Ensure adequate ventilation.

**Storage precautions**                      Keep containers tightly closed in a dry, cool and well-ventilated place. Avoid contact with:  
Strong oxidising agents  
Strong acids  
Strong alkalies.

**Storage class**                                Chemical storage.

**Packaging materials**                      Use specially constructed containers only.

**7.3 Specific end uses**

See Section 1.2.

**8. Exposure Controls/Personal Protection****8.1 Control parameters**

---

**Exposure Limits** Contains no substances with occupational exposure limit values

**Component Information**

Chemical Name	EU OEL - Third List	Austria	Denmark
Potassium chloride	Not determined	Not determined	Not determined
Chemical Name	France	Germany	Hungary
Potassium chloride	Not determined	Not determined	Not determined
Chemical Name	Italy	Netherlands	Norway
Potassium chloride	Not determined	Not determined	Not determined
Chemical Name	Poland	Portugal	Romania
Potassium chloride	Not determined	Not determined	Not determined
Chemical Name	Spain	Switzerland	UK
Potassium chloride	Not determined	Not determined	Not determined

**8.2 Exposure controls**

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

**Engineering Controls**  
Ensure adequate ventilation.

**Personal protective equipment**

- Eye protection** Use eye protection according to EN 166, designed to protect against liquid splashes. Tightly fitting safety goggles. Safety glasses with side-shields.
- Hand protection** Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training  
Use protective gloves made of: Neoprene Nitrile PVC  
Be aware that liquid may penetrate the gloves. Frequent change is advisable.
- Respiratory protection** No personal respiratory protective equipment normally required, In case of insufficient ventilation wear suitable respiratory equipment, Respirator with a vapor filter (EN 141), Chemical respirator with inorganic vapour cartridge (Grey B), Half mask with a particle filter P2 (BS EN 143), At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
- Skin and body protection** Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.

**Hygiene Measures** Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.



**8.2.3 Environmental exposure controls**

**Environmental exposure** Use appropriate containment to avoid environmental contamination See section 6 for more information

## 9. Physical and Chemical Properties

### 9.1 Information on basic physical and chemical properties

<b>Physical state</b>	Liquid
<b>Appearance</b>	No information available
<b>Odour</b>	Odourless
<b>Colour</b>	Colourless
<b>Odour threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
pH	~ 7	
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	102 °C / 215 °F	
Flash point	No information available	
Evaporation rate	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapour pressure	No information available	
Vapour density	No information available	
Specific gravity	No information available	
Bulk density	No information available	
Relative density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	
<b>Explosive properties</b>	Not applicable	
<b>Oxidising properties</b>	None known	

### 9.2 Other information

<b>Pour point</b>	No information available
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	None
<b>Density</b>	1.08 - 1.57 g/ml (8.33 - 9.7 lb/gal) @ 20°C

### **Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

## 10. Stability and Reactivity

### 10.1 Reactivity

No specific reactivity hazards associated with this product.

### 10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

### 10.3 Possibility of Hazardous Reactions

#### **Hazardous polymerisation**

Hazardous polymerisation does not occur.

### 10.4 Conditions to avoid

None known.

### 10.5 Incompatible materials

Strong oxidising agents. Strong acids. Strong alkalies.

### 10.6 Hazardous decomposition products

See Section 5.2.

## 11. Toxicological Information

### 11.1 Information on toxicological effects

#### **Acute toxicity**

<b>Inhalation</b>	Inhalation of vapours in high concentration may cause irritation of respiratory system.
<b>Eye contact</b>	May cause slight irritation.
<b>Skin contact</b>	Prolonged contact may cause redness and irritation.
<b>Ingestion</b>	Ingestion may cause stomach discomfort.
<b>Unknown acute toxicity</b>	Not applicable.

#### **Toxicology data for the components**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Potassium chloride	= 2600 mg/kg ( Rat )	No data available	No data available

<b>Sensitisation</b>	This product does not contain any components suspected to be sensitizing.
<b>Mutagenic effects</b>	This product does not contain any known or suspected mutagens.
<b>Carcinogenicity</b>	This product does not contain any known or suspected carcinogens.
<b>Reproductive toxicity</b>	This product does not contain any known or suspected reproductive hazards.
<b>Routes of exposure</b>	None known.
<b>Routes of entry</b>	No route of entry noted.
<b>Specific target organ toxicity - Single exposure</b>	Not classified

<b>Specific target organ toxicity - Repeated exposure</b>	Not classified.
<b>Aspiration hazard</b>	Not applicable.
<b>Other information</b>	Key literature references and sources for data. See Section 16 for more information.

## 12. Ecological Information

### 12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Listed on PLONOR list of OSPAR

#### **Toxicity to algae**

See component information below.

#### **Toxicity to fish**

See component information below.

#### **Toxicity to daphnia and other aquatic invertebrates**

See component information below.

#### **Toxicology data for the components**

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Potassium chloride	750 - 1020 mg/L LC50 Pimephales promelas 96 h = 1060 mg/L LC50 Lepomis macrochirus 96 h	= 2500 mg/L EC50 Desmodesmus subspicatus 72 h	= 83 mg/L EC50 Daphnia magna 48 h = 825 mg/L EC50 Daphnia magna 48 h

### 12.2 Persistence and degradability

Not Applicable - Inorganic chemical.

### 12.3 Bioaccumulative potential

Not Applicable - Inorganic chemical.

### 12.4 Mobility

#### **Mobility**

Soluble in water.

#### **Mobility in soil**

No information available.

**12.5 Results of PBT and vPvB assessment**

Not classified as PBT/vPvB by current EU criteria.

**12.6 Other adverse effects.**

None known.

**12.7 Other information**

Key literature references and sources for data. See Section 16 for more information.

**13. Disposal Considerations****13.1 Waste treatment methods****Waste from residues/unused products**

Dispose of in accordance with local regulations.

**Contaminated packaging**

Empty containers should be taken to an approved waste handling site for recycling or disposal.

**EWC Waste Disposal No**

According to the European Waste Catalogue, Waste Codes are not product specific, but application specific Waste codes should be assigned by the user based on the application for which the product was used. The following Waste Codes are only suggestions: EWC waste disposal No: 06 03 99.

**14. Transport information****14.1. UN number**

Not regulated

**14.2. UN proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

**14.3. Hazard class(es)**

**ADR/RID/ADN/ADG Hazard class** Not regulated

**IMDG Hazard class** Not regulated

**ICAO Hazard class/division** Not regulated

**14.4 Packing group**

**ADR/RID/ADN/ADG Packing Group** Not regulated

**IMDG Packing group** Not regulated

**ICAO Packing group** Not regulated

**14.5 Environmental hazard**

No

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## 14.6 Special precautions

Not applicable

## 14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code

Please contact SDS@slb.com for info regarding transport in Bulk.

## 15. Regulatory Information

### 15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

Commission Regulation (EU) 2015/830 of 28 May 2015 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC, 2000/21/EC and 453/2010 including amendments.

This safety data sheet complies with the requirements of Regulation (EC) No. 1272/2008.

#### International inventories

USA, Toxic Substances Control Act inventory (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Inventory - Japan - Existing and New Chemicals list	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korea (KECL)	Complies
Inventory - New Zealand - Inventory of Chemicals (NZIoC)	Complies

#### Europe - REACH

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

### 15.2 Chemical Safety Report

No information available

## 16. Other Information

**Prepared by** Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Sandra McWilliam

**Supersedes Date:** 21/Jul/2015

**Revision date** 25/Oct/2018

**Version** 3

**This SDS has been revised in the following section(s)** All sections No changes with regard to classification have been made.

**Key literature references and sources for data**

www.ChemADVISOR.com

Supplier

National Chemical Inventories

National regulatory information

National occupational exposure limits

**Training Advice**

Do not handle until all safety precautions have been read and understood

Follow general hygiene considerations recognised as common good workplace practices

**Full text of H-Statements referred to under sections 2 and 3**

This product is not classified as hazardous therefore no (H) hazard statements assigned.

**Disclaimer**

The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

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## Safety Data Sheet SAFE-CARB\* (All Grades)

### 1. Identification of the Substance/Preparation and of the Company/Undertaking

#### 1.1 Product identifier

Product name	SAFE-CARB* (All Grades)
Product code	PID1361
Synonyms	SAFE-CARB* 2, 10, 20, 25, 40,140, 250, 500, 600, 750, 1400, 2500, SAFE-CARB* COARSE
REACH Registration Name	With respect to minerals, Article 2 § 7(b) and Annex V point 7 explicitly exempt from registration and evaluation "minerals which occur in nature, if they are not chemically modified." This product is exempt from registration. Exempt Annex V ENTRY 7.

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Lost circulation material. Weighting agent. Bridging material.

**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

##### Supplier

M-I Drilling Fluids UK Limited  
Westhill Business Park  
Westhill AB32 6JL Aberdeenshire  
Scotland United Kingdom

+47 51577424

SDS@slb.com

#### 1.4 Emergency Telephone Number

**Emergency telephone** - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

Denmark	Poison Control Hotline (DK): +45 82 12 12 12
Germany	+49 69 222 25285
Norway	Poison information centre: +47 22 59 13 00

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP] Commission Regulation (EU) No 2015/830 of 28 May 2015

**Health hazards** Not classified  
**Environmental hazards** Not classified  
**Physical Hazards** Not classified

**2.2 Label elements**

**Signal word**

None

**Hazard Statements**

This product is not classified as hazardous therefore no (H) hazard statements assigned.

**Precautionary Statements**

This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

**Contains**

Calcium carbonate

Crystalline silica (impurity)

**2.3 Other hazards**

Not classified as PBT/vPvB by current EU criteria  
 Product dust may be irritating to eyes, skin and respiratory system

**3. Composition/information on Ingredients**

**3.1 Substances**

Chemical Name	EC No	CAS No	Weight-%	Component information	REACH registration number
Calcium carbonate	207-439-9	471-34-1	60-100	Not classified	Exempt
Crystalline silica (impurity)	238-878-4	14808-60-7	<1	STOT RE. 2 (H373)	Not applicable

**3.2 Mixtures**

Not applicable

**Comments**

Naturally occurring mineral.

This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis. IARC Monographs, Vol. 68, 1997, concludes that there is sufficient evidence that inhaled crystalline silica in the form of quartz or cristobalite from occupational sources causes cancer in humans. IARC Classification Group I.

## 4. First Aid Measures

### 4.1 First aid measures

<b>Inhalation</b>	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
<b>Ingestion</b>	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
<b>Skin contact</b>	Wash skin thoroughly with soap and water. Get medical attention if irritation persists.
<b>Eye Contact</b>	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if any discomfort continues.

### 4.2. Most important symptoms and effects, both acute and delayed

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

#### **Symptoms**

<b>Inhalation</b>	Please see Section 11. Toxicological Information for further information.
<b>Ingestion</b>	Please see Section 11. Toxicological Information for further information.
<b>Skin contact</b>	Please see Section 11. Toxicological Information for further information.
<b>Eye contact</b>	Please see Section 11. Toxicological Information for further information.

### 4.3 Indication of any immediate medical attention and special treatment needed

**Notes to physician** Treat symptomatically.

## 5. Firefighting Measures

### 5.1 Extinguishing media

#### **Suitable extinguishing media**

Use extinguishing agent suitable for type of surrounding fire.

#### **Extinguishing media which must not be used for safety reasons**

None known.

### 5.2. Special hazards arising from the substance or mixture

#### **Unusual fire and explosion hazards**

None known.

#### **Hazardous combustion products**

Fire or high temperatures create: Carbon oxides (COx).

### 5.3 Advice for firefighters

#### **Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

#### **Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

## **6. Accidental Release Measures**

### 6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

### 6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

#### **Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

### 6.3 Methods and material for containment and cleaning up

#### **Methods for containment**

Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimise spreading.

#### **Methods for cleaning up**

Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

### 6.4 Reference to other sections

See section 13 for more information.

## **7. Handling and Storage**

### 7.1 Precautions for safe handling

#### **Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation.

#### **Hygiene Measures**

Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product. Remove contaminated clothing.

### 7.2 Conditions for safe storage, including any incompatibilities

**Technical measures/precautions** Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

**Storage precautions** Keep containers tightly closed in a dry, cool and well-ventilated place. Protect from moisture.

**Storage class** Chemical storage.

**Storage class, TRGS 510, Germany** Storage class 9: no classification

**Packaging materials** Use specially constructed containers only

**7.3 Specific end uses**

See Section 1.2.

**8. Exposure Controls/Personal Protection**

**8.1 Control parameters**

**Exposure Limits** No biological limit allocated

**Component Information**

Chemical Name	EU OEL - Third List	Austria	Denmark
Calcium carbonate	Not determined	Not determined	Not determined
Crystalline silica (impurity)	Not determined	0.15 mg/m <sup>3</sup> TWA alveolar dust, respirable fraction	0.1mg/m <sup>3</sup>
Chemical Name	France	Germany	Hungary
Calcium carbonate	10 mg/m <sup>3</sup> TWA	Not determined	Not determined
Crystalline silica (impurity)	0.1 mg/m <sup>3</sup> TWA	Not determined	0.15mg/m <sup>3</sup> TWA
Chemical Name	Italy	Netherlands	Norway
Calcium carbonate	Not determined	Not determined	Not determined
Crystalline silica (impurity)	Not determined	0.075 mg/m <sup>3</sup>	0.3 mg/m <sup>3</sup> TWA total dust 0.1 mg/m <sup>3</sup> TWA respirable dust 0.9 mg/m <sup>3</sup> STEL total dust 0.3 mg/m <sup>3</sup> STEL respirable dust Carcinogen
Chemical Name	Poland	Portugal	Romania
Calcium carbonate	10 mg/m <sup>3</sup> TWA NDS <2% free crystalline silica	10 mg/m <sup>3</sup> TWA particulate matter containing no Asbestos and <1% Crystalline silica	Not determined
Crystalline silica (impurity)	2 mg/m <sup>3</sup> TWA NDS >50% free crystalline silica 0.3 mg/m <sup>3</sup> TWA NDS >50% free crystalline silica 4.0 mg/m <sup>3</sup> TWA NDS 2% to 50% free crystalline silica 1.0 mg/m <sup>3</sup> TWA NDS 2% to 50% free crystalline silica	0.025 mg/m <sup>3</sup> TWA respirable fraction	0.1mg/m <sup>3</sup> TWAdust, respirable fraction
Chemical Name	Spain	Switzerland	UK
Calcium carbonate	Not determined	3 mg/m <sup>3</sup> TWA MAK	Not determined
Crystalline silica (impurity)	0.05 mg/m <sup>3</sup> TWA VLA-ED	0.15 mg/m <sup>3</sup> TWA MAK	Not determined

**8.2 Exposure controls**

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

**Engineering Controls**

Ensure adequate ventilation. Mechanical ventilation or local exhaust ventilation is required.

**Personal protective equipment**

- Eye protection** Use eye protection according to EN 166, designed to protect against powders and dusts. Tightly fitting safety goggles. Safety glasses with side-shields.
- Hand protection** Repeated or prolonged contact Use protective gloves made of: Nitrile Neoprene Frequent change is advisable
- Respiratory protection** No personal respiratory protective equipment normally required, In case of insufficient ventilation wear suitable respiratory equipment, Suitable mask with particle filter P3 (European Norm 143), At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
- Skin and body protection** Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.

**Hygiene Measures** Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.



**8.2.3 Environmental exposure controls**

**Environmental exposure** Use appropriate containment to avoid environmental contamination See section 6 for more information

**9. Physical and Chemical Properties**

**9.1 Information on basic physical and chemical properties**

<b>Physical state</b>	Solid
<b>Appearance</b>	Powder Dust
<b>Odour</b>	Odourless
<b>Colour</b>	White
<b>Odour threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
<b>pH</b>	Not applicable	
<b>pH @ dilution</b>	8.5 - 9.5	@ 100 g/l
<b>Melting / freezing point</b>	No information available	
<b>Boiling point/range</b>	No information available	
<b>Flash point</b>	No information available	
<b>Evaporation rate</b>	No information available	
<b>Flammability (solid, gas)</b>	Not applicable	
<b>Flammability Limit in Air</b>		
<b>Upper flammability limit</b>	Not applicable	
<b>Lower flammability limit</b>	Not applicable	
<b>Vapour pressure</b>	No information available	
<b>Vapour density</b>	No information available	
<b>Specific gravity</b>	2.6 - 2.8	@ 20 °C
<b>Bulk density</b>	No information available	
<b>Relative density</b>	No information available	
<b>Water solubility</b>	Insoluble in water	
<b>Solubility in other solvents</b>	No information available	

**Autoignition temperature** No information available  
**Decomposition temperature** 825 °C / 1517°F  
**Kinematic viscosity** No information available  
**Dynamic viscosity** No information available  
**log Pow** No information available

**Explosive properties** Not applicable  
**Oxidising properties** None known

#### **9.2 Other information**

**Pour point** No information available  
**Molecular weight** No information available  
**VOC content(%)** None  
**Density** No information available

#### **Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

## **10. Stability and Reactivity**

### **10.1 Reactivity**

No specific reactivity hazards associated with this product.

### **10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

### **10.3 Possibility of Hazardous Reactions**

#### **Hazardous polymerisation**

Hazardous polymerisation does not occur.

### **10.4 Conditions to avoid**

Avoid dust formation. Protect from moisture.

### **10.5 Incompatible materials**

No materials to be especially mentioned.

### **10.6 Hazardous decomposition products**

See Section 5.2.

## **11. Toxicological Information**

### **11.1 Information on toxicological effects**

#### **Acute toxicity**

#### **Product information**

This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis.

<b>Inhalation</b>	Inhalation of dust in high concentration may cause irritation of respiratory system.
<b>Eye contact</b>	Dust may cause mechanical irritation.
<b>Skin contact</b>	Prolonged contact may cause redness and irritation.
<b>Ingestion</b>	Ingestion may cause stomach discomfort.
<b>Unknown acute toxicity</b>	Not applicable.

**Toxicology data for the components**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Calcium carbonate	= 6450 mg/kg ( Rat )	No data available	No data available
Crystalline silica (impurity)	= 500 mg/kg ( Rat )	No data available	No data available

<b>Sensitisation</b>	This product does not contain any components suspected to be sensitizing.
<b>Mutagenic effects</b>	This product does not contain any known or suspected mutagens.
<b>Carcinogenicity</b>	Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled.
<b>Reproductive toxicity</b>	This product does not contain any known or suspected reproductive hazards.
<b>Routes of exposure</b>	Inhalation.
<b>Routes of entry</b>	Inhalation.
<b>Specific target organ toxicity - Single exposure</b>	Not classified
<b>Specific target organ toxicity - Repeated exposure</b>	Not classified.
<b>Aspiration hazard</b>	Not applicable.
<b>Other information</b>	Key literature references and sources for data. See Section 16 for more information.

**12. Ecological Information**

**12.1 Toxicity**

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.  
 Listed on PLONOR list of OSPAR

**Toxicity to algae**  
 This product is not considered toxic to algae.

**Toxicity to fish**

This product is not considered toxic to fish.

**Toxicity to daphnia and other aquatic invertebrates**

This product is not considered toxic to invertebrates.

**Toxicology data for the components**

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Calcium carbonate	No information available	No information available	No information available
Crystalline silica (impurity)	LC50 Danio rerio (zebra fish) : > 10000 mg/l 96h	EC50: > 1000 mg/l 72h	LC50 Daphnia magna (Water flea): > 10000 mg/l 24h

**12.2 Persistence and degradability**

Not Applicable - Inorganic chemical.

**12.3 Bioaccumulative potential**

Not Applicable - Inorganic chemical.

**12.4 Mobility**

**Mobility**

Insoluble in water.

**Mobility in soil**

No information available.

**12.5 Results of PBT and vPvB assessment**

Not classified as PBT/vPvB by current EU criteria.

**12.6 Other adverse effects.**

None known.

**12.7 Other information**

Key literature references and sources for data. See Section 16 for more information.

## 13. Disposal Considerations

### 13.1 Waste treatment methods

<b>Waste from residues/unused products</b>	Dispose of in accordance with local regulations.
<b>Contaminated packaging</b>	Empty containers should be taken to an approved waste handling site for recycling or disposal.
<b>EWC Waste Disposal No</b>	According to the European Waste Catalogue, Waste Codes are not product specific, but application specific Waste codes should be assigned by the user based on the application for which the product was used. The following Waste Codes are only suggestions: EWC waste disposal No: 06 03 99

## 14. Transport information

### 14.1. UN number

Not regulated

### 14.2. UN proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

### 14.3. Hazard class(es)

<b>ADR/RID/ADN/ADG Hazard class</b>	Not regulated
<b>IMDG Hazard class</b>	Not regulated
<b>ICAO Hazard class/division</b>	Not regulated

### 14.4 Packing group

<b>ADR/RID/ADN/ADG Packing Group</b>	Not regulated
<b>IMDG Packing group</b>	Not regulated
<b>ICAO Packing group</b>	Not regulated

### 14.5 Environmental hazard

No

### 14.6 Special precautions

Not applicable

### 14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code

Please contact SDS@slb.com for info regarding transport in Bulk.

## 15. Regulatory Information

### 15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

**Germany, Water Endangering Classes (VwVwS)** Water endangering class = nwg

**Technical Rules for Hazardous Substances (TRGS)** TRGS 220 National aspects when compiling safety data sheets  
TRGS 510 Storage of hazardous substances in non stationary containers  
TRGS 900 Occupational exposure limits

#### Germany

Regulations governing systems for handling substances hazardous to waters  
Hazardous substances ordinance

Commission Regulation (EU) 2015/830 of 28 May 2015 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC, 2000/21/EC and 453/2010 including amendments.

This safety data sheet complies with the requirements of Regulation (EC) No. 1272/2008.

Dutch Mining Regulations: In accordance with Mining Regulations 9.2 and Chapter 4 of the Working Conditions Decree.

#### International inventories

USA, Toxic Substances Control Act inventory (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Inventory - Japan - Existing and New Chemicals list	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korea (KECL)	Complies
Inventory - New Zealand - Inventory of Chemicals (NZIoC)	Complies

#### Europe - REACH

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

Denmark Pr. no. 2175905

### 15.2 Chemical Safety Report

No information available

## 16. Other Information

<b>Prepared by</b>	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
<b>Supersedes Date:</b>	18/Feb/2016
<b>Revision date</b>	07/Jul/2018
<b>Version</b>	9
<b>This SDS has been revised in the following section(s)</b>	1, 2, 4, 7, 8, 15, 16 No changes with regard to classification have been made. Updated according to GHS/CLP.

### Key literature references and sources for data

www.ChemADVISOR.com

Supplier

National Chemical Inventories

National regulatory information

National occupational exposure limits

### Training Advice

Do not handle until all safety precautions have been read and understood

Follow general hygiene considerations recognised as common good workplace practices

### Full text of H-Statements referred to under sections 2 and 3

This product is not classified as hazardous therefore no (H) hazard statements assigned.

H373 - May cause damage to organs through prolonged or repeated exposure if inhaled

\*A mark of M-I L.L.C., a Schlumberger Company

### Disclaimer

The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

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Safety data sheet number PID1370  
Version 11  
Revision date 22/Feb/2017  
Supercedes date 11/Jan/2017



## Safety Data Sheet SAFE-COR\*

### 1. Identification of the substance/preparation and of the Company/undertaking

#### 1.1 Product identifier

Product name SAFE-COR\*  
Product code PID1370

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Corrosion inhibitor

Uses advised against Consumer use

#### 1.3 Details of the supplier of the safety data sheet

##### Supplier

M-I Drilling Fluids UK Limited  
C/O Schlumberger  
Enterprise Drive  
Westhill Industrial Estate  
Westhill, AB32 6TQ  
Scotland UK  
+47 51577424

MISDS@slb.com

#### 1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

Germany	+49 69 222 25285
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### 2. Hazards identification

#### 2.1 Classification of the substance or mixture

Regulation (EC) No. 1272/2008

##### Health hazards

Serious eye damage/eye irritation	Category 2
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##### Environmental hazards

Chronic aquatic toxicity	Category 3
--------------------------	------------

Physical Hazards Not classified

#### 2.2 Label elements



**Signal word**  
WARNING

**Hazard statements**

H319 - Causes serious eye irritation  
H412 - Harmful to aquatic life with long lasting effects

**Precautionary Statements - EU (§28, 1272/2008)**

P264 - Wash face, hands and any exposed skin thoroughly after handling  
P273 - Avoid release to the environment  
P280 - Wear protective gloves/ protective clothing/ eye protection/ face protection  
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing  
P337 + P313 - If eye irritation persists: Get medical advice/attention  
P501 - Dispose of contents/container in accordance with local regulations.

**Contains**

Ethanol, 2,2-oxybis-, reaction products with ammonia, morpholine derivatives residues

**2.3 Other hazards**

Not classified as PBT/vPvB by current EU criteria

**Australian statement of hazardous/dangerous nature**

Classified as Hazardous according to the criteria of NOHSC.  
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

**3. Composition/information on ingredients**

**3.1 Substances**

Not applicable

**3.2 Mixtures**

Chemical Name	EC-No.	CAS No	Weight-%	Classification (67/548)	Classification (Reg. 1272/2008)	REACH registration number
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**Suitable extinguishing media**

Water Fog, Alcohol Foam, CO<sub>2</sub>, Dry Chemical.

**Extinguishing media which must not be used for safety reasons**

None known.

**5.2 Special hazards arising from the substance or mixture**

**Unusual fire and explosion hazards**

None known.

**Hazardous combustion products**

Thermal decomposition can lead to release of irritating gases and vapours

**5.3 Advice for firefighters**

**Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

**Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

**6. Accidental release measures**

**6.1 Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. See also section 8.

**6.2 Environmental precautions**

The product should not be allowed to enter drains, water courses or the soil.

**Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

**6.3 Methods and material for containment and cleaning up**

**Methods for containment**

Prevent further leakage or spillage if safe to do so. Dyke far ahead of liquid spill for later disposal.

**Methods for cleaning up**

Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

**6.4 Reference to other sections**

See section 13 for more information.

**7. Handling and storage**

**7.1 Precautions for safe handling**

**Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

**Hygiene measures**

Use good work and personal hygiene practices to avoid exposure When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

**7.2 Conditions for safe storage, including any incompatibilities**

- Technical measures/precautions** Ensure adequate ventilation.
- Storage precautions** Keep containers tightly closed in a dry, cool and well-ventilated place Avoid frost. Store at room temperature Avoid contact with: Acids Nitrites
- Storage class** Chemical storage.
- Packaging materials** Use specially constructed containers only

**7.3 Specific end uses**

See Section 1.2.

**8. Exposure controls/personal protection**

**8.1 Control parameters**

**Exposure Limits** Contains no substances with occupational exposure limit values  
 No biological limit allocated

Chemical Name	EU OEL - Third List	Austria	Australia	Denmark
Ethanol, 2,2-oxybis-, reaction products with ammonia, morpholine derivatives residues	Not determined	Not determined	Not determined	Not determined
Chemical Name	Malaysia	France	Germany	Hungary
Ethanol, 2,2-oxybis-, reaction products with ammonia, morpholine derivatives residues	Not determined	Not determined	Not determined	Not determined
Chemical Name	New Zealand	Italy	Netherlands	Norway
Ethanol, 2,2-oxybis-, reaction products with ammonia, morpholine derivatives residues	Not determined	Not determined	Not determined	Not determined
Chemical Name	Poland	Portugal	Romania	Russia
Ethanol, 2,2-oxybis-, reaction products with ammonia, morpholine derivatives residues	Not determined	Not determined	Not determined	Not determined
Chemical Name	Spain	Switzerland	Turkey	UK
Ethanol, 2,2-oxybis-, reaction products with ammonia, morpholine derivatives residues	Not determined	Not determined	Not determined	Not determined

**Derived No Effect Level (DNEL)**

**Long term exposure systemic effects**

Ethanol, 2,2-oxybis-, reaction products with ammonia, morpholine derivatives residues  
 Dermal 6.67 mg/kg  
 Inhalation 25.52 mg/m<sup>3</sup>

**Predicted No Effect Concentration (PNEC)**

Ethanol, 2,2-oxybis-, reaction products with ammonia, morpholine derivatives residues

Fresh Water	0.045 mg/l
Sea Water	0.0045 mg/l
Fresh water sediment	0.796 mg/kg
Sea sediment	0.0769 mg/kg
Soil	0.133 mg/kg
Impact on sewage treatment	100 mg/l
Intermittent release	0.45 mg/l

**8.2 Exposure controls**

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

**Engineering measures to reduce exposure**

Ensure adequate ventilation. Local exhaust ventilation.

**Personal protective equipment**

<b>Eye protection</b>	Use eye protection according to EN 166, designed to protect against liquid splashes. Tightly fitting safety goggles. Safety glasses with side-shields.
<b>Hand protection</b>	Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Neoprene PVC Nitrile rubber Break through time >480 minutes Glove thickness 0.4 mm
<b>Respiratory protection</b>	Be aware that liquid may penetrate the gloves. Frequent change is advisable. No personal respiratory protective equipment normally required, In case of insufficient ventilation wear suitable respiratory equipment, Use respirator with organic vapor protection (A, brown), At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
<b>Skin and body protection</b>	Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.

**Hygiene measures**

Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing and gloves, including the inside, before re-use.



**9. Physical and chemical properties**

**9.1 Information on basic physical and chemical properties**

<b>Physical state</b>	Liquid
<b>Appearance</b>	No information available
<b>Odour</b>	Slight
<b>Colour</b>	Dark amber
<b>Odour threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
pH	Approximately 11.5	
pH @ dilution		
Melting / freezing point	No information available	
Boiling point/range	> 100 °C / > 212 °F	
Flash point	151.6 °C / 305 °F	PMCC
Evaporation rate	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapour pressure	No information available	
Vapour density	No information available	
Specific gravity	No information available	
Bulk density	No information available	
Relative density	1.10 sg	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	4 cP	@ 25 °C
log Pow	No information available	
Explosive properties	Not applicable	
Oxidising properties	None known	
<b><u>9.2 Other information</u></b>		
Pour point	-12°C (<11°F)	
Molecular weight	No information available	
VOC content(%)	None	
Density	No information available	

## 10. Stability and reactivity

### 10.1 Reactivity

No specific reactivity hazards associated with this product.

### 10.2 Chemical stability

Stable under normal conditions.

### 10.3 Possibility of Hazardous Reactions

#### **Hazardous polymerisation**

Hazardous polymerisation does not occur.

### 10.4 Conditions to avoid

Store at room temperature. Avoid frost.

### 10.5 Incompatible materials



**12. Ecological information**

**12.1 Toxicity**

Harmful to aquatic life with long lasting effects

**Toxicity to algae**

See component information below.

**Toxicity to fish**

See component information below.

**Toxicity to daphnia and other aquatic invertebrates**

See component information below.

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Ethanol, 2,2-oxybis-, reaction products with ammonia, morpholine derivatives residues	OECD; Acute LC50; 96 hours Semi-static; Fish > 45 g/l	OECD; Acute ErC50 (growth rate); 72 hours Static; Algae; 45 mg/kg OECD 201 Algae, Growth Inhibitor Test; Chronic NOECr; 72 hours Static; Algae; 3.2 mg/l	OECD; Acute EC50; 48 hours Static, Daphnia; > 100 g/l

**12.2 Persistence and degradability**

Not readily biodegradable.

**12.3 Bioaccumulative potential**

No bioaccumulation expected due to high molecular weight.

**12.4 Mobility in soil**

**Mobility**

The product is water soluble, and may spread in water systems.

**12.5 Results of PBT and vPvB assessment**

Not classified as PBT/vPvB by current EU criteria.

**12.6 Other adverse effects.**

None known.

## 13. Disposal considerations

### 13.1 Waste treatment methods

<b>Waste from residues / unused products</b>	Dispose of in accordance with local regulations.
<b>Contaminated packaging</b>	Empty containers should be transported/delivered using a registered waste carrier for local recycling or waste disposal.
<b>EWC Waste Disposal No</b>	According to the European Waste Catalogue, Waste Codes are not product specific, but application specific Waste codes should be assigned by the user based on the application for which the product was used The following Waste Codes are only suggestions: EWC waste disposal No: 07 01 04

## 14. Transport information

### 14.1. UN number

Not regulated

### 14.2. UN proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

### 14.3. Hazard class(es)

<b>ADR/RID/ADN/ADG Hazard class</b>	Not regulated
<b>IMDG Hazard class</b>	Not regulated
<b>ICAO Hazard class/division</b>	Not regulated

### 14.4 Packing group

<b>ADR/RID/ADN/ADG Packing Group</b>	Not regulated
<b>IMDG Packing group</b>	Not regulated
<b>ICAO Packing group</b>	Not regulated

### 14.5 Environmental hazard

No

### 14.6 Special precautions

Not applicable

### 14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code

Please contact MISDS@slb.com for info regarding transport in Bulk.

## 15. Regulatory information

**15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture**

**Germany, Water Endangering Classes (VwVwS)** Water endangering class = 1

**Australian Standard for the Uniform Scheduling of Drugs and Poisons**  
 No poisons schedule number allocated

**New Zealand hazard classification** Eye Irrit. Cat. 2 / Chronic aquatic toxicity - Cat. 3

**HSNO approval no.** HSR003599

**Commission Regulation (EU) No 453/2010 of 20 May 2010 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH). Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC, including amendments.**

This safety data sheet complies with the requirements of Regulation (EC) No. 1272/2008.

**National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].  
 National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].  
 National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].**

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

ADG Code – Australian Dangerous Goods Code.

**International inventories**

<b>USA, Toxic Substances Control Act inventory (TSCA)</b>	Complies
<b>European Union - EINECS and ELINCS</b>	Complies
<b>Canada (DSL)</b>	Complies
<b>Philippines (PICCS)</b>	Complies
<b>Inventory - Japan - Existing and New Chemicals list</b>	Does not Comply
<b>China (IECSC)</b>	Complies
<b>Australia (AICS)</b>	Complies
<b>Korea (KECL)</b>	Does not Comply
<b>Inventory - New Zealand - Inventory of Chemicals (NZIoC)</b>	Complies

**15.2 Chemical Safety Report**

No information available

**16. Other information**

**Prepared by** Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse

**Supersedes date** 11/Jan/2017

**Revision date** 22/Feb/2017

**Version** 11

**This SDS has been revised in the following section(s)** 2, 3, 4, 7, 10, 11, 12, 13, 15, 16 There have been changes with regard to classification.

**Text of R phrases mentioned in Section 3**

R36 - Irritating to eyes

R52/53 - Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment

**Full text of H-Statements referred to under sections 2 and 3**

H319 - Causes serious eye irritation

H412 - Harmful to aquatic life with long lasting effects

\*A mark of M-I L.L.C., a Schlumberger Company

**Disclaimer**

The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

Safety data sheet number PID1387

Version 8

Revision date 23/Nov/2016

Supercedes date 08/Oct/2014



## Safety Data Sheet SAFE-SCAV\* CA

### 1. Identification of the substance/preparation and of the Company/undertaking

#### 1.1 Product identifier

Product name SAFE-SCAV\* CA  
Product code PID1387  
Denmark Pr. no. 1333035

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Oxygen Scavenger.

Uses advised against Consumer use

#### 1.3 Details of the supplier of the safety data sheet

##### Supplier

M-I Drilling Fluids UK Limited  
C/O Schlumberger  
Enterprise Drive  
Westhill Industrial Estate  
Westhill, AB32 6TQ  
Scotland UK  
+47 51577424

MISDS@slb.com

#### 1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

Denmark	Poison Control Hotline (DK): +45 82 12 12 12
Norway	Poison information centre: +47 22 59 13 00

### 2. Hazards identification

#### 2.1 Classification of the substance or mixture

Regulation (EC) No. 1272/2008

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

#### 2.2 Label elements

##### Signal word

None

**Hazard statements**

This product is not classified as hazardous therefore no (H) hazard statements assigned.

**Precautionary Statements - EU (§28, 1272/2008)**

This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

-

**Contains**

**2.3 Other data**

Not classified as PBT/vPvB by current EU criteria

**Australian statement of hazardous/dangerous nature**

Classified as Non-Hazardous according to the criteria of NOHSC.  
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

**3. Composition/information on ingredients**

**3.1 Substances**

This product does not contain any hazardous ingredients, or ingredients with national workplace exposure limits.

**3.2 Mixtures**

Not applicable

**4. First aid measures**

**4.1 First Aid**

**Inhalation**

If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

**Ingestion**

Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

**Skin contact**

Wash off immediately with soap and plenty of water removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.

**Eye contact**

Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses. Get medical attention if any discomfort continues.

#### **4.2 Most important symptoms and effects, both acute and delayed**

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

#### **Main symptoms**

**Inhalation** Please see Section 11. Toxicological Information for further information.

**Ingestion** Please see Section 11. Toxicological Information for further information.

**Skin contact** Please see Section 11. Toxicological Information for further information.

**Eye contact** Please see Section 11. Toxicological Information for further information.

#### **4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician** Treat symptomatically.

### **5. Fire-fighting measures**

#### **5.1 Extinguishing media**

##### **Suitable extinguishing media**

Water Fog, Alcohol Foam, CO<sub>2</sub>, Dry Chemical.

##### **Extinguishing media which shall not be used for safety reasons**

Do not use water jet.

#### **5.2 Special hazards arising from the substance or mixture**

##### **Unusual fire and explosion hazards**

Dust may form explosive mixture in air.

##### **Hazardous combustion products**

Fire or high temperatures create: Carbon oxides (CO<sub>x</sub>).

#### **5.3 Advice for firefighters**

##### **Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

##### **Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

### **6. Accidental release measures**

#### **6.1 Personal precautions, protective equipment and emergency procedures**

Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. If spilled, take caution, as material can cause surfaces to become very slippery. Use personal protective equipment. See also section 8.

## **6.2 Environmental precautions**

The product should not be allowed to enter drains, water courses or the soil.

### **Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

## **6.3 Methods and materials for containment and cleaning up**

### **Methods for containment**

Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimise spreading.

### **Methods for cleaning up**

Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

## **6.4 Reference to other sections**

See section 13 for more information.

# **7. Handling and storage**

## **7.1 Precautions for safe handling**

### **Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. If spilled, take caution, as material can cause surfaces to become very slippery.

### **Hygiene measures**

Use good work and personal hygiene practices to avoid exposure Do not eat, drink or smoke when using this product Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

## **7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions** Ensure adequate ventilation. Take precautionary measures against static discharges.

**Storage precautions** Keep containers tightly closed in a dry, cool and well-ventilated place Avoid contact with:  
Heat, flames and sparks Strong oxidising agents Strong bases Metals

**Storage class** Chemical storage.

**Packaging material** Use specially constructed containers only

## **7.3 Specific end uses**

See Section 1.2.

# **8. Exposure controls/personal protection**

## **8.1 Control parameters**

**Exposure Limits** The product does not contain any hazardous materials with occupational exposure limits established.  
No biological limit allocated

## 8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

### Engineering measures to reduce exposure

Ensure adequate ventilation. Mechanical ventilation or local exhaust ventilation is required.

### Personal protective equipment

<b>Eye protection</b>	Tightly fitting safety goggles. Safety glasses with side-shields.
<b>Hand protection</b>	Repeated or prolonged contact:, Use protective gloves made of:, Nitrile, Butyl, Frequent change is advisable.
<b>Respiratory protection</b>	No personal respiratory protective equipment normally required, In case of insufficient ventilation wear suitable respiratory equipment, Half mask with a particle filter P2 (BS EN 143), At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
<b>Skin and body protection</b>	Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.

### Hygiene measures

Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.



## 9. Physical and chemical properties

### 9.1 Information on basic physical and chemical properties

<b>Physical state</b>	Solid
<b>Appearance</b>	Powder Crystalline
<b>Odour</b>	Odourless
<b>Colour</b>	White
<b>Odour threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
<b>pH</b>	No information available	
<b>pH @ dilution</b>	5.5 - 8.0	@ 10%
<b>Melting/freezing point</b>	No information available	
<b>Boiling point/range</b>	No information available	
<b>Flash point</b>	No information available	
<b>Evaporation rate</b>	No information available	
<b>Flammability (solid, gas)</b>	Not applicable	
<b>Flammability Limits in Air</b>		

<b>Upper flammability limit</b>	Not applicable	
<b>Lower flammability limit</b>	Not applicable	
<b>Vapour pressure</b>	No information available	
<b>Vapour density</b>	No information available	
<b>Specific gravity</b>	No information available	
<b>Bulk density</b>	No information available	
<b>Relative density</b>	1.65 sg	@ 20 °C.
<b>Water solubility</b>	Soluble in water	
<b>Solubility in other solvents</b>	No information available	
<b>Autoignition temperature</b>	No information available	
<b>Decomposition temperature</b>	No information available	
<b>Kinematic viscosity</b>	No information available	
<b>Dynamic viscosity</b>	No information available	
<b>Log Pow</b>	No information available	
<b>Explosive properties</b>	Suspended dust may present a dust explosion hazard	
<b>Oxidising properties</b>	None known	

**9.2 Other information**

<b>Pour point</b>	No information available
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	None
<b>Density</b>	No information available

**10. Stability and reactivity**

**10.1 Reactivity**

Dust may form explosive mixture in air.

**10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerisation**

Hazardous polymerisation does not occur.

**10.4 Conditions to avoid**

Avoid contact with heat, sparks, open flame, and static discharge. Avoid dust formation.

**10.5 Incompatible materials**

Metals. Strong bases. Strong oxidising agents.

**10.6 Hazardous decomposition products**

See Section 5.2.

**11. Toxicological information**

**11.1 Information on toxicological effects**

---

**Acute toxicity**

<b>Inhalation</b>	Inhalation of dust in high concentration may cause irritation of respiratory system.
<b>Eye contact</b>	Dust may cause mechanical irritation.
<b>Skin contact</b>	Prolonged contact may cause redness and irritation.
<b>Ingestion</b>	Ingestion may cause stomach discomfort.
<b>Unknown acute toxicity</b>	Not applicable.

<b>Sensitisation</b>	This product does not contain any components suspected to be sensitizing.
<b>Mutagenic effects</b>	This product does not contain any known or suspected mutagens.
<b>Carcinogenicity</b>	This product does not contain any known or suspected carcinogens.

<b>Reproductive toxicity</b>	This product does not contain any known or suspected reproductive hazards.
<b>Routes of exposure</b>	None known.
<b>Routes of entry</b>	No route of entry noted.
<b>Specific target organ toxicity (single exposure)</b>	Not classified
<b>Specific target organ toxicity (repeated exposure)</b>	Not classified.
<b>Aspiration hazard</b>	Not applicable.

## 12. Ecological information

### 12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

#### **Toxicity to algae**

This product is not considered toxic to algae.

#### **Toxicity to fish**

This product is not considered toxic to fish.

**Toxicity to daphnia and other aquatic invertebrates**

This product is not considered toxic to invertebrates.

**12.2 Persistence and degradability**

Not readily biodegradable.

**12.3 Bioaccumulative potential**

Does not bioaccumulate.

**12.4 Mobility in soil**

**Mobility**

Soluble in water.

**12.5 Results of PBT and vPvB assessment**

Not classified as PBT/vPvB by current EU criteria.

**12.6 Other adverse effects.**

None known.

**13. Disposal considerations**

**13.1 Waste treatment methods**

**Waste from residues / unused products**

Dispose of in accordance with local regulations.

**Contaminated packaging**

Empty containers should be transported/delivered using a registered waste carrier for local recycling or waste disposal.

**EWC waste disposal No.**

According to the European Waste Catalogue, Waste Codes are not product specific, but application specific. Waste codes should be assigned by the user based on the application for which the product was used. The following Waste Codes are only suggestions: EWC

waste disposal No: 07 01 99.

## 14. Transport information

### 14.1 UN number

Not regulated

### 14.2 Proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

### 14.3. Hazard class(es)

<b>ADR/RID/ADN/ADG Hazard class</b>	Not regulated
<b>IMDG Hazard class</b>	Not regulated
<b>ICAO Hazard class/division</b>	Not regulated

### 14.4 Packing group

<b>ADR/RID/ADN/ADG Packing Group</b>	Not regulated
<b>IMDG Packing group</b>	Not regulated
<b>ICAO Packing group</b>	Not regulated

### 14.5 Environmental hazard

No

### 14.6 Special precautions

Not applicable

### 14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code

Please contact MISDS@slb.com for info regarding transport in Bulk.

## 15. Regulatory information

### 15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

**Germany, Water Endangering Classes (VwVwS)** Water endangering class = 1

#### **Australian Standard for the Uniform Scheduling of Drugs and Poisons**

No Poisons Schedule number allocated

Commission Regulation (EU) No 453/2010 of 20 May 2010 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH). Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC, including amendments.

This safety data sheet complies with the requirements of Regulation (EC) No. 1272/2008.

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as Dangerous Goods by the criteria of the Australian Dangerous Goods Code (ADG Code) for transport by road or rail.

Dutch Mining Regulations: In accordance with Mining Regulations 9.2 and Chapter 4 of the Working Conditions Decree.

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)

The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP) International inventories

USA, Toxic Substances Control Act inventory (TSCA)	Complies
European Union - EINECS and ELINCS	Complies
Canada (DSL)	Complies.
Philippines (PICCS)	Complies
Inventory - Japan - Existing and New Chemicals list	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korea (KECL)	Complies
Inventory - New Zealand - Inventory of Chemicals (NZIoC)	Complies

Contact REACH@miswaco.slb.com for REACH information.

### 15.2 Chemical Safety Report

No information available

## 16. Other information

<b>Prepared by</b>	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
<b>Supersedes date</b>	08/Oct/2014
<b>Revision date</b>	23/Nov/2016
<b>Version</b>	8
<b>The following sections have been revised:</b>	2,, 3,, 6,, 7,, 8,, 9,, 10,, 11,, 16, No changes with regard to classification have been made.

**Full text of H-Statements referred to under sections 2 and 3**

This product is not classified as hazardous therefore no (H) hazard statements assigned.

\*A mark of M-I L.L.C., a Schlumberger Company

**Disclaimer**

The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

Safety data sheet number MI10641  
Version 6  
Revision date 10/Jun/2015  
Supercedes date 04/Mar/2013



## Safety Data Sheet SAFE-SOLV E

### 1. Identification of the substance/preparation and of the Company/undertaking

#### 1.1 Product identifier

Product name SAFE-SOLV E  
Product code MI10641

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended use Drilling fluid additive.

Uses advised against Consumer use

#### 1.3 Details of the supplier of the safety data sheet

Supplier identification  
M-I Drilling Fluids UK Limited  
C/O Schlumberger  
Enterprise Drive  
Westhill Industrial Estate  
Westhill, AB32 6TQ  
Scotland UK  
+47 51577424  
MISDS@slb.com

#### 1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

Netherlands	National Poisons Information Center (NL): +31 30 274 88 88 (NB: this service is only available to health professionals)
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### 2. Hazards identification

#### 2.1 Classification of the substance or mixture

Regulation (EC) No. 1272/2008

##### Health hazards

Aspiration toxicity	Category 1
Skin corrosion/irritation	Category 2

Environmental hazards Not classified

Physical Hazards Not classified

#### 2.2 Label Elements



**Signal word**

DANGER

**Hazard statements**

H304 - May be fatal if swallowed and enters airways

H315 - Causes skin irritation

**EU specific hazard statements**

EUH066 - Repeated exposure may cause skin dryness or cracking

**Precautionary Statements - EU (§28, 1272/2008)**

P280 - Wear protective gloves/ protective clothing/ eye protection/ face protection

P301 + P330 + P331 - IF SWALLOWED: rinse mouth. Do NOT induce vomiting

P301 + P310 - IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician

P302 + P352 - IF ON SKIN: Wash with plenty of soap and water

P332 + P313 - If skin irritation occurs: Get medical advice/ attention

P501 - Dispose of contents/container in accordance with local regulations.

**Supplementary precautionary statements**

P264 - Wash face, hands and any exposed skin thoroughly after handling

P362 - Take off contaminated clothing and wash before re-use

-

**Contains**

Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics

Terpenes and Terpenoids, sweet orange oil

**2.3 Other data**

Not classified as PBT/vPvB by current EU criteria

### 3. Composition/information on ingredients

**3.1 Substances**

Not Applicable

**3.2 Mixtures**

Component	EC-No.	CAS-No	Weight % - range	Classification (67/548)	Classification (Reg. 1272/2008)	REACH registration number
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics	926-141-6	*	60-100	Xn; R65, R66	Asp. Tox. 1 (H304) EUH066	01-2119456620-43-x xxx
Terpenes and Terpenoids, sweet orange oil	232-433-8	8028-48-6	10-30	F;R10 Xn;R65 Xi;R38 R52/53	Flam. Liq. 3 (H226) Asp Tox. 1 (H304) Skin Irrit. 2 (H315)	01-2119493353-35-x xxx

**Comments**

Terpenes and Terpenoids, sweet orange oil can also use CAS 68647-72-3.

\*Substances which have an EC Number that begins with the number "9" is a Provisional List Number. The list numbers published by ECHA do not have any legal significance. The EC substance definition and related classification & labelling has been developed in the framework of the Regulation (EC) No 1907/2006 (REACH). For information about the related CAS number see section 15 of this SDS.

**4. First aid measures**

**4.1 First Aid**

- Inhalation** Move the exposed person to fresh air at once. If breathing has stopped, begin artificial respiration. Seek medical attention at once.
- Ingestion** Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention.
- Skin contact** Wash off immediately with soap and plenty of water removing all contaminated clothes and shoes. Seek medical attention.
- Eye contact** Remove contact lenses. Promptly wash eyes with lots of water while lifting eye lids. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

**4.2 Most important symptoms and effects, both acute and delayed**

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

**Main symptoms**

- Inhalation** Please see Section 11. Toxicological Information for further information.
- Ingestion** Please see Section 11. Toxicological Information for further information.
- Skin contact** Please see Section 11. Toxicological Information for further information.
- Eye contact** Please see Section 11. Toxicological Information for further information.

**4.3 Indication of any immediate medical attention and special treatment needed**

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**Notes to physician** Treat symptomatically.

## 5. Fire-fighting measures

### 5.1 Extinguishing media

**Suitable extinguishing media**

Water spray, dry chemical, carbon dioxide (CO<sub>2</sub>), or foam.

**Extinguishing media which shall not be used for safety reasons**

Do not use a solid water stream as it may scatter and spread fire.

### 5.2 Special hazards arising from the substance or mixture

**Unusual fire and explosion hazards**

None known.

**Hazardous combustion products**

Fire or high temperatures create: Carbon oxides (CO<sub>x</sub>).

### 5.3 Advice for firefighters

**Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

**Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

## 6. Accidental release measures

### 6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

### 6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

**Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

### 6.3 Methods and materials for containment and cleaning up

**Methods for Containment**

Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

**Methods for cleaning up**

Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

### 6.4 Reference to other sections

See section 13 for more information.

**7. Handling and storage**

**7.1 Precautions for safe handling**

**Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

**Hygiene measures**

Use good work and personal hygiene practices to avoid exposure Wash hands and face before breaks and immediately after handling the product. When using do not smoke, eat or drink. Remove contaminated clothing.

**7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions** Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

**Storage precautions** Keep containers tightly closed in a dry, cool and well-ventilated place. Avoid heat, flames and other sources of ignition. Avoid contact with: Strong oxidising agents Strong acids. Strong bases

**Storage class** Chemical storage.

**Packaging material** Use specially constructed containers only

**7.3 Specific end uses**

See also Section 1.2.

**8. Exposure controls/personal protection**

**8.1 Control parameters**

**Exposure limits** Oil mist (mineral) workplace exposure limits are currently under review by legislative authorities. This workplace exposure limit (WEL) standard is applicable to highly refined mineral oils and is provided as a guidance limit only LT. EXP = 5mg/m<sup>3</sup> and ST. EXP = 10mg/m<sup>3</sup>.

Component	EU OEL - Third List	Austria	Australia	Denmark
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics	Not determined	Not determined	Not determined	Not determined
Terpenes and Terpenoids, sweet orange oil	Not determined	Not determined	Not determined	Not determined

Component	Malaysia	France	Germany	Hungary
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics	Not determined	Not determined	Not determined	Not determined
Terpenes and Terpenoids, sweet orange oil	Not determined	Not determined	Not determined	Not determined

Component	New Zealand	Italy	Netherlands	Norway
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics	Not Determined	Not determined	Not determined	Not determined
Terpenes and Terpenoids, sweet orange oil	Not Determined	Not determined	Not determined	Not determined

Component	Poland	Portugal	Romania	Russia
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics	Not determined	Not determined	Not determined	Not determined
Terpenes and Terpenoids, sweet orange oil	Not determined	Not determined	Not determined	Not determined

Component	Spain	Switzerland	Turkey	UK
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics	Not determined	Not determined	Not determined	Not determined
Terpenes and Terpenoids, sweet orange oil	Not determined	Not determined	Not determined	Not determined

## 8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

### Engineering measures to reduce exposure

Ensure adequate ventilation. Provide mechanical general and/or local exhaust ventilation to prevent release of vapor or mist into work environment.

### Personal protective equipment

<b>Eye protection</b>	It is good practice to wear goggles when handling any chemical. Tightly fitting safety goggles.
<b>Hand protection</b>	Use protective gloves made of:., Nitrile, Neoprene, Be aware that liquid may penetrate the gloves. Frequent change is advisable.
<b>Respiratory protection</b>	In case of inadequate ventilation wear respiratory protection, Use respirator with organic vapor protection (A, brown), At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
<b>Skin and body protection</b>	Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.

### Hygiene measures

Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.



## 9. Physical and chemical properties

### 9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	No information available
Odour	Sweet
Colour	Colourless
Odor threshold	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
pH	No information available	
pH @ dilution		
Melting/freezing point	< -20 °C / -4 °F	
Boiling point/range	173 °C / 343.4 °F	
Flash Point	65 °C / 149 °F	
Evaporation rate	No information available	
Flammability (solid, gas)	Not Applicable	
Flammability Limits in Air		
Upper flammability Limit	5	
Lower flammability limit	0.7	
Vapor pressure	~2 mmHg	@ 20 °C
Vapor density	No information available	
Specific gravity	No information available	
Bulk density	No information available	
Relative density	0.81 sg	@ 20 °C.
Water solubility	Insoluble in water	
Solubility in other solvents	soluble organic solvents	
Autoignition temperature	230 °C / 446 °F	
Decomposition temperature	No information available	
Kinematic viscosity	<20.5 mm <sup>2</sup> /s	@ 40 °C
Viscosity, dynamic	No information available	
Log Pow	No information available	
Explosive properties	No information available	
Oxidizing properties	No information available	

### 9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available
Density VALUE	No information available

## 10. Stability and reactivity

### 10.1 Reactivity

No specific reactivity hazards associated with this product.

**10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerization**  
 Not known.

**10.4 Conditions to avoid**

Avoid heat, flames and other sources of ignition.

**10.5 Incompatible materials**

Strong oxidising agents. Strong acids. Strong bases.

**10.6 Hazardous decomposition products**

See also section 5.2.

**11. Toxicological information**

**11.1 Information on toxicological effects**

**Acute toxicity**

<b>Inhalation</b>	Inhalation of vapours in high concentration may cause irritation of respiratory system. May cause additional affects as listed under "Ingestion".
<b>Eye contact</b>	May cause irritation.
<b>Skin contact</b>	Causes skin irritation. Prolonged contact may cause redness and irritation. Repeated exposure may cause skin dryness or cracking.
<b>Ingestion</b>	May be fatal if swallowed and enters airways. Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhoea.
<b>Unknown acute toxicity</b>	Not Applicable.

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics	No data available	No data available	No data available
Terpenes and Terpenoids, sweet orange oil	= 4400 mg/kg ( Rat )	> 2000 mg/kg ( Rabbit )	No data available

**Sensitisation** This product does not contain any components suspected to be sensitizing.

**Mutagenic effects** This product does not contain any known or suspected mutagens.

**Carcinogenicity** This product does not contain any known or suspected carcinogens.

**Reproductive toxicity** This product does not contain any known or suspected reproductive hazards.

**Routes of exposure** Ingestion. Skin contact. Inhalation.

**Routes of entry** Ingestion. Inhalation.

**Specific target organ toxicity (single exposure)** Not classified

**Specific target organ toxicity (repeated exposure)** Not classified.

**Aspiration hazard** May be fatal if swallowed and enters airways.

**12. Ecological information**

**12.1 Toxicity**

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

**Toxicity to algae**  
 This product is not considered toxic to algae.

**Toxicity to fish**  
 This product is not considered toxic to fish.

**Toxicity to daphnia and other aquatic invertebrates**  
 This product is not considered toxic to invertebrates.

Component	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics	No information available	No information available	No information available
Terpenes and Terpenoids, sweet orange oil	> 124 mg/L LC50 (Scophthalmus) = 96 h	> 450 mg/L EC50 (Skeletonema) = 72 h	> 100 mg/L LC50 (Acartia) = 48 h

**12.2 Persistence and degradability**

Product is biodegradable.

**12.3 Bioaccumulative potential**

The product does not contain any substances expected to be bioaccumulating.

#### **12.4 Mobility in soil**

**Mobility**

Insoluble in water.

#### **12.5 Results of PBT and vPvB assessment**

Not classified as PBT/vPvB by current EU criteria.

#### **12.6 Other adverse effects.**

None known.

### **13. Disposal considerations**

#### **13.1 Waste treatment methods**

**Waste from residues / unused products**

Dispose of in accordance with local regulations.

**Contaminated packaging**

Empty containers should be transported/delivered using a registered waste carrier for local recycling or waste disposal.

**EWC waste disposal No.**

According to the European Waste Catalogue, Waste Codes are not product specific, but application specific. Waste codes should be assigned by the user based on the application for which the product was used. The following Waste Codes are only suggestions: EWC waste disposal No: 07 01 04 Waste Code: 7152 Organic waste without halogen.

### **14. Transport information**

#### **14.1 UN number**

Not regulated

#### **14.2 Proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

#### **14.3. Hazard class(es)**

**ADR/RID/ADN/ADG Hazard class** Not regulated

**IMDG Hazard class** Not regulated

**ICAO Hazard class/division** Not regulated

#### **14.4 Packing group**

**ADR/RID/ADN/ADG Packing Group** Not regulated  
**IMDG Packing group** Not regulated  
**ICAO Packing group** Not regulated

**14.5 Environmental hazard**

No

**14.6 Special precautions**

Not Applicable

**14.7 Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code**

Please contact MISDS@slb.com for info regarding transport in Bulk.

**15. Regulatory information**

**15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture**

Commission Regulation (EU) No 453/2010 of 20 May 2010 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH). Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC, including amendments.

This safety data sheet complies with the requirements of Regulation (EC) No. 1272/2008.

Dutch Mining Regulations: In accordance with Mining Regulations 9.2 and Chapter 4 of the Working Conditions Decree.

**International inventories**

<b>USA, Toxic Substances Control Act inventory (TSCA)</b>	Complies
<b>European Union - EINECS and ELINCS</b>	Complies
<b>Canada, Domestic Substance List (DSL)</b>	Complies
<b>Philippines (PICCS)</b>	Complies
<b>Inventory - Japan - Existing and New Chemicals list</b>	Does not Comply
<b>China (IECSC)</b>	Complies
<b>Australia (AICS)</b>	Complies
<b>Korea (KECL)</b>	Complies
<b>Inventory - New Zealand - Inventory of Chemicals (NZIoC)</b>	Complies

Contact REACH@miswaco.slb.com for REACH information.

CAS Number 64742-47-8 can be used to identify the substance given a list number in section 3 in areas not subject to the REACH regulation.

**15.2 Chemical Safety Report**

No information available

## 16. Other information

<b>Prepared by</b>	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Sandra McWilliam
<b>Supersedes date</b>	04/Mar/2013
<b>Revision date</b>	10/Jun/2015
<b>Version</b>	6

**The following sections have been revised** Updated according to GHS/CLP, This SDS have been made in a new database and therefore a new layout. There have been changes with regard to classification.

### Text of R phrases mentioned in Section 3

R10 - Flammable  
R38 - Irritating to skin  
R65 - Harmful: may cause lung damage if swallowed  
R66 - Repeated exposure may cause skin dryness or cracking

R52/53 - Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment

### Full text of H-Statements referred to under sections 2 and 3

H304 - May be fatal if swallowed and enters airways  
H315 - Causes skin irritation  
H226 - Flammable liquid and vapor  
EUH066 - Repeated exposure may cause skin dryness or cracking

†A mark of M-I L.L.C.

### Disclaimer

The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

Safety data sheet number MI10114  
Version 7  
Revision date 22/Jul/2015  
Supercedes date 13/Jun/2013



## Safety Data Sheet SAFE-SURF<sup>†</sup> E

### 1. Identification of the substance/preparation and of the Company/undertaking

#### 1.1 Product identifier

Product name SAFE-SURF<sup>†</sup> E  
Product code MI10114  
Denmark Pr. no. 1529863

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended use Displacement Chemical  
Uses advised against Consumer use

#### 1.3 Details of the supplier of the safety data sheet

Supplier identification  
M-I Drilling Fluids UK Limited  
C/O Schlumberger  
Enterprise Drive  
Westhill Industrial Estate  
Westhill, AB32 6TQ  
Scotland UK  
+47 51577424  
MISDS@slb.com

#### 1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

### 2. Hazards identification

#### 2.1 Classification of the substance or mixture

Regulation (EC) No. 1272/2008

##### Health hazards

Serious eye damage/eye irritation	Category 1
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Environmental hazards Not classified

Physical Hazards Not classified

#### 2.2 Label Elements



**Signal word**

DANGER

**Hazard statements**

H318 - Causes serious eye damage

**Precautionary Statements - EU (§28, 1272/2008)**

P280 - Wear protective gloves/ protective clothing/ eye protection/ face protection

P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing

P310 - Immediately call a POISON CENTER or doctor/ physician

P501 - Dispose of contents/container in accordance with local regulations.

-

-

**Contains**

Alcohols, C6-12, ethoxylated

Fatty acids, coco, reaction products with ethanolamine, ethoxylated

2-butoxyethanol

**2.3 Other data**

Not classified as PBT/vPvB by current EU criteria

**3. Composition/information on ingredients**

**3.1 Substances**

Not Applicable

**3.2 Mixtures**

Component	EC-No.	CAS-No	Weight % - range	Classification (67/548)	Classification (Reg. 1272/2008)	REACH registration number
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Alcohols, C6-12, ethoxylated		68439-45-2	5-10	Xn;R22 Xi;R41	Acute Tox. 4 (H302) Eye Dam. 1 (H318)	No data available
Fatty acids, coco, reaction products with ethanolamine, ethoxylated		61791-08-0	5-10	Xi; R41	Eye Dam. 1 (H318)	No data available
2-butoxyethanol	203-905-0	111-76-2	1-5	Xn; R20/21/22 Xi; R36/38	Acute Tox. 4 (H302) Acute Tox. 4 (H312) Acute Tox. 4 (H332) Skin Irrit. 2 (H315) Eye Irrit. 2 (H319)	01-2119475108-36-x xxx

**Comments**

The product contains other ingredients which do not contribute to the overall classification.

**4. First aid measures**

**4.1 First Aid**

<b>Inhalation</b>	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
<b>Ingestion</b>	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.
<b>Skin contact</b>	Wash off immediately with soap and plenty of water removing all contaminated clothes and shoes. Get medical attention if irritation persists.
<b>Eye contact</b>	Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first five minutes, then continue rinsing eye. Seek medical attention at once.

**4.2 Most important symptoms and effects, both acute and delayed**

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

**Main symptoms**

<b>Inhalation</b>	Please see Section 11. Toxicological Information for further information.
<b>Ingestion</b>	Please see Section 11. Toxicological Information for further information.
<b>Skin contact</b>	Please see Section 11. Toxicological Information for further information.
<b>Eye contact</b>	Please see Section 11. Toxicological Information for further information.

**4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician** Treat symptomatically.

## 5. Fire-fighting measures

### 5.1 Extinguishing media

**Suitable extinguishing media**

Use extinguishing media appropriate for surrounding material.

**Extinguishing media which shall not be used for safety reasons**

None known.

### 5.2 Special hazards arising from the substance or mixture

**Unusual fire and explosion hazards**

None known.

**Hazardous combustion products**

Fire or high temperatures create: Carbon oxides (COx), Nitrogen oxides (NOx).

### 5.3 Advice for firefighters

**Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

**Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

## 6. Accidental release measures

### 6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

### 6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

**Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

### 6.3 Methods and materials for containment and cleaning up

**Methods for Containment**

Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

**Methods for cleaning up**

Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

### 6.4 Reference to other sections

See section 13 for more information.

## 7. Handling and storage

**7.1 Precautions for safe handling**

**Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

**Hygiene measures**

Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands before eating, drinking or smoking. Remove contaminated clothing.

**7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions** Ensure adequate ventilation. Keep airborne concentrations below exposure limits. Keep away from open flames, hot surfaces and sources of ignition.

**Storage precautions** Keep containers tightly closed in a dry, cool and well-ventilated place. Store above freezing temperature. Avoid contact with: Strong acids. Strong bases. Strong oxidising agents.

**Storage class** Chemical storage.

**Packaging material** Use specially constructed containers only.

**7.3 Specific end uses**

See also Section 1.2.

**8. Exposure controls/personal protection**

**8.1 Control parameters**

Component	EU OEL - Third List	Austria	Australia	Denmark
Alcohols, C6-12, ethoxylated	Not determined	Not determined	Not determined	Not determined
Fatty acids, coco, reaction products with ethanolamine, ethoxylated	Not determined	Not determined	Not determined	Not determined
2-butoxyethanol	20 ppm TWA 98 mg/m <sup>3</sup> TWA 50 ppm STEL 246 mg/m <sup>3</sup> STEL Possibility of significant uptake through the skin	Not determined	skin notation 20 ppm TWA; 96.9 mg/m <sup>3</sup> TWA 50 ppm STEL; 242 mg/m <sup>3</sup> STEL	20 ppm 98 mg/m <sup>3</sup>

Component	Malaysia	France	Germany	Hungary
Alcohols, C6-12, ethoxylated	Not determined	Not determined	Not determined	Not determined
Fatty acids, coco, reaction products with ethanolamine, ethoxylated	Not determined	Not determined	Not determined	Not determined

2-butoxyethanol	20 ppm TWA 96.7 mg/m <sup>3</sup> TWA Skin notation	2 ppm 9.8 mg/m <sup>3</sup>	10 ppm MAK 49 mg/m <sup>3</sup> MAK	Not determined
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Component	New Zealand	Italy	Netherlands	Norway
Alcohols, C6-12, ethoxylated	Not Determined	Not determined	Not determined	Not determined
Fatty acids, coco, reaction products with ethanolamine, ethoxylated	Not Determined	Not determined	Not determined	Not determined
2-butoxyethanol	25 ppm TWA 121 mg/m <sup>3</sup> TWA Possibility of significant uptake through the skin	Not determined	100 mg/m <sup>3</sup> GW	10 ppm TWA 50 mg/m <sup>3</sup> TWA 20 ppm STEL 75 mg/m <sup>3</sup> STEL Skin

Component	Poland	Portugal	Romania	Russia
Alcohols, C6-12, ethoxylated	Not determined	Not determined	Not determined	Not determined
Fatty acids, coco, reaction products with ethanolamine, ethoxylated	Not determined	Not determined	Not determined	Not determined
2-butoxyethanol	200 mg/m <sup>3</sup> STEL Skin 98 mg/m <sup>3</sup> TWA	20 ppm TWA	Not determined	5 mg/m <sup>3</sup> MAC

Component	Spain	Switzerland	Turkey	UK
Alcohols, C6-12, ethoxylated	Not determined	Not determined	Not determined	Not determined
Fatty acids, coco, reaction products with ethanolamine, ethoxylated	Not determined	Not determined	Not determined	Not determined
2-butoxyethanol	50 ppm VLA-EC 245 mg/m <sup>3</sup> VLA-EC Skin 20 ppm VLA-ED indicative limit value 98 mg/m <sup>3</sup> VLA-ED indicative limit value	20 ppm STEL 98 mg/m <sup>3</sup> STEL Skin 10 ppm MAK 49 mg/m <sup>3</sup> MAK	50 ppm STEL 246 mg/m <sup>3</sup> STEL Skin 20 ppm TWA 98 mg/m <sup>3</sup> TWA	50 ppm STEL 246 mg/m <sup>3</sup> STEL Skin 25 ppm TWA 123 mg/m <sup>3</sup> TWA

#### Derived No Effect Level (DNEL)

##### Short term exposure local effects

**2-butoxyethanol**  
Inhalation 246 mg/m<sup>3</sup>

##### Short term exposure systemic effects

**2-butoxyethanol**  
Dermal 89 mg/kg  
Inhalation 1091 mg/m<sup>3</sup>

##### Long term exposure systemic effects

**2-butoxyethanol**  
Dermal 125 mg/kg  
Inhalation 98 mg/m<sup>3</sup>

##### Predicted No Effect Concentration (PNEC)

**2-butoxyethanol**  
Fresh Water 8.8 mg/l

Sea Water	0.88 mg/l
Fresh water sediment	34.6 mg/kg
Sea sediment	3.46 mg/kg
Soil	2.33 mg/kg
Impact on Sewage Treatment	463 mg/l
Intermittent release	9.1 mg/l

**8.2 Exposure controls**

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

**Engineering measures to reduce exposure**

Ensure adequate ventilation. Provide mechanical general and/or local exhaust ventilation to prevent release of vapor or mist into work environment.

**Personal protective equipment**

- Eye protection** It is good practice to wear Safety Glasses with Side-shields when handling any chemical.
- Hand protection** Use protective gloves made of: Nitrile, Rubber, Be aware that liquid may penetrate the gloves. Frequent change is advisable.
- Respiratory protection** In case of insufficient ventilation wear suitable respiratory equipment, Use respirator with organic vapor protection (A, brown), At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
- Skin and body protection** Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.

**Hygiene measures**

Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.



**9. Physical and chemical properties**

**9.1 Information on basic physical and chemical properties**

<b>Physical state</b>	Liquid
<b>Appearance</b>	No information available
<b>Odour</b>	Slight
<b>Colour</b>	Colourless
<b>Odor threshold</b>	Not applicable

Property	Values	Remarks
pH	8	
pH @ dilution		
Melting/freezing point	0 °C / 32 °F	
Boiling point/range	100 °C / 212 °F	

<b>Flash Point</b>	> 93 °C / > 199.4 °F
<b>Evaporation rate</b>	negligible
<b>Flammability (solid, gas)</b>	Not Applicable
<b>Flammability Limits in Air</b>	
<b>Upper flammability Limit</b>	Not applicable
<b>Lower flammability limit</b>	Not applicable
<b>Vapor pressure</b>	No information available
<b>Vapor density</b>	No information available
<b>Specific gravity</b>	No information available
<b>Bulk density</b>	No information available
<b>Relative density</b>	1.0 sg @ 20 °C.
<b>Water solubility</b>	Soluble in water
<b>Solubility in other solvents</b>	No information available
<b>Autoignition temperature</b>	No information available
<b>Decomposition temperature</b>	No information available
<b>Kinematic viscosity</b>	No information available
<b>Viscosity, dynamic</b>	No information available
<b>Log Pow</b>	<2

<b>Explosive properties</b>	Not Applicable
<b>Oxidizing properties</b>	None known.

**9.2 Other information**

<b>Pour point</b>	No information available
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	None
<b>Density VALUE</b>	No information available

**10. Stability and reactivity**

**10.1 Reactivity**

No specific reactivity hazards associated with this product.

**10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerization**

Hazardous polymerisation does not occur.

**10.4 Conditions to avoid**

Avoid frost. Keep away from open flames, hot surfaces and sources of ignition.

**10.5 Incompatible materials**

Strong oxidising agents. Strong acids. Strong bases.

**10.6 Hazardous decomposition products**

See also section 5.2.

## 11. Toxicological information

### 11.1 Information on toxicological effects

#### Acute toxicity

<b>Inhalation</b>	May cause irritation of respiratory tract.
<b>Eye contact</b>	Causes serious eye damage.
<b>Skin contact</b>	Prolonged contact may cause redness and irritation. May be absorbed through the skin in harmful amounts.
<b>Ingestion</b>	Ingestion may cause stomach discomfort.
<b>Unknown acute toxicity</b>	Not Applicable.

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Alcohols, C6-12, ethoxylated	No data available	No data available	No data available
Fatty acids, coco, reaction products with ethanolamine, ethoxylated	No data available	No data available	No data available
2-butoxyethanol	= 470 mg/kg ( Rat )	= 220 mg/kg ( Rabbit ) = 2270 mg/kg ( Rat )	= 2.21 mg/L ( Rat ) 4 h = 450 ppm ( Rat ) 4 h

**Sensitisation** This product does not contain any components suspected to be sensitizing.

**Mutagenic effects** This product does not contain any known or suspected mutagens.

**Carcinogenicity** This product does not contain any known or suspected carcinogens.

**Reproductive toxicity** This product does not contain any known or suspected reproductive hazards.

**Routes of exposure** Eye contact. Skin contact.

**Routes of entry** Eye contact. Skin absorption.

**Specific target organ toxicity (single exposure)** Not classified

**Specific target organ toxicity (repeated exposure)** Not classified.

**Aspiration hazard** No hazard from product as supplied.

## 12. Ecological information

**12.1 Toxicity**

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

**Toxicity to algae**

This product is not considered toxic to algae.

**Toxicity to fish**

This product is not considered toxic to fish.

**Toxicity to daphnia and other aquatic invertebrates**

This product is not considered toxic to invertebrates.

Component	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Alcohols, C6-12, ethoxylated	No information available	No information available	No information available
Fatty acids, coco, reaction products with ethanolamine, ethoxylated	No information available	No information available	No information available
2-butoxyethanol	2950 mg/L LC50 (Lepomis macrochirus) = 96 h 1490 mg/L LC50 (Lepomis macrochirus) = 96 h	No information available	= 1698 - 1940 mg/L (LC50; Daphnia magna) = 1720 mg/L (EC50; water flea)

**12.2 Persistence and degradability**

Product is biodegradable.

**12.3 Bioaccumulative potential**

Does not bioaccumulate.

**Log Pow**

<2

**12.4 Mobility in soil**

**Mobility**

Soluble in water.

**12.5 Results of PBT and vPvB assessment**

Not classified as PBT/vPvB by current EU criteria.

**12.6 Other adverse effects.**

None known.

**13. Disposal considerations**

**13.1 Waste treatment methods**

<b>Waste from residues / unused products</b>	Dispose of in accordance with local regulations.
<b>Contaminated packaging</b>	Empty containers should be transported/delivered using a registered waste carrier for local recycling or waste disposal.
<b>EWC waste disposal No.</b>	According to the European Waste Catalogue, Waste Codes are not product specific, but application specific. Waste codes should be assigned by the user based on the application for which the product was used. The following Waste Codes are only suggestions: EWC waste disposal No: 07 01 04 Waste Code: 7152 Organic waste without halogen.

**14. Transport information**

**14.1 UN number**

Not regulated

**14.2 Proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

**14.3. Hazard class(es)**

<b>ADR/RID/ADN/ADG Hazard class</b>	Not regulated
<b>IMDG Hazard class</b>	Not regulated
<b>ICAO Hazard class/division</b>	Not regulated

**14.4 Packing group**

<b>ADR/RID/ADN/ADG Packing Group</b>	Not regulated
<b>IMDG Packing group</b>	Not regulated
<b>ICAO Packing group</b>	Not regulated

**14.5 Environmental hazard**

No

**14.6 Special precautions**

Not Applicable

**14.7 Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code**

Please contact MISDS@slb.com for info regarding transport in Bulk.

## 15. Regulatory information

### 15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

Germany, Water Endangering Classes (VwVwS) Water endangering class = 1

Australian Standard for the Uniform Scheduling of Drugs and Poisons

2-butoxyethanol  
Schedule 6

Commission Regulation (EU) No 453/2010 of 20 May 2010 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH). Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC, including amendments.

This safety data sheet complies with the requirements of Regulation (EC) No. 1272/2008.

Dutch Mining Regulations: In accordance with Mining Regulations 9.2 and Chapter 4 of the Working Conditions Decree.

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)

The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP) International inventories

USA, Toxic Substances Control Act inventory (TSCA)	Complies
European Union - EINECS and ELINCS	Complies
Canada, Domestic Substance List (DSL)	Complies
Philippines (PICCS)	Complies
Inventory - Japan - Existing and New Chemicals list	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korea (KECL)	Complies
Inventory - New Zealand - Inventory of Chemicals (NZIoC)	Complies

Contact REACH@miswaco.slb.com for REACH information.

### 15.2 Chemical Safety Report

No information available

## 16. Other information

Prepared by Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse

Supersedes date 13/Jun/2013

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Revision date 22/Jul/2015

Version 7

**The following sections have been revised:** This SDS have been made in a new database and therefore a new layout. No changes with regard to classification have been made, Updated according to GHS/CLP.

**Text of R phrases mentioned in Section 3**

R22 - Harmful if swallowed

R41 - Risk of serious damage to eyes

R20/21/22 - Harmful by inhalation, in contact with skin and if swallowed

R36/38 - Irritating to eyes and skin

**Full text of H-Statements referred to under sections 2 and 3**

H318 - Causes serious eye damage

H302 - Harmful if swallowed

H312 - Harmful in contact with skin

H315 - Causes skin irritation

H319 - Causes serious eye irritation

H332 - Harmful if inhaled

†A mark of M-I L.L.C.

**Disclaimer**

The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

Safety data sheet number PID12251  
Version 2  
Revision date 15/Sep/2015  
Supercedes date 24/Jun/2010



## Safety Data Sheet SAFE-T-PICKLE<sup>†</sup>

Quantity restrictions apply! Not to be used in quantities of 1 tonne or more within the EEA.

### 1. Identification of the substance/preparation and of the Company/undertaking

#### 1.1 Product identifier

Product name SAFE-T-PICKLE<sup>†</sup>  
Product code PID12251

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended use Completion fluid additive.

Uses advised against Consumer use

#### 1.3 Details of the supplier of the safety data sheet

Supplier identification  
M-I Drilling Fluids UK Limited  
C/O Schlumberger  
Enterprise Drive  
Westhill Industrial Estate  
Westhill, AB32 6TQ  
Scotland UK  
+47 51577424  
MISDS@slb.com

#### 1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

### 2. Hazards identification

#### 2.1 Classification of the substance or mixture

Regulation (EC) No. 1272/2008

##### Health hazards

Aspiration toxicity	Category 1
Skin corrosion/irritation	Category 2
Skin sensitisation	Category 1

Environmental hazards Not classified

Physical Hazards Not classified

#### 2.2 Label Elements



**Signal word**

DANGER

**Hazard statements**

H304 - May be fatal if swallowed and enters airways

H315 - Causes skin irritation

H317 - May cause an allergic skin reaction

**Precautionary Statements - EU (§28, 1272/2008)**

P264 - Wash face, hands and any exposed skin thoroughly after handling

P280 - Wear protective gloves/ protective clothing/ eye protection/ face protection

P301 + P310 - IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician

P331 - Do NOT induce vomiting

P302 + P352 - IF ON SKIN: Wash with plenty of soap and water

P501 - Dispose of contents/container in accordance with local regulations.

**Supplementary precautionary statements**

P261 - Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray

P272 - Contaminated work clothing should not be allowed out of the workplace

P333 + P313 - If skin irritation or rash occurs: Get medical advice/ attention

P362 - Take off contaminated clothing and wash before re-use

**Contains**

Distillates (petroleum), hydrotreated light

Citrus Extract

**2.3 Other data**

Not classified as PBT/vPvB by current EU criteria

**3. Composition/information on ingredients**

**3.1 Substances**

Not Applicable

**3.2 Mixtures**

Component	EC-No.	CAS-No	Weight % - range	Classification (67/548)	Classification (Reg. 1272/2008)	REACH registration number
Distillates (petroleum), hydrotreated light	265-149-8	64742-47-8	30-60	Xn; R65	Asp. Tox. 1 (H304)	No data available
Citrus Extract		68647-72-3	30-60	F; R10 Xn; R65 Xi; R38, R43	Flam Liq.3(H226) Skin Irrit.2(H315) Skin Sens.1(H317) Asp Tox.1(H304)	No data available

**Comments**

For CAS# 68647-72-3 we can use CAS# 94266-47-7 as an alternative for Inventory Compliance.

**4. First aid measures**

**4.1 First Aid**

- Inhalation** If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
- Ingestion** Rinse mouth. Do not induce vomiting without medical advice. If vomiting occurs spontaneously, minimize the risk of aspiration by properly positioning the affected person. Never give anything by mouth to an unconscious person. Immediate medical attention is required.
- Skin contact** Wash off immediately with soap and plenty of water removing all contaminated clothes and shoes. Get medical attention if irritation persists.
- Eye contact** Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

**4.2 Most important symptoms and effects, both acute and delayed**

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

**Main symptoms**

- Inhalation** Please see Section 11. Toxicological Information for further information.
- Ingestion** Please see Section 11. Toxicological Information for further information.
- Skin contact** Please see Section 11. Toxicological Information for further information.
- Eye contact** Please see Section 11. Toxicological Information for further information.

**4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician** Treat symptomatically.

**5. Fire-fighting measures**

### **5.1 Extinguishing media**

#### **Suitable extinguishing media**

Water Fog, Alcohol Foam, CO<sub>2</sub>, Dry Chemical.

#### **Extinguishing media which shall not be used for safety reasons**

Do not use a solid water stream as it may scatter and spread fire.

### **5.2 Special hazards arising from the substance or mixture**

#### **Unusual fire and explosion hazards**

Vapors are heavier than air and may spread along floors.

#### **Hazardous combustion products**

Fire or high temperatures create:, Carbon oxides (CO<sub>x</sub>).

### **5.3 Advice for firefighters**

#### **Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

#### **Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

## **6. Accidental release measures**

### **6.1 Personal precautions, protective equipment and emergency procedures**

Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. Use personal protective equipment. See also section 8.

### **6.2 Environmental precautions**

The product should not be allowed to enter drains, water courses or the soil.

#### **Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

### **6.3 Methods and materials for containment and cleaning up**

#### **Methods for Containment**

Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

#### **Methods for cleaning up**

Absorb with earth, sand or other non-combustable material and transfer to containers for later disposal. After cleaning, flush away traces with water.

### **6.4 Reference to other sections**

See section 13 for more information.

## **7. Handling and storage**

### **7.1 Precautions for safe handling**

**Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use. Take precautionary measures against static discharges. Persons susceptible to allergic reactions should not handle this product.

**Hygiene measures**

Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product. Remove contaminated clothing.

**7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions** Ensure adequate ventilation. Take precautionary measures against static discharges. Keep airborne concentrations below exposure limits.

**Storage precautions** Keep containers tightly closed in a dry, cool and well-ventilated place. Avoid heat, flames and other sources of ignition. Avoid contact with: Strong oxidising agents Strong acids.

**Storage class** Chemical storage.

**Packaging material** Use specially constructed containers only

**7.3 Specific end uses**

See Section 1.2.

**8. Exposure controls/personal protection**

**8.1 Control parameters**

**Exposure limits** Oil mist (mineral) workplace exposure limits are currently under review by legislative authorities. This workplace exposure limit (WEL) standard is applicable to highly refined mineral oils and is provided as a guidance limit only. LT. EXP = 5mg/m<sup>3</sup> and ST. EXP = 10mg/m<sup>3</sup>.

Component	EU OEL - Third List	Austria	Australia	Denmark
Distillates (petroleum), hydrotreated light	Not determined	Not determined	Not determined	Not determined
Citrus Extract	Not determined	Not determined	Not determined	Not determined

Component	Malaysia	France	Germany	Hungary
Distillates (petroleum), hydrotreated light	Not determined	Not determined	Not determined	Not determined
Citrus Extract	Not determined	Not determined	Not determined	Not determined

Component	New Zealand	Italy	Netherlands	Norway
Distillates (petroleum), hydrotreated light	Not Determined	Not determined	Not determined	Not determined
Citrus Extract	Not Determined	Not determined	Not determined	Not determined

Component	Poland	Portugal	Romania	Russia
Distillates (petroleum), hydrotreated light	Not determined	Not determined	Not determined	Not determined
Citrus Extract	Not determined	Not determined	Not determined	Not determined

Component	Spain	Switzerland	Turkey	UK
Distillates (petroleum), hydrotreated light	Not determined	Not determined	Not determined	Not determined
Citrus Extract	Not determined	Not determined	Not determined	Not determined

## 8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

### Engineering measures to reduce exposure

Ensure adequate ventilation. Provide mechanical general and/or local exhaust ventilation to prevent release of vapor or mist into work environment.

### Personal protective equipment

#### Eye protection

Safety glasses with side-shields.

#### Hand protection

Use protective gloves made of:., Nitrile, Be aware that liquid may penetrate the gloves. Frequent change is advisable.

#### Respiratory protection

No personal respiratory protective equipment normally required, In case of insufficient ventilation wear suitable respiratory equipment, Use respirator with organic vapor protection (A, brown), At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

#### Skin and body protection

Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.

### Hygiene measures

Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.



## 9. Physical and chemical properties

**9.1 Information on basic physical and chemical properties**

<b>Physical state</b>	Liquid
<b>Appearance</b>	No information available
<b>Odour</b>	Citrus
<b>Colour</b>	Clear - Pale yellow
<b>Odor threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
pH	No information available	
pH @ dilution		
Melting/freezing point	No information available	
Boiling point/range	176 °C / 348.8 °F	
Flash Point	61 °C / 142 °F	PMCC
Evaporation rate	< 1	
Flammability (solid, gas)	Not Applicable	
Flammability Limits in Air		
Upper flammability Limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	2 mmHg	
Vapor density	> 1	(Air = 1.0)
Specific gravity	0.825	
Bulk density	No information available	
Relative density	No information available	
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Viscosity, dynamic	No information available	
Log Pow	No information available	
<b>Explosive properties</b>	Not Applicable	
<b>Oxidizing properties</b>	None known.	

**9.2 Other information**

<b>Pour point</b>	No information available
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	None
<b>Density VALUE</b>	No information available

**10. Stability and reactivity**

**10.1 Reactivity**

No specific reactivity hazards associated with this product.

**10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerization**

Hazardous polymerisation does not occur.

**10.4 Conditions to avoid**

Avoid contact with heat, sparks, open flame, and static discharge.

**10.5 Incompatible materials**

Strong oxidising agents. Strong acids.

**10.6 Hazardous decomposition products**

See also section 5.2.

**11. Toxicological information**

**11.1 Information on toxicological effects**

**Acute toxicity**

<b>Inhalation</b>	Inhalation of vapours in high concentration may cause irritation of respiratory system. May cause additional affects as listed under "Ingestion".
<b>Eye contact</b>	May cause slight irritation.
<b>Skin contact</b>	Causes skin irritation. May cause an allergic skin reaction.
<b>Ingestion</b>	May be fatal if swallowed and enters airways.
<b>Unknown acute toxicity</b>	Not Applicable.

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Distillates (petroleum), hydrotreated light	> 5000 mg/kg ( Rat )	> 2000 mg/kg ( Rabbit )	> 5.2 mg/L ( Rat ) 4 h
Citrus Extract	No data available	No data available	No data available

<b>Sensitisation</b>	May cause allergic skin reaction.
<b>Mutagenic effects</b>	This product does not contain any known or suspected mutagens.
<b>Carcinogenicity</b>	This product does not contain any known or suspected carcinogens.

**Reproductive toxicity** This product does not contain any known or suspected reproductive hazards.

**Routes of exposure** Ingestion. Skin contact.

**Routes of entry** Ingestion. Skin contact.

**Specific target organ toxicity (single exposure)** Not classified

**Specific target organ toxicity (repeated exposure)** Not classified.

**Aspiration hazard** May be fatal if swallowed and enters airways.

**12. Ecological information**

**12.1 Toxicity**

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

**Toxicity to algae**

See component information below.

**Toxicity to fish**

See component information below.

**Toxicity to daphnia and other aquatic invertebrates**

See component information below.

Component	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Distillates (petroleum), hydrotreated light	96 Hr LC 50 Pimephales promelas; 45 mg/l	No information available	4720 mg/L LC50 (Den-dronereides heteropoda) = 96 h
Citrus Extract	No information available	No information available	No information available

**12.2 Persistence and degradability**

No product level data available.

**12.3 Bioaccumulative potential**

No product level data available.

**12.4 Mobility in soil**

**Mobility**

Insoluble in water.

**12.5 Results of PBT and vPvB assessment**

Not classified as PBT/vPvB by current EU criteria.

**12.6 Other adverse effects.**

None known.

**13. Disposal considerations**

**13.1 Waste treatment methods**

<b>Waste from residues / unused products</b>	Dispose of in accordance with local regulations.
<b>Contaminated packaging</b>	Empty containers should be transported/delivered using a registered waste carrier for local recycling or waste disposal.
<b>EWC waste disposal No.</b>	According to the European Waste Catalogue, Waste Codes are not product specific, but application specific. Waste codes should be assigned by the user based on the application for which the product was used. The following Waste Codes are only suggestions: EWC waste disposal No: 07 01 04

**14. Transport information**

**14.1 UN number**

Not regulated

**14.2 Proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

**14.3. Hazard class(es)**

<b>ADR/RID/ADN/ADG Hazard class</b>	Not regulated
<b>IMDG Hazard class</b>	Not regulated
<b>ICAO Hazard class/division</b>	Not regulated

**14.4 Packing group**

<b>ADR/RID/ADN/ADG Packing Group</b>	Not regulated
<b>IMDG Packing group</b>	Not regulated
<b>ICAO Packing group</b>	Not regulated

**14.5 Environmental hazard**

No

**14.6 Special precautions**

Not Applicable

**14.7 Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code**

Please contact MISDS@slb.com for info regarding transport in Bulk.

**15. Regulatory information**

**15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture**

**Australian Standard for the Uniform Scheduling of Drugs and Poisons**

No Poisons Schedule number allocated

Commission Regulation (EU) No 453/2010 of 20 May 2010 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH). Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC, including amendments.

This safety data sheet complies with the requirements of Regulation (EC) No. 1272/2008.

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as Dangerous Goods by the criteria of the Australian Dangerous Goods Code (ADG Code) for transport by road or rail.

**International inventories**

USA, Toxic Substances Control Act inventory (TSCA)	Complies
European Union - EINECS and ELINCS	Complies
Canada, Domestic Substance List (DSL)	Complies
Philippines (PICCS)	Complies
Inventory - Japan - Existing and New Chemicals list	Does not Comply
China (IECSC)	Complies
Australia (AICS)	Complies
Korea (KECL)	Complies
Inventory - New Zealand - Inventory of Chemicals (NZIoC)	Complies

Restricted for use in Europe until REACH assessed. Please contact REACH@miswaco.slb.com if intended for use in Europe. CAS Number 94266-47-4 can be used to identify the substance mentioned in Section 3, under Comments, for the International Inventories.

**15.2 Chemical Safety Report**

No information available

## 16. Other information

<b>Prepared by</b>	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
<b>Supercedes date</b>	24/Jun/2010
<b>Revision date</b>	15/Sep/2015
<b>Version</b>	2
<b>The following sections have been revised:</b>	This SDS have been made in a new database and therefore a new layout. There have been changes with regard to classification, Updated according to GHS/CLP.

### Text of R phrases mentioned in Section 3

R10 - Flammable  
R38 - Irritating to skin  
R43 - May cause sensitization by skin contact  
R65 - Harmful: may cause lung damage if swallowed

### Full text of H-Statements referred to under sections 2 and 3

H304 - May be fatal if swallowed and enters airways  
H315 - Causes skin irritation  
H317 - May cause an allergic skin reaction

H226 - Flammable liquid and vapor

†A mark of M-I L.L.C.

### Disclaimer

The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

Safety data sheet number PID1477

Version 7

Revision date 03/Oct/2018

Supercedes Date: 06/Jul/2018



## Safety Data Sheet SODA ASH

### 1. Identification of the Substance/Preparation and of the Company/Undertaking

#### 1.1 Product identifier

**Product name** SODA ASH  
**Product code** PID1477  
**Country Limitations** For use only in North Sea countries (NSG)  
**Synonyms** SODIUM CARBONATE

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** pH modifier

**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

##### Supplier

M-I Drilling Fluids UK Limited  
Westhill Business Park  
Westhill AB32 6JL Aberdeenshire  
Scotland United Kingdom

+47 51577424

SDS@slb.com

#### 1.4 Emergency Telephone Number

**Emergency telephone** - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

<b>Denmark</b>	Poison Control Hotline (DK): +45 82 12 12 12
<b>Netherlands</b>	National Poisons Information Centre (NL): +31 30 274 88 88 (NB: this service is only available to health professionals)
<b>Norway</b>	Poison information centre: +47 22 59 13 00

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP] Commission Regulation (EU) No 2015/830 of 28 May 2015

##### Health hazards

Serious eye damage/eye irritation	Category 2
-----------------------------------	------------

**Environmental hazards** Not classified

**Physical Hazards** Not classified

**2.2 Label elements**



**Signal word**  
 WARNING

**Hazard Statements**

H319 - Causes serious eye irritation

**Precautionary Statements**

P264 - Wash face, hands and any exposed skin thoroughly after handling

P280 - Wear protective gloves/protective clothing/eye protection/face protection

P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing

P337 + P313 - If eye irritation persists: Get medical advice/attention

P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

-

**Contains**

Sodium carbonate

**2.3 Other hazards**

Not classified as PBT/vPvB by current EU criteria

Reacts violently with acids.

**3. Composition/information on Ingredients**

**3.1 Substances**

Chemical Name	EC No	CAS No	Weight-%	Component information	REACH registration number
Sodium carbonate	207-838-8	497-19-8	60-100	Eye Irrit. 2 (H319)	01-2119485498-19-XXXX

**3.2 Mixtures**

Not applicable

## 4. First Aid Measures

### 4.1 First aid measures

<b>Inhalation</b>	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
<b>Ingestion</b>	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.
<b>Skin contact</b>	Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention if irritation persists.
<b>Eye Contact</b>	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

### 4.2. Most important symptoms and effects, both acute and delayed

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

#### **Symptoms**

<b>Inhalation</b>	Please see Section 11. Toxicological Information for further information.
<b>Ingestion</b>	Please see Section 11. Toxicological Information for further information.
<b>Skin contact</b>	Please see Section 11. Toxicological Information for further information.
<b>Eye contact</b>	Please see Section 11. Toxicological Information for further information.

### 4.3 Indication of any immediate medical attention and special treatment needed

**Notes to physician** Treat symptomatically.

## 5. Firefighting Measures

### 5.1 Extinguishing media

#### **Suitable extinguishing media**

Water Fog, Alcohol Foam, CO<sub>2</sub>, Dry Chemical.

#### **Extinguishing media which must not be used for safety reasons**

None known.

### 5.2. Special hazards arising from the substance or mixture

#### **Unusual fire and explosion hazards**

None known.

**Hazardous combustion products**

Fire or high temperatures create: Carbon oxides (COx), Sodium oxides.

**5.3 Advice for firefighters**

**Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

**Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

**6. Accidental Release Measures**

**6.1. Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. See also section 8.

**6.2 Environmental precautions**

The product should not be allowed to enter drains, water courses or the soil.

**Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

**6.3 Methods and material for containment and cleaning up**

**Methods for containment**

Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimise spreading and keep powder dry.

**Methods for cleaning up**

Avoid dust formation. Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

**6.4 Reference to other sections**

See section 13 for more information.

**7. Handling and Storage**

**7.1 Precautions for safe handling**

**Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation.

**Hygiene Measures**

Use good work and personal hygiene practices to avoid exposure Do not eat, drink or smoke when using this product Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

**7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions** Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

**Storage precautions** Keep containers tightly closed in a dry, cool and well-ventilated place Protect from moisture Avoid contact with: Metals Strong oxidising agents Strong acids

**Storage class** Chemical storage.

**Packaging materials** Use specially constructed containers only

**7.3 Specific end uses**

See Section 1.2.

**8. Exposure Controls/Personal Protection**

**8.1 Control parameters**

**Exposure Limits** NUI = Nuisance dust, TWA 4mg/m<sup>3</sup> Respirable Dust, 10mg/m<sup>3</sup> Total Dust.

**Component Information**

Chemical Name	EU OEL - Third List	Austria	Denmark
Sodium carbonate	Not determined	Not determined	Not determined
Chemical Name	France	Germany	Hungary
Sodium carbonate	Not determined	Not determined	Not determined
Chemical Name	Italy	Netherlands	Norway
Sodium carbonate	Not determined	Not determined	Not determined
Chemical Name	Poland	Portugal	Romania
Sodium carbonate	Not determined	Not determined	3mg/m <sup>3</sup> STEL 1mg/m <sup>3</sup> TWA
Chemical Name	Spain	Switzerland	UK
Sodium carbonate	Not determined	Not determined	Not determined

**Derived No Effect Level (DNEL)**

**Long term exposure systemic effects**

**Sodium carbonate**

Inhalation 10 mg/m<sup>3</sup>

**8.2 Exposure controls**

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

**Engineering Controls**

Ensure adequate ventilation. Mechanical ventilation or local exhaust ventilation is required. Provide appropriate exhaust ventilation at places where dust is formed. See section 7 for more information.

**Personal protective equipment**

**Eye protection**

Use eye protection according to EN 166, designed to protect against powders and dusts. Tightly fitting safety goggles. Safety glasses with side-shields.

**Hand protection**

Wear gloves according to EN 374 to protect against skin effects from powders Use protective gloves made of: Nitrile rubber  
 Break through time >480 minutes  
 Glove thickness 0.11 mm

**Respiratory protection** Frequent change is advisable  
 No personal respiratory protective equipment normally required, In case of insufficient ventilation wear suitable respiratory equipment, Half mask with a particle filter P2 (BS EN 143), At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

**Skin and body protection** Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.

**Hygiene Measures** Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.



**8.2.3 Environmental exposure controls**

**Environmental exposure** Use appropriate containment to avoid environmental contamination See section 6 for more information

**9. Physical and Chemical Properties**

**9.1 Information on basic physical and chemical properties**

**Physical state** Solid  
**Appearance** Powder Dust  
**Odour** Odourless  
**Colour** White  
**Odour threshold** Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
pH	No information available	
pH @ dilution	> 12	@ 10 g/l
Melting / freezing point	851 °C / 1564 °F	
Boiling point/range	No information available	
Flash point	Non-flammable	
Evaporation rate	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapour pressure	No information available	
Vapour density	No information available	
Specific gravity	No information available	
Bulk density	No information available	
Relative density	2.53 sg	@ 20 °C.
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	> 400°C (752°F)	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	

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<b>log Pow</b>	Not determined
<b>Explosive properties</b>	Not applicable
<b>Oxidising properties</b>	None known
<b>9.2 Other information</b>	
<b>Pour point</b>	No information available
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	None
<b>Density</b>	No information available

**Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

## 10. Stability and Reactivity

### 10.1 Reactivity

Reacts violently with acids.

### 10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

### 10.3 Possibility of Hazardous Reactions

#### **Hazardous polymerisation**

Hazardous polymerisation does not occur.

### 10.4 Conditions to avoid

Avoid dust formation. Protect from moisture.

### 10.5 Incompatible materials

Oxidizing agents.

### 10.6 Hazardous decomposition products

See Section 5.2.

## 11. Toxicological Information

### 11.1 Information on toxicological effects

#### **Acute toxicity**

#### **Inhalation**

Inhalation of dust may cause shortness of breath, tightness of the chest, a sore throat and cough.

#### **Eye contact**

Causes serious eye irritation.

#### **Skin contact**

Prolonged contact may cause redness and irritation.

**Ingestion** Ingestion may cause stomach discomfort.

**Unknown acute toxicity** Not applicable.

**Toxicology data for the components**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Sodium carbonate	= 4090 mg/kg ( Rat )	No data available	= 2300 mg/m <sup>3</sup> ( Rat ) 2 h

**Sensitisation** This product does not contain any components suspected to be sensitizing.

**Mutagenic effects** This product does not contain any known or suspected mutagens.

**Carcinogenicity** This product does not contain any known or suspected carcinogens.

**Reproductive toxicity** This product does not contain any known or suspected reproductive hazards.

**Routes of exposure** Eye contact. Inhalation.

**Routes of entry** No route of entry noted.

**Specific target organ toxicity - Single exposure** Not classified

**Specific target organ toxicity - Repeated exposure** Not classified.

**Aspiration hazard** Not applicable.

**Other information** Key literature references and sources for data. See Section 16 for more information.

**12. Ecological Information**

**12.1 Toxicity**

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment. Listed on PLONOR list of OSPAR

**Toxicity to algae**  
 See component information below.

**Toxicity to fish**  
 See component information below.

**Toxicity to daphnia and other aquatic invertebrates**  
 See component information below.

**Toxicology data for the components**

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates

Sodium carbonate	310 - 1220 mg/L LC50 Pimephales promelas 96 h = 300 mg/L LC50 Lepomis macrochirus 96 h	= 242 mg/L EC50 Nitzschia 120 h	= 265 mg/L EC50 Daphnia magna 48 h
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**12.2 Persistence and degradability**

Not Applicable - Inorganic chemical.

**12.3 Bioaccumulative potential**

Not Applicable - Inorganic chemical.

**12.4 Mobility**

**Mobility**

Soluble in water.

**Mobility in soil**

No information available.

**12.5 Results of PBT and vPvB assessment**

Not classified as PBT/vPvB by current EU criteria.

**12.6 Other adverse effects.**

None known.

**12.7 Other information**

Key literature references and sources for data. See Section 16 for more information.

**13. Disposal Considerations**

**13.1 Waste treatment methods**

**Waste from residues/unused products**

Dispose of in accordance with local regulations.

**Contaminated packaging**

Empty containers should be taken to an approved waste handling site for recycling or disposal.

**EWC Waste Disposal No**

According to the European Waste Catalogue, Waste Codes are not product specific, but application specific Waste codes should be assigned by the user based on the application for which the product was used The following Waste Codes are only suggestions: EWC waste disposal No: 06 02 05 Waste Code: 7091

**14. Transport information**

**14.1. UN number**

Not regulated

**14.2. UN proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

**14.3. Hazard class(es)**

**ADR/RID/ADN/ADG Hazard class** Not regulated

**IMDG Hazard class** Not regulated

**ICAO Hazard class/division** Not regulated

**14.4 Packing group**

**ADR/RID/ADN/ADG Packing Group** Not regulated

**IMDG Packing group** Not regulated

**ICAO Packing group** Not regulated

**14.5 Environmental hazard**

No

**14.6 Special precautions**

Not applicable

**14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code**

Please contact SDS@slb.com for info regarding transport in Bulk.

## 15. Regulatory Information

### 15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

Commission Regulation (EU) 2015/830 of 28 May 2015 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC, 2000/21/EC and 453/2010 including amendments.

This safety data sheet complies with the requirements of Regulation (EC) No. 1272/2008.

Dutch Mining Regulations: In accordance with Mining Regulations 9.2 and Chapter 4 of the Working Conditions Decree.

#### International inventories

USA, Toxic Substances Control Act inventory (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Inventory - Japan - Existing and New Chemicals list	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korea (KECL)	Complies
Inventory - New Zealand - Inventory of Chemicals (NZIoC)	Complies

#### Europe - REACH

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

Norway Pr. no.	46156
Denmark Pr. no.	336795

For use only in North Sea countries (NSG)

### 15.2 Chemical Safety Report

No information available

## 16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	06/Jul/2018
Revision date	03/Oct/2018

**Version** 7

**This SDS has been revised in the following section(s)** 1, 2, 15, 16 For use only in North Sea countries (NSG)  
No changes with regard to classification have been made.

**Key literature references and sources for data**

www.ChemADVISOR.com

Supplier

National Chemical Inventories

National regulatory information

National occupational exposure limits

**Training Advice**

Do not handle until all safety precautions have been read and understood

Follow general hygiene considerations recognised as common good workplace practices

**HMIS classification**

Health	2
Flammability	0
Physical hazard	0
PPE	E

**Full text of H-Statements referred to under sections 2 and 3**

H319 - Causes serious eye irritation

**Disclaimer**

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Safety data sheet number 142104

Version 2

Revision date 04/Apr/2017

Supercedes date 24/May/2012



## Safety Data Sheet SODIUM CHLORIDE / SODIUM FORMATE BRINE

### 1. Identification of the substance/preparation and of the Company/undertaking

#### 1.1 Product identifier

**Product name** SODIUM CHLORIDE / SODIUM FORMATE BRINE  
**Product code** 142104

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Drilling fluid additive. Completion brine.

#### 1.3 Details of the supplier of the safety data sheet

##### **Supplier**

M-I Drilling Fluids UK Limited  
C/O Schlumberger  
Enterprise Drive  
Westhill Industrial Estate  
Westhill, AB32 6TQ  
Scotland UK  
+47 51577424

MISDS@slb.com

#### 1.4 Emergency Telephone Number

**Emergency telephone** - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

**Classification according to Regulation (EC) No. 1272/2008 [CLP]**

**Health hazards** Not classified

**Environmental hazards** Not classified

**Physical Hazards** Not classified

#### 2.2 Label elements

##### **Signal word**

None

##### **Hazard statements**

This product is not classified as hazardous therefore no (H) hazard statements assigned.

**Precautionary Statements - EU (§28, 1272/2008)**

This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

**Contains**

Sodium chloride

Sodium formate

**2.3 Other hazards**

Not classified as PBT/vPvB by current EU criteria

**3. Composition/information on ingredients**

**3.1 Substances**

Not applicable

**3.2 Mixtures**

Chemical Name	EC No	CAS No	Weight-%	Classification according to 67/548/EEC	Regulation (EC) No 1272/2008	REACH registration number
Sodium chloride	231-598-3	7647-14-5	10-30	-	Not classified	Exempt
Sodium formate	205-488-0	141-53-7	0-10	-	Not classified	No data available

**Comments**

The product contains other ingredients which do not contribute to the overall classification.

**4. First aid measures**

**4.1 First Aid**

**Inhalation**

If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

**Ingestion**

Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

**Skin contact**

Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

**Eye contact** Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses. Get medical attention if any discomfort continues.

#### **4.2 Most important symptoms and effects, both acute and delayed**

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

#### **Main symptoms**

**Inhalation** Please see Section 11. Toxicological Information for further information.

**Ingestion** Please see Section 11. Toxicological Information for further information.

**Skin contact** Please see Section 11. Toxicological Information for further information.

**Eye contact** Please see Section 11. Toxicological Information for further information.

#### **4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician** Treat symptomatically.

## **5. Fire-fighting measures**

### **5.1 Extinguishing media**

**Suitable extinguishing media**  
Use extinguishing agent suitable for type of surrounding fire.

**Extinguishing media which must not be used for safety reasons**  
None known.

### **5.2 Special hazards arising from the substance or mixture**

**Unusual fire and explosion hazards**  
None known.

**Hazardous combustion products**  
Fire or high temperatures create: Hydrogen chloride gas, Oxides of:, Sodium, Chlorides.

### **5.3 Advice for firefighters**

**Special protective equipment for fire-fighters**  
As in any fire, wear self-contained breathing apparatus and full protective gear.

**Special Fire-Fighting Procedures**  
Containers close to fire should be removed immediately or cooled with water.

## **6. Accidental release measures**

## **6.1 Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. See also section 8.

## **6.2 Environmental precautions**

The product should not be allowed to enter drains, water courses or the soil.

### **Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

## **6.3 Methods and material for containment and cleaning up**

### **Methods for containment**

Prevent further leakage or spillage if safe to do so. Dyke far ahead of liquid spill for later disposal.

### **Methods for cleaning up**

Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

## **6.4 Reference to other sections**

See section 13 for more information.

# **7. Handling and storage**

## **7.1 Precautions for safe handling**

### **Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

### **Hygiene measures**

Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product. Remove contaminated clothing.

## **7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions** Ensure adequate ventilation.

**Storage precautions** Keep containers tightly closed in a dry, cool and well-ventilated place. Avoid contact with:  
Strong oxidising agents  
Strong acids

**Storage class** Chemical storage.

**Packaging materials** Use specially constructed containers only

## **7.3 Specific end uses**

See Section 1.2.

# **8. Exposure controls/personal protection**

## **8.1 Control parameters**

## Exposure Limits

Because this product is a liquid, the dust-related Workplace Exposure Limits for the components do not apply.

Chemical Name	EU OEL - Third List	Austria	Australia	Denmark
Sodium chloride	Not determined	Not determined	Not determined	Not determined
Sodium formate	Not determined	Not determined	Not determined	Not determined
Chemical Name	Malaysia	France	Germany	Hungary
Sodium chloride	Not determined	Not determined	Not determined	Not determined
Sodium formate	Not determined	Not determined	Not determined	Not determined
Chemical Name	New Zealand	Italy	Netherlands	Norway
Sodium chloride	Not determined	Not determined	Not determined	Not determined
Sodium formate	Not determined	Not determined	Not determined	Not determined
Chemical Name	Poland	Portugal	Romania	Russia
Sodium chloride	Not determined	Not determined	Not determined	5 mg/m <sup>3</sup> MAC
Sodium formate	Not determined	Not determined	Not determined	10 mg/m <sup>3</sup> MAC
Chemical Name	Spain	Switzerland	Turkey	UK
Sodium chloride	Not determined	Not determined	Not determined	Not determined
Sodium formate	Not determined	Not determined	Not determined	Not determined

## 8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

### Engineering measures to reduce exposure

Ensure adequate ventilation. Mechanical ventilation or local exhaust ventilation is required.

### Personal protective equipment

#### Eye protection

Use eye protection according to EN 166, designed to protect against liquid splashes. Tightly fitting safety goggles. Safety glasses with side-shields.

#### Hand protection

Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training

Impervious gloves made of: Butyl PVC

Break through time >480 minutes

Glove thickness =>0.5 mm

Be aware that liquid may penetrate the gloves. Frequent change is advisable.

#### Respiratory protection

No personal respiratory protective equipment normally required, In case of insufficient ventilation wear suitable respiratory equipment, Use respirator with organic vapor protection (A, brown), At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

#### Skin and body protection

Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.

### Hygiene measures

Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.



## 9. Physical and chemical properties

### 9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Aqueous solution
Odour	Odourless
Colour	Colourless
Odour threshold	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
pH	8.5	
pH @ dilution		
Melting / freezing point	-5 °C / 23 °F	
Boiling point/range	106 °C / 222.8 °F	
Flash point	No information available	
Evaporation rate	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapour pressure	No information available	
Vapour density	No information available	
Specific gravity	No information available	
Bulk density	No information available	
Relative density	1.008 - 1.200 g/cm <sup>3</sup>	@ 20 °C.
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	
Explosive properties	Not applicable	
Oxidising properties	None known	

### 9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

## 10. Stability and reactivity

### 10.1 Reactivity

No specific reactivity hazards associated with this product.

## 10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

## 10.3 Possibility of Hazardous Reactions

### **Hazardous polymerisation**

Hazardous polymerisation does not occur.

## 10.4 Conditions to avoid

None known.

## 10.5 Incompatible materials

Strong oxidising agents. Strong acids.

## 10.6 Hazardous decomposition products

See Section 5.2.

# 11. Toxicological information

## 11.1 Information on toxicological effects

### **Acute toxicity**

<b>Inhalation</b>	Inhalation of vapours in high concentration may cause irritation of respiratory system.
<b>Eye contact</b>	May cause slight irritation.
<b>Skin contact</b>	Prolonged contact may cause redness and irritation.
<b>Ingestion</b>	Ingestion may cause stomach discomfort.
<b>Unknown acute toxicity</b>	Not applicable.

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Sodium chloride	= 3 g/kg ( Rat )	> 10 g/kg ( Rabbit )	> 42 g/m <sup>3</sup> ( Rat ) 1 h
Sodium formate	= 11200 mg/kg ( Rat )	No data available	No data available

**Sensitisation** This product does not contain any components suspected to be sensitizing.

**Mutagenic effects** This product does not contain any known or suspected mutagens.

**Carcinogenicity** This product does not contain any known or suspected carcinogens.

<b>Reproductive toxicity</b>	This product does not contain any known or suspected reproductive hazards.
<b>Routes of exposure</b>	None known.
<b>Routes of entry</b>	No route of entry noted.
<b>Specific target organ toxicity - Single exposure</b>	Not classified
<b>Specific target organ toxicity - Repeated exposure</b>	Not classified.
<b>Aspiration hazard</b>	Not applicable.

**12. Ecological information**

**12.1 Toxicity**

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment. Listed on PLONOR list of OSPAR

**Toxicity to algae**  
 This product is not considered toxic to algae.

**Toxicity to fish**  
 This product is not considered toxic to fish.

**Toxicity to daphnia and other aquatic invertebrates**  
 This product is not considered toxic to invertebrates.

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Sodium chloride	= 12946 mg/L LC50 Lepomis macrochirus 96 h 5560 - 6080 mg/L LC50 Lepomis macrochirus 96 h 6420 - 6700 mg/L LC50 Pimephales promelas 96 h 4747 - 7824 mg/L LC50 Oncorhynchus mykiss 96 h 6020 - 7070 mg/L LC50 Pimephales promelas 96 h = 7050 mg/L LC50 Pimephales promelas 96 h	No information available	340.7 - 469.2 mg/L EC50 Daphnia magna 48 h = 1000 mg/L EC50 Daphnia magna 48 h
Sodium formate	= 5000 mg/L LC50 Lepomis macrochirus 24 h	No information available	> 1000 mg/L EC50 Daphnia magna 24 h

**12.2 Persistence and degradability**

No product level data available.

## 12.3 Bioaccumulative potential

No product level data available.

## 12.4 Mobility in soil

### **Mobility**

Soluble in water.

## 12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

## 12.6 Other adverse effects.

None known.

## 13. Disposal considerations

### 13.1 Waste treatment methods

#### **Waste from residues / unused products**

Dispose of in accordance with local regulations.

#### **Contaminated packaging**

Empty containers should be transported/delivered using a registered waste carrier for local recycling or waste disposal.

#### **EWC Waste Disposal No**

According to the European Waste Catalogue, Waste Codes are not product specific, but application specific Waste codes should be assigned by the user based on the application for which the product was used The following Waste Codes are only suggestions: EWC waste disposal No: 07 01 99.

## 14. Transport information

### 14.1. UN number

Not regulated

### 14.2. UN proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

### 14.3. Hazard class(es)

ADR/RID/ADN/ADG Hazard class Not regulated  
IMDG Hazard class Not regulated  
ICAO Hazard class/division Not regulated

#### 14.4 Packing group

ADR/RID/ADN/ADG Packing Group Not regulated  
IMDG Packing group Not regulated  
ICAO Packing group Not regulated

#### 14.5 Environmental hazard

No

#### 14.6 Special precautions

Not applicable

#### 14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code

The product has been assessed and contained in Chapters 17/18 of the IBC Code and the latest MEPC.2/Circular and is permitted to be carried under Annex II of MARPOL and resolution A.673 (16) Offshore Supply Vessel Code. Ship Type:- 3. Pollution Category:- Z.

Proper Shipping Name: Drilling brines, including: calcium bromide solution, calcium chloride solution and sodium chloride solution.

## 15. Regulatory information

### 15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

Commission Regulation (EU) No 453/2010 of 20 May 2010 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH). Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC, including amendments.

This safety data sheet complies with the requirements of Regulation (EC) No. 1272/2008.

#### International inventories

USA, Toxic Substances Control Act inventory (TSCA)	Complies
European Union - EINECS and ELINCS	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Inventory - Japan - Existing and New Chemicals list	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korea (KECL)	Complies
Inventory - New Zealand - Inventory of Chemicals (NZIoC)	Complies

### 15.2 Chemical Safety Report

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No information available

## 16. Other information

<b>Prepared by</b>	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
<b>Supersedes date</b>	24/May/2012
<b>Revision date</b>	04/Apr/2017
<b>Version</b>	2
<b>This SDS has been revised in the following section(s)</b>	This SDS have been made in a new database and therefore a new layout. No changes with regard to classification have been made. Updated according to GHS/CLP.

### Full text of H-Statements referred to under sections 2 and 3

This product is not classified as hazardous therefore no (H) hazard statements assigned.

### Disclaimer

The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

## 1. Identification of the substance/preparation and of the Company/undertaking

### 1.1 Product identifier

Product name SOLACIDE

### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Biocide

Uses advised against Consumer use

### 1.3 Details of the supplier of the safety data sheet

#### Supplier

Solent Chemicals Private Limited  
No. 12 New Industrial Road  
#03-02A Morningstar Centre  
Singapore 536202  
T: +65 6383 0138  
Fax: +65 6383 5228  
info@solentchem.com

### 1.4 Emergency Telephone Number

Emergency telephone - Singapore +65-63830138 (24 Hour)

## 2. Hazards identification

### 2.1 Classification of the substance or mixture

Classification according to (EC) No. 1272/2008

#### Health hazards

Acute oral toxicity	Category 4
Acute inhalation toxicity - vapor	Category 2
Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 1
Skin sensitization	Category 1
Specific target organ toxicity (repeated exposure)	Category 1

Environmental hazards Not classified

Physical Hazards Not classified

### 2.2 Label elements



**Signal word**  
DANGER

**Hazard statements**

H302 - Harmful if swallowed  
H315 - Causes skin irritation  
H317 - May cause an allergic skin reaction  
H318 - Causes serious eye damage  
H330 - Fatal if inhaled  
H372 - Causes damage to organs through prolonged or repeated exposure

**Precautionary Statements - EU (§28, 1272/2008)**

P260 - Do not breathe dust/fume/gas/mist/vapors/spray  
P280 - Wear protective gloves/ protective clothing/ eye protection/ face protection  
P304 + P340 - IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing  
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing  
P310 - Immediately call a POISON CENTER or doctor/ physician  
P403 + P233 - Store in a well-ventilated place. Keep container tightly closed

**Supplementary precautionary statements**

P264 - Wash face, hands and any exposed skin thoroughly after handling  
P270 - Do not eat, drink or smoke when using this product  
P271 - Use only outdoors or in a well-ventilated area  
P272 - Contaminated work clothing should not be allowed out of the workplace  
P284 - Wear respiratory protection  
P301 + P312 - IF SWALLOWED: Call a POISON CENTER or doctor/ physician if you feel unwell  
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water  
P314 - Get medical advice/attention if you feel unwell  
P330 - Rinse mouth  
P333 + P313 - If skin irritation or rash occurs: Get medical advice/ attention  
P362 - Take off contaminated clothing and wash before reuse  
P501 - Dispose of contents/ container to an approved waste disposal plant

**Classification according to EU Directives 67/548/EEC or 1999/45/EC**

**Indication of danger**

T - Toxic  
Xn - Harmful  
Xi - Irritant

**R-code(s)**

R22, R23, R38, R41 R43, R48/23

**Contains**

2,2''',2''-(hexahydro-1,3,5-triazine-1,3,5-triyl)triethanol

Tetrasodium ethylenediaminetetraacetate

2-aminoethanol

*For the full text of the R-phrases and H-Statements mentioned in this Section, see Section 16.*

### 2.3 Other data

Not classified as PBT/vPvB by current EU criteria

#### Australian statement of hazardous/dangerous nature

Classified as Hazardous according to the criteria of NOHSC.

HAZARDOUS SUBSTANCE. DANGEROUS GOODS.

## 3. Composition/information on ingredients

### 3.1 Substances

Not Applicable

### 3.2 Mixtures

Component	EC-No.	CAS-No	Weight % range	Classification (67/548)	Classification (Reg. 1272/2008)
2,2''',2''-(hexahydro-1,3,5-triazine-1,3,5-triyl) triethanol	255-208-0	4719-04-4	60-100	Xn; R22 T; R23 T; R48/23 R43	Acute Tox. 4 (H302) Acute Tox. 2 (H330) Skin Sens. 1 (H317) STOT RE. 1 (H372)
Tetrasodium ethylenediaminetetraacetate	200-573-9	64-02-8	1-5	Xn; R22 Xi; R41	Acute Tox. 4 (H302) Eye Dam. 1 (H318)
2-aminoethanol	205-483-3	141-43-5	1-5	Xn; R20/21/22 C; R34	Acute Tox. 4 (H302) Acute Tox. 4 (H312) Acute Tox. 4 (H332) Skin Corr. 1B (H314)

### Comments

The product contains other ingredients which do not contribute to the overall classification.

## 4. First aid measures

### 4.1 First-Aid Measures

#### Inhalation

Move the exposed person to fresh air at once. Provide fresh air, warmth and rest, preferably in a comfortable upright sitting position. If not breathing, give artificial respiration; if breathing is difficult, give medical oxygen. Get medical attention immediately.

#### Ingestion

Rinse mouth thoroughly with water. Never give anything by mouth to an unconscious person. Do not induce vomiting without medical advice. Get medical attention immediately.

#### Skin contact

Remove contaminated clothing immediately and wash skin with soap and water for at least 15 minutes. Get medical attention immediately.

#### Eye contact

Make sure to remove any contact lenses from the eyes before rinsing. Flush immediately with plenty of water, holding the eyelids open. Continue to rinse for at least 15 minutes. Get medical attention immediately.

#### **4.2 Most important symptoms and effects, both acute and delayed**

**General advice** Seek medical attention for all burns, regardless how minor they may seem. The severity of the symptoms described will vary dependent of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

#### **Main symptoms**

**Inhalation** Please see Section 11. Toxicological Information for further information.

**Ingestion** Please see Section 11. Toxicological Information for further information.

**Skin contact** Please see Section 11. Toxicological Information for further information.

**Eye contact** Please see Section 11. Toxicological Information for further information.

#### **4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician** Treat symptomatically.

### **5. Fire-fighting measures**

#### **5.1 Extinguishing media**

##### **Suitable extinguishing media**

Use water spray, fog, mist, dry chemical, carbon dioxide or foam.

##### **Extinguishing media which shall not be used for safety reasons**

None known.

#### **5.2 Special hazards arising from the substance or mixture**

##### **Unusual fire and explosion hazards**

None known.

##### **Hazardous combustion products**

Fire or high temperatures create: Vapours/gases/fumes of: Carbon monoxide (CO). Carbon dioxide (CO<sub>2</sub>). Nitrous gases (NO<sub>x</sub>). Sulfurous gases (SO<sub>x</sub>).

#### **5.3 Advice for firefighters**

##### **Special protective equipment for fire-fighters**

Self-contained breathing apparatus in positive pressure demand and full protective clothing must be worn in case of fire.

##### **Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

##### **Hazchem code ADG**

2X

## 6. Accidental release measures

### 6.1 Personal precautions, protective equipment and emergency procedures

Do not breathe vapors or spray mist. Keep people away from and upwind of spill/leak. Do not get on skin or clothing. Wash thoroughly after handling. Use personal protective equipment. See also section 8.

### 6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

#### **Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

### 6.3 Methods and materials for containment and cleaning up

#### **Methods for containment**

Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

#### **Methods for cleaning up**

Contain and collect spillage with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local/national regulations (see Section 13).

### 6.4 Reference to other sections

See section 13 for more information.

## 7. Handling and storage

### 7.1 Precautions for safe handling

#### **Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid spills and splashing during use. Persons susceptible to allergic reactions should not handle this product. Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use with adequate ventilation. Avoid prolonged exposure. Avoid spilling, skin and eye contact. Avoid inhalation of vapors and spray mists. When using do not smoke, eat or drink.

### 7.2 Conditions for safe storage, including any incompatibilities

<b>Technical measures/precautions</b>	Ensure adequate ventilation. Keep airborne concentrations below exposure limits.
<b>Storage precautions</b>	Keep containers tightly closed in a dry, cool and well-ventilated place. Avoid contact with: Strong acids. Strong oxidizing agents Nitrites
<b>Storage class</b>	Toxic storage.
<b>Packaging material</b>	Use specially constructed containers only Plastic container

### 7.3 Specific end uses

See Section 1.2.

## 8. Exposure controls/personal protection

### 8.1 Control parameters

**Exposure limits** No biological limit allocated

#### Derived No Effect Level (DNEL)

#### Long term exposure local effects

##### 2-aminoethanol

Inhalation 3.3 mg/m<sup>3</sup>

#### Long term exposure systemic effects

##### 2-aminoethanol

Dermal 1 mg/kg

#### Predicted No Effect Concentration (PNEC)

##### 2-aminoethanol

Fresh water 0.085 mg/l

Sea water 0.0085 mg/l

Fresh water sediment 0.434 mg/kg

Sea sediment 0.0434 mg/kg

Soil 0.0367 mg/kg

Impact on sewage treatment 100 mg/l

Intermittent release 0.028 mg/l

### 8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

#### Engineering measures to reduce exposure

Provide adequate general and local exhaust ventilation in work areas. When working in confined spaces (tanks, containers, etc.), ensure that there is a supply of air suitable for breathing and wear the recommended equipment. Provide eyewash station and safety shower.

#### Personal protective equipment

##### Eye protection

Wear splash-proof chemical safety goggles to prevent any possibility of eye contact. Face-shield

##### Hand protection

Impervious gloves made of: Neoprene, Nitrile, Viton, PVC, Be aware that liquid may penetrate the gloves. Frequent change is advisable.

##### Respiratory protection

Use respirator with organic vapor protection (A, brown), At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used, if there are conditions in which this triazine containing product produces a vapor, a chemical respirator with A1 + Formaldehyde and P2 particulate pre-filter combination would be required.

##### Skin and body protection

Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.

##### Hygiene measures

Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.



## 9. Physical and chemical properties

### 9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Clear
Odor	Characteristic
Color	Colorless - Pale yellow
Odor threshold	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
pH	No information available	
pH @ dilution	9.5 - 11.5	@ 100g/l H <sub>2</sub> O
Melting/freezing point	No information available	
Boiling point/range	> 100 °C	
Flash point	> 200 °C	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not Applicable	
Flammability Limits in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	No information available	
Bulk density	No information available	
Relative density	1.15 - 1.16	
Water solubility	Miscible with water.	
Solubility in other solvents	No information available	
Autoignition temperature	>200 °C	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	Not information available	
Log Pow	Not determined	
Explosive properties	Not Applicable	
Oxidizing properties	None known.	

### 9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content (%)	None
Density	No information available

## 10. Stability and reactivity

### 10.1 Reactivity

Contact with strong acids develops formaldehyde.

**10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerization**

Hazardous polymerization does not occur.

**10.4 Conditions to avoid**

None known.

**10.5 Incompatible materials**

Strong oxidizing agents. Nitrites. Strong acids.

**10.6 Hazardous decomposition products**

See also section 5.2.

**11. Toxicological information**

**11.1 Information on toxicological effects**

**Acute toxicity**

**Product information**

This product may contain or release trace amounts of formaldehyde. The International Agency for Research on Cancer (IARC) has classified formaldehyde as a Group 1 carcinogen (limited evidence in humans, sufficient evidence in animals). Exposure to formaldehyde has been linked to adverse reproductive effects in some human and animal studies. In other reproductive studies, however, no adverse effects were noted. (Meditext). Formaldehyde may also cause skin sensitisation (allergic reaction).

**Inhalation**

Fatal if inhaled. May cause damage to organs through prolonged or repeated exposure.

**Eye contact**

Causes serious eye irritation.

**Skin contact**

Causes skin irritation. May cause an allergic skin reaction. Components of the product may be absorbed into the body through the skin.

**Ingestion**

Harmful if swallowed.

**Acute toxicity**

**LD50 Oral** > 1000 - <2000 mg/kg (rat)

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
2,2',2''',2''''-(hexahydro-1,3,5-triazine-1,3,5-triyl)triethanol	= 763 mg/kg ( Rat )	> 2 g/kg ( Rat )	No data available
Tetrasodium ethylenediaminetetraacetate	= 10 g/kg ( Rat )	No data available	No data available
2-aminoethanol	= 1720 mg/kg ( Rat )	= 1025 mg/kg ( Rabbit ) = 1 mL/kg ( Rabbit )	No data available

<b>Sensitization</b>	May cause sensitization by skin contact.
<b>Mutagenic effects</b>	This product does not contain any known or suspected mutagens.
<b>Carcinogenicity</b>	This product does not contain any known or suspected carcinogens.
<b>Reproductive toxicity</b>	None known.
<b>Routes of exposure</b>	Inhalation. Ingestion. Skin contact. Eye contact.
<b>Routes of entry</b>	Inhalation. Ingestion. Skin absorption.
<b>Specific target organ toxicity (single exposure)</b>	Not classified
<b>Specific target organ toxicity (related exposure)</b>	Category 1
<b>Target organ effects</b>	Respiratory system
<b>Aspiration hazard</b>	No hazard from product as supplied

## 12. Ecological information

### 12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

#### Toxicity to algae

See component information below.

#### Toxicity to fish

See component information below.

#### Toxicity to daphnia and other aquatic invertebrates

See component information below.

Component	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
2,2",2"-(hexahydro-1,3,5-triazine-1, 3,5-triyl)triethanol	No information available	No information available	No information available
Tetrasodium ethylenediaminetetraacetate	41 mg/L LC50 (Lepomis macrochirus) = 96 h 59.8 mg/L LC50 (Pimephales promelas) = 96 h	1.01 mg/L EC50 (Desmodesmus subspicatus) = 72 h	610 mg/L EC50 (Daphnia magna) = 24 h

2-aminoethanol	227 mg/L LC50 (Pimephales promelas) = 96 h 3684 mg/L LC50 (Brachydanio rerio) = 96 h 300 - 1000 mg/L LC50 (Lepomis macrochirus) =96h 114 - 196 mg/L LC50 (Oncorhynchus mykiss) = 96 h 200 mg/L LC50 (Oncorhynchus mykiss) = 96 h	15 mg/L EC50 (Desmodesmus subspicatus) = 72 h	65 mg/L EC50 (Daphnia magna) = 48 h
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### **12.2 Persistence and degradability**

Product is biodegradable.

### **12.3 Bioaccumulative potential**

No product level data available.

### **12.4 Mobility in soil**

#### **Mobility**

The product is miscible with water. May spread in water systems.

### **12.5 Results of PBT and vPvB assessment**

Not classified as PBT/vPvB by current EU criteria.

### **12.6 Other adverse effects.**

None known.

## **13. Disposal considerations**

### **13.1 Waste treatment methods**

**Waste from residues / unused products** Dispose of in accordance with local regulations.

#### **Contaminated packaging**

Empty containers should be taken for local recycling, recovery or waste disposal.

#### **EWC Waste disposal No.**

According to the European Waste Catalogue, Waste Codes are not product specific, but application specific. Waste codes should be assigned by the user based on the application for which the product was used. The following Waste Codes are only suggestions: EWC waste disposal No: 07 04 01 Waste Code: 7111 - Pesticides without mercury

## 14. Transport information

### 14.1 UN Number

UN/ID No. (ADR/RID/ADN/ADG)	UN2810
UN No. (IMDG)	UN2810
UN No. (ICAO)	UN2810

### 14.2 Proper shipping name

TOXIC LIQUID, ORGANIC, N.O.S. (2,2',2''-(hexahydro-1,3,5-triazine-1,3,5-triyl)triethanol)

### 14.3 Hazard class(es)

ADR/RID/ADN Hazard class	6.1
IMDG Hazard class	6.1
ICAO Hazard class/division	6.1

### 14.4 Packing group

ADR/RID/ADN Packing Group	II
IMDG Packing group	II
ICAO Packing group	II



### 14.5 Environmental hazard

No

### 14.6 Special precautions

Hazard identification no (ADR)	60
EmS (IMDG)	F-A, S-A
Emergency action code	2X
Tunnel restriction code	(D/E)
Hazchem code ADG	2X

### 14.7 Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable

## 15. Regulatory information

### 15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

#### Australian Standard for the Uniform Scheduling of Drugs and Poisons

2-aminoethanol  
Schedule 4  
Schedule 6  
Schedule 5

**New Zealand hazard classification** Classified

**HSNO approval no.** HSR002625; N.O.S. (Toxic [6.1, 6.7]) Group Standard 2006

**Group number** 6.1B, 6.1D, 6.5B

**This safety data sheet complies with the requirements of Regulation (EC) No. 1272/2008.**

**National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].**

**National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].**

**National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].**

**Safe Work Australia.**

**Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).**

**ADG Code – Australian Dangerous Goods Code.**

#### International inventories

USA (TSCA)	Complies
European Union (EINECS and ELINCS)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

#### 15.2 Chemical Safety Report

No information available

### 16. Other information

INFORMATION SOURCES - Safety Data Sheet, Misc. manufacturers. Product information provided by the commercial vendor(s).

#### Text of R phrases mentioned in Section 2 and 3

R22 - Harmful if swallowed

R23 - Toxic by inhalation

R34 - Causes burns

R41 - Risk of serious damage to eyes

R43 - May cause sensitization by skin contact

R38 - Irritating to skin

R48/23 - Toxic: danger of serious damage to health by prolonged exposure through inhalation

R20/21/22 - Harmful by inhalation, in contact with skin and if swallowed

#### Full text of H-Statements referred to under sections 2 and 3

H302 - Harmful if swallowed

H315 - Causes skin irritation

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H317 - May cause an allergic skin reaction  
H318 - Causes serious eye damage  
H330 - Fatal if inhaled  
H372 - Causes damage to organs through prolonged or repeated exposure  
H312 - Harmful in contact with skin  
H314 - Causes severe skin burns and eye damage  
H318 - Causes serious eye damage  
H332 - Harmful if inhaled

#### DISCLAIMER

The information in this Data Sheet applies only to the products described herein and produced or supplied by us. It is based on our experience and on the data available to us at the time of its issue and is accurate to the best of our knowledge. The customer is strongly advised to observe and ensure that their employees, customers or users observe all information contained herein. However, no warranty is made or implied that the information is accurate or complete and we shall not be liable whatsoever arising out of the use of information or the products described herein. Where third party products are used in conjunction with or instead of products produced or supplied customers or users should themselves obtain all necessary technical, health and safety information about such products from third party.

Safety data sheet number MI14834  
Version 1  
Revision date 04/May/2015  
Supercedes date 12/May/2011



## Safety Data Sheet TEG/EGMBE 70/30

### 1. Identification of the substance/preparation and of the Company/undertaking

#### 1.1 Product identifier

Product name TEG/EGMBE 70/30  
Product code MI14834

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended use Commercial chemical

Uses advised against Consumer use

#### 1.3 Details of the supplier of the safety data sheet

**Supplier identification**  
M-I Drilling Fluids UK Limited  
C/O Schlumberger  
Enterprise Drive  
Westhill Industrial Estate  
Westhill, AB32 6TQ  
Scotland UK  
+47 51577424  
MISDS@slb.com

#### 1.4 Emergency Telephone Number

**Emergency telephone** - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

<b>Netherlands</b>	National Poisons Information Center (NL): +31 30 274 88 88 (NB: this service is only available to health professionals)
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### 2. Hazards identification

#### 2.1 Classification of the substance or mixture

Regulation (EC) No. 1272/2008

##### Health hazards

Acute oral toxicity	Category 4
Acute dermal toxicity	Category 4
Acute inhalation toxicity - vapor	Category 4
Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 2

Environmental hazards Not classified

Physical Hazards Not classified

## 2.2 Label Elements



**Signal word**  
WARNING

### Hazard statements

H302 - Harmful if swallowed  
H312 - Harmful in contact with skin  
H315 - Causes skin irritation  
H319 - Causes serious eye irritation  
H332 - Harmful if inhaled

### Precautionary Statements - EU (§28, 1272/2008)

P280 - Wear protective gloves/ protective clothing/ eye protection/ face protection  
P261 - Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray  
P301 + P312 - IF SWALLOWED: Call a POISON CENTER or doctor/ physician if you feel unwell  
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing  
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water  
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.

### Supplementary precautionary statements

P262 - Do not get in eyes, on skin, or on clothing  
P264 - Wash face, hands and any exposed skin thoroughly after handling  
P270 - Do not eat, drink or smoke when using this product  
P271 - Use only outdoors or in a well-ventilated area  
P310 - Immediately call a POISON CENTRE or doctor/physician  
P330 - Rinse mouth  
P332 + P313 - If skin irritation occurs: Get medical advice/ attention  
P337 + P313 - If eye irritation persists: Get medical advice/attention  
P362 - Take off contaminated clothing and wash before re-use  
P501 - Dispose of contents/container in accordance with local regulations.

### Classification according to EU Directives 67/548/EEC or 1999/45/EC

#### **Indication of danger**

Xn - Harmful  
Xi - Irritant

#### **R-code(s)**

R20/21/22 R36/38

#### **Contains**

2,2'-(ethylenedioxy)diethanol

2-butoxyethanol

For the full text of the R-phrases and H-Statements mentioned in this Section, see Section 16.

### 2.3 Other data

Not classified as PBT/vPvB by current EU criteria

## 3. Composition/information on ingredients

### 3.1 Substances

Not Applicable

### 3.2 Mixtures

Component	EC-No.	CAS-No	Weight % - range	Classification (67/548)	Classification (Reg. 1272/2008)	REACH registration number
2,2'-(ethylenedioxy)diethanol	203-953-2	112-27-6	60-100	-	Not classified	01-2119438366-35-xxx
2-butoxyethanol	203-905-0	111-76-2	30-60	Xn; R20/21/22 Xi; R36/38	Acute Tox. 4 (H302) Acute Tox. 4 (H312) Acute Tox. 4 (H332) Skin Irrit. 2 (H315) Eye Irrit. 2 (H319)	01-2119475108-36-xxx

## 4. First aid measures

### 4.1 First Aid

#### **Inhalation**

Move the exposed person to fresh air at once. If breathing is difficult, (trained personnel should) give oxygen. Seek medical attention at once.

#### **Ingestion**

Do NOT induce vomiting. Rinse mouth. Drink 1 or 2 glasses of water. Never give anything by mouth to an unconscious person. Get immediate medical attention.

#### **Skin contact**

Wash off immediately with soap and plenty of water removing all contaminated clothes and shoes. Seek medical attention.

#### **Eye contact**

Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses. Continue to rinse for at least 15 minutes. Seek medical attention.

### 4.2 Most important symptoms and effects, both acute and delayed

#### **General advice**

The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

**Main symptoms**

**Inhalation** Please see Section 11. Toxicological Information for further information.

**Ingestion** Please see Section 11. Toxicological Information for further information.

**Skin contact** Please see Section 11. Toxicological Information for further information.

**Eye contact** Please see Section 11. Toxicological Information for further information.

**4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician** Treat symptomatically.

**5. Fire-fighting measures**

**5.1 Extinguishing media**

**Suitable extinguishing media**

Dry chemical, CO<sub>2</sub>, water spray or regular foam.

**Extinguishing media which shall not be used for safety reasons**

Do not use a solid water stream as it may scatter and spread fire.

**5.2 Special hazards arising from the substance or mixture**

**Unusual fire and explosion hazards**

None known.

**Hazardous combustion products**

Fire or high temperatures create: Carbon monoxide, Carbon dioxide (CO<sub>2</sub>).

**5.3 Advice for firefighters**

**Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

**Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

**6. Accidental release measures**

**6.1 Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. See also section 8.

**6.2 Environmental precautions**

The product should not be allowed to enter drains, water courses or the soil.

**Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

### **6.3 Methods and materials for containment and cleaning up**

#### **Methods for Containment**

Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

#### **Methods for cleaning up**

Absorb with earth, sand or other non-combustable material and transfer to containers for later disposal. After cleaning, flush away traces with water.

### **6.4 Reference to other sections**

See section 13 for more information.

## **7. Handling and storage**

### **7.1 Precautions for safe handling**

#### **Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

#### **Hygiene measures**

Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product. Remove contaminated clothing.

### **7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions** Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

**Storage** Keep containers tightly closed in a dry, cool and well-ventilated place. Store in original container Avoid contact with: Oxidizing agents Reducing agents Acids Alkalis Peroxides Aluminum Avoid excessive heat for prolonged periods of time.

**Storage class** Chemical storage.

**Packaging material** Use specially constructed containers only

### **7.3 Specific end uses**

See also Section 1.2.

## **8. Exposure controls/personal protection**

### **8.1 Control parameters**

Component	EU OEL - Third List	Austria	Australia	Denmark
2,2'-(ethylenedioxy)diethanol	Not determined	Not determined	Not determined	Not determined
2-butoxyethanol	20 ppm TWA 98 mg/m <sup>3</sup> TWA 50 ppm STEL 246 mg/m <sup>3</sup> STEL Possibility of significant uptake through the skin	Not determined	skin notation 20 ppm TWA; 96.9 mg/m <sup>3</sup> TWA 50 ppm STEL; 242 mg/m <sup>3</sup> STEL	20 ppm 98 mg/m <sup>3</sup>

Component	Finland	France	Germany	Hungary
2,2'-(ethylenedioxy)diethanol	Not determined	Not determined	1000 mg/m <sup>3</sup> MAK	Not determined
2-butoxyethanol	Not determined	2 ppm 9.8 mg/m <sup>3</sup>	10 ppm MAK 49 mg/m <sup>3</sup> MAK	Not determined

Component	New Zealand	Italy	Netherlands	Norway
2,2'-(ethylenedioxy)diethanol	Not Determined	Not determined	Not determined	Not determined
2-butoxyethanol	25 ppm TWA 121 mg/m <sup>3</sup> TWA Possibility of significant uptake through the skin	Not determined	100 mg/m <sup>3</sup> GW	10 ppm TWA 50 mg/m <sup>3</sup> TWA 20 ppm STEL 75 mg/m <sup>3</sup> STEL Skin

Component	Poland	Portugal	Romania	Russia
2,2'-(ethylenedioxy)diethanol	Not determined	Not determined	Not determined	10 mg/m <sup>3</sup> MAC
2-butoxyethanol	200 mg/m <sup>3</sup> STEL Skin 98 mg/m <sup>3</sup> TWA	20 ppm TWA	Not determined	5 mg/m <sup>3</sup> MAC

Component	Spain	Switzerland	Turkey	UK
2,2'-(ethylenedioxy)diethanol	Not determined	2000 mg/m <sup>3</sup> STEL inhalable 1000 mg/m <sup>3</sup> MAK inhalable	Not determined	Not determined
2-butoxyethanol	50 ppm VLA-EC 245 mg/m <sup>3</sup> VLA-EC Skin 20 ppm VLA-ED indicative limit value 98 mg/m <sup>3</sup> VLA-ED indicative limit value	20 ppm STEL 98 mg/m <sup>3</sup> STEL Skin 10 ppm MAK 49 mg/m <sup>3</sup> MAK	50 ppm STEL 246 mg/m <sup>3</sup> STEL Skin 20 ppm TWA 98 mg/m <sup>3</sup> TWA	50 ppm STEL 246 mg/m <sup>3</sup> STEL Skin 25 ppm TWA 123 mg/m <sup>3</sup> TWA

**Derived No Effect Level (DNEL)**

**Short term exposure local effects**

**2-butoxyethanol**

Inhalation 246 mg/m<sup>3</sup>

**Long term exposure local effects**

**2,2'-(ethylenedioxy)diethanol**

Inhalation 50 mg/m<sup>3</sup>

**Short term exposure systemic effects**

**2-butoxyethanol**

Dermal	89 mg/kg
Inhalation	1091 mg/m <sup>3</sup>

**Long term exposure systemic effects**

<b>2,2'-(ethylenedioxy)diethanol</b>	
Dermal	40 mg/kg
<b>2-butoxyethanol</b>	
Dermal	125 mg/kg
Inhalation	98 mg/m <sup>3</sup>

**Predicted No Effect Concentration (PNEC)**

<b>2,2'-(ethylenedioxy)diethanol</b>	
Fresh Water	10 mg/l
Sea Water	1 mg/l
Fresh water sediment	46 mg/kg
Soil	3.32 mg/kg
Impact on Sewage Treatment	10 mg/l
Intermittent release	10 mg/l
<b>2-butoxyethanol</b>	
Fresh Water	8.8 mg/l
Sea Water	0.88 mg/l
Fresh water sediment	34.6 mg/kg
Sea sediment	3.46 mg/kg
Soil	2.33 mg/kg
Impact on Sewage Treatment	463 mg/l
Intermittent release	9.1 mg/l

**8.2 Exposure controls**

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

**Engineering measures to reduce exposure**

Ensure adequate ventilation. Mechanical ventilation or local exhaust ventilation is required.

**Personal protective equipment**

<b>Eye protection</b>	It is good practice to wear goggles when handling any chemical. Tightly fitting safety goggles.
<b>Hand protection</b>	Use protective gloves made of:., Butyl, Viton, Be aware that liquid may penetrate the gloves. Frequent change is advisable.
<b>Respiratory protection</b>	In case of insufficient ventilation wear suitable respiratory equipment, Respirator with combination filter for vapor/particulate, Type A2/P2, At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
<b>Skin and body protection</b>	Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.

**Hygiene measures**

Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.



## 9. Physical and chemical properties

### 9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Clear
Odour	Mild
Colour	Colourless
Odor threshold	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
pH	5	@1%
pH @ dilution		
Melting/freezing point	No information available	
Boiling point/range	No information available	
Flash Point	> 65 °C / > 149 °F	
Evaporation rate	No information available	
Flammability (solid, gas)	Not Applicable	
Flammability Limits in Air		
Upper flammability Limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	No information available	
Bulk density	No information available	
Relative density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Viscosity, dynamic	No information available	
Log Pow	Not determined	
Explosive properties	Not Applicable	
Oxidizing properties	None known.	

### 9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density VALUE	1.046 ± 0.03g/ml

## 10. Stability and reactivity

### 10.1 Reactivity

No specific reactivity hazards associated with this product.

**10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerization**  
 Not known.

**10.4 Conditions to avoid**

Avoid excessive heat for prolonged periods of time.

**10.5 Incompatible materials**

Oxidizing agents. Reducing agents. Acids. Alkalis. Peroxides. Aluminum.

**10.6 Hazardous decomposition products**

See also section 5.2.

**11. Toxicological information**

**11.1 Information on toxicological effects**

**Acute toxicity**

<b>Product information</b>	Prolonged and repeated contact with solvents over a long period may lead to permanent health problems.
<b>Inhalation</b>	Harmful by inhalation.
<b>Eye contact</b>	Causes serious eye irritation.
<b>Skin contact</b>	Harmful in contact with skin. Components of the product may be absorbed into the body through the skin. Causes skin irritation.
<b>Ingestion</b>	Harmful if swallowed. Ingestion may cause stomach discomfort.
<b>Unknown acute toxicity</b>	Not Applicable.

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
2,2'-(ethylenedioxy)diethanol	= 15000 mg/kg ( Rat )	= 22460 mg/kg ( Rabbit )	No data available
2-butoxyethanol	= 470 mg/kg ( Rat )	= 220 mg/kg ( Rabbit ) = 2270 mg/kg ( Rat )	= 2.21 mg/L ( Rat ) 4 h = 450 ppm ( Rat ) 4 h

**Sensitisation** This product does not contain any components suspected to be sensitizing.

**Mutagenic effects** This product does not contain any known or suspected mutagens.

<b>Carcinogenicity</b>	This product does not contain any known or suspected carcinogens.
<b>Reproductive toxicity</b>	This product does not contain any known or suspected reproductive hazards.
<b>Routes of exposure</b>	Skin contact. Eye contact. Inhalation. Ingestion.
<b>Routes of entry</b>	Skin contact. Inhalation. Ingestion.
<b>Specific target organ toxicity (single exposure)</b>	Not classified
<b>Specific target organ toxicity (repeated exposure)</b>	Not classified.
<b>Aspiration hazard</b>	No hazard from product as supplied.

**12. Ecological information**

**12.1 Toxicity**

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment. The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.

**Toxicity to algae**  
 See component information below.

**Toxicity to fish**  
 See component information below.

**Toxicity to daphnia and other aquatic invertebrates**  
 See component information below.

Component	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
2,2'-(ethylenedioxy)diethanol	56200 - 63700 mg/L LC50 (Pimephales promelas) = 96 h 61000 mg/L LC50 (Lepomis macrochirus) = 96 h 10000 mg/L LC50 (Lepomis macrochirus) = 96 h	No information available	42426 mg/L EC50 (Daphnia magna) = 48 h
2-butoxyethanol	2950 mg/L LC50 (Lepomis macrochirus) = 96 h 1490 mg/L LC50 (Lepomis macrochirus) = 96 h	No information available	= 1698 - 1940 mg/L (LC50; Daphnia magna) = 1720 mg/L (EC50; water flea)

**12.2 Persistence and degradability**

Readily biodegradable.

**12.3 Bioaccumulative potential**

Does not bioaccumulate.

**12.4 Mobility in soil**

**Mobility**

Soluble in water.

**12.5 Results of PBT and vPvB assessment**

Not classified as PBT/vPvB by current EU criteria.

**12.6 Other adverse effects.**

None known.

**13. Disposal considerations**

**13.1 Waste treatment methods**

**Waste from residues / unused products**

Dispose of in accordance with local regulations.

**Contaminated packaging**

Empty containers should be transported/delivered using a registered waste carrier for local recycling or waste disposal.

**EWC waste disposal No.**

According to the European Waste Catalogue, Waste Codes are not product specific, but application specific. Waste codes should be assigned by the user based on the application for which the product was used. The following Waste Codes are only suggestions: EWC waste disposal No: 07 01 04 Waste Code: 7152 Organic waste without halogen.

**14. Transport information**

The product is not covered by international regulation on the transport of dangerous goods (IMDG, IATA,ADR/RID/ADG).

**14.1 UN number**

Not regulated

**14.2 Proper shipping name**

Not regulated

**14.3. Hazard class(es)**

ADR/RID/ADN Hazard class	Not regulated
IMDG Hazard class	Not regulated
ICAO Hazard class/division	Not regulated

**14.4 Packing group**

ADR/RID/ADN Packing Group	Not regulated
IMDG Packing group	Not regulated
ICAO Packing group	Not regulated

**14.5 Environmental hazard**

No

**14.6 Special precautions**

Not Applicable

**14.7 Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code**

Please contact MISDS@slb.com for info regarding transport in Bulk.

## 15. Regulatory information

**15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture**

**Australian Standard for the Uniform Scheduling of Drugs and Poisons**

2-butoxyethanol  
Schedule 6

Commission Regulation (EU) No 453/2010 of 20 May 2010 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH). Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC, including amendments.

This safety data sheet complies with the requirements of Regulation (EC) No. 1272/2008.

Dutch Mining Regulations: In accordance with Mining Regulations 9.2 and Chapter 4 of the Working Conditions Decree.

**International inventories**

USA, Toxic Substances Control Act inventory (TSCA)	Complies
European Union - EINECS and ELINCS	Complies
Canada, Domestic Substance List (DSL)	Complies

Philippines (PICCS)	Complies
Inventory - Japan - Existing and New Chemicals list	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korea (KECL)	Complies
Inventory - New Zealand - Inventory of Chemicals (NZIoC)	Complies

Contact REACH@miswaco.slb.com for REACH information.

### 15.2 Chemical Safety Report

No information available

## 16. Other information

Prepared by	Global Chemical Regulatory Compliance (GCRC) , Catherine Mansell
Supersedes date	12/May/2011
Revision date	04/May/2015
Version	1
The following sections have been revised	This SDS have been made in a new database and therefore a new layout. No changes with regard to classification have been made, Updated according to GHS/CLP.

### Text of R phrases mentioned in Section 3

R20/21/22 - Harmful by inhalation, in contact with skin and if swallowed  
R36/38 - Irritating to eyes and skin

### Full text of H-Statements referred to under sections 2 and 3

H302 - Harmful if swallowed  
H312 - Harmful in contact with skin  
H315 - Causes skin irritation  
H319 - Causes serious eye irritation  
H332 - Harmful if inhaled

### Disclaimer

The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

Safety data sheet number PID2232  
Version 5  
Revision date 05/Dec/2017  
Supersedes date 05/Nov/2014



## Safety Data Sheet VERSACOAT\* IC

### 1. Identification of the substance/preparation and of the Company/undertaking

#### 1.1 Product identifier

**Product name** VERSACOAT\* IC  
**Product code** PID2232  
**Country Limitations** This SDS is not for use in EU/EEA.

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Emulsifier

**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

##### Supplier

M-I Drilling Fluids UK Limited  
Westhill Business Park  
Westhill AB32 6JL Aberdeenshire  
Scotland United Kingdom

+47 51577424

SDS@slb.com

#### 1.4 Emergency Telephone Number

**Emergency telephone** - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP]

##### Health hazards

Aspiration toxicity	Category 1
Serious eye damage/eye irritation	Category 1
Skin sensitisation	Category 1

**Environmental hazards** Not classified

**Physical Hazards**

Flammable Liquids

Category 3

## 2.2 Label elements



### Signal word

DANGER

### Hazard statements

H304 - May be fatal if swallowed and enters airways  
H317 - May cause an allergic skin reaction  
H318 - Causes serious eye damage  
H226 - Flammable liquid and vapour

### Precautionary Statements - EU (§28, 1272/2008)

P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking  
P280 - Wear protective gloves/protective clothing/eye protection/face protection  
P301 + P310 - IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician  
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing  
P310 - Immediately call a POISON CENTER or doctor/physician  
P331 - Do NOT induce vomiting

### Supplementary precautionary statements

P233 - Keep container tightly closed  
P240 - Ground/bond container and receiving equipment  
P241 - Use explosion-proof electrical/ ventilating/ lighting/ equipment  
P242 - Use only non-sparking tools  
P243 - Take precautionary measures against static discharge  
P261 - Avoid breathing dust/fume/gas/mist/vapours/spray  
P272 - Contaminated work clothing should not be allowed out of the workplace  
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water  
P333 + P313 - If skin irritation or rash occurs: Get medical advice/attention  
P363 - Wash contaminated clothing before reuse  
P370 + P378 - In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish  
P403 + P235 - Store in a well-ventilated place. Keep cool  
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

### Contains

Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics\*

Fatty acids, tall-oil, reaction products with diethylenetriamine, maleic anhydride, tetraethylenepentamine and triethylenetetramine

Hydrocarbons, C13-C16, isoalkanes, cyclics, < 2% aromatics\*

2-methylpropan-1-ol

### 2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

## 3. Composition/information on ingredients

### 3.1 Substances

Not applicable

### 3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%	Regulation (EC) No 1272/2008	REACH registration number
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	926-141-6	RM1004246	30-60	Asp. Tox. 1 (H304) EUH066	01-2119456620-4 3-xxxx
Fatty acids, tall-oil, reaction products with diethylenetriamine, maleic anhydride, tetraethylenepentamine and triethylenetetramine	273-601-0	68990-47-6	30-60	Skin Sens. 1 (H317)	01-2119496070-4 2-xxxx
Hydrocarbons, C13-C16, isoalkanes, cyclics, < 2% aromatics*	918-973-3	MI22509	5-10	Asp. Tox. 1 (H304) EUH066	01-2119458871-3 0-xxxx
2-methylpropan-1-ol	201-148-0	78-83-1	5-10	Skin Irrit. 2 (H315) Eye Dam. 1 (H318) STOT SE 3 (H335) STOT SE 3 (H336) Flam. Liq. 3 (H226)	01-2119484609-2 3-xxxx

### **Comments**

Fatty acids, tall-oil, reaction products with diethylenetriamine, maleic anhydride, tetraethylenepentamine and triethylenetetramine can use either CAS # 68990-47-6 or CAS # 68442-77-3.

\*Substances which have an EC Number that begins with the number "9" is a Provisional List Number. The list numbers published by ECHA do not have any legal significance. The EC substance definition and related classification & labelling has been developed in the framework of the Regulation (EC) No 1907/2006 (REACH). For information about the related CAS number see section 15 of this SDS.

## 4. First aid measures

### 4.1 First aid measures

#### **Inhalation**

If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

#### **Ingestion**

Rinse mouth. Do not induce vomiting without medical advice. If vomiting occurs spontaneously, minimize the risk of aspiration by properly positioning the affected person. Never give anything by mouth to an unconscious person. Immediate medical attention is

required.

**Skin contact**

Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.

**Eye Contact**

Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Seek immediate medical attention/advice.

**4.2. Most important symptoms and effects, both acute and delayed**

**General advice**

The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

**Symptoms**

**Inhalation**

Please see Section 11. Toxicological Information for further information.

**Ingestion**

Please see Section 11. Toxicological Information for further information.

**Skin contact**

Please see Section 11. Toxicological Information for further information.

**Eye contact**

Please see Section 11. Toxicological Information for further information.

**4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician**

Treat symptomatically.

**5. Fire-fighting measures**

**5.1 Extinguishing media**

**Suitable extinguishing media**

P378 - Use dry sand, dry chemical or alcohol-resistant foam to extinguish.

**Extinguishing media which must not be used for safety reasons**

Do not use a solid water stream as it may scatter and spread fire.

**5.2. Special hazards arising from the substance or mixture**

**Unusual fire and explosion hazards**

FLAMMABLE. Vapours are heavier than air and may spread along floors. Vapors may travel considerable distance to source of ignition and flash back.

**Hazardous combustion products**

Thermal decomposition can lead to release of irritating gases and vapours

**5.3 Advice for firefighters**

**Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

### Special Fire-Fighting Procedures

Containers close to fire should be removed immediately or cooled with water.

## 6. Accidental release measures

### 6.1. Personal precautions, protective equipment and emergency procedures

Evacuate personnel to safe areas. Remove all sources of ignition. Use personal protective equipment. See also section 8.

### 6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

#### Environmental exposure controls

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

### 6.3 Methods and material for containment and cleaning up

#### Methods for containment

Prevent further leakage or spillage if safe to do so. Dyke far ahead of liquid spill for later disposal.

#### Methods for cleaning up

Take precautionary measures against static discharges. Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. Use clean non-sparking tools to collect absorbed material. Ground and bond containers when transferring material. After cleaning, flush away traces with water.

### 6.4 Reference to other sections

See section 13 for more information.

## 7. Handling and storage

### 7.1 Precautions for safe handling

#### Handling

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use. Persons susceptible to allergic reactions should not handle this product.

#### Hygiene Measures

Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product. Remove contaminated clothing.

### 7.2 Conditions for safe storage, including any incompatibilities

<b>Technical measures/precautions</b>	Ensure adequate ventilation. Keep airborne concentrations below exposure limits. Take precautionary measures against static discharges. Use spark-proof tools and explosion-proof equipment. Ensure all equipment is electrically grounded before beginning transfer operations.
<b>Storage precautions</b>	Keep containers tightly closed in a dry, cool and well-ventilated place. Avoid heat, flames and other sources of ignition. Oxidizing agents.
<b>Storage class</b>	Flammable liquid storage.

**Packaging materials** Use specially constructed containers only

**7.3 Specific end uses**

See Section 1.2.

**8. Exposure controls/personal protection**

**8.1 Control parameters**

**Exposure Limits**

Oil mist (mineral) workplace exposure limits are currently under review by legislative authorities. This workplace exposure limit (WEL) standard is applicable to highly refined mineral oils and is provided as a guidance limit only LT. EXP = 5mg/m<sup>3</sup> and ST. EXP = 10mg/m<sup>3</sup>.

**Component Information**

<b>Chemical Name</b>	<b>EU OEL - Third List</b>	<b>Austria</b>	<b>Australia</b>	<b>Denmark</b>
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	Not determined	Not determined	Not determined	Not determined
Fatty acids, tall-oil, reaction products with diethylenetriamine, maleic anhydride, tetraethylenepentamine and triethylenetetramine	Not determined	Not determined	Not determined	Not determined
Hydrocarbons, C13-C16, isoalkanes, cyclics, < 2% aromatics*	Not determined	Not determined	Not determined	Not determined
2-methylpropan-1-ol	Not determined	200 ppm STEL 600 mg/m <sup>3</sup> STEL 50 ppm TWA 150 mg/m <sup>3</sup> TWA	50ppmTWA 152mg/m <sup>3</sup> TWA	50 ppm Ceiling Butanol, isomers 150 mg/m <sup>3</sup> Ceiling Butanol, isomers Potential for cutaneous absorption (listed under Butanol, all isomers)
<b>Chemical Name</b>	<b>Malaysia</b>	<b>France</b>	<b>Germany</b>	<b>Hungary</b>
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	Not determined	Not determined	Not determined	Not determined
Fatty acids, tall-oil, reaction products with diethylenetriamine, maleic anhydride, tetraethylenepentamine and triethylenetetramine	Not determined	Not determined	Not determined	Not determined
Hydrocarbons, C13-C16, isoalkanes, cyclics, < 2% aromatics*	Not determined	Not determined	Not determined	Not determined
2-methylpropan-1-ol	50 ppm TWA 152 mg/m <sup>3</sup> TWA	50 ppmTWA 150 mg/m <sup>3</sup> TWA	100 ppm TWA 310 mg/m <sup>3</sup> TWA	Not determined
<b>Chemical Name</b>	<b>New Zealand</b>	<b>Italy</b>	<b>Netherlands</b>	<b>Norway</b>
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	Not determined	Not determined	Not determined	Not determined
Fatty acids, tall-oil, reaction products with diethylenetriamine, maleic anhydride, tetraethylenepentamine and triethylenetetramine	Not determined	Not determined	Not determined	Not determined
Hydrocarbons, C13-C16, isoalkanes, cyclics, < 2% aromatics*	Not determined	Not determined	Not determined	Not determined
2-methylpropan-1-ol	50 ppm TWA 152 mg/m <sup>3</sup> TWA	Not determined	Not determined	25 ppm Ceiling; 75 mg/m <sup>3</sup> Ceiling Skin
<b>Chemical Name</b>	<b>Poland</b>	<b>Portugal</b>	<b>Romania</b>	<b>Russia</b>
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	Not determined	Not determined	Not determined	Not determined

Fatty acids, tall-oil, reaction products with diethylenetriamine, maleic anhydride, tetraethylenepentamine and triethylenetetramine	Not determined	Not determined	Not determined	Not determined
Hydrocarbons, C13-C16, isoalkanes, cyclics, < 2% aromatics*	Not determined	Not determined	Not determined	Not determined
2-methylpropan-1-ol	200 mg/m <sup>3</sup> STEL NDSCh 100 mg/m <sup>3</sup> TWA NDS	50 ppm TWA	66ppmSTEL 200mg/m <sup>3</sup> STEL 33ppmTWA 100mg/m <sup>3</sup> TWA	10 mg/m <sup>3</sup> MAC
<b>Chemical Name</b>	<b>Spain</b>	<b>Switzerland</b>	<b>Turkey</b>	<b>UK</b>
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	Not determined	Not determined	Not determined	Not determined
Fatty acids, tall-oil, reaction products with diethylenetriamine, maleic anhydride, tetraethylenepentamine and triethylenetetramine	Not determined	Not determined	Not determined	Not determined
Hydrocarbons, C13-C16, isoalkanes, cyclics, < 2% aromatics*	Not determined	Not determined	Not determined	Not determined
2-methylpropan-1-ol	50 ppm TWA VLA-ED 154 mg/m <sup>3</sup> TWA VLA-ED	50 ppm STEL 150 mg/m <sup>3</sup> STEL 50 ppm TWA MAK 150 mg/m <sup>3</sup> TWA MAK	Not determined	75 ppm STEL 231 mg/m <sup>3</sup> STEL 50 ppm TWA 154 mg/m <sup>3</sup> TWA

#### Derived No Effect Level (DNEL)

##### Short term exposure local effects

**Fatty acids, tall-oil, reaction products with diethylenetriamine, maleic anhydride, tetraethylenepentamine and triethylenetetramine**

Dermal 1388 µg/cm<sup>2</sup>  
Inhalation 14693 µg/m<sup>3</sup>

##### Long term exposure local effects

**Fatty acids, tall-oil, reaction products with diethylenetriamine, maleic anhydride, tetraethylenepentamine and triethylenetetramine**

Dermal 1388 µg/cm<sup>2</sup>  
Inhalation 14693 µg/m<sup>3</sup>

**2-methylpropan-1-ol**

Inhalation 310 mg/m<sup>3</sup>

##### Short term exposure systemic effects

**Fatty acids, tall-oil, reaction products with diethylenetriamine, maleic anhydride, tetraethylenepentamine and triethylenetetramine**

Dermal 33332 µg/kg  
Inhalation 29386 µg/m<sup>3</sup>

##### Long term exposure systemic effects

**Fatty acids, tall-oil, reaction products with diethylenetriamine, maleic anhydride, tetraethylenepentamine and triethylenetetramine**

Dermal 16666 µg/kg  
Inhalation 14693 µg/m<sup>3</sup>

##### Predicted No Effect Concentration (PNEC)

**Fatty acids, tall-oil, reaction products with diethylenetriamine, maleic anhydride, tetraethylenepentamine and triethylenetetramine**

Fresh Water 0.00217 mg/L  
Sea Water 0.000217 mg/L  
Freshwater sediment 180 mg/kg  
Sea sediment 18 mg/kg  
Soil 146 mg/kg  
Impact on sewage treatment 1 mg/l  
Intermittent release 0.0217 mg/l

**2-methylpropan-1-ol**

Fresh Water 0.4 mg/l  
Sea Water 0.04 mg/l  
Freshwater sediment 1.52 mg/kg

Sea sediment	0.152 mg/kg
Soil	0.0699 mg/kg
Impact on sewage treatment	10 mg/l
Intermittent release	11 mg/l

**8.2 Exposure controls**

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

**Engineering Controls**

Ensure adequate ventilation. Mechanical ventilation or local exhaust ventilation is required.

**Personal protective equipment**

<b>Eye protection</b>	Use eye protection according to EN 166, designed to protect against liquid splashes. Tightly fitting safety goggles. Safety glasses with side-shields.
<b>Hand protection</b>	Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Impervious gloves made of: Neoprene Nitrile PVC Break through time >480 minutes Glove thickness >=0.4 mm
<b>Respiratory protection</b>	Be aware that liquid may penetrate the gloves. Frequent change is advisable. In case of insufficient ventilation wear suitable respiratory equipment, Respirator with a vapor filter (EN 141), Use respirator with organic vapor protection (A, brown), At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
<b>Skin and body protection</b>	Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.

**Hygiene Measures**

Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.



**8.2.3 Environmental exposure controls**

<b>Environmental exposure</b>	Local authorities should be advised if significant spillages cannot be contained See section 6 for more information
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**9. Physical and chemical properties**

**9.1 Information on basic physical and chemical properties**

<b>Physical state</b>	Liquid
<b>Appearance</b>	No information available
<b>Odour</b>	Characteristic
<b>Colour</b>	Dark brown
<b>Odour threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
pH	No information available	

<b>pH @ dilution</b>	No information available	
<b>Melting / freezing point</b>	No information available	
<b>Boiling point/range</b>	No information available	
<b>Flash point</b>	42.8 °C / 109.04 °F	Closed cup
<b>Evaporation rate</b>	No information available	
<b>Flammability (solid, gas)</b>	Not applicable	
<b>Flammability Limit in Air</b>		
<b>Upper flammability limit</b>	Not applicable	
<b>Lower flammability limit</b>	Not applicable	
<b>Vapour pressure</b>	No information available	
<b>Vapour density</b>	No information available	
<b>Specific gravity</b>	No information available	
<b>Bulk density</b>	No information available	
<b>Relative density</b>	0.844	@ 25 °C.
<b>Water solubility</b>	Insoluble in water	
<b>Solubility in other solvents</b>	No information available	
<b>Autoignition temperature</b>	No information available	
<b>Decomposition temperature</b>	No information available	
<b>Kinematic viscosity</b>	18.5 cSt	@ 40 °C
<b>Dynamic viscosity</b>	No information available	
<b>log Pow</b>	No information available	

**Explosive properties** No information available  
**Oxidising properties** No information available

**9.2 Other information**

**Pour point** No information available  
**Molecular weight** No information available  
**VOC content(%)** No information available  
**Density** No information available

**Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

**10. Stability and reactivity**

**10.1 Reactivity**

Flammable liquid and vapour.

**10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerisation**

Hazardous polymerisation does not occur.

**10.4 Conditions to avoid**

Avoid heat, flames and other sources of ignition. Take precautionary measures against static charges.

**10.5 Incompatible materials**

Oxidizing agents.

**10.6 Hazardous decomposition products**

See Section 5.2.

**11. Toxicological information**

**11.1 Information on toxicological effects**

**Acute toxicity**

<b>Inhalation</b>	Inhalation of vapours in high concentration may cause irritation of respiratory system.
<b>Eye contact</b>	Causes serious eye damage.
<b>Skin contact</b>	May cause an allergic skin reaction. May be absorbed through the skin in harmful amounts. Repeated exposure may cause skin dryness or cracking.
<b>Ingestion</b>	May be fatal if swallowed and enters airways. Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhoea.
<b>Unknown acute toxicity</b>	Not applicable.

**Toxicology data for the components**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	No data available	No data available	No data available
Fatty acids, tall-oil, reaction products with diethylenetriamine, maleic anhydride, tetraethylenepentamine and triethylenetetramine	> 2020 mg/kg (Rat) Literature data	> 2000 mg/kg (Rat) OECD 402 - Duration: 24h - Literature data	No data available
Hydrocarbons, C13-C16, isoalkanes, cyclics, < 2% aromatics*	No data available	No data available	No data available
2-methylpropan-1-ol	No data available	No data available	No data available

<b>Sensitisation</b>	May cause sensitisation by skin contact.
<b>Mutagenic effects</b>	This product does not contain any known or suspected mutagens.
<b>Carcinogenicity</b>	This product does not contain any known or suspected carcinogens.
<b>Reproductive toxicity</b>	This product does not contain any known or suspected reproductive hazards.
<b>Routes of exposure</b>	Skin contact. Eye contact. Ingestion. Inhalation.
<b>Routes of entry</b>	Skin absorption. Inhalation.
<b>Specific target organ toxicity - Single exposure</b>	Not classified

**Specific target organ toxicity - Repeated exposure** Not classified.

**Aspiration hazard** May be fatal if swallowed and enters airways.

## 12. Ecological information

### 12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

#### Toxicity to algae

This product is not considered toxic to algae.

#### Toxicity to fish

This product is not considered toxic to fish.

#### Toxicity to daphnia and other aquatic invertebrates

This product is not considered toxic to invertebrates.

#### Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	No information available	No information available	No information available
Fatty acids, tall-oil, reaction products with diethylenetriamine, maleic anhydride, tetraethylenepentamine and triethylenetetramine	OECD 203 Fish LC50 > 100 mg/l - Duration h: 96 Literature data	OECD 201 Algae EC50 > 100 mg/l - Duration h: 72 Literature data	OECD 202 Daphnia magna NOEC = 100 mg/l - Duration h: 48 Literature data
Hydrocarbons, C13-C16, isoalkanes, cyclics, < 2% aromatics*	No information available	No information available	No information available
2-methylpropan-1-ol	No information available	No information available	No information available

### 12.2 Persistence and degradability

No product level data available. See component information below.

Chemical Name	Persistence and degradability
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	Readily biodegradable
Fatty acids, tall-oil, reaction products with diethylenetriamine, maleic anhydride, tetraethylenepentamine and triethylenetetramine	Not readily biodegradable - Test OECD 301D Duration 28 days : 2.7% (Literature data)
Hydrocarbons, C13-C16, isoalkanes, cyclics, < 2% aromatics*	Readily biodegradable
2-methylpropan-1-ol	Readily biodegradable

### 12.3 Bioaccumulative potential

No product level data available. See component information below.

<b>Chemical Name</b>	<b>Bioaccumulation</b>
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	No information available
Fatty acids, tall-oil, reaction products with diethylenetriamine, maleic anhydride, tetraethylenepentamine and triethylenetetramine	Not likely to bioaccumulate Notes: Literature data (estimated)
Hydrocarbons, C13-C16, isoalkanes, cyclics, < 2% aromatics*	No information available
2-methylpropan-1-ol	No information available

#### **12.4 Mobility**

##### **Mobility**

Insoluble in water. See component information below.

<b>Chemical Name</b>	<b>Mobility</b>
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	No information available
Fatty acids, tall-oil, reaction products with diethylenetriamine, maleic anhydride, tetraethylenepentamine and triethylenetetramine	No information available
Hydrocarbons, C13-C16, isoalkanes, cyclics, < 2% aromatics*	No information available
2-methylpropan-1-ol	No information available

##### **Mobility in soil**

No information available.

<b>Chemical Name</b>	<b>Mobility in soil</b>
Hydrocarbons, C11-C14, n-alkanes, isoalkanes, cyclics, < 2% aromatics*	No information available
Fatty acids, tall-oil, reaction products with diethylenetriamine, maleic anhydride, tetraethylenepentamine and triethylenetetramine	No information available
Hydrocarbons, C13-C16, isoalkanes, cyclics, < 2% aromatics*	No information available
2-methylpropan-1-ol	No information available

#### **12.5 Results of PBT and vPvB assessment**

Not classified as PBT/vPvB by current EU criteria.

#### **12.6 Other adverse effects.**

None known.

## 13. Disposal considerations

### 13.1 Waste treatment methods

<b>Waste from residues / unused products</b>	Dispose of in accordance with local regulations.
<b>Contaminated packaging</b>	Empty containers should be transported/delivered using a registered waste carrier for local recycling or waste disposal.
<b>EWC Waste Disposal No</b>	According to the European Waste Catalogue, Waste Codes are not product specific, but application specific Waste codes should be assigned by the user based on the application for which the product was used The following Waste Codes are only suggestions: EWC waste disposal No: 07 01 04

## 14. Transport information

Vietnam: Decree No. 104/2009/ND-CP dated 09/11/2009 of the Government providing for the list of dangerous goods and the transport of dangerous goods by road motor vehicles Vietnam: Decree No 29/2005/NĐ-CP dated 10/3/2005 of the Government on the list of dangerous goods and the transport of dangerous goods on inland waterways

### 14.1. UN number

<b>UN/ID No. (ADR/RID/ADN/ADG)</b>	UN1212
<b>UN No. (IMDG)</b>	UN1212
<b>UN No. (ICAO/ANAC)</b>	UN1212

### 14.2. UN proper shipping name

ISOBUTANOL (ISOBUTYL ALCOHOL) mixture

### 14.3. Hazard class(es)

<b>ADR/RID/ADN/ADG Hazard class</b>	3
<b>IMDG Hazard class</b>	3
<b>ICAO Hazard class/division</b>	3

### 14.4 Packing group

<b>ADR/RID/ADN/ADG Packing Group</b>	III
<b>IMDG Packing group</b>	III
<b>ICAO Packing group</b>	III



### 14.5 Environmental hazard

No

**14.6 Special precautions**

Hazard ID	30
EmS (IMDG)	F-E, S-D
Emergency Action Code (EAC)	•3Y
Tunnel restriction code	(D/E)

**14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code**

Please contact SDS@slb.com for info regarding transport in Bulk.

**15. Regulatory information**

**15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture**

Commission Regulation (EU) No 453/2010 of 20 May 2010 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH). Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC, including amendments.

This safety data sheet complies with the requirements of Regulation (EC) No. 1272/2008.

**International inventories**

USA, Toxic Substances Control Act inventory (TSCA)	Complies
European Union - EINECS and ELINCS	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Inventory - Japan - Existing and New Chemicals list	Does not comply
China (IECSC)	Complies
Australia (AICS)	Complies
Korea (KECL)	Complies
Inventory - New Zealand - Inventory of Chemicals (NZIoC)	Complies

**Europe - REACH**

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

CAS Number 64742-47-8 can be used to identify the substance given a list number in section 3 in areas not subject to the REACH regulation.

This SDS is not for use in EU/EEA.

**15.2 Chemical Safety Report**

No information available

## 16. Other information

<b>Prepared by</b>	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
<b>Supersedes date</b>	05/Nov/2014
<b>Revision date</b>	05/Dec/2017
<b>Version</b>	5
<b>This SDS has been revised in the following section(s)</b>	All sections Product Code change No changes with regard to classification have been made.

### Full text of H-Statements referred to under sections 2 and 3

H304 - May be fatal if swallowed and enters airways  
H317 - May cause an allergic skin reaction  
H318 - Causes serious eye damage  
H226 - Flammable liquid and vapour

H315 - Causes skin irritation  
H335 - May cause respiratory irritation  
H336 - May cause drowsiness or dizziness

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### Disclaimer

The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

Safety data sheet number PID18473

Version 2

Revision date 07/Nov/2017

Supersedes date 13/Feb/2015



## Safety Data Sheet VERSATROL\* MC

### 1. Identification of the substance/preparation and of the Company/undertaking

#### 1.1 Product identifier

Product name VERSATROL\* MC  
Product code PID18473

REACH Registration Name Exempt

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Fluid loss reducer.

Uses advised against Consumer use

#### 1.3 Details of the supplier of the safety data sheet

##### **Supplier**

M-I Drilling Fluids UK Limited  
Westhill Business Park  
Westhill AB32 6JL Aberdeenshire  
Scotland United Kingdom

+47 51577424

SDS@slb.com

#### 1.4 Emergency Telephone Number

**Emergency telephone** - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP]

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

#### 2.2 Label elements

##### **Signal word**

None

**Hazard statements**

This product is not classified as hazardous therefore no (H) hazard statements assigned.

**Precautionary Statements - EU (§28, 1272/2008)**

This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

**Contains**

Organic mineral

**2.3 Other hazards**

Suspended dust may present a dust explosion hazard

Not classified as PBT/vPvB by current EU criteria

**3. Composition/information on ingredients**

**3.1 Substances**

Chemical Name	EC No	CAS No	Weight-%	Regulation (EC) No 1272/2008	REACH registration number
Organic mineral	Listed	Proprietary	60-100	Not classified	Exempt

**3.2 Mixtures**

Not applicable

**4. First aid measures**

**4.1 First aid measures**

**Inhalation**

If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

**Ingestion**

Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

**Skin contact**

Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

**Eye Contact**

Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

**4.2. Most important symptoms and effects, both acute and delayed**

**General advice**

The severity of the symptoms described will vary dependant of the concentration and the

length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

**Symptoms**

**Inhalation** Please see Section 11. Toxicological Information for further information.

**Ingestion** Please see Section 11. Toxicological Information for further information.

**Skin contact** Please see Section 11. Toxicological Information for further information.

**Eye contact** Please see Section 11. Toxicological Information for further information.

**4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician** Treat symptomatically.

**5. Fire-fighting measures**

**5.1 Extinguishing media**

**Suitable extinguishing media**

Use extinguishing media appropriate for surrounding material.

**Extinguishing media which must not be used for safety reasons**

None known.

**5.2. Special hazards arising from the substance or mixture**

**Unusual fire and explosion hazards**

Dust may form explosive mixture in air.

**Hazardous combustion products**

Fire or high temperatures create: Carbon oxides (CO<sub>x</sub>).

**5.3 Advice for firefighters**

**Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

**Special Fire-Fighting Procedures**

Containers close to fire should be removed immediately or cooled with water.

**6. Accidental release measures**

**6.1. Personal precautions, protective equipment and emergency procedures**

Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. Use personal protective equipment. See also section 8. If spilled, take caution, as material can cause surfaces to become very slippery.

**6.2 Environmental precautions**

The product should not be allowed to enter drains, water courses or the soil.

**Environmental exposure controls**

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

**6.3 Methods and material for containment and cleaning up**

**Methods for containment**

Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimise spreading.

**Methods for cleaning up**

Sweep up and shovel into suitable containers for disposal. Take precautionary measures against static discharges. Avoid dust formation. After cleaning, flush away traces with water.

**6.4 Reference to other sections**

See section 13 for more information.

**7. Handling and storage**

**7.1 Precautions for safe handling**

**Handling**

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Remove all sources of ignition. If spilled, take caution, as material can cause surfaces to become very slippery.

**Hygiene Measures**

Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product. Remove contaminated clothing.

**7.2 Conditions for safe storage, including any incompatibilities**

**Technical measures/precautions** Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

**Storage precautions** Keep containers tightly closed in a dry, cool and well-ventilated place. Avoid contact with: Strong oxidising agents, Heat, flames and sparks.

**Storage class** Chemical storage.

**Packaging materials** Use specially constructed containers only.

**7.3 Specific end uses**

See Section 1.2.

**8. Exposure controls/personal protection**

**8.1 Control parameters**

**Exposure Limits** NUI = Nuisance dust, TWA 4mg/m<sup>3</sup> Respirable Dust, 10mg/m<sup>3</sup> Total Dust.

**Component Information**

Chemical Name	EU OEL - Third List	Austria	Australia	Denmark
---------------	---------------------	---------	-----------	---------

Organic mineral	Not determined	Not determined	Not determined	Not determined
<b>Chemical Name</b>	<b>Malaysia</b>	<b>France</b>	<b>Germany</b>	<b>Hungary</b>
Organic mineral	Not determined	Not determined	Not determined	Not determined
<b>Chemical Name</b>	<b>New Zealand</b>	<b>Italy</b>	<b>Netherlands</b>	<b>Norway</b>
Organic mineral	Not determined	Not determined	Not determined	Not determined
<b>Chemical Name</b>	<b>Poland</b>	<b>Portugal</b>	<b>Romania</b>	<b>Russia</b>
Organic mineral	Not determined	Not determined	Not determined	Not determined
<b>Chemical Name</b>	<b>Spain</b>	<b>Switzerland</b>	<b>Turkey</b>	<b>UK</b>
Organic mineral	Not determined	Not determined	Not determined	Not determined

## 8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

### Engineering Controls

Ensure adequate ventilation.

### Personal protective equipment

#### Eye protection

Use eye protection according to EN 166, designed to protect against powders and dusts. Tightly fitting safety goggles. Safety glasses with side-shields.

#### Hand protection

Wear gloves according to EN 374 to protect against skin effects from powders Repeated or prolonged contact Neoprene Nitrile Frequent change is advisable

#### Respiratory protection

No personal respiratory protective equipment normally required, In case of insufficient ventilation wear suitable respiratory equipment, Half mask with a particle filter P2 (BS EN 143), At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

#### Skin and body protection

Wear suitable protective clothing, Provide eyewash station.

### Hygiene Measures

Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.



### 8.2.3 Environmental exposure controls

#### Environmental exposure

Local authorities should be advised if significant spillages cannot be contained See section 6 for more information

## 9. Physical and chemical properties

### 9.1 Information on basic physical and chemical properties

<b>Physical state</b>	Solid
<b>Appearance</b>	Powder Dust
<b>Odour</b>	Odourless
<b>Colour</b>	Black
<b>Odour threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
pH	No information available	
pH @ dilution		
Melting / freezing point	212.7-215.5 °C / 415-420 °F	
Boiling point/range	No information available	
Flash point	310 °C / 590 °F	Cleveland Open Cup (COC)
Evaporation rate	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	250-500 g/m <sup>3</sup>	
Lower flammability limit	Not applicable	
Vapour pressure	No information available	
Vapour density	No information available	
Specific gravity	1.04 - 1.06	20 °C
Bulk density	540 kg/m <sup>3</sup> / ~34 lb/ft <sup>3</sup>	
Relative density	No information available	
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	500 °C / 932 °F	
Decomposition temperature	288 °C / 550 °F	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	
<b>Explosive properties</b>	Suspended dust may present a dust explosion hazard	
<b>Oxidising properties</b>	None known	

**9.2 Other information**

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

**Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

**10. Stability and reactivity**

**10.1 Reactivity**

Dust may form explosive mixture in air.

**10.2 Chemical stability**

Stable under normal temperature conditions and recommended use.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerisation**

Hazardous polymerisation does not occur.

**10.4 Conditions to avoid**

Avoid heat, flames and other sources of ignition.

**10.5 Incompatible materials**

Strong oxidising agents.

**10.6 Hazardous decomposition products**

See Section 5.2.

**11. Toxicological information**

**11.1 Information on toxicological effects**

**Acute toxicity**

<b>Inhalation</b>	Inhalation of dust in high concentration may cause irritation of respiratory system.
<b>Eye contact</b>	Dust may cause mechanical irritation.
<b>Skin contact</b>	Prolonged contact may cause redness and irritation.
<b>Ingestion</b>	Ingestion may cause stomach discomfort.
<b>Unknown acute toxicity</b>	Not applicable.

**Toxicology data for the components**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Organic mineral	No data available	No data available	No data available

<b>Sensitisation</b>	This product does not contain any components suspected to be sensitizing.
<b>Mutagenic effects</b>	This product does not contain any known or suspected mutagens.
<b>Carcinogenicity</b>	This product does not contain any known or suspected carcinogens.
<b>Reproductive toxicity</b>	This product does not contain any known or suspected reproductive hazards.
<b>Routes of exposure</b>	Inhalation.
<b>Routes of entry</b>	Inhalation.
<b>Specific target organ toxicity - Single exposure</b>	Not classified
<b>Specific target organ toxicity - Repeated exposure</b>	Not classified.
<b>Aspiration hazard</b>	Not applicable.

## 12. Ecological information

### 12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

#### **Toxicity to algae**

This product is not considered toxic to algae.

#### **Toxicity to fish**

This product is not considered toxic to fish.

#### **Toxicity to daphnia and other aquatic invertebrates**

This product is not considered toxic to invertebrates.

#### **Toxicology data for the components**

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Organic mineral	No information available	No information available	No information available

### 12.2 Persistence and degradability

The product is not biodegradable.

### 12.3 Bioaccumulative potential

Does not bioaccumulate.

### 12.4 Mobility in soil

#### **Mobility**

Insoluble in water.

#### **Mobility in soil**

No information available.

### 12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

### 12.6 Other adverse effects.

None known.

## 13. Disposal considerations

### 13.1 Waste treatment methods

<b>Waste from residues / unused products</b>	Dispose of in accordance with local regulations.
<b>Contaminated packaging</b>	Empty containers should be transported/delivered using a registered waste carrier for local recycling or waste disposal.
<b>EWC Waste Disposal No</b>	According to the European Waste Catalogue, Waste Codes are not product specific, but application specific Waste codes should be assigned by the user based on the application for which the product was used The following Waste Codes are only suggestions: EWC waste disposal No: 07 01 99.

## 14. Transport information

### 14.1. UN number

Not regulated

### 14.2. UN proper shipping name

The product is not covered by international regulation on the transport of dangerous goods

### 14.3. Hazard class(es)

<b>ADR/RID/ADN/ADG Hazard class</b>	Not regulated
<b>IMDG Hazard class</b>	Not regulated
<b>ICAO Hazard class/division</b>	Not regulated

### 14.4 Packing group

<b>ADR/RID/ADN/ADG Packing Group</b>	Not regulated
<b>IMDG Packing group</b>	Not regulated
<b>ICAO Packing group</b>	Not regulated

### 14.5 Environmental hazard

No

### 14.6 Special precautions

Not applicable

### 14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code

Please contact SDS@slb.com for info regarding transport in Bulk.

## 15. Regulatory information

### 15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

Commission Regulation (EU) No 453/2010 of 20 May 2010 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH). Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC, including amendments.

This safety data sheet complies with the requirements of Regulation (EC) No. 1272/2008.

#### International inventories

USA, Toxic Substances Control Act inventory (TSCA)	Complies
European Union - EINECS and ELINCS	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Inventory - Japan - Existing and New Chemicals list	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korea (KECL)	Complies
Inventory - New Zealand - Inventory of Chemicals (NZIoC)	Complies

#### Europe - REACH

All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006. For products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

#### 15.2 Chemical Safety Report

No information available

### 16. Other information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes date	13/Feb/2015
Revision date	07/Nov/2017
Version	2
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made.

#### Full text of H-Statements referred to under sections 2 and 3

This product is not classified as hazardous therefore no (H) hazard statements assigned.

\*A mark of M-I L.L.C., a Schlumberger Company

**Disclaimer**

The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

## Safety Data Sheet VG-PLUS\*

### 1. Identification of the substance/preparation and of the Company/undertaking

#### 1.1 Product identifier

Product name VG-PLUS\*  
Product code PID1709

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Viscosifier.

Uses advised against Consumer use

#### 1.3 Details of the supplier of the safety data sheet

##### Supplier

M-I Drilling Fluids UK Limited  
Westhill Business Park  
Westhill AB32 6JL Aberdeenshire  
Scotland United Kingdom

+47 51577424

SDS@slb.com

#### 1.4 Emergency Telephone Number

**Emergency telephone** - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600

Denmark	Poison Control Hotline (DK): +45 82 12 12 12
Germany	+49 69 222 25285
Norway	Poison information centre: +47 22 59 13 00

### 2. Hazards Identification

#### 2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP]

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

#### 2.2 Label elements

**Signal word**

None

**Hazard statements**

This product is not classified as hazardous therefore no (H) hazard statements assigned.

**Precautionary Statements - EU (§28, 1272/2008)**

This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

**Contains**

Crystalline silica (impurity)

**2.3 Other hazards**

Combustible dust

Not classified as PBT/vPvB by current EU criteria

**Australian statement of hazardous/dangerous nature**

Classified as Non-Hazardous according to the criteria of NOHSC.  
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

**3. Composition/information on ingredients**

**3.1 Substances**

Chemical Name	EC No	CAS No	Weight-%	Regulation (EC) No 1272/2008	REACH registration number
Crystalline silica (impurity)	238-878-4	14808-60-7	< 1	STOT Rep. 2 - H373	Exempt

**3.2 Mixtures**

Not applicable

**Comments**

This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis. IARC Monographs, Vol. 68, 1997, concludes that there is sufficient evidence that inhaled crystalline silica in the form of quartz or cristobalite from occupational sources causes cancer in humans. IARC Classification Group I.

The product contains other ingredients which do not contribute to the overall classification.

**4. First aid measures**

**4.1 First aid measures**

**Inhalation**

If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

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<b>Ingestion</b>	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
<b>Skin contact</b>	Wash skin thoroughly with soap and water. Get medical attention if irritation persists.
<b>Eye Contact</b>	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

**4.2. Most important symptoms and effects, both acute and delayed**

**General advice** The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

**Symptoms**

**Inhalation** Please see Section 11. Toxicological Information for further information.

**Ingestion** Please see Section 11. Toxicological Information for further information.

**Skin contact** Please see Section 11. Toxicological Information for further information.

**Eye contact** Please see Section 11. Toxicological Information for further information.

**4.3 Indication of any immediate medical attention and special treatment needed**

**Notes to physician** Treat symptomatically.

**5. Fire-fighting measures**

**5.1 Extinguishing media**

**Suitable extinguishing media**

Use extinguishing media appropriate for surrounding material.

**Extinguishing media which must not be used for safety reasons**

Do not use water jet.

**5.2. Special hazards arising from the substance or mixture**

**Unusual fire and explosion hazards**

Dust may form explosive mixture in air.

**Hazardous combustion products**

Fire or high temperatures create: Carbon oxides (COx), Nitrogen oxides (NOx), Hydrogen chloride gas.

**5.3 Advice for firefighters**

**Special protective equipment for fire-fighters**

As in any fire, wear self-contained breathing apparatus and full protective gear.

### Special Fire-Fighting Procedures

Containers close to fire should be removed immediately or cooled with water.

## 6. Accidental release measures

### 6.1. Personal precautions, protective equipment and emergency procedures

Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. Use personal protective equipment. See also section 8. If spilled, take caution, as material can cause surfaces to become very slippery.

### 6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

### Environmental exposure controls

Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

### 6.3 Methods and material for containment and cleaning up

#### Methods for containment

Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimise spreading.

#### Methods for cleaning up

Sweep up and shovel into suitable containers for disposal. Take precautionary measures against static discharges. After cleaning, flush away traces with water.

### 6.4 Reference to other sections

See section 13 for more information.

## 7. Handling and storage

### 7.1 Precautions for safe handling

#### Handling

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Remove all sources of ignition. If spilled, take caution, as material can cause surfaces to become very slippery.

#### Hygiene Measures

Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product. Remove contaminated clothing.

### 7.2 Conditions for safe storage, including any incompatibilities

<b>Technical measures/precautions</b>	Ensure adequate ventilation. Take precautionary measures against static discharges. Keep airborne concentrations below exposure limits.
<b>Storage precautions</b>	Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from open flames, hot surfaces and sources of ignition. Protect from moisture. Avoid contact with: Oxidizing agents
<b>Storage class</b>	Chemical storage.
<b>Packaging materials</b>	Use specially constructed containers only

**7.3 Specific end uses**

See Section 1.2.

**8. Exposure controls/personal protection**

**8.1 Control parameters**

**Exposure Limits** No biological limit allocated

Chemical Name	EU OEL - Third List	Austria	Australia	Denmark
Crystalline silica (impurity)	Not determined	0.15 mg/m <sup>3</sup> TWA alveolar dust, respirable fraction	0.1 mg/m <sup>3</sup> TWA respirable dust	0.1 mg/m <sup>3</sup>
Chemical Name	Malaysia	France	Germany	Hungary
Crystalline silica (impurity)	0.1 mg/m <sup>3</sup> TWA	0.1 mg/m <sup>3</sup> TWA	Not determined	0.15 mg/m <sup>3</sup> TWA
Chemical Name	New Zealand	Italy	Netherlands	Norway
Crystalline silica (impurity)	0.1 mg/m <sup>3</sup> TWA Confirmed carcinogen	Not determined	0.075 mg/m <sup>3</sup>	0.3 mg/m <sup>3</sup> TWA total dust 0.1 mg/m <sup>3</sup> TWA respirable dust 0.9 mg/m <sup>3</sup> STEL total dust 0.3 mg/m <sup>3</sup> STEL respirable dust Carcinogen
Chemical Name	Poland	Portugal	Romania	Russia
Crystalline silica (impurity)	2 mg/m <sup>3</sup> TWA NDS >50% free crystalline silica 0.3 mg/m <sup>3</sup> TWA NDS >50% free crystalline silica 4.0 mg/m <sup>3</sup> TWA NDS 2% to 50% free crystalline silica 1.0 mg/m <sup>3</sup> TWA NDS 2% to 50% free crystalline silica	0.025 mg/m <sup>3</sup> TWA respirable fraction	0.1 mg/m <sup>3</sup> TWA dust, respirable fraction	3 mg/m <sup>3</sup> STEL 1123 disintegration aerosol, total mass of aerosols 3 mg/m <sup>3</sup> STEL 1124 total mass of aerosols 1 mg/m <sup>3</sup> TWA 1123 1 mg/m <sup>3</sup> TWA 1124 Fibrogenic substance glass; regulated under Quartz 1123, 1124
Chemical Name	Spain	Switzerland	Turkey	UK
Crystalline silica (impurity)	0.05 mg/m <sup>3</sup> TWA VLA-ED	0.15 mg/m <sup>3</sup> TWA MAK	Not determined	Not determined

**8.2 Exposure controls**

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

**Engineering Controls**

Ensure adequate ventilation. Mechanical ventilation or local exhaust ventilation is required.

**Personal protective equipment**

<b>Eye protection</b>	Use eye protection according to EN 166, designed to protect against powders and dusts. Tightly fitting safety goggles. Safety glasses with side-shields.
<b>Hand protection</b>	Wear gloves according to EN 374 to protect against skin effects from powders Repeated or prolonged contact Use protective gloves made of: Neoprene Nitrile Frequent change is advisable
<b>Respiratory protection</b>	Respirator must be worn if exposed to dust, Suitable mask with particle filter P3 (European Norm 143), At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
<b>Skin and body protection</b>	Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.

**Hygiene Measures** Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.



## 9. Physical and chemical properties

### 9.1 Information on basic physical and chemical properties

<b>Physical state</b>	Solid
<b>Appearance</b>	Powder Dust
<b>Odour</b>	Odourless
<b>Colour</b>	Off-white
<b>Odour threshold</b>	Not applicable

Property	Values	Remarks
pH	No information available	
pH @ dilution		
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	n/a No information available	
Evaporation rate	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	> = 0.05 g/l	
Vapour pressure	No information available	
Vapour density	No information available	
Specific gravity	1.5 sg	20 °C
Bulk density	528 kg/m <sup>3</sup> (33 lb/ft <sup>3</sup> )	
Relative density	No information available	
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	190 °C / 374 °F	
Decomposition temperature	200°C / 392°F	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	

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<b>log Pow</b>	No information available
<b>Explosive properties</b>	Suspended dust may present a dust explosion hazard
<b>Oxidising properties</b>	No information available
<b>9.2 Other information</b>	
<b>Pour point</b>	No information available
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	No information available
<b>Density</b>	No information available

**Comments**

The data listed above are typical physical and chemical properties and should not be construed as product specification.

## 10. Stability and reactivity

### 10.1 Reactivity

Dust may form explosive mixture in air.

### 10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

### 10.3 Possibility of Hazardous Reactions

#### **Hazardous polymerisation**

Hazardous polymerisation does not occur.

### 10.4 Conditions to avoid

Keep away from open flames, hot surfaces and sources of ignition. Take precautionary measures against static charges. Avoid dust formation. Protect from moisture.

### 10.5 Incompatible materials

Oxidizing agents.

### 10.6 Hazardous decomposition products

See Section 5.2.

## 11. Toxicological information

### 11.1 Information on toxicological effects

#### **Acute toxicity**

#### **Product information**

This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis.

#### **Inhalation**

Inhalation of dust in high concentration may cause irritation of respiratory system.

**Eye contact** Dust may cause mechanical irritation.

**Skin contact** Prolonged contact may cause redness and irritation.

**Ingestion** Ingestion may cause stomach discomfort.

**Unknown acute toxicity** Not applicable.

**Toxicology data for the components**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Crystalline silica (impurity)	= 500 mg/kg ( Rat )	No data available	No data available

**Sensitisation** This product does not contain any components suspected to be sensitizing.

**Mutagenic effects** This product does not contain any known or suspected mutagens.

**Carcinogenicity** Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled.

**Reproductive toxicity** This product does not contain any known or suspected reproductive hazards.

**Routes of exposure** Inhalation.

**Routes of entry** Inhalation.

**Specific target organ toxicity - Single exposure** Not classified

**Specific target organ toxicity - Repeated exposure** Not classified.

**Aspiration hazard** Not applicable.

## 12. Ecological information

### 12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

**Toxicity to algae**  
 This product is not considered toxic to algae.

**Toxicity to fish**  
 This product is not considered toxic to fish.

**Toxicity to daphnia and other aquatic invertebrates**

This product is not considered toxic to invertebrates.

**12.2 Persistence and degradability**

Not readily biodegradable.

**12.3 Bioaccumulative potential**

Does not bioaccumulate.

**12.4 Mobility in soil**

**Mobility**

Insoluble in water.

**12.5 Results of PBT and vPvB assessment**

Not classified as PBT/vPvB by current EU criteria.

**12.6 Other adverse effects.**

None known.

**13. Disposal considerations**

**13.1 Waste treatment methods**

**Waste from residues / unused products**

Dispose of in accordance with local regulations.

**Contaminated packaging**

Empty containers should be transported/delivered using a registered waste carrier for local recycling or waste disposal.

**EWC Waste Disposal No**

According to the European Waste Catalogue, Waste Codes are not product specific, but application specific Waste codes should be assigned by the user based on the application for which the product was used The following Waste Codes are only suggestions: EWC waste disposal No: 01 05 99

**14. Transport information**

**14.1. UN number**

Not regulated

**14.2. UN proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

**14.3. Hazard class(es)**

**ADR/RID/ADN/ADG Hazard class** Not regulated

**IMDG Hazard class** Not regulated

**ICAO Hazard class/division** Not regulated

**14.4 Packing group**

**ADR/RID/ADN/ADG Packing Group** Not regulated

**IMDG Packing group** Not regulated

**ICAO Packing group** Not regulated

**14.5 Environmental hazard**

No

**14.6 Special precautions**

Not applicable

**14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code**

Please contact SDS@slb.com for info regarding transport in Bulk.

## 15. Regulatory information

**15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture**

**Germany, Water Endangering Classes (VwVwS)** Water endangering class = 1

**Australian Standard for the Uniform Scheduling of Drugs and Poisons**

No poisons schedule number allocated

**New Zealand hazard classification** Not classified.

**HSNO approval no.** Not required.

**Group number** Not required.

Commission Regulation (EU) No 453/2010 of 20 May 2010 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH). Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC, including amendments.

This safety data sheet complies with the requirements of Regulation (EC) No. 1272/2008.

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].  
 National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].  
 National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG).

Dutch Mining Regulations: In accordance with Mining Regulations 9.2 and Chapter 4 of the Working Conditions Decree.

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 [P.U.(A) 310/2013] (CLASS Regulations)

The Industry Code of Practice on Chemical Classification and Hazard Communication 2014 [P.U. (B) 128/2014] (ICOP) International inventories

USA, Toxic Substances Control Act inventory (TSCA)	Complies
European Union - EINECS and ELINCS	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Inventory - Japan - Existing and New Chemicals list	Does not Comply
China (IECSC)	Complies
Australia (AICS)	Complies
Korea (KECL)	Complies
Inventory - New Zealand - Inventory of Chemicals (NZIoC)	Complies

Denmark Pr. no. 1928223

### 15.2 Chemical Safety Report

No information available

## 16. Other information

<b>Prepared by</b>	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
<b>Supersedes date</b>	04/Dec/2014
<b>Revision date</b>	31/Jul/2017
<b>Version</b>	8
<b>This SDS has been revised in the following section(s)</b>	All sections Product Code change No changes with regard to classification have been made.

**Full text of H-Statements referred to under sections 2 and 3**

This product is not classified as hazardous therefore no (H) hazard statements assigned.

H373 - May cause damage to organs through prolonged or repeated exposure if inhaled

\*A mark of M-I L.L.C., a Schlumberger Company

**Disclaimer**

The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.



## Safety Data Sheet WALNUT NUT PLUG\* (All Grades)

### 1. Identification

#### 1.1 Product identifier

**Product name** WALNUT NUT PLUG\* (All Grades)  
**Product code** 12190  
**Synonyms** WALNUT PLUG\* FINE, WALNUT PLUG\* MEDIUM, WALNUT PLUG\* COARSE

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Recommended Use** Lost circulation material.  
**Uses advised against** Consumer use

#### 1.3 Details of the supplier of the safety data sheet

##### Supplier

**M-I L.L.C.**  
P.O.Box 42842  
Houston, TX 77242  
www.miswaco.slb.com  
Telephone: 1 281-561-1511

##### Schlumberger Canada, Ltd.

200, 125 - 9th Avenue SE  
Calgary, Alberta T2G 0P6, Canada  
Telephone: 1-613-992-4624

**E-mail address** sdsmi@slb.com

##### Prepared by

Global Regulatory Compliance - Chemicals (GRC - Chemicals)

#### 1.4 Emergency Telephone Number

**Emergency telephone** (24 Hour) Asia Pacific +65 3158 1074, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, USA +1 281 561 1600, Canada +1 800 579 7421, Argentina: +54 11 5984 3690, Brazil : 0800-720-8000 0800-777-2323 (WGRA)

### 2. Hazards identification

#### 2.1 Classification of the substance or mixture

##### GHS - Classification

##### Health hazards

Carcinogenicity	Category 1A
Specific target organ toxicity - Repeated exposure	Category 2

**Environmental hazards** Not classified

**Physical Hazards**

Combustible dust

**2.2 Label elements**



**Signal word**

DANGER

**Hazard statements**

- H350i - May cause cancer by inhalation
- H373 - May cause damage to organs through prolonged or repeated exposure if inhaled
- H232 - May form combustible dust concentrations in air

**Precautionary statements**

- P201 - Obtain special instructions before use
- P260 - Do not breathe dust/fume/gas/mist/vapors/spray
- P264 - Wash face, hands and any exposed skin thoroughly after handling
- P270 - Do not eat, drink or smoke when using this product
- P281 - Use personal protective equipment as required
- P309 + P311 - IF exposed or if you feel unwell: Call a POISON CENTER or doctor/physician
- P314 - Get medical advice/attention if you feel unwell

- P202 - Do not handle until all safety precautions have been read and understood
- P240 - Ground/bond container and receiving equipment
- P241 - Use explosion-proof electrical/ ventilating/ lighting/ equipment
- P243 - Take precautionary measures against static discharge
- P501 - Dispose of contents/ container to an approved waste disposal plant

**Hazards not otherwise classified**

None known

**Unknown acute toxicity** Not applicable.

**3. Composition/information on Ingredients**

**3.1 Substances**

Chemical Name	CAS No	Weight-%
Polysaccharide	Proprietary	99 - 100
Silica, crystalline, quartz	14808-60-7	0.5 - 1.5

**3.2 Mixtures**

Not applicable

**Comments**

Proprietary component(s) in section 3 of this SDS does not/do not trigger application of trade secret exemption under Hazardous

Materials Information Review Act (HMIRA). The proprietary component in this product contributes to combustible dust classification.

Percentages (concentrations) represented as a range are due to batch-to-batch variability.

## 4. First aid measures

### 4.1 First aid measures

<b>Inhalation</b>	Move to fresh air. If breathing is difficult, (trained personnel should) give oxygen. Get medical attention immediately if symptoms occur.
<b>Ingestion</b>	Call a physician or Poison Control Center. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
<b>Skin contact</b>	Wash skin thoroughly with soap and water. Remove contaminated clothing and launder before reuse. Get medical attention if irritation persists.
<b>Eye Contact</b>	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

### 4.2. Most important symptoms and effects, both acute and delayed Most important symptoms and effects, both acute and delayed

#### Symptoms

<b>Inhalation</b>	Please see Section 11. Toxicological Information for further information.
<b>Ingestion</b>	Please see Section 11. Toxicological Information for further information.
<b>Skin contact</b>	Please see Section 11. Toxicological Information for further information.
<b>Eye contact</b>	Please see Section 11. Toxicological Information for further information.

### 4.3 Indication of any immediate medical attention and special treatment needed

<b>Notes to physician</b>	Treat symptomatically
---------------------------	-----------------------

## 5. Fire-fighting measures

### 5.1 Extinguishing media

#### Suitable extinguishing media

Water Fog, Alcohol Foam, CO<sub>2</sub>, Dry Chemical.

#### Extinguishing media which must not be used for safety reasons

Do not use a solid water stream as it may scatter and spread fire.

### 5.2. Special hazards arising from the substance or mixture Special hazards arising from the substance or mixture

#### Unusual fire and explosion hazards

Dusts or fumes may form explosive mixtures in air.

#### Hazardous combustion products

Silicon oxide, Carbon oxides (CO<sub>x</sub>).

### 5.3 Advice for firefighters

#### Special protective equipment for fire-fighters

As in any fire, wear self-contained breathing apparatus and full protective gear.

## 6. Accidental release measures

### 6.1. Personal precautions, protective equipment and emergency procedures

Wear suitable protective equipment. Evacuate personnel to safe areas. Prevent further leakage or spillage if safe to do so. Avoid dust formation. Suspended dust may present a dust explosion hazard. Avoid contact with heat, sparks, open flame, and static discharge. Avoid breathing dust; if exposed to high dust concentration, leave area immediately.

### 6.2 Environmental precautions

Do not allow material to contaminate ground water system.

#### **Environmental exposure controls**

Local authorities should be advised if significant spillages cannot be contained.

### 6.3 Methods and material for containment and cleaning up

#### **Methods for containment**

Cover powder spill with plastic sheet or tarp to minimize spreading.

#### **Methods for cleaning up**

Shovel into suitable container for disposal. Take precautionary measures against static discharges. Prevent dust cloud. Powdered material may form explosive dust-air mixtures.

### 6.4 Reference to other sections

See section 13 for more information.

## 7. Handling and storage

### 7.1 Precautions for safe handling

#### **Handling**

Handle in accordance with good industrial hygiene and safety practice. Fine dust dispersed in air may ignite. Avoid breathing dust; if exposed to high dust concentration, leave area immediately. Avoid contact with skin, eyes and clothing. Provide appropriate exhaust ventilation at places where dust is formed. Take precautionary measures against static discharges.

### 7.2 Conditions for safe storage, including any incompatibilities

**Technical measures/precautions**      Ensure adequate ventilation. Keep airborne concentrations below exposure limits. Use spark-proof tools and explosion-proof equipment.

**Storage precautions**                      Follow safe warehousing practices regarding palletizing, banding, shrink-wrapping and/or stacking. Avoid heat, flames and other sources of ignition. Protect from moisture

## 8. Exposure controls/personal protection

### 8.1 Control parameters

Component Information

Component	ACGIH TLV	OSHA PEL
Polysaccharide ( 99 - 100 )	10 mg/m <sup>3</sup>	15 mg/m <sup>3</sup> (Total); 5 mg/m <sup>3</sup> (Respirable)
Silica, crystalline, quartz 14808-60-7 ( 0.5 - 1.5 )	0.025 mg/m <sup>3</sup>	see Table Z-3

Silica, crystalline, quartz

OSHA - Final PELs - Table Z-3 Mineral Dusts

(250)/( %SiO<sub>2</sub> + 5 ) mppcf TWA, respirable fraction; (10)/( %SiO<sub>2</sub> + 2 ) mg/m<sup>3</sup> TWA, respirable fraction

## 8.2 Exposure controls

A risk assessment is recommended to be performed by a qualified and trained personnel to analyze the worksite and recommends the appropriate controls such as engineering controls, work practice controls, and administrative controls as primary means of reducing employee exposure. When there is a remaining hazards after applying the primary controls, Personal Protective Equipment (PPE) must be used.

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

### **Engineering Controls**

Apply technical measures to comply with the occupational exposure limits. Keep airborne concentrations below exposure limits.

### **Personal protective equipment**

<b>Eye protection</b>	Tightly fitting safety goggles.
<b>Hand protection</b>	Neoprene Nitrile
<b>Respiratory Protection</b>	All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent. If exposed to airborne particles of this product use at least a NIOSH-approved N95 half-mask disposable or re-useable particulate respirator. In work environments containing oil mist/aerosol use at least a NIOSH-approved P95 half-mask disposable or re-useable particulate respirator.
<b>Skin and body protection</b>	Wear suitable protective clothing, Ensure that eyewash stations and safety showers are close to the workstation location.
<b>Hygiene measures</b>	Wash hands before breaks and immediately after handling the product, Remove and wash contaminated clothing before re-use.

## **9. Physical and chemical properties**

### 9.1 Information on basic physical and chemical properties

<b>Physical state</b>	Solid
<b>Appearance</b>	Opaque
<b>Color</b>	Light brown
<b>Odor</b>	Mild
<b>Odor threshold</b>	Not applicable

<u>Property</u>	<u>Values</u>	<u>Remarks</u>
<b>pH</b>	Not applicable	
<b>pH @ dilution</b>		No information available
<b>Melting / freezing point</b>	No information available	
<b>Boiling point/range</b>	No information available	
<b>Flash point</b>	No information available	PMCC
<b>Evaporation rate (BuAc =1)</b>	No information available	
<b>Flammability (solid, gas)</b>	Not applicable	
<b>Flammability Limit in Air</b>		
<b>Upper flammability limit</b>	No information available	
<b>Lower flammability limit</b>	No information available	
<b>Vapor pressure</b>	No information available	
<b>Vapor density</b>	No information available	
<b>Specific gravity</b>	1.1 - 1.4	
<b>Bulk density</b>	No information available	
<b>Water solubility</b>	Dispersible	
<b>Solubility in other solvents</b>	No information available	
<b>Autoignition temperature</b>	No information available	
<b>Decomposition temperature</b>	No information available	

<b>Kinematic viscosity</b>	No information available
<b>Dynamic viscosity</b>	No information available
<b>log Pow</b>	No information available
<b>Explosive properties</b>	Suspended dust may present a dust explosion hazard
<b>Oxidizing properties</b>	No information available

**9.2 Other information**

<b>Pour point</b>	No information available
<b>Molecular weight</b>	No information available
<b>VOC content(%)</b>	No information available
<b>Density</b>	No information available

**Comments**

The data listed above are typical physical and chemical properties that do not constitute product specification. Please refer to Technical Data Sheet for specifications.

## 10. Stability and reactivity

**10.1 Reactivity**

Combustible material. Dust may form explosive mixture in air.

**10.2 Chemical stability**

Stable. Hazardous polymerization does not occur.

**10.3 Possibility of Hazardous Reactions**

**Hazardous polymerization**

Hazardous polymerization does not occur.

**10.4 Conditions to avoid**

Avoid contact with heat, sparks, open flame, and static discharge.

**10.5 Incompatible materials**

Strong oxidizing agents.

**10.6 Hazardous decomposition products**

Silicon oxide. Carbon oxides (COx).

## 11. Toxicological information

**11.1 Information on toxicological effects**

**Acute toxicity**

<b>Inhalation</b>	Inhalation of dust in high concentration may cause irritation of respiratory system. Repeated or prolonged inhalation of crystalline silica dust can cause delayed lung injury, and other diseases, including silicosis and lung cancer.
<b>Eye contact</b>	Dust contact with the eyes can lead to mechanical irritation.
<b>Skin contact</b>	Repeated exposure may cause skin dryness or cracking.
<b>Ingestion</b>	Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea.

**Toxicology data for the components**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Polysaccharide	> 5 g/kg ( Rat )	> 2 g/kg ( Rabbit )	> 5800 mg/m <sup>3</sup> ( Rat ) 4 h
Silica, crystalline, quartz	= 500 mg/kg ( Rat )	No data available	No data available

Chemical Name	IARC Group 1 or 2	ACGIH - Carcinogens	OSHA listed carcinogens	NTP
Polysaccharide	No data available	No data available	No data available	Known Human Carcinogen
Silica, crystalline, quartz	Group 1; Monograph 100C [2012] Monograph 100C [2012] (listed under Crystalline silica inhaled in the form of quartz or cristobalite from occupational sources); Monograph 68 [1997] Group 1; Monograph 68 [1997]	A2 Suspected Human Carcinogen	Present	Known Human Carcinogen

<b>Sensitization</b>	Not classified.
<b>Mutagenic effects</b>	No evidence of mutagenic properties.
<b>Carcinogenicity</b>	Contains a known or suspected carcinogen. Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled.
<b>Reproductive toxicity</b>	No evidence of toxicity to reproduction.
<b>Developmental toxicity</b>	Not known to cause birth defects or have a deleterious effect on a developing fetus.
<b>Routes of exposure</b>	Skin contact. Inhalation. Eye contact.
<b>Routes of entry</b>	Inhalation.
<b>Specific target organ toxicity - Single exposure</b>	Not classified
<b>Specific target organ toxicity - Repeated exposure</b>	Category 2.
<b>Target organ effects</b>	Lungs.
<b>Aspiration hazard</b>	Not applicable.

## 12. Ecological information

### 12.1 Toxicity

#### Toxicity to algae

See component information below.

#### Toxicity to fish

See component information below.

#### Toxicity to daphnia and other aquatic invertebrates

See component information below.

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Polysaccharide	No information available	No information available	No information available
Silica, crystalline, quartz	No information available	No information available	No information available

**12.2 Persistence and degradability**

No product level data available.

**12.3 Bioaccumulative potential**

No product level data available.

**12.4 Mobility in soil**

No information available.

**12.5 Results of PBT and vPvB assessment**

This preparation contains no substance considered to be persistent, bioaccumulating nor toxic (PBT)  
This preparation contains no substance considered to be very persistent nor very bioaccumulating (vPvB)

**12.6 Other adverse effects.**

None known.

**13. Disposal considerations**

**13.1 Waste treatment methods**

<b>Disposal Method</b>	Disposal should be made in accordance with federal, state and local regulations. Keep all sources of ignition away and avoid creating dust conditions. If heavy dusting cannot be avoided, ground all equipment.  Empty containers should be handled in a manner not to cause dusting during collection, transportation and disposal.
<b>Contaminated packaging</b>	Do not re-use empty containers. Do not burn, or use a cutting torch on, the empty drum. Dispose of in accordance with local regulations.

**14. Transport information**

**14.1. UN number**

<b>UN No. (DOT)</b>	Not regulated
<b>UN No. (TDG)</b>	Not regulated
<b>UN/ID No. (ADR/RID/ADN/ADG)</b>	Not regulated
<b>UN No. (IMDG)</b>	Not regulated
<b>UN No. (ICAO)</b>	Not regulated

**14.2. UN proper shipping name**

The product is not covered by international regulation on the transport of dangerous goods

**14.3 Hazard class(es)**

<b>DOT Hazard class</b>	Not regulated
<b>TDG Hazard class</b>	Not regulated
<b>ADR/RID/ADN/ADG Hazard class</b>	Not regulated
<b>IMDG Hazard class</b>	Not regulated
<b>ICAO Hazard class/division</b>	Not regulated

**14.4 Packing group**

DOT Packing group	Not regulated
TDG Packing group	Not regulated
ADR/RID/ADN/ADG Packing group	Not regulated
IMDG Packing group	Not regulated
ICAO Packing group	Not regulated

**14.5 Environmental hazard**

Marine pollutant No

**14.6 Special precautions**

Not applicable

**15. Regulatory information**

**International inventories**

USA (TSCA)	Complies
Canada (DSL)	Complies
European Union (EINECS and ELINCS)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

**U.S. Federal and State Regulations**

**SARA 311/312 Hazard Categories**

Delayed (chronic) health hazard. Fire Hazard (Combustible Dust)

Chemical Name	SARA 302 / TPQs	SARA 313	CERCLA RQ
Polysaccharide	N/A	N/A	N/A
Silica, crystalline, quartz	N/A	N/A	N/A

**State Comments**

Proposition 65: This product contains chemical(s) considered by the State of California's Safe Drinking Water and Toxic Enforcement Act of 1986 to cause cancer and/or reproductive toxicity. See table under U.S. Federal and State Regulations for the specific chemicals.

**Canadian Classification**

This Safety Data Sheet has been prepared in compliance with the Hazardous Products Regulations.

**16. Other information**

Supersedes date	31/Jan/2017
Revision date	18/May/2017

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**Version** 8

**This SDS has been revised in the following section(s)** All sections. Updated according to WHMIS 2015.

**HMIS classification**

Health	1*
Flammability	1
Physical hazard	0
PPE	E

N/A - Not Applicable, N/D - Not Determined.

\*A mark of M-I L.L.C., a Schlumberger Company

**Disclaimer**

The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

## **Appendix E – Summary of Waste Streams**



## Summary of Primary Waste Streams

Ref	Waste Stream	Description	Classification of Waste	Generation Source	Handling and Segregation Practices	Reduction Strategy	Final Disposal Point
1	Aerosol Cans	Maintenance , painting, cleaning can include flammable dispersant medium such as LPG	Non Hazardous (after been depressurised)	Maintenance and Catering	Aerosol cans should be depressurised use an industrial type can depressuriser where released vapour and contents are captured into the system before discarding the cans into waste metal	where practical source items in bulk and use is reuseable pump packs	Recycling depot
2	Batteries	Batteries include industrial and automotive-type carbonaire and lead-acid cell batteries, as well as commercial-size cadmium and lithium batteries. Non-industrial batteries, including household and single cell batteries used to power small electronic equipment such as flashlights, radios, watches, and stereos are considered trash and are not included in this waste stream.	Hazardous	Powered devices including Cranes, Forklifts Lifeboats	Batteries should be taped to prevent dislodgement of cell caps and wrapped in plastic. They should be then strapped to a pallet and sent ashore for recycling/disposal	Utilise long life batteries and adopt effective recharging strategies to prolong operational life	Onshore
3	Consumer Electronics and Toner cartridges	Print cartridges from printers	Non hazardous	Administrative Operations	Items should be boxed and sent ashore	Send onshore for reuse	Onshore
4	Domestic Trash	Includes waste such as office supplies, paper, wood, bottles, cans, crockery, plastics, aluminum, glass, household batteries	Non Hazardous	Living accommodations, offices, warehouses and workshops, mess halls, workshops,	Wood, scrap metal, non industrial batteries, and other reusable materials are segregated from the trash.	Recycle items that can be reused	Land fill
5	Drums and Containers	Drums and containers include used empty plastic and metal drums, pails, cans, buckets, lab-chemical bottles, and similar containers that at one time held industrial chemicals. Empty drums and containers are generally defined as those that	Non Hazardous	Rig Operations	Items should be stored on original carrier and returned to point of origin for reuse where practical	Reuse of drums	Supplier



## Summary of Primary Waste Streams

Ref	Waste Stream	Description	Classification of Waste	Generation Source	Handling and Segregation Practices	Reduction Strategy	Final Disposal Point
6	Expired medications (controlled substances)	Controlled substances include morphine and pethadine)	Non Hazardous (Controlled Substance)	Rig medical facilities and onshore facilities	Any controlled substance needs to be signed off the rig by the toolpusher with an accompanying MMO. The substances are to be hand carried typically by the medic who will pass them onto SOS for collection and disposal.	N/A	SOS
7	Flourescent tubes and Light Bulbs	This includes all light bulbs from the accommodation and rig operation	Hazardous (mercury content)	Rig Operation	Bulbs shouldn't be crushed. They should be stored in their original packaging or similar and sent ashore for correct disposal	Use low energy long life bulbs	Onshore
8	Glass	Glass generated from daily operations. Primarily containers used for storage of foodstuffs, drink premixes and maintenance liquids, doesn't apply to light bulbs or tubes	Non Hazardous	Maintenance and Catering	Glass items are to be segregated and sent ashore for recycling	Reuse where practical	Recycling depot
9	Hazardous Chemicals	All chemicals that are hazardous by composition	Hazardous	Rig Operations	Chemicals should be stored as per guidelines on the relevant MSDS and stored in designated HAZCHEM storage locations (sackroom, designated area on pipe deck etc)		Original Supplier
10	Medical Waste	Medical waste includes materials such as bandages, dressings, surgical waste, human tissue, hypodermic needles, medical laboratory waste, regurgitated, and bodily fluids from ill persons.	Hazardous	Rig medical facilities and onshore facilities	Red colored plastic garbage bags labeled "Medical Waste" and/or having the internationally recognized biological symbol on them are used to collect and clearly distinguish medical waste from other waste. Hypodermic needles are stored in designated "sharps bins". When a bin is full, it is taped closed and incinerated with other medical waste. Medical waste bags are not opened once they are removed from medical facilities. These bags are handled with extreme caution and are kept segregated from non-medical waste.	N/A	Incinerator
11	Oily Rags and Gloves	Rags and cotton gloves used in daily operations		Rig Operations	Oily Rags and Gloves are to be segregated	Where practical, gloves and rags are to be washed and reused	Onshore



## Summary of Primary Waste Streams

Ref	Waste Stream	Description	Classification of Waste	Generation Source	Handling and Segregation Practices	Reduction Strategy	Final Disposal Point
12	Oily water	Generated from tank cleaning, drainage from bunding system	Hazardous	Rig Operations	Oily water is routed into drainage sytem which passes through the oily water seperator where the oil component is then routed to the oil storage tank and sent ashore for disposal	N/A	Onshore
13	Paints and Thinners	This includes waste or surplus paint and paint contaminated thinners that have no further use	Hazardous	Rig Operations	Waste paint and thinners is to be stored in metal drums and sent ashore when full	The use of wash baths that reuse thinners	Onshore
14	Refrigerants	Different categories of Freon which are used throughout operations	Hazardous	Air conditioning/refrigerant systems	Appropriate PPE when handling and stored as per HAZMAT Guidelines	Appropriate system should be in place to capture and recycle	Onshore
15	Scrap metal	Bulk scrap metal includes large pieces of equipment or construction materials made of steel or other metal alloys such as vehicles, wire rope, electrical or telecommunications cables, steel tubular, tanks, process vessels, obsolete empty compressed gas cylinders, crushed empty steel drums, and structural steel.	Non Hazardous	Rig Operations	Scrap metal is to be segregated in a trash metal skip.	N/A	Scrap metal recycling depot
16	Sewage	All Blackwater generated from accommodation	Hazardous	Toilets	Waste is routed to sewage plant and broken down before been discharged overboard.	N/A	Offshore
17	Victual Waste (food waste)	All food waste that is biodegradable	Non Hazardous	Mess halls and galleys	Food may be discharged offshore if it passes through a food grinder and the finalproduct can pass through a 25mm screen	Manage food consignments so as to minimise spoilt food	Offshore
18	Waste Oil	Waste oil includes any used or spent petroleum-based liquid, such as lubricating oil or motor oil. Used organic solvents and waste cooking oil are included in this waste stream.	Hazardous	Internal combustion engines throughout the operation	Waste oil is to be circulated into the waste oil holding tank and then transferred into drums for transport onshore for recycling or disposal	N/A	Recycling depot

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Waste Management PRO-04-0567

# **Appendix F - Drill Cuttings Dispersion and Oil Spill Modelling Report**

*Oil Spill and Drilling Muds Modelling  
Study*

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## **EXECUTIVE SUMMARY**

**PETRONAS Carigali Myanmar (Hong Kong) Limited** (PCML) is planning to conduct infill drilling within the Yetagun Gas Field in Block M-12, M-13 and M-14 (*Figure 1.1*). As per the Myanmar Environmental Impact Assessment (EIA) Procedure, this Project requires an EIA and an Environmental Management Plan (EMP) to be prepared and submitted to the Environmental Conservation Department (ECD) of the Ministry of Natural Resources and Environmental Conservation (MONREC).

PCML has commissioned **Environmental Resources Management (ERM) – Hong Kong, Limited** to undertake oil spill and drill cuttings and muds discharge modelling for the drilling project. The scope of the modelling is limited to the prediction of the trajectory and spread of spilled / discharged material from the Yetagun platform to surrounding areas under the influence of the ambient winds and currents.

As part of the drilling programme, an unplanned diesel spill during a vessel collision event scenario was considered and oil spill modelling was performed to predict the spatial extent of the hypothetical diesel releases, the directions the spill are likely to travel, the thickness of the surface slick, the time of travel, and the dissolved-phase aromatic hydrocarbon (DAH) component concentrations. Drilling muds modelling for the planned discharge of cuttings and synthetic-based mud was also conducted to predict the magnitude of sedimentation rate, deposition thickness on the seabed and total suspended solids (TSS) concentration after the planned release. The present report details the results of the modelling and will support assessments of physical, chemical and / or biological impacts from diesel spill and drill cutting and mud discharge from the proposed exploration project.

In the oil spill scenario, an amount of 100 m<sup>3</sup> of diesel was released near the surface over fifteen (15) minutes at the location of a vessel collision. In the event the oil spill scenario occurred, the trajectory of spill would depend on the prevailing wind and current conditions at the time. In both spill scenarios in January and April, the model indicated oil trajectories would generally be towards the northwest and southwest, away from the shoreline of mainland Myanmar. The model indicates no stranding of oil at shoreline locations would be predicted in both oil spill in January and April. Oil patches were predicted to be at least 60 km from mainland Myanmar throughout the modelled periods. Areas within reach of surface oil thickness where oiling impacts to seabirds could occur at offshore areas over 90 km away from major islands (and even further away from mainland Myanmar) in both seasons and up to 40 km away from the Yetagun platform. The areas that may be within reach of being exposed to dissolved aromatic concentrations greater than a 50 ppb threshold is 1,163 km<sup>2</sup> in January and 1,989 km<sup>2</sup> in April and would be confined to offshore open waters. It was noted, due to the stochastic nature of the modelling, that in the event of an

actual spill, the area above either of these thresholds will be considerably smaller.

For the discharge of drill cuttings and mud, the model predicted sedimentation and deposition would remain close to the drill center in both seasons. The TSS plume is expected to be diluted gradually with increasing distance from the release site, reducing to below 10 mg/L within approximately 4 km from the release site. The model predicted the maximum TSS concentration is predicted to be 481.93 mg/L for after the release over the whole simulation period. The model predicted that the discharge cuttings and mud will be cover wide area surrounding the drill center with cuttings pile at the drill center (maximum deposition thickness of 1,139 mm).

# 1 INTRODUCTION

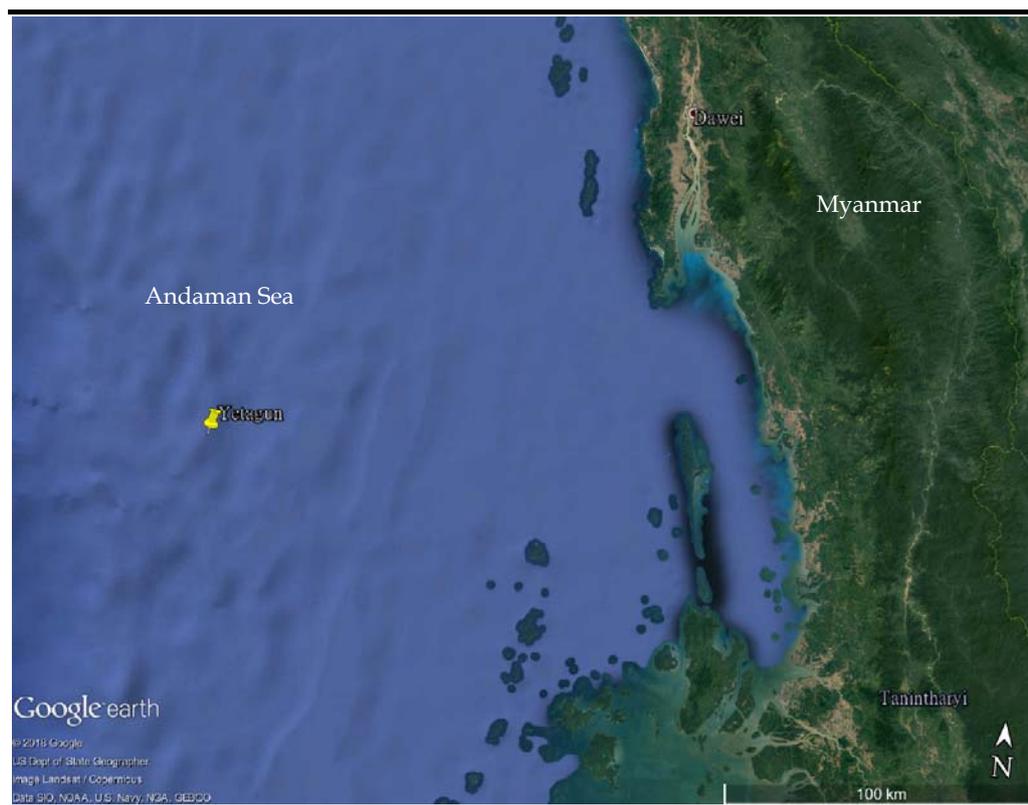
## 1.1 PROJECT BACKGROUND

**PETRONAS Carigali Myanmar (Hong Kong) Limited (PCML)** is planning to conduct infill drilling within the Yetagun Gas Field in Block M-12, M-13 and M-14 (*Figure 1.1*). As per the Myanmar Environmental Impact Assessment (EIA) Procedure, this Project requires an EIA and an Environmental Management Plan (EMP) to be prepared and submitted to the Environmental Conservation Department (ECD) of the Ministry of Natural Resources and Environmental Conservation (MONREC).

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**Figure 1.1**     *Location Map of Proposed Drill Center*



**1.2**     *OBJECTIVES OF THIS STUDY*

The objectives of the *Oil Spill and Drilling Cutting and Muds Discharge Modelling Study* are to model the transport and fate of unplanned accidental release of diesel oil due to tank rupture during vessel collision, and planned discharge of cuttings and synthetic-based mud during drilling operations;

It should be noted that this Study is limited to the examination of the trajectory, concentration and deposition footprint of the spilled / discharged material under prevailing circumstances using available information and assumptions.

**1.3**     *STRUCTURE OF THIS DOCUMENT*

The structure of this document is as follows:

**Section 1: Introduction**

Summarises the Project background and objectives of the Study.

**Section 2: Study Methodology**

Presents an overview of the computer modelling techniques adopted to quantify the impacts. The section also presents a broad description of the setup of spill simulations.

### ***Section 3: Modelling Results***

#### ***3.1 - Diesel Spill***

Presents the results and interpretation of the modelling of the diesel spill event.

#### ***3.1 - Discharge of Cuttings and Mud***

Presents the results and interpretation of the modelling of the discharge of cuttings and synthetic-based mud.

### ***Section 4: Conclusions***

Summarises the key findings and limitations of the Study.

## 2 *STUDY METHODOLOGY*

### 2.1 *INTRODUCTION*

This section presents an overview of the study methodology, including a description of the computer modelling techniques employed, a broad description of model process and a description of model setup.

### 2.2 *MODELLING METHODOLOGY*

The spill modelling presented here used Chemical and Oil Spill Impact Model (COSIM) to simulate the transport and fate of diesel spill at the site. The fate and transport of unplanned loss of SBM is simulated by using Generalized Integrated Fate and Transport (GIFT) model. COSIM and GIFT are modules of the Generalized Environmental Modelling System for Surface Waters (GEMSS®), a public domain, integrated system of three-dimensional hydrodynamic and transport modules embedded in a geographic information and environmental data system.

GEMSS® includes a grid generator and editor, control file generator, two- and three-dimensional post processing viewers, and an animation tool. It uses a database approach to store and access model results. The database approach is also used for field data; as a result, the GEMSS viewers can be used to display model results, field data or both, a capability useful for understanding the behaviour of the prototype as well as calibrating the model. The field data analysis features can be used independently using GEMSS modelling capability.

#### 2.2.1 *COSIM*

COSIM is a three-dimensional oil spill model. The theoretical formulation of COSIM can be found in Kolluru et al. (1994) <sup>(1)</sup>. The model operates both in Lagrangian and Eulerian frameworks. In the Lagrangian framework, the oil or chemicals on the surface and in the water column are represented by a series of particles. The particles are advected in x-, y- and z- directions due to the combined action of currents and winds (Kolluru, 1999)<sup>(2)</sup>. The particles are diffused using a 3-D random walk method (Bear and Verruijt, 1987) <sup>(3)</sup> in x-, y- and z-directions.

A COSIM application requires three types of data: (1) spatial data, primarily the waterbody shoreline and bathymetry, but also the locations, elevations,

- (1) Kolluru, V.S., M. L. Spaulding and E. Anderson. 1994. A Three Dimensional Subsurface Oil Dispersion Model using a Particle Based Approach. In Proceedings of the 17th Arctic and Marine Oil Spill Program (AMOP) Technical Seminar, Vancouver, British Columbia
- (2) Kolluru, V. S. 1999. "GEMSS-COSIM: Chemical and Oil Spill Impact Model - Technical Documentation". J. E. Edinger Associates, Wayne, Pennsylvania
- (3) Bear, Jacob and Arnold Verruijt, 1987. "Modeling Ground Water Flow and Pollution with Computer Programs for Sample Cases", Kluwer Academic publishers.

and configurations of man-made structures; (2) temporal data, i.e., time-varying boundary condition data defining currents and meteorological conditions, and spill release rates; and (3) chemical properties data and volumetric proportions of the spilled substances.

For input to the model, the spatial data are encoded primarily in two input files: the control and the bathymetry. The data in these files are geo-referenced. The temporal data are encoded in many files, each file representing a set of time-varying boundary conditions. Each record in the boundary condition files is stamped with a year-month-day-hour-minute address. Chemical property and volumetric proportion values are stored in a database read by the COSIM control file. The database contains properties of various chemicals and oil types and the constituent compounds comprising them.

## 2.2.2

### GIFT

GIFT simulates the fate of dissolved and particulate material discharged from dredging barges, mine tailings, drill cuttings and muds, and produced water. GIFT was derived from a shell-based approach to modelling described in Kolluru and Spaulding <sup>(1)</sup> (1993). The main core of GIFT has physical models to predict near- and far-field characteristics of discharges. The near-field model is dependent on the type of discharge. The user selects the near-field model most appropriate for the application of interest. The far-field transport and fate of contaminants are predicted by a three-dimensional particle-based model using a random walk procedure <sup>(2)</sup> <sup>(3)</sup>. The particle model allows the user to predict the transport and fate of dissolved and settling or buoyant particles from single or multiple diffusers. Sub bottom processes such as deposition, erosion, slurry flow due to slope failure and dissolution is modelled using the Lagrangian particle method. The fate of multi-component mixtures can be predicted by linear superposition. Biological or chemical processes, such as contaminant growth, decay or conversion, are easily incorporated by simply altering the particle's mass appropriately. A more detailed description of GIFT and its application to predict the transport and fate of mine tailings in deep waters is given in Kolluru *et al* <sup>(4)</sup> (1998). GIFT has been applied in several drilling mud and cuttings modelling projects recently in Myanmar and the wider region .

(1) Kolluru, V. S. and M. L. Spaulding, 1993. "SEASHELL-Software for the simulation of transport and fate of pollutants in coastal waters". In: *Proceedings of 3rd International Conference on Estuarine and Coastal modeling*, American Society of Civil Engineers, September 9-10, Oak Brook, Illinois.

(2) Ellegaard, A. C., 1991. "A PC Modeling System for the Simulation of Transport and Fate of Solutes and Suspended Substances". *Proceedings of the Second International Conference on Coastal and Estuary Modeling*, Tampa, November 13-15, Florida, pp. 188-201.

(3) Heineman, M. and R. Walton, 1989. "Application of Particle Tracking Model for Ocean Outfall Siting in New Bedford, Massachusetts". In *Proceedings of the First International Conference on Estuarine and Coastal Modeling*, Newport, Rhode Island, November 15- 17, pp. 92-101.

(4) Kolluru, V. S., E. M. Buchak and J. E. Edinger, 1998. "Integrated Model to Simulate the Transport and Fate of Mine Tailings in Deep Waters," in the *Proceedings of the Tailings and Mine Waste '98 Conference*, Fort Collins, Colorado, USA, January 26-29.

Hydrodynamic information mapped onto the model grid was used to disperse drilling mud, which was modelled as particles. Movement in the vertical direction resulted in the settling and deposition of the mud on to the seabed.

The model produces 3-D, time-varying distributions of concentrations of the introduced muds and cuttings based on release rates specified for the particular materials and their properties.

### 2.2.3 *Stochastic Simulation for Oil Spill Modelling*

Time-varying, numerical hydrodynamic and transport models can be run in two modes: deterministic mode and stochastic mode. Deterministic simulations are used primarily for hindcasts, i.e., reproducing a historical period using datasets that represent actual conditions for the historical period being simulated.

In this study the model was run in stochastic mode. In the stochastic mode, estimates are made of the likelihood of particular trajectories of the oil spill. Stochastic modelling uses varied wind and current conditions compiled in a historical multi-year database of past conditions of the region, to evaluate the probable distribution of hydrocarbons in the event of a spill. The model is run many times with different random start time to represent time-varying conditions. A total of 25 simulation runs were modelled (also called “iterations” or “replicates”), and the results are summarized as a probability plot. The probability plot shows the extent and location of areas that could be reached by oil.

It may be noted that the spill modelling does not account for any spill response actions to minimise environmental impacts in the event of a spill.

### 2.2.4 *Modelling Process*

The generalized architecture for the model has several components that together form the overall process. This process describes what data are required, how they are used to define the model domain and simulation periods, the simulations, and the outputs. These components are:

- *Data* consists of spatial and temporally variable data and information specific to the project. These data include: bathymetry, shoreline, wind, currents, waves, air temperature, water temperature, volumetric proportions of the products, release rates, spill origin, and response scenarios.
- *Setup and diagnostics* include general data QA/QC, examination of transport potential to determine model domain and simulation period, and examination of test runs to refine model domain. This component also includes development of the computation grid from the spatial data.
- *Simulation* of water and spill movement and concurrent calculation of fate processes as the spilled material is dispersed and transported through the model domain over time and undergoes degradation and phase changes.

Fate processes include photo-oxidation, evaporation, dissolution, advection, dispersion, sedimentation, biodegradation, entrainment and emulsification. These processes are driven by the physical properties of the various spill products and environmental conditions, primarily water and air temperatures.

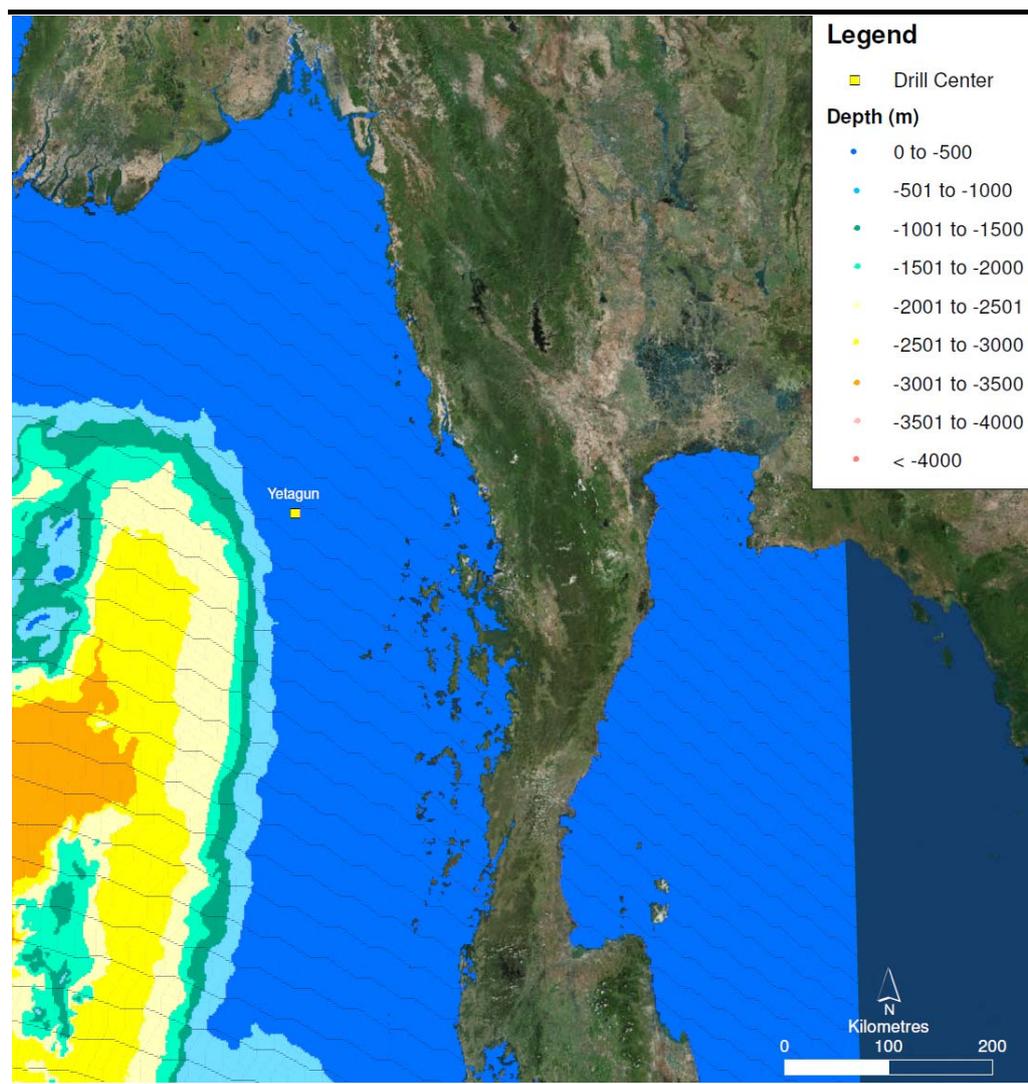
- *Output and processing* consists of slick thickness, travel time, DAH concentrations, etc. Depending on simulation mode (stochastic or deterministic) these outputs are then processed as probability tables, probability mapping, synoptic mapping, and time series mapping.

## 2.3 *MODEL SETUP*

### 2.3.1 *Bathymetry and Model Grid*

Bathymetry data from the public General Bathymetric Chart of the Oceans (GEBCO) was used for the entire model. The GEBCO bathymetry dataset is a global bathymetric grid with 30 arc-seconds spacing (*Figure 2.2*). The bathymetric data were interpolated to the model grids (i.e. 200 by 200 cells for drill cuttings and mud discharge; 475 by 565 cells for diesel spill). The water depth at the drill centre is around 100 m below mean sea level (MSL).

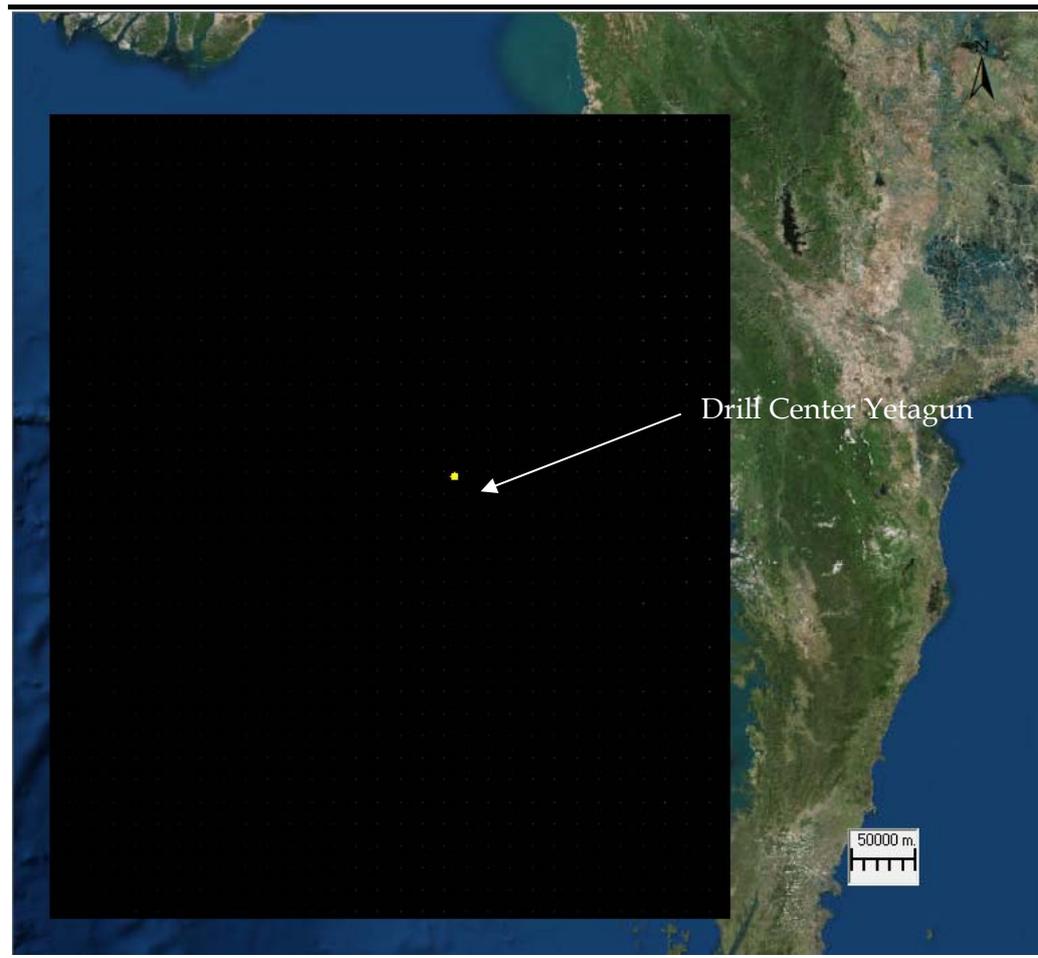
Figure 2.1 GEBCO Bathymetry within Study Area (IOC, et al, 2003) <sup>(1)</sup>



The COSIM model grid, as shown below in *Figure 2.3* represents the spatial extent for the spill analysis and covers an area of approximately 475 km by 565 km with a cell size of 1 km by 1 km. The extent of the grid allows all potential trajectories towards nearby shoreline to be encompassed. During the development of this model grid, model coverage was designed to elongate along the north-south axis (the dominant flow direction) provide more coverage for the potential shoreline oiling.

<sup>(1)</sup> IOC, IHO and BODC. 2003. "Centenary Edition of the GEBCO Digital Atlas", published on CD-ROM on behalf of the Intergovernmental Oceanographic Commission and the International Hydrographic Organization as part of the General Bathymetric Chart of the Oceans

Figure 2.2 Model Grid for Oil Spill Study



The GIFT model grid, as shown below in *Figure 2.4* represents the spatial extent for the drilling muds analysis and covers an area of approximately 10 km by 10 km with a cell size of 50 m by 50 m. The extent of the grid allows all potential trajectories to be encompassed.

Figure 2.3 Model Grid for Drilling Muds Modelling



### 2.3.2 Meteorological Data

Hourly air temperature data were obtained from the National Oceanographic Atmospheric Administration (NOAA) National Climatic Data Centre (NCDC) at Station Mergui of Myanmar. Station Mergui is located at 12.433°N, 98.600°E, approximately 200 km southeast to the Project site (Figure 2.5). It should be noted that there is another meteorology station (Dawei at 14.100°N, 98.217°E, about 187 km northeast) in the vicinity. The data at Dawei was not adopted even though it is closer to the drilling platform because the Dawei dataset contain much higher number of missing data.

Measured wind data at Station Mergui from 1<sup>st</sup> January 2008 to 31<sup>st</sup> December 2017 (10 years) were adopted for stochastic modelling for diesel spill modelling. Monthly wind rose plots for these years are provided below in Figure 2.6. Wind dominance in the southeast-northwest direction can be observed from January to May and from October to December. For the period from June to August, wind from southwest occurs frequently while wind from northwest becomes less frequent. The average wind speed in this period is over the year is 4.83 m/s, ranging from 2.24 m/s in September to 3.12 m/s in March.

The parameters used as input into the models were year, month, day, hour, wind direction, and wind speed.

Figure 2.4 Locations of Mergui and Dawei Stations in Myanmar

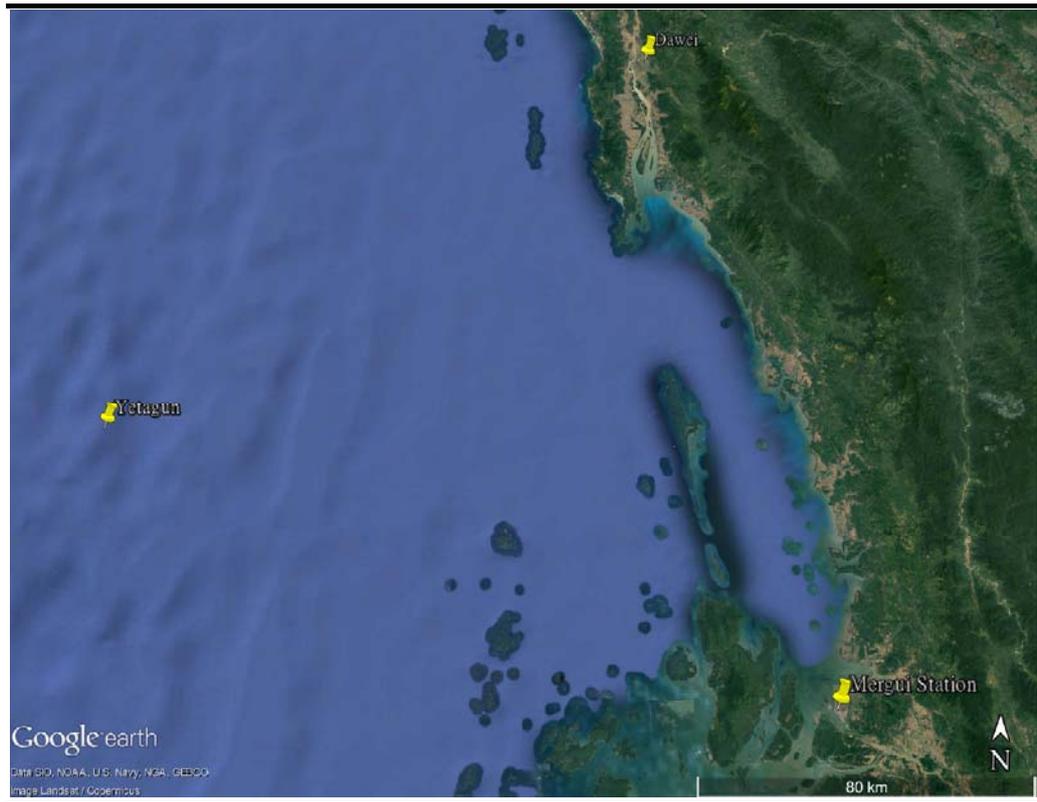
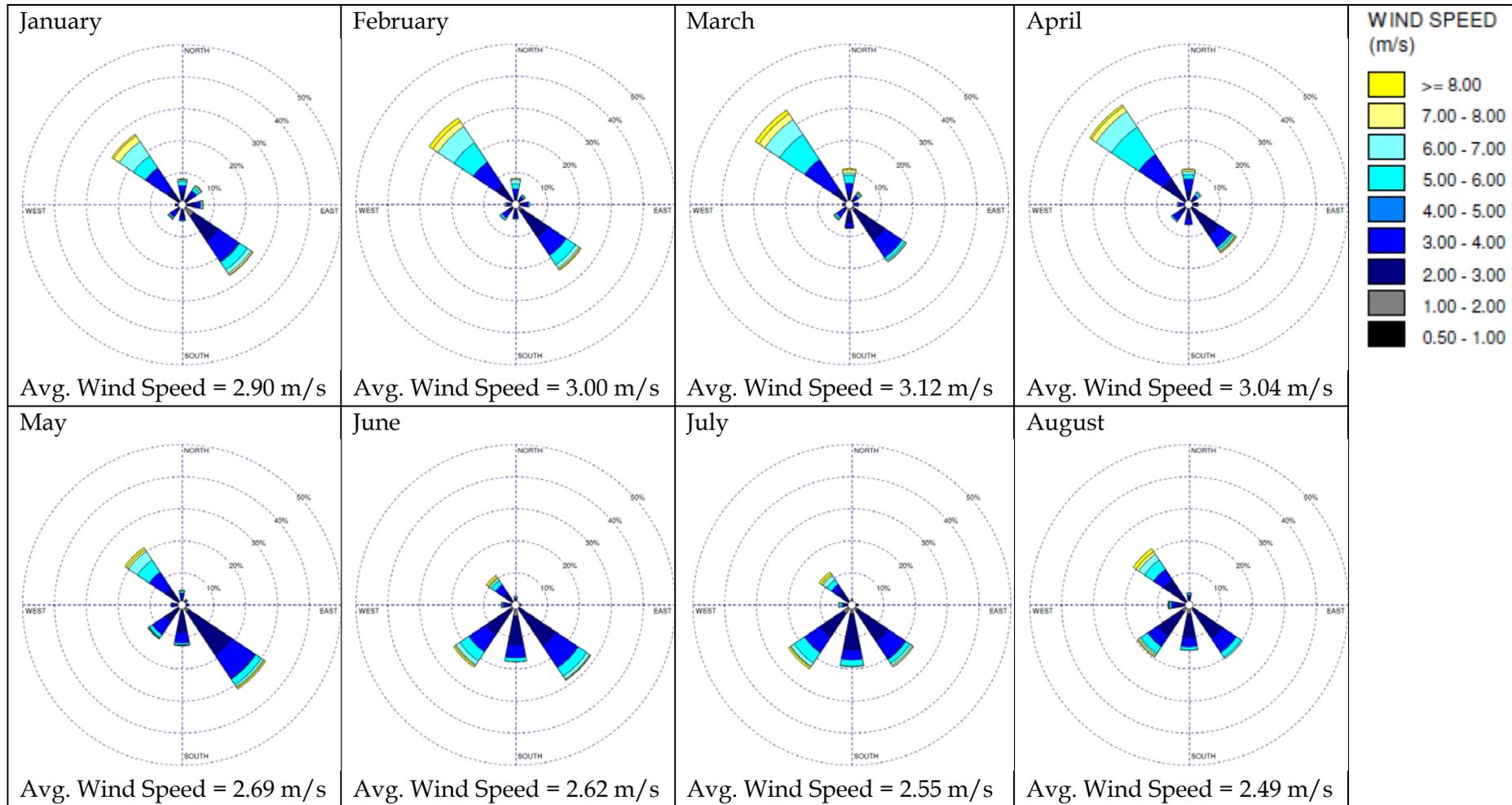
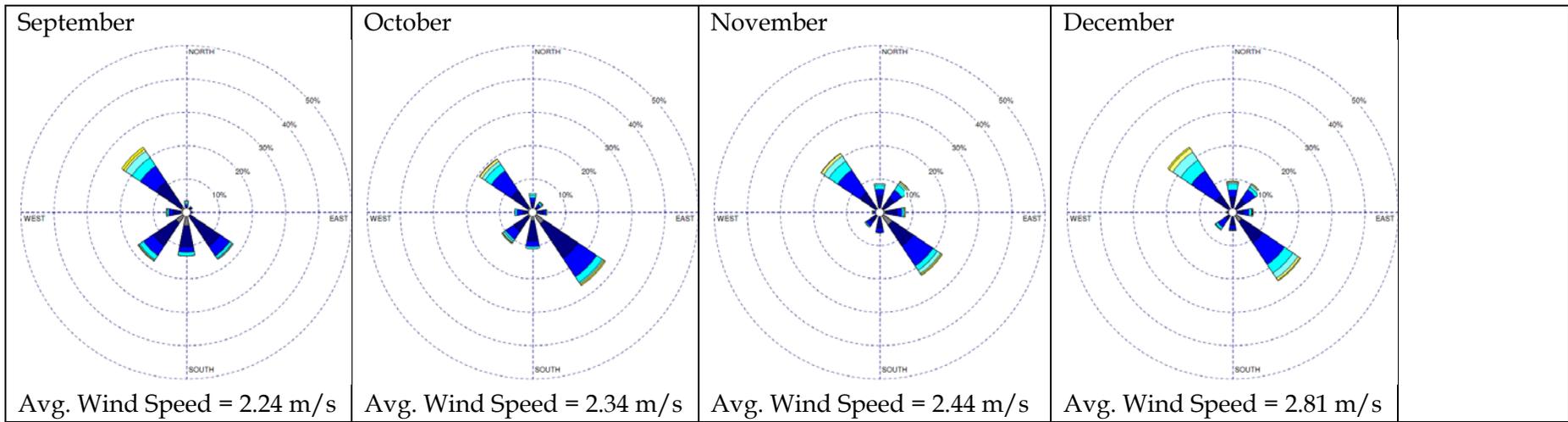


Figure 2.5 Wind Rose (Wind Direction from) at Mergui Station at Myanmar (2008-2017)





2.3.3

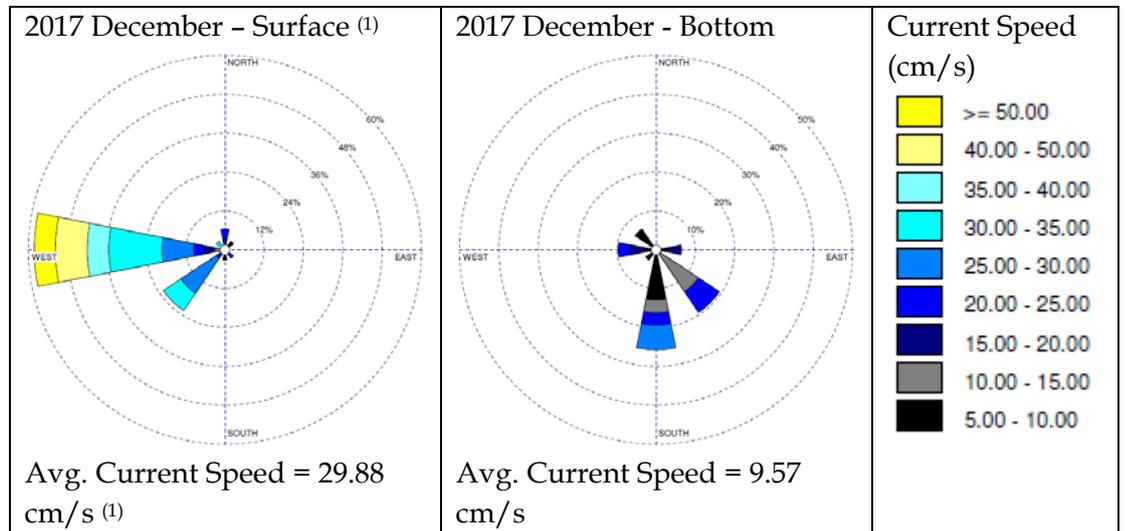
**Ocean Current Data**

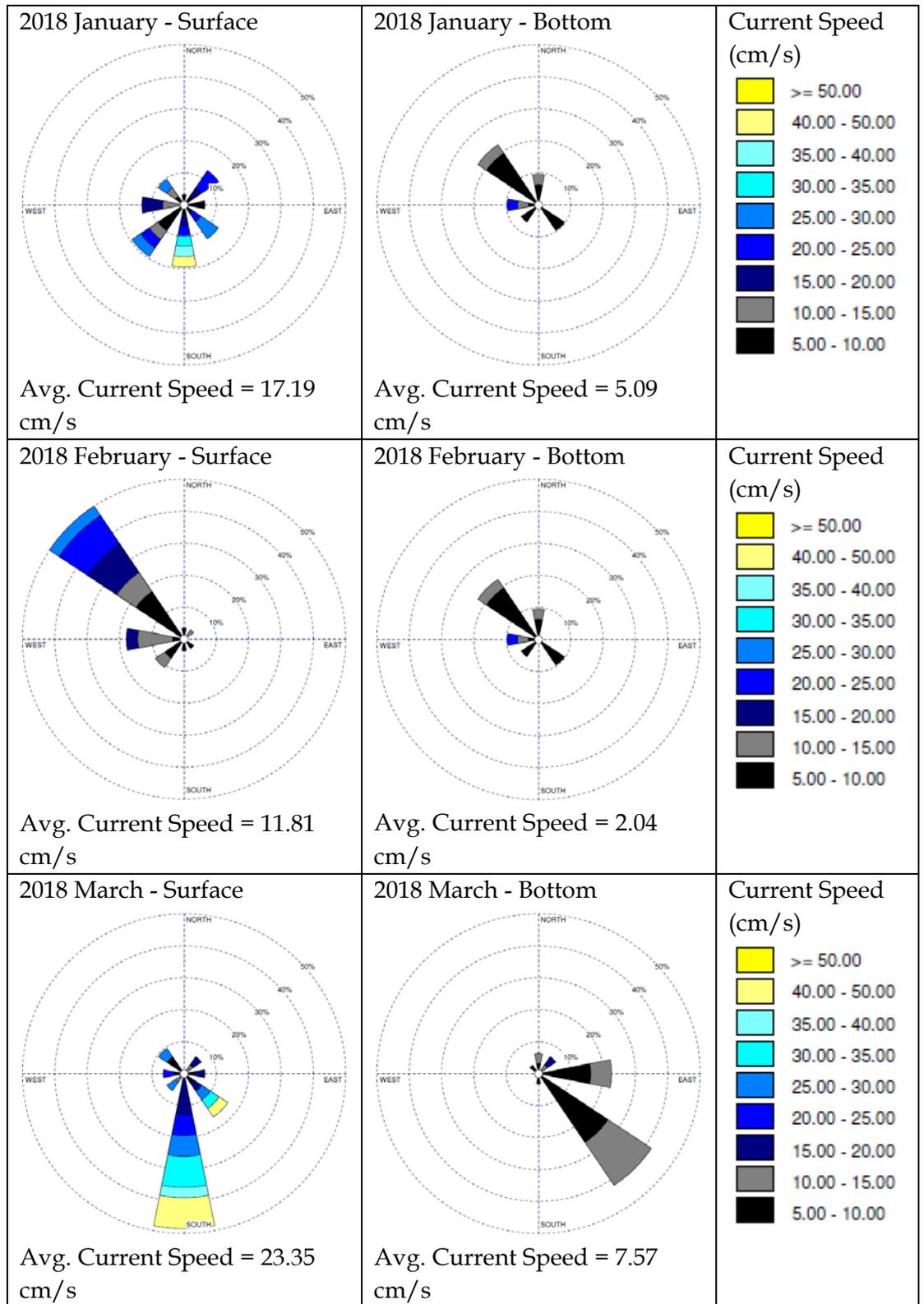
The Hybrid Coordinate Ocean Model (HYCOM) Consortium provides near real-time global ocean prediction system based on the HYCOM and the Navy Coupled Ocean Data Assimilation (NCODA). In the absence of direct current data collected from at Yetagun, depth-varying daily average currents (speed and direction), water temperature and salinity data were obtained from the publically available HYCOM + NCODA Global 1/12° Analysis (2008 - Present) through Asia Pacific Data Research Center (APDRC).

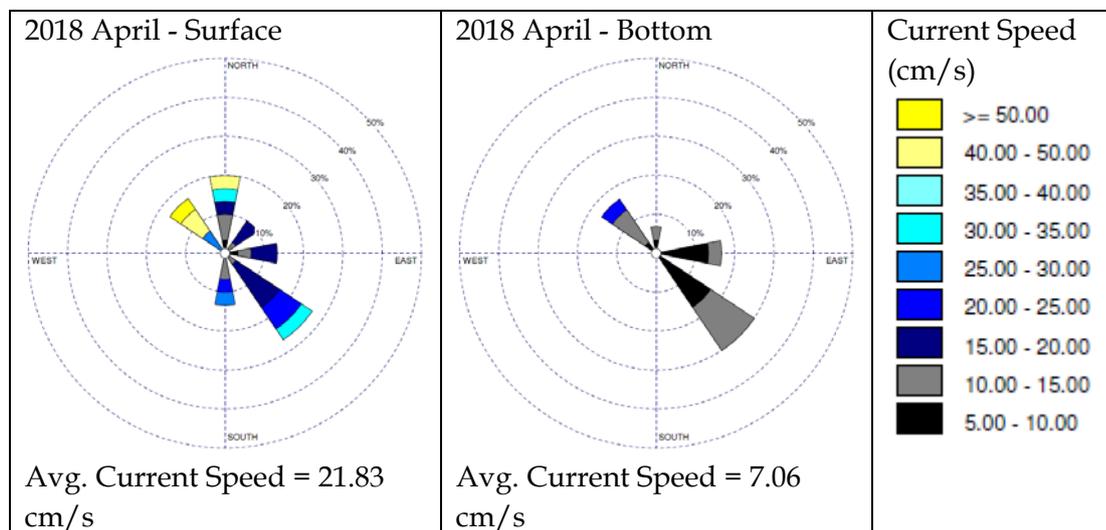
HYCOM currents were provided daily by time and every 1/12° longitude and latitude horizontally. Vertically, values are provided every 10 m from the surface to 25 m deep. Below 25 m, the spacing becomes increasingly larger, from 15 m to 50 m increments. Figure 2.6 present rose plots for surface and bottom current (flow direction and velocity) for 2017 December to 2018 April period (i.e. selected period for modelling), at the location of 13.1°N, 96.9°E, about 6.6 km northeast to the Project site that is available in the database.

Based on the HYCOM data, surface currents near Project site is dominated by flow towards south / west /northwest (away from Myanmar shoreline) in December, February and March. In January and April, there is no single dominant flow direction. For current near bottom, the current velocity is lower in general. The flow direction does not always align with the surface flow direction.

**Figure 2.6** *Rose Plot (Current Flow Direction) near Project Site - 2017 December to 2018 April*







Note: (1) The scale for percentage time occurrence for this plot is different from the rest because of dominant current to the west. Maximum for this plot is 60% while those for other plots are 50%.

### 2.3.4 Summary of Environmental Data

Modelling behaviour of spilled oil, cuttings and mud in oceanic environments requires consideration of both winds and currents. The influence of winds on ocean transport is primarily near the surface, and decreases exponentially with depth. The fate and transport of spilled diesel cuttings and mud in the water column below the surface are primarily a function of ambient ocean currents at those depths. Datasets for these forcing functions that represent conditions near Yetagun platform were obtained and used in the modelling effort. Both winds and currents datasets represent modelled conditions in the respective months stipulated in the modelling information request list agreed by the client (i.e. March and July for discharge of cuttings and mud; April and August for diesel spill). The current dataset varies with depth. The bathymetric data were obtained from the GEBCO database and bathymetric survey results provided by the Client.

## 2.4 DESIGN OF MODEL SCENARIOS

### 2.4.1 Summary of Model Scenarios

Diesel spill from a tank rupture during vessel collision and discharge of cuttings and synthetic-based mud close to seabed were investigated based on scoping of potential impacts as part of the EIA for the project. Hence one oil spill scenario and discharge of cuttings and synthetic-based mud close to seabed scenario were thus considered to assess the potential impacts from drilling at the Yetagun platform.

- 100 m<sup>3</sup> diesel spill from vessel collision; and
- discharge of 2,294 m<sup>3</sup> of drill cutting and 1,350 m<sup>3</sup> mud during 69 days of drilling of three exploratory wells.

The stochastic approach used for oil spill modelling was described in detail in *Section 2.2.3*. The stochastic approach requires that oil spill simulation consists of multiple model runs. In each of these runs (referred to as an “iteration”), the metocean conditions have been randomized. The simulation results are provided in a series of diagrams or tables that are probabilistic summaries of the iteration set.

*Table 2.1* and *Table 2.2* summarize detailed model inputs for each scenario.

**Table 2.1** *Model Input for Oil Spill Model Scenario*

Type of Release	Unit	Vessel collision
Amount of Oil Spilled	m <sup>3</sup>	75
Type of Oil	-	Diesel
Location of Release	Easting, Northing	13°2'57.563" 96°52'7.763"
Depth of Release	m (below sea surface)	Sea surface
Time of Release	dd/mm hh:mm:ss	January and April
Duration of Release	minutes	15

**Table 2.2** *Model Input for Discharge of Cuttings and Synthetic-based mud Scenario*

Item	Unit	
Total wells to be drilled	-	one
Please specify / describe any batch drilling operations	-	Single well
Location of Release	Easting, Northing	13°2'57.563" 96°52'7.763"
Water depth(s)	m	About 100
Time of Release	dd/mm hh:mm:ss	Mid Jan – Early Apr
Drill cuttings release amount	m <sup>3</sup>	2,294 (refer to <i>Table 2.3</i> below for amount discharged for each period.)
Drilling muds release amount	m <sup>3</sup>	1,350 (refer to <i>Table 2.3</i> below for amount discharged for each period.)
Discharge duration	day	69
Density	kg/m <sup>3</sup>	Drill Cutting: 2680; Synthetic-based mud: 1,078
Depth of discharge pipe below Mean Sea Level (m)	m	Varies
Discharge orientation (vertical or horizontal)	-	Vertically downward

**Table 2.3** *Modelled Schedule for Drilling Operation*

Date (YYYY/MM/DD)	Amount of Cuttings (m <sup>3</sup> )	Amount of Mud (m <sup>3</sup> )
-------------------	--------------------------------------	---------------------------------

<u>Well 1</u>		
2018/01/16 - 2018/01/19	87	100
2018/01/19 - 2018/01/22	292	350
2018/01/22 - 2018/01/29	326	0
2018/01/29 - 2018/02/03	74	0
2018/02/03 - 2018/02/08	4	0
<u>Well 2</u>		
2018/02/08 - 2018/02/11	87	100
2018/02/11 - 2018/02/14	229	350
2018/02/14 - 2018/02/21	284	0
2018/02/21 - 2018/02/26	222	0
2018/02/26 - 2018/03/03	11	0
<u>Well 3</u>		
2018/03/03 - 2018/03/06	87	100
2018/03/06 - 2018/03/09	292	350
2018/03/09 - 2018/03/16	199	0
2018/03/16 - 2018/03/21	70	0
2018/03/21 - 2018/03/26	30	0

#### 2.4.2

#### *Diesel Properties*

Components of a typical diesel fuel oil were taken from ERM's COSIM database of oil properties (*Table 2.4*). These include the BTEX monoaromatics, naphthalenes, methylcyclohexane, pentane, hexane, heptane, octane, indane, indene, and decalin. The values for the properties for each compound or group of compounds for diesel fuel were also obtained from ERM's COSIM database. COSIM calculates the fate and transport of each component of the oil separately. The total volume released is divided among each component group based on the mass proportions described in the assay. The mass proportions are converted into volumetric proportions based on each group's average density.

**Table 2.4 Properties of Standard Diesel**

Cut Name	Boiling point for distillation cut °C	% volume in liquid	Melting point for each distillation cut °C	Solubility at 25 °C (mg/l)	Molecular weight (g/mole)	Vapour pressure at 25 °C (Pascal)	Density (g/cm <sup>3</sup> )	Latent heat of liquid (KJ/Kg)	Cut Viscosity (cP)
BTEX	110.12	5.9	-45	1.290	103.98	6996.342	0.870	36.2	0.61
Indanes	207.60	4.1	-35.8	152.550	132.21	195.451	0.997	39.63	-
Indenes	182.37	1.8	-13.68	332.4	116.16	153.321	1.039	40.07	-
Naphthalenes	240.58	8.2	52.02	0.277	155.89	5.350	1.009	64.80	-
Biphenyls / acenaphthenes	279.05	2.6	81.85	0.123	154.21	2.156	1.032	66.09	-
Fluorenes / acenaphthylenes	298.05	1.4	114.85	0.027	187.26	0.124	1.120	76.40	-
Phenanthrenes	363.05	0.7	85.12	0.0093	206.28	0.00938	1.052	92.10	-
Paraffins	108.10	41.3	-72.25	0.430	106.05	22755.514	0.672	35.61	-
Cycloalkanes	100.74	34.	-89.75	0.479	99.94	7328.492	0.764	35.90	0.709

### 2.4.3 Particle Properties

Table 2.4 below shows the particle size distributions for cuttings and synthetic-based mud that are used for simulation. The particle size distribution for synthetic-based mud assumed based on previous modelling studies (1) (2) (3) (4) overseas.

**Table 2.5 Particle Size Distribution for Cuttings**

Classes	Sizes (microns)	Mass Fraction	Settling Velocity (cm/s)
1	500	0.10	2.6
2	1000	0.10	5.8
3	1500	0.60	14.0
4	2000	0.20	14.0

**Table 2.6 Particle Size Distribution for Synthetic-based mud**

Classes	Sizes (microns)	Mass Fraction	Settling Velocity (cm/s)
1	707.1	0.1	11.03
2	500	1.2	7.7
3	353.6	2.4	5.2
4	250	3.8	3.4
5	176.8	5.1	2.1
6	125	6.6	1.3
7	88.4	8.1	0.7
8	62.5	9.1	0.4
9	44.2	9.2	0.2
10	31.3	8.6	0.1
11	22.1	7.8	0.05
12	15.6	7.0	0.02
13	11	6.5	0.01
14	7.8	6.1	0.006
15	5.5	5.6	0.003
16	3.9	4.8	0.002
17	2.8	3.8	0.0007
18	2	2.5	0.0004
19	1.4	0.9	0.0002
20	1	0.59	0.0001
21	0.7	0.46	0.000050
22	0.5	0.28	0.000025
23	0.36	0.03	0.000010

(1) ERM – Siam (2007-8) Block G4-48c EIA Study

(2) ERM – Hong Kong (2011) Block B Vietnam Study

(3) ERM – Hong Kong (2011) Block 64-18 EIA Study

(4) ERM – Hong Kong (2014) Block 62/02, Yinggehai Offshore Exploration Drilling, Hainan, China ESHIA Study

**3.1 OIL SPILL MODELLING****3.1.1 Outputs of COSIM and Thresholds**

Oil spill modelling was performed to inform assessment of potential environmental impacts of a spill. The model calculated the spatial extent of areas within reach of exposure to hydrocarbons based on multiple spill trajectories, the maximum thickness of the surface slick, and the minimum time of travel. The model also calculated the maximum dissolved aromatic hydrocarbon (DAH) concentrations. *Table 3.1* summarizes the significance of these outputs and how they are applied to the overall risk assessment.

**Table 3.1 Outputs of COSIM**

<b>Output component</b>	<b>Importance of information</b>	<b>Potential use of information</b>
Geographic distribution and probability of contact slick	Understanding relative risk and extent of a spill event	Risk analysis and response planning
Geographic distribution of oil thicknesses	Understanding extent of significant oil mass per area and the smothering effects on biota	Response planning and ecological effects
Probability of shoreline impact and time to impact	Understanding risk to coastal receptors and extent of shoreline response	Risk analysis and response planning (clean-up extent after impact)
Travel time	Assist in spill response planning to understand the range of times when oil may contact sensitive locations	Response planning (time to intercept before shoreline impact)
DAH concentrations	Dissolved fractions present a different risk and response issue than solid and free liquid product forms and have implications for aquatic life	Aquatic toxicity assessment and ecological risk

Modelling outputs are provided with reference to thresholds for:

- Surface oiling thickness
- Dissolved aromatic hydrocarbons

For surface oiling (i.e. floating slicks), a threshold of 0.04 µm oil thickness was adopted. This threshold is considered to be highly conservative for delineating areas potentially exposed to surface slicks and represents the thickness of floating oil that may be visible on the water surface. A silvery sheen appears

at thicknesses between 0.04 µm to 0.3 µm based on recommended values from the 2006 Bonn Agreement Oil Appearance Code <sup>(1)</sup> (*Table 3.2*).

The area affected by visible oil, which might trigger social or economic impacts will be larger than the area where biological impacts might be expected. The minimal thickness of surface oil that might result in harm to seabirds through ingestion from preening of contaminated feathers, or loss of thermal protection of feathers has been estimated by different researchers at approximately 10 µm<sup>(2)</sup> and 25 µm<sup>(3)</sup>. Hence a 10 µm thickness threshold is likely a conservative threshold in terms of potential harmful effects to seabirds.

**Table 3.2** 2006 BONN Agreement Oil Appearance Code

Code	Description - Appearance	Layer Thickness Interval (µm/micron)
1	Sheen (silvery/grey)	0.04 to 0.3
2	Rainbow	0.3 to 5.0
3	Metallic	5.0 to 50
4	Discontinuous true oil colour	50 to 200
5	Continuous true oil colour	200 to more than 200

Modelling outputs for dissolved aromatic hydrocarbons (the toxic soluble component that is responsible for most toxicity in water-oil mixtures) are presented with reference to 50 ppb threshold concentrations.

Toxicity thresholds for aromatics are found in the literature in terms of a 96-hour LC50 (i.e., the concentration in which 50% of test organisms die after exposure to constant conditions over a 96-hour period). According to ANZECC and ARMCANZ (2000) <sup>(4)</sup> and French (2000) <sup>(5)</sup>, dissolved aromatic 96-hour LC50 value ranges between 100 to 1,000 ppb.

(1) The Bonn Agreement Oil Appearance Code, Annex A of the Bonn Agreement Surveillance Handbook, 2004. The full handbook can be downloaded from the Bonn Agreement website: <http://www.bonnagreement.org/eng/html/welcome.html>

(2) French, D.P. 2000. Estimation of Oil Toxicity Using an Additive Toxicity Model. In Proceedings, 23rd Arctic and Marine Oil Spill Program (AMOP) Technical Seminar, June 14-16, 2000, Vancouver, Canada, Emergencies Science Division, Environment Canada, Ottawa, ON, Canada

(3) Koops et al 2004 Use of dispersants in oil spill response to minimise environmental damage to birds and aquatic organisms. Paper presented at Interspill 2004, 14-17 2004.

(4) ANZECC & ARMCANZ. 2000. Australian and New Zealand guidelines for fresh and marine water quality. October 2000. National Water Quality Management Strategy Paper No. 4, Australian and New Zealand Environment and Conservation Council & Agriculture and Resource and Management Council of Australia and New Zealand, Canberra, Australia.

(5) French, D.P. 2000. Estimation of Oil Toxicity Using an Additive Toxicity Model. In Proceedings, 23rd Arctic and Marine Oil Spill Program (AMOP) Technical Seminar, June 14-16, 2000, Vancouver, Canada, Emergencies Science Division, Environment Canada, Ottawa, ON, Canada.

50 ppb of DAH is taken as an average 96 hr LC50 value for 95% of the aquatic organisms tested (including species exposed during sensitive life stages) <sup>(1) (2)</sup>. This is considered a conservative threshold, as the exposure of marine flora and fauna to marine diesel is expected to be less than 96 hours, given the rapid evaporation rates, dispersal and dilution of diesel in the marine environment.

Mass balance plots are also presented in order to illustrate the fate of the oil as time-varying percentages of the total mass for the five primary phases: surfaced oil, dissolved oil, entrained oil (whole oil droplets suspended in the water column), and the mass of oil evaporated or volatilized to the atmosphere. The mass balance plots are taken from individual iterations, but the rates of evaporation, dissolution, and entrainment will be similar between iterations.

### 3.1.2 *COSIM Results*

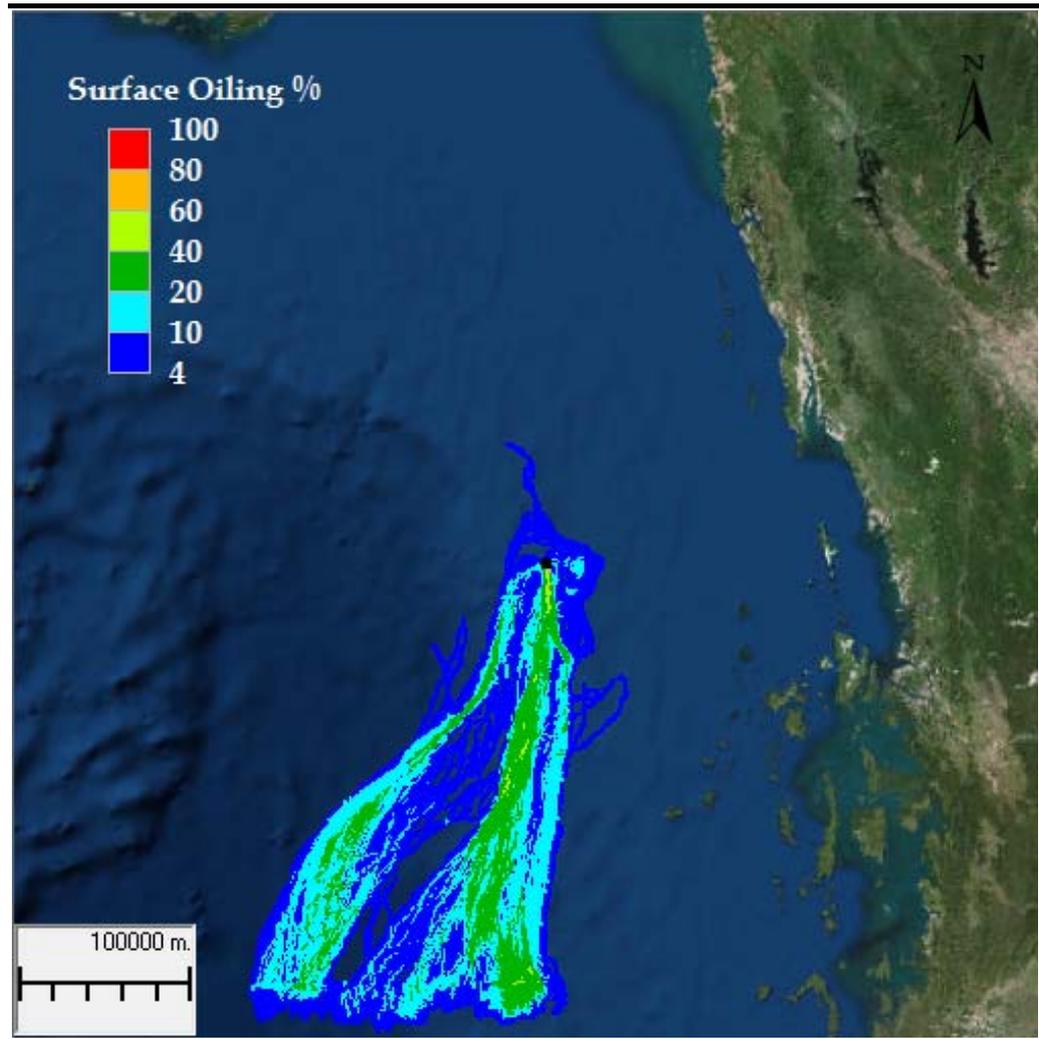
In oil spill modelling, 100 m<sup>3</sup> of diesel was released at the sea surface within 15 min from the vessel collision location.

*Figure 3.1* and *Figure 3.2* show the likelihood of surface oil at any concentration reaching locations during the two week simulation including below visible concentrations (<0.04 µm). A 100% probability contour near the release centre is a region where every simulation showed that oil travelled over that location on the surface at least once. If a region is coloured 20% probability, that means one-fifth of the simulations showed a trajectory which pass through that region. The resulting oil trajectory was generally towards the south or southwest in both January and April.

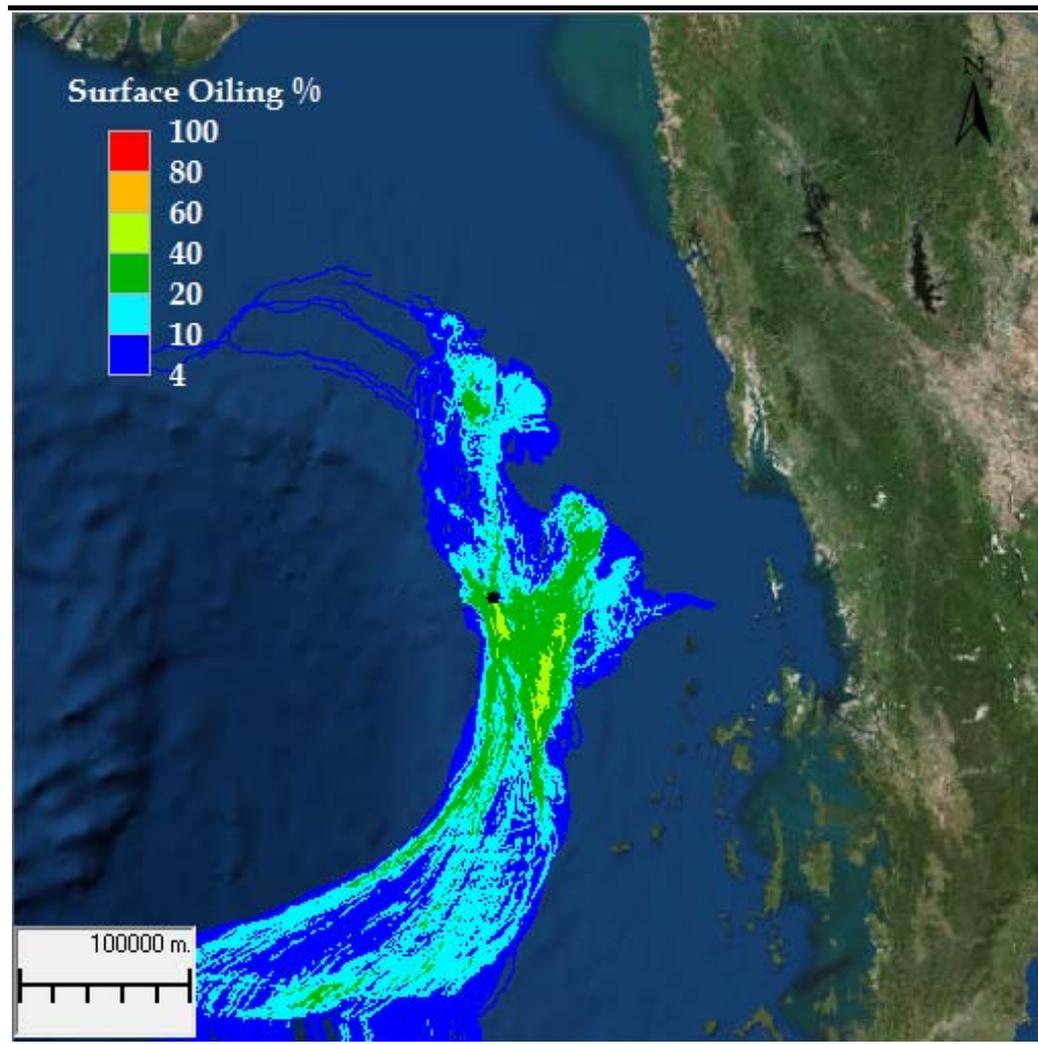
(1) French-McCay, D. P. 2002. Development and Application of an Oil Toxicity and Exposure Model, OilToxEx. *Environmental Toxicology and Chemistry*. 21 (10), 2080-2094

(2) French-McCay, D.P, 2003. Development and application of damage assessment modelling: example assessment for the North Cape oil spill. *Marine Pollution Bulletin* 47, 9-12.

Figure 3.1 Likelihood (%) of Exposure to Surface Oil at any Concentration from a 15 Minute 100 m<sup>3</sup> Diesel Surface Spill in January

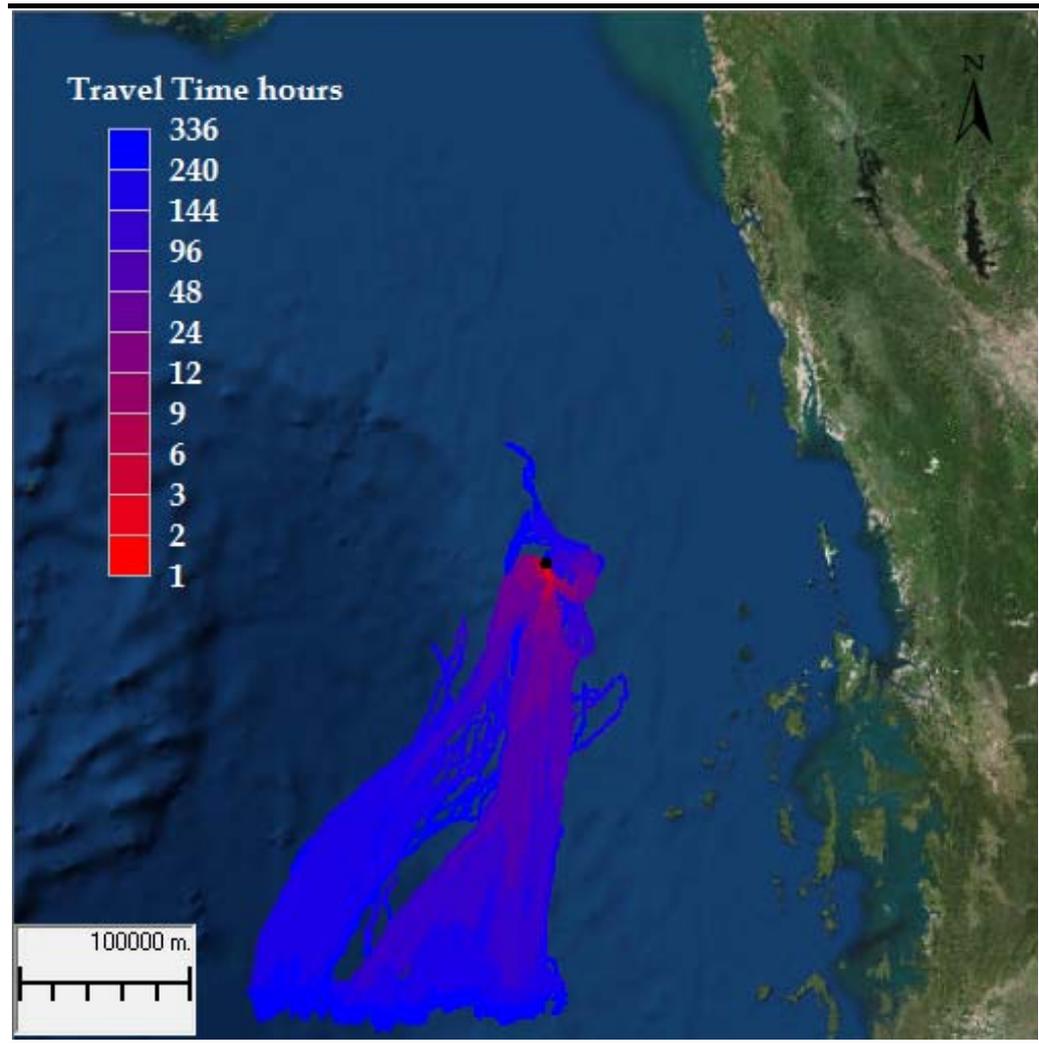


**Figure 3.2** *Likelihood (%) of Exposure to Surface Oil at any Concentration from a 15 Minute 100 m<sup>3</sup> Diesel Surface Spill in April*

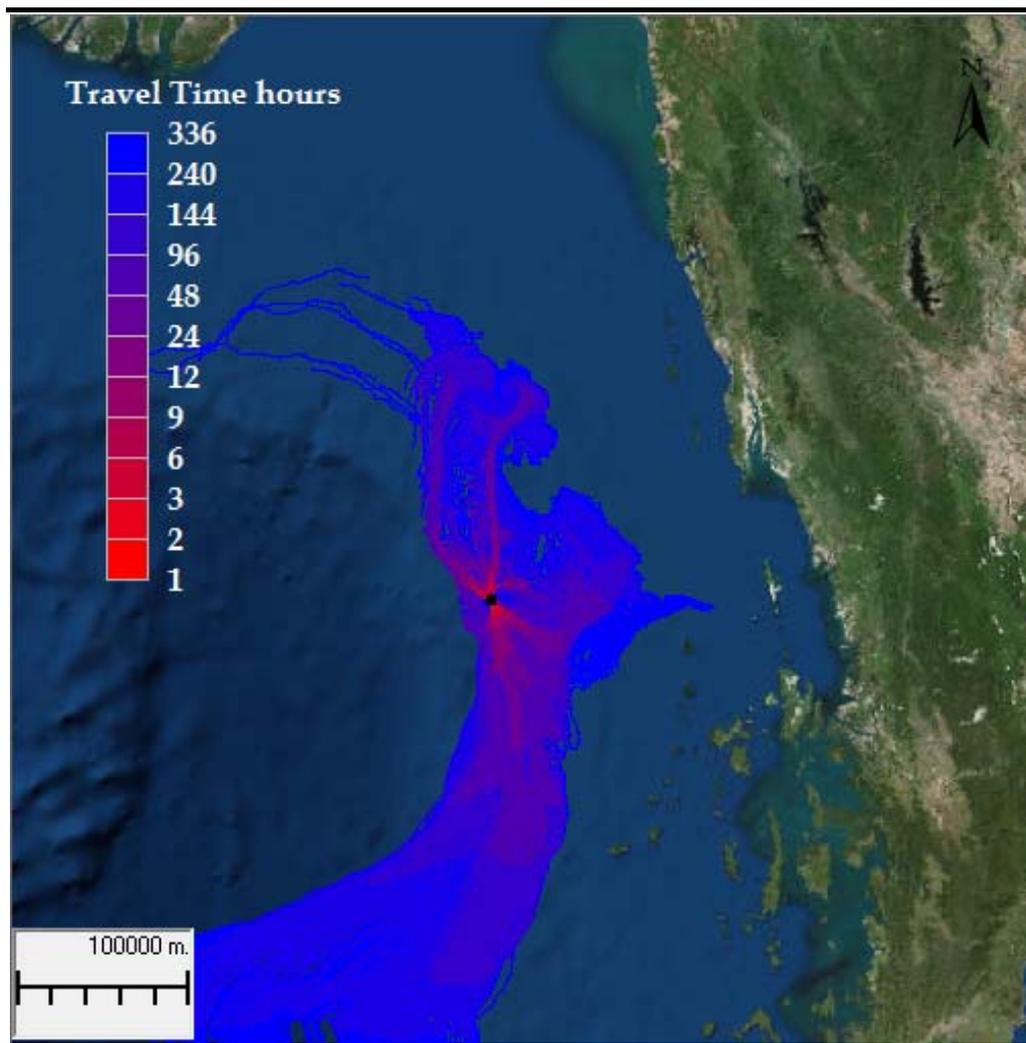


The model predicted the maximum distance for surface oil to travel in 2 weeks (demarcated by 4% probability contour) is over 130 km from release location for both spill in January and April. The model indicated surface oil travels approximately 41 km after one day of simulation and travel up to approximately 300 km after 14 days (*Figure 3.3* and *Figure 3.4*).

Figure 3.3 Minimum Time (Hours) to Exposure to Surface Oil at any Concentration in the Event of a 15 Minute 100 m<sup>3</sup> Diesel Surface Spill in January



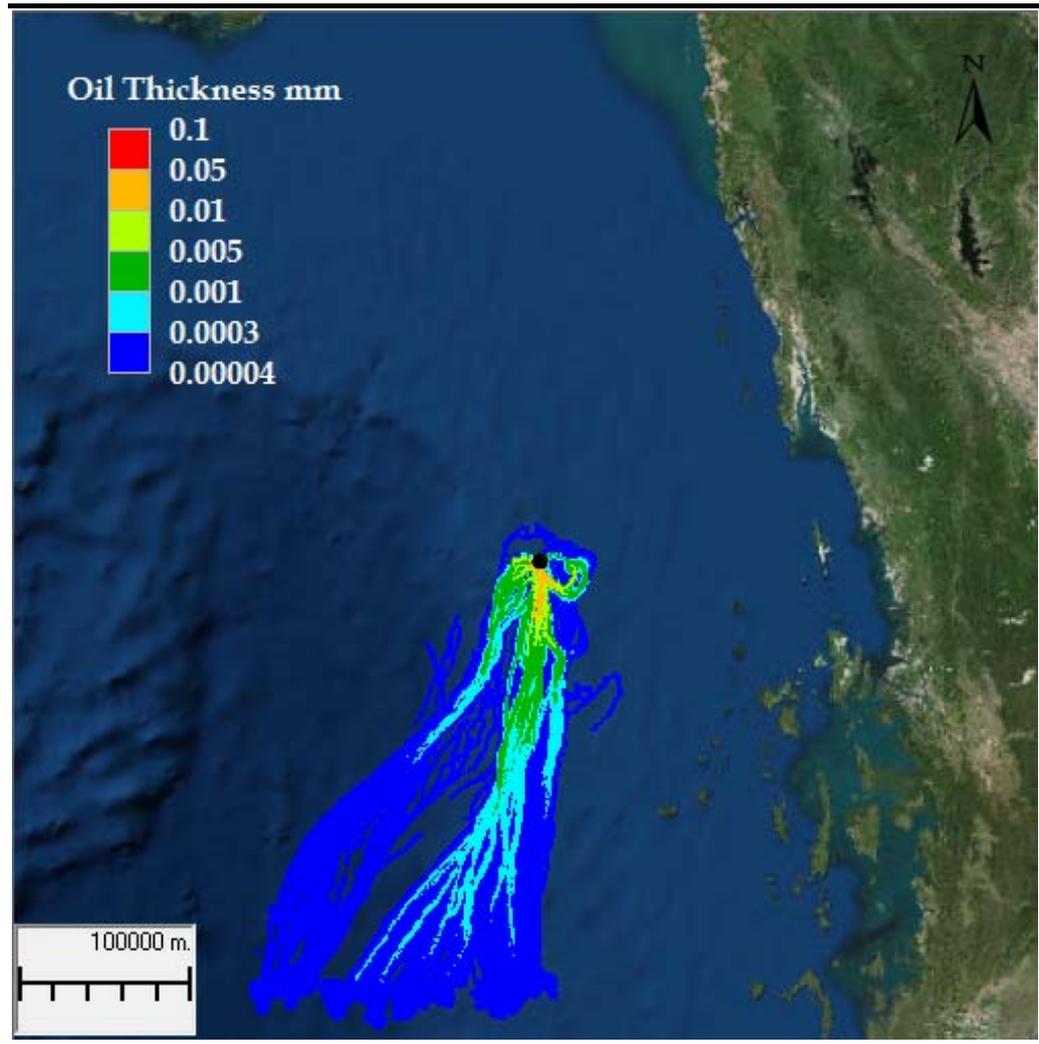
**Figure 3.4** *Minimum Time (Hours) to Exposure to Surface Oil at any Concentration in the Event of a 15 Minute 100 m<sup>3</sup> Diesel Surface Spill in April*



Over the simulation period, the model indicated surface oil is predicted to stay offshore and will not reach shoreline in the 14-day modelling period. *Figure 3.5* and *Figure 3.6* show the maximum thickness of surface slicks based on the combined stochastic results. Results of the model indicate no surface oiling at level which would impact seabirds nor be visible would occur nearshore in both January and April. Oil patches were predicted to be over 60 km away from the mainland Myanmar and over 40 km away from other islands in January. For spill in April, oil patches were at least 57 km away from the mainland Myanmar and about 17 km away from other islands.

*Figure 3.5* and *Figure 3.6* also indicate locations within reach of surface oil thickness above the 10  $\mu\text{m}$  (i.e. 0.01mm) threshold for oiling impacts to seabirds are confined to offshore areas up to as far as approximately 40 km away from the release site in January and 27 km away in April. The model indicated the area within reach of exposure to surface oil that might be harmful to seabirds is 158 km<sup>2</sup> and 456 km<sup>2</sup> respectively in January and April.

Figure 3.5 Maximum Thickness (mm) of Surface Oil in the Event of a 15 Minute 100 m<sup>3</sup> Diesel Surface Spill in January



**Figure 3.6** *Maximum Thickness (mm) of Surface Oil in the Event of a 15 Minute 100 m<sup>3</sup> Diesel Surface Spill in April*

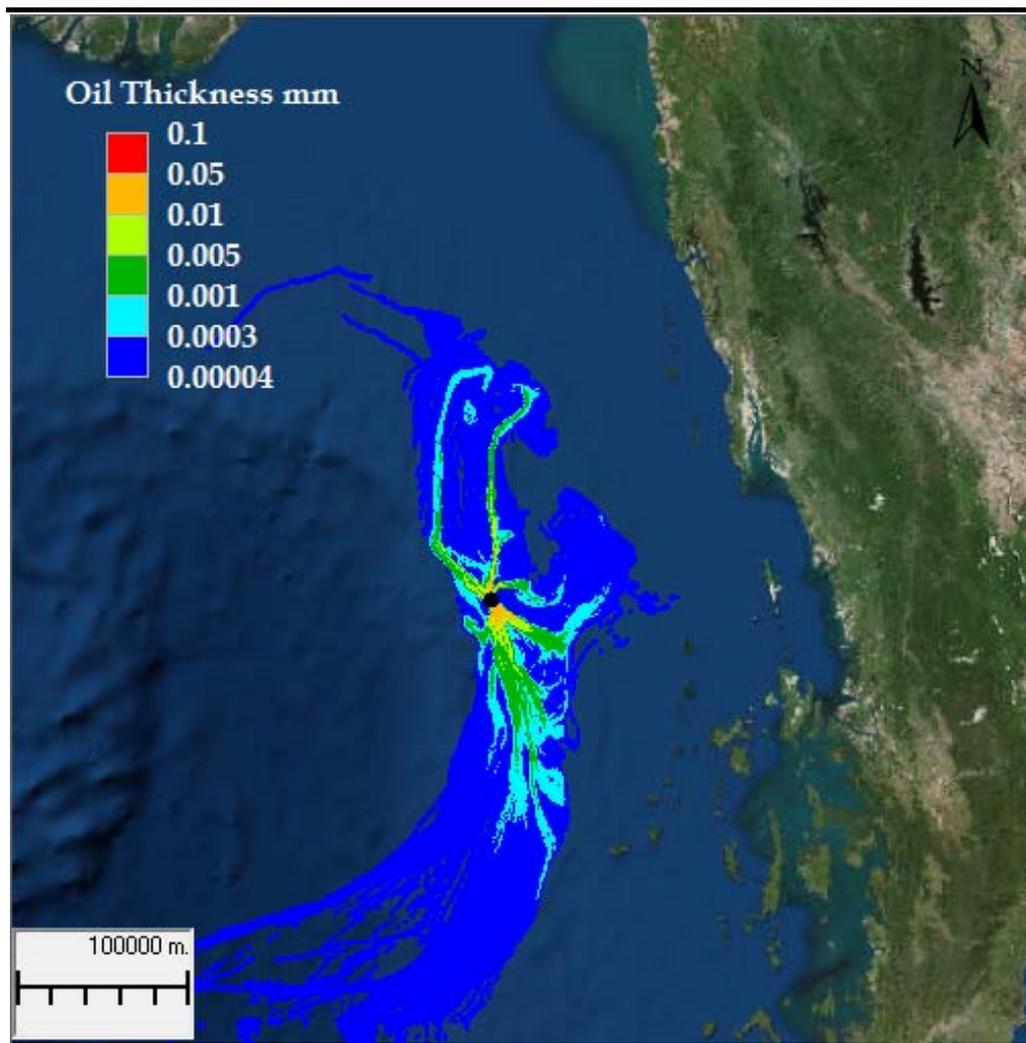


Figure 3.7 and Figure 3.8 show maximum instantaneous DAH concentrations. Those are maximum instantaneous DAH at each location at any given time based on combined results from 25 release simulations. A threshold value of 50 ppb was included in plotting the results.

Table 3.3 summarizes the areas with aromatic concentrations greater than the 50 ppb threshold, which is 1,163 km<sup>2</sup> in January and 1,989 km<sup>2</sup> in April. It is noted that the reported concentrations are instantaneous maxima. The figures illustrate the locations that have the potential to be exposed to the instantaneous maximum concentrations above the threshold concentration. The areas predicted are not the region affected by a single spill event or long term exposures to the concentrations above the threshold.

The actual area exposed in the event that this scenario occurred would be considerably smaller but generally within this envelope and would be dependent on the prevailing wind and current conditions at the time.

Figure 3.7 Maximum Dissolved Aromatics Concentrations in ppb in the Event of a 15 Minute 100 m<sup>3</sup> Diesel Surface Spill in January

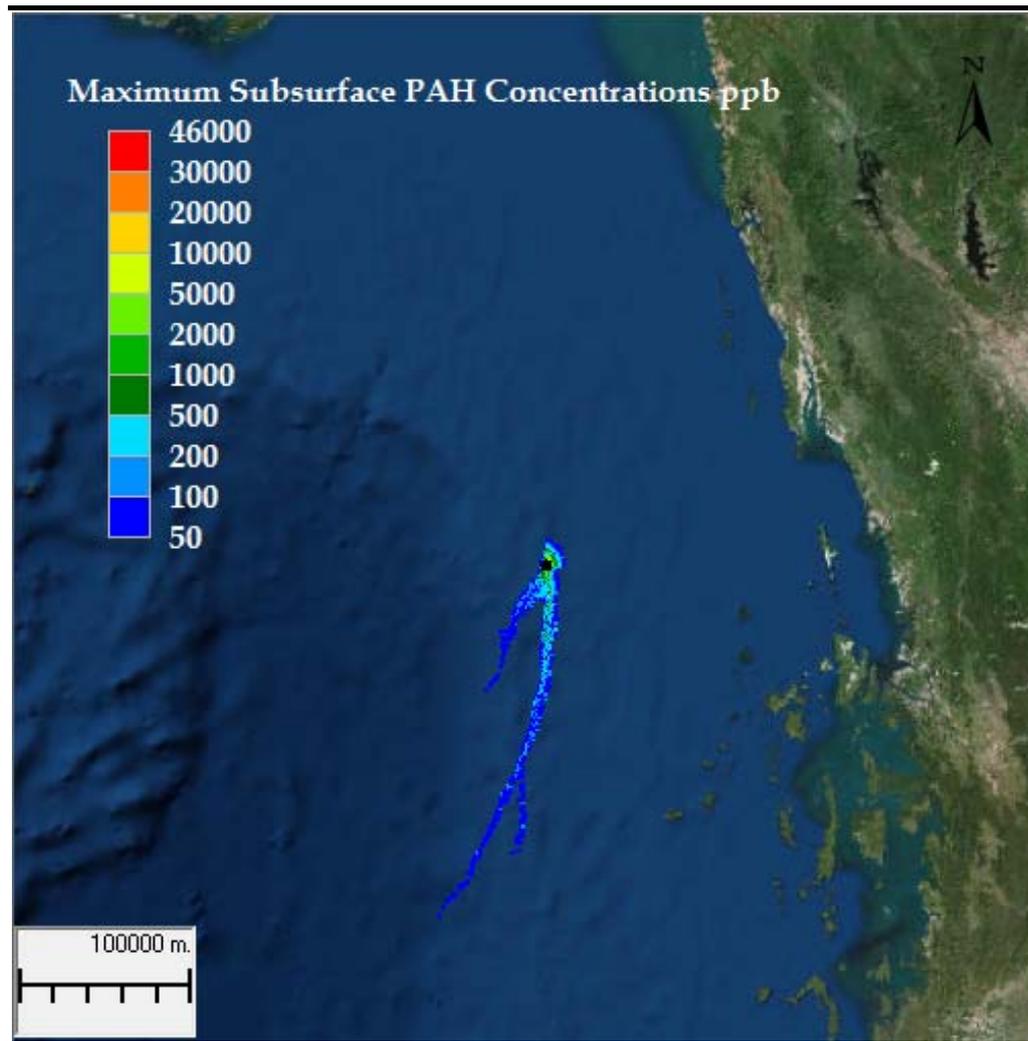
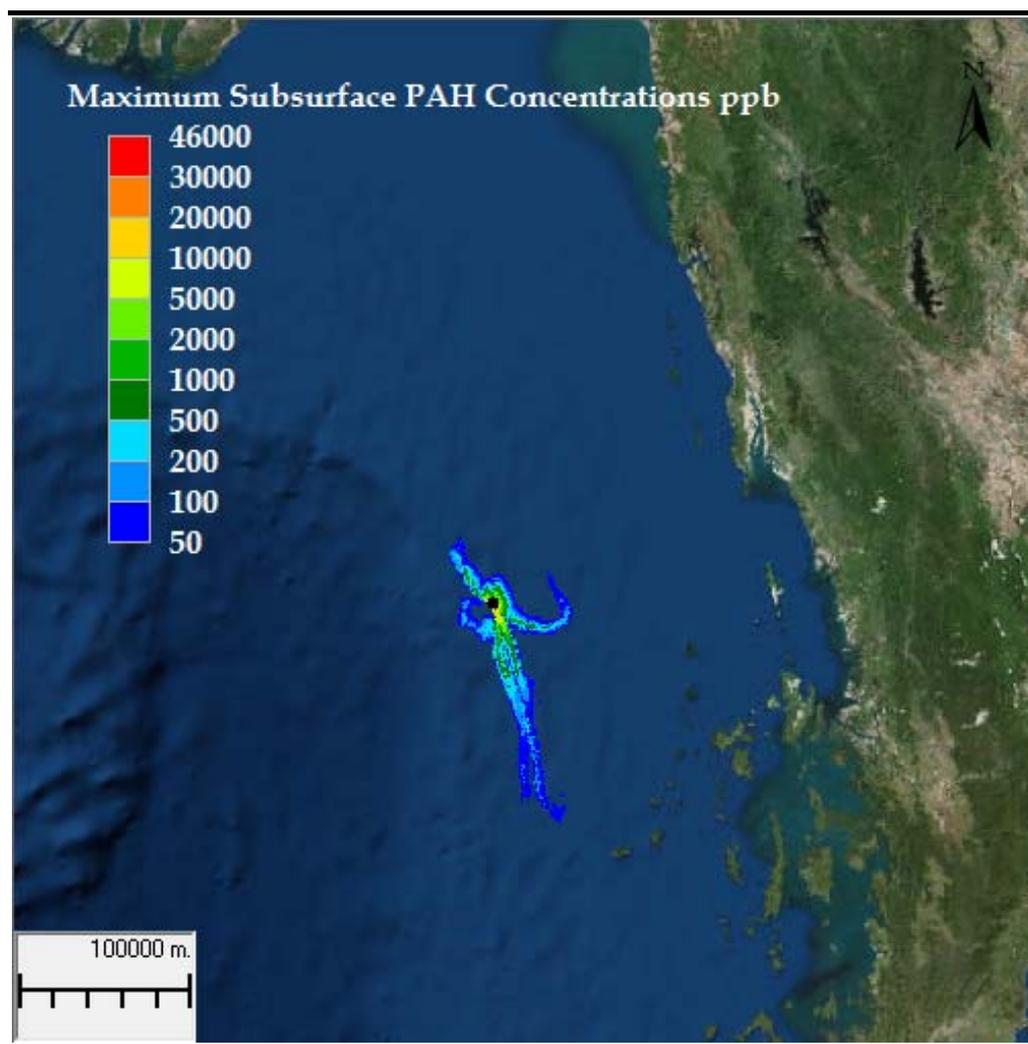


Figure 3.8 Maximum Dissolved Aromatics Concentrations in ppb in the Event of a 15 Minute 100 m<sup>3</sup> Diesel Surface Spill in April



Averaged mass balance for all iterations is shown in Figure 3.9 and Figure 3.10, which is a summary of mass balance from individual iterations. The label "Surface" denotes the mass that is on the water surface as surface slick. "Entrained" is for the mass that has been entrained from the surface but is not dissolved. "Shoreline" is for the mass that has contacted shoreline. It can be zero if there is no shoreline contact. "Evaporated" is for the mass that has evaporated from the water surface. "Dissolved" is for the mass that has dissolved into the water column. The entraining effect of winds and waves caused the variability in these plots. During times of strong winds, there will be an increase in the amount dissolved mass simultaneous with a decrease in the amount of mass floating on the surface.

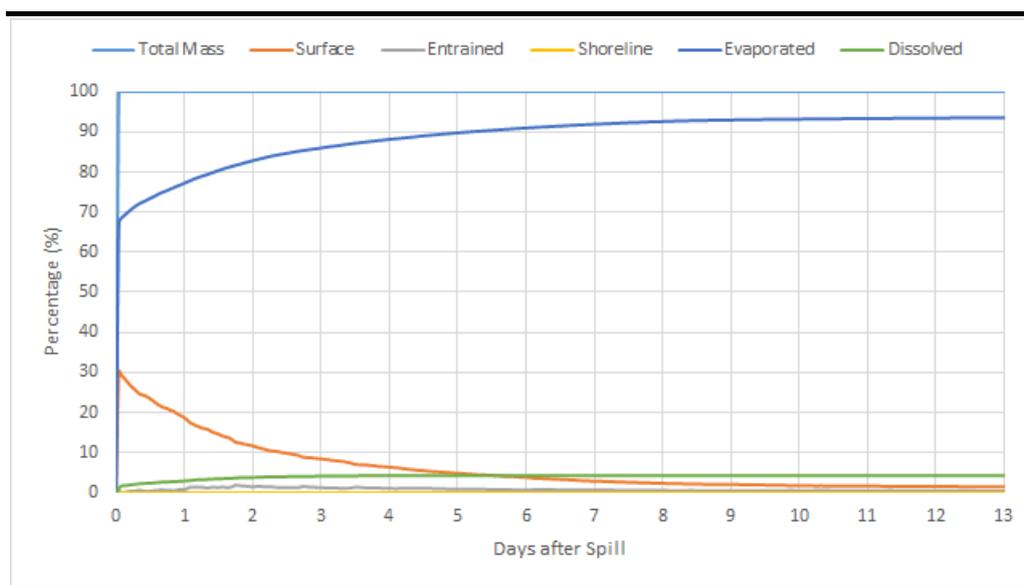
In general, the surface oil represents approximately 19% and 17% of the mass 24 hours after the release respectively in January and April. Two days after the release has ended, this surface proportion decreased to 12% and 11% respectively. In two weeks after the release has ended, up to 94% and 91% of the diesel would be lost to the atmosphere through evaporation, resulting in

minimum (1.4% for January 1.3% for April) remaining on surface, less than 8% dissolved in water and less than 1% entrained in water in droplet form. In the model, the biodegradation process was conservatively assumed to be zero; however, the oil compounds remaining in the water column would breakdown with half-lives in the range of days to weeks, depending on the complexity of the molecule and the presence of the necessary hydrocarbon-consuming bacteria.

**Table 3.3 Oil Spill Results Summary**

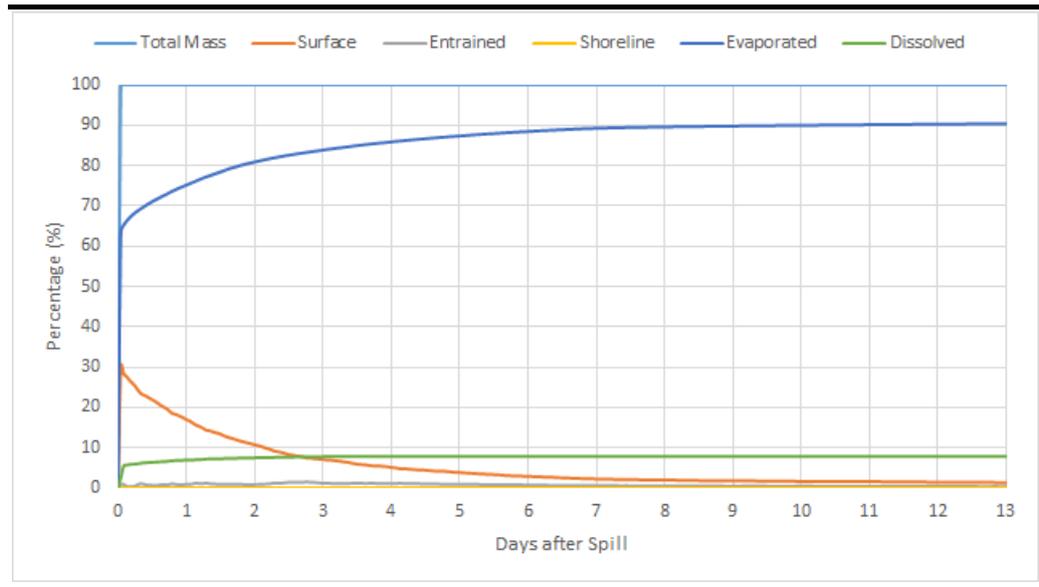
Composition	January	April
Total Shoreline Exposed to Surface Oiling (km)	0	0
Minimum Travel Time to Reach Shoreline (day)	No shoreline oiling predicted	No shoreline oiling predicted
Zone of Potential Visible Surface Oiling (>0.04 µm) (km <sup>2</sup> )	27404	40310
Zone of Potential Surface Oiling with harmful effect on seabirds (>10 µm) (km <sup>2</sup> )	158	456
Maximum Instantaneous Oil thickness (mm)	0.1053	0.1053
Max. Instantaneous Dissolved Aromatics (ppb)	29128	40945
Zone with Potential for Exposure to Dissolved Aromatic Concentrations above 50 ppb (km <sup>2</sup> )	1163	1989

**Figure 3.9 Mass Balance - January Runs Average**



Note: No shoreline oiling was predicted.

Figure 3.10 Mass Balance - April Runs Average



Note: No shoreline oiling was predicted.

## 3.2 DRILLING MUDS MODELLING

### 3.2.1 Output of GIFT and Thresholds

As the model is able to track sediment to mass per area (thickness) that are lower than biologically significant levels, the sediment deposition thickness plots have been set to a minimum reporting thickness of 0.3  $\mu\text{m}$  (0.0003 mm).

Similarly, a minimum reporting value of sedimentation rate of 1  $\text{mg}/\text{cm}^2/\text{day}$  was selected. A conservative minimum reporting value of 1  $\text{mg}/\text{L}$  for Total Suspended Solids (TSS) concentrations has been used to present the results, which is below background concentration of 2-3  $\text{mg}/\text{L}$  in regions with low natural TSS concentrations.

The results of the modelling are illustrated as contour plots. The contour plots represented maximum sedimentation rates ( $\text{mg}/\text{cm}^2/\text{day}$ ), maximum deposition thickness (mm) on seabed, and maximum TSS concentration ( $\text{mg}/\text{L}$ ) over the full modelling simulation period. All predicted parameters are the increment above ambient values.

### 3.2.2 GIFT Results

The following section presents the findings for the modelled drill cuttings and SBM discharge scenario from mid-January to early-April. It may be noted that apart from the effect of the currents, important factors determining the modelling outcomes include particle size distribution of the released cuttings and muds as well as the height above the seabed (i.e. water depth) at which the releases occur. In the model, the speed at which particles settle to the seabed is determined by their size. The model takes into account that smaller particles have a slower settling velocity, which exposes them for a longer time to ambient current forcing allowing them to be transported for further distances in the direction of the prevailing current. In contrast, larger, heavier particles may settle sooner meaning they are likely to settle closer to the release location. Similarly, the height of the release above the seabed also affects the outcome of the modelling. Self-evidently, a particle of a particular size that is released higher in the water column will take longer to settle to the seabed than the same sized particle released closer to the seabed. In this way, particles that are released higher above the seabed will be exposed for a longer time to ambient current forcing allowing them to be transported for further distances by the prevailing current.

Modelling results for the discharge of cuttings (total 2,294  $\text{m}^3$ ) and mud (total 1,350  $\text{m}^3$ ) at the Yetagun platform in mid-January to late March are summarized in *Table 3.3* and illustrated in *Figure 3.11 - Figure 3.13*.

**Table 3.4** *Modelling Results for Discharge of Cuttings cuttings (total 2,294  $\text{m}^3$ ) and mud (total 1,350  $\text{m}^3$ ) at Yetagun platform*

Parameter	March
Maximum Sedimentation Rate ( $\text{mg}/\text{cm}^2/\text{day}$ )	8532

Parameter	March
Location of Maximum Sedimentation Rate (m)	Drill Center
Seabed Area affected for Sedimentation Rate > 1 mg cm <sup>-2</sup> day <sup>-1</sup> (km <sup>2</sup> )	2.128
Maximum Deposition Thickness (mm)	1139
Location of Maximum Deposition Thickness (m)	Drill Center
Seabed Area affected for Thickness > 0.3μm (km <sup>2</sup> )	10.00
Maximum TSS concentration (mg/L)	481.93
Location of Maximum TSS Concentration (m)	About 360 m Southwest of Drill Center, Close to seabed

The results indicated maximum sedimentation and deposition would remain close to the drill center in both seasons. Modelling results indicate that the concentrations of suspended mud particles will decrease over distance from the drilling location and over time, reducing to below 1 mg/L within a maximum of approximately 4 km southeast of the release site. The maximum TSS concentration predicted during the cuttings and mud discharge is about 481.93 mg/L at about 360 m southwest of the drill center and near seabed level. The predicted maximum TSS concentration for cuttings and mud discharge modelled is shown in *Figure 3.11*. It is also important to note that the TSS concentrations shown in *Figure 3.11* reflects the maximum concentration at any one time over the entire simulation period and should not be interpreted as an instantaneous concentration (i.e. at a snapshot in time).

*Figure 3.11 Predicted Maximum Total Suspended Solids Concentration for Cuttings and Mud Discharge*

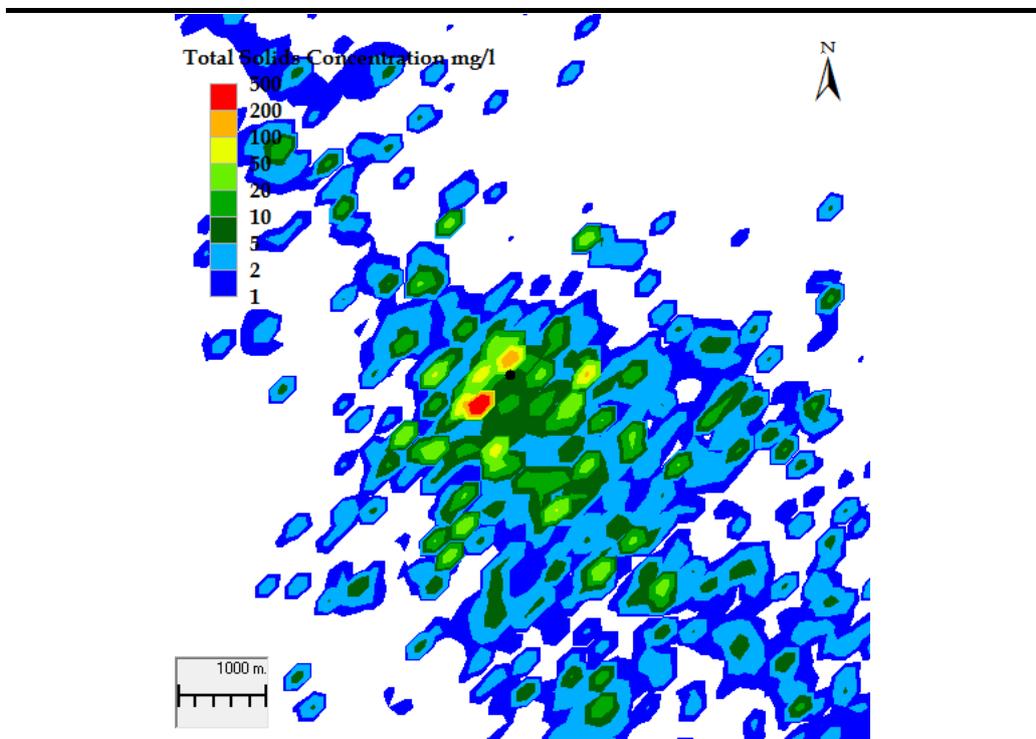
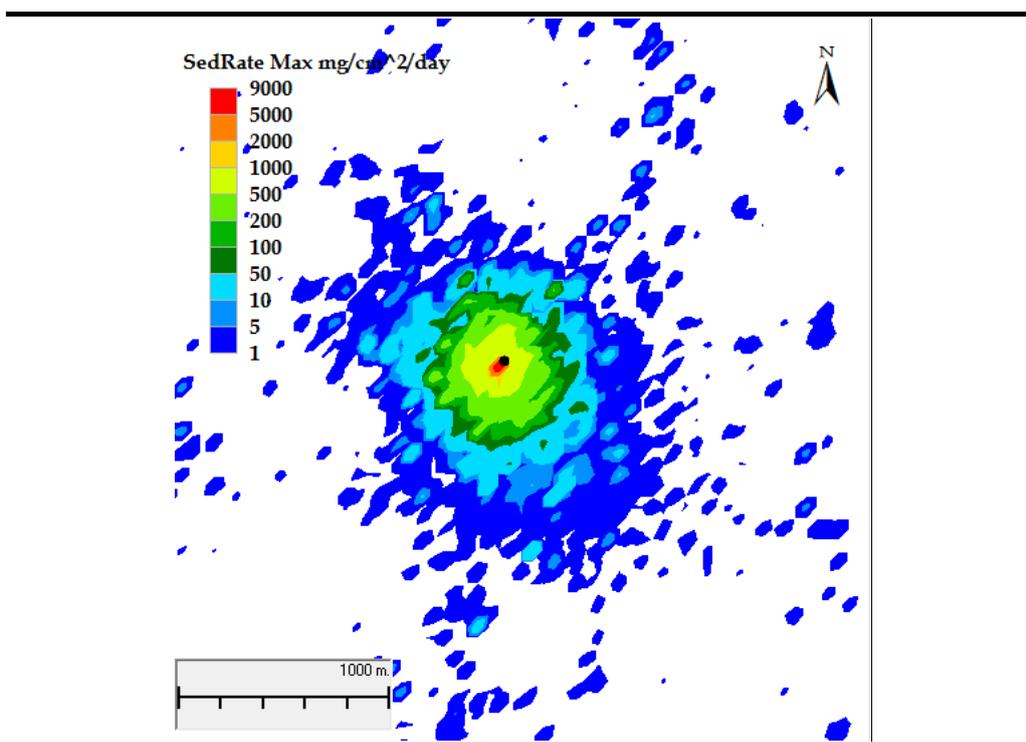


Figure 3.12 give an overview of maximum sedimentation rates from the modelled discharge of cuttings and mud. As shown, sedimentation is predicted to cover a wide area but relative high sedimentation rate occur near the drill center. The patches of area with low sedimentation rate predicted are expected to be suspended mud particles settling further away when conditions allow. Also the maximum sedimentation rate is predicted to be elongated in the southeast – northwest axis, reflecting the local prevailing current during the period.

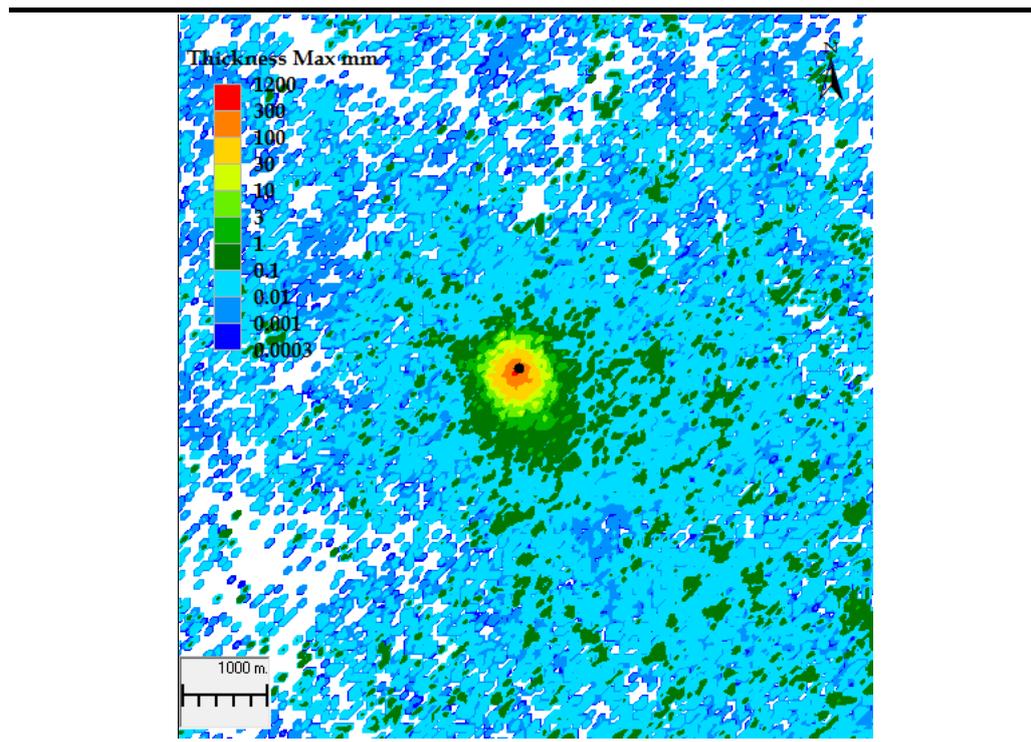
Figure 3.12 Predicted Maximum Sedimentation Rate for Cuttings and Mud Discharge



As indicated in Table 2.2, a total of 2,294 m<sup>3</sup> of cuttings and 1,350 m<sup>3</sup> of SBM were released to drill three wells by the model. Of these, 100% of cutting materials and about 20% of mud are sand-sized particles or greater (>63 μm).

Figure 3.13 show the sea floor deposition thickness from the modelled discharge of cuttings and mud. The model predicted that the discharged cuttings will be deposited as a cutting pile on the seabed. The maximum deposition thickness (1,139 mm) is predicted to occur at the drill centre. This thickness takes into account lateral transport of deposited particles as described in Section 2.2.2 and is calculated on the basis of a 50 x 50 m model grid cell, and illustrates formation of a cuttings pile will be localised at the well site. Although the total discharge volume for cuttings and mud is substantial (cuttings of 2,294 m<sup>3</sup> and mud of 1,350 m<sup>3</sup>), the release is modelled to occur over a 69-day period, which result in relatively low release rates.

Figure 3.13 Predicted Deposition Thickness for Cuttings and Mud Discharge



PCML has commissioned **Environmental Resources Management (ERM) – Hong Kong, Limited** to undertake oil spill and drill cuttings and muds discharge modelling for the drilling project. The scope of the modelling is limited to the prediction of the trajectory and spread of spilled / discharged material from platform Yetagun to surrounding areas under the influence of the ambient winds and currents.

In the oil spill scenario, an amount of 100 m<sup>3</sup> of diesel was released near the surface over fifteen (15) minutes at the location of a vessel collision. In the event the oil spill scenario occurred, the trajectory of spill would depend on the prevailing wind and current conditions at the time. In both spill scenarios in January and April, the model indicated oil trajectories would generally be towards the northwest and southwest, away from the shoreline of mainland Myanmar. The model indicates no stranding of oil at shoreline locations would be predicted in both oil spill in January and April.

Oil patches were predicted to be at least 60 km from mainland Myanmar throughout the modelled periods. Areas within reach of surface oil thickness where oiling impacts to seabirds could occur at offshore areas over 90 km away from major islands (and even further away from mainland Myanmar) in both seasons and up to 40 km away from the Yetagun platform.

The areas that may be within reach of being exposed to dissolved aromatic concentrations greater than a 50 ppb threshold is 1,163 km<sup>2</sup> in January and 1,989 km<sup>2</sup> in April and would be confined to offshore open waters. It was noted, due to the stochastic nature of the modelling, that in the event of an actual spill, the area above either of these thresholds will be considerably smaller.

For the discharge of drill cuttings and mud, the model predicted sedimentation and deposition would remain close to the drill center in both seasons. The TSS plume is expected to be diluted gradually with increasing distance from the release site, reducing to below 10 mg/L within approximately 4 km from the release site. The model predicted the maximum TSS concentration is predicted to be 481.93 mg/L for after the release over the whole simulation period. The model predicted that the discharge cuttings and mud will be cover wide area surrounding the drill center with cuttings pile at the drill center (maximum deposition thickness of 1,139 mm).

# **Appendix G - Summary of MARPOL Discharge Requirements**

**Simplified overview of the discharge provisions of the revised  
MARPOL Annex V (resolution MEPC.201(62)) which  
entered into force on 1 January 2013**

(for the full text of the respective discharge requirements please refer to the text of the revised  
MARPOL Annex V, and for more detailed guidance please consult the  
2012 Guidelines for the Implementation of MARPOL Annex V (resolution MEPC.219(63))

Type of garbage	Ships outside special areas	Ships within special areas	Offshore platforms and all ships within 500 m of such platforms
Food waste comminuted or ground	Discharge permitted ≥3 nm from the nearest land and <i>en route</i>	Discharge permitted ≥12 nm from the nearest land and <i>en route</i>	Discharge permitted ≥12 nm from the nearest land
Food waste not comminuted or ground	Discharge permitted ≥12 nm from the nearest land and <i>en route</i>	Discharge prohibited	Discharge prohibited
Cargo residues <sup>1</sup> not contained in wash water	Discharge permitted ≥12 nm from the nearest land and <i>en route</i>	Discharge prohibited	Discharge prohibited
Cargo residues <sup>1</sup> contained in wash water		Discharge only permitted in specific circumstances <sup>2</sup> and ≥12 nm from the nearest land and <i>en route</i>	Discharge prohibited
Cleaning agents and additives <sup>1</sup> contained in cargo hold wash water	Discharge permitted	Discharge only permitted in specific circumstances <sup>2</sup> and ≥12 nm from the nearest land and <i>en route</i>	Discharge prohibited
Cleaning agents and additives <sup>1</sup> contained in deck and external surfaces wash water		Discharge permitted	Discharge prohibited
Carcasses of animals carried on board as cargo and which died during the voyage	Discharge permitted as far from the nearest land as possible and <i>en route</i>	Discharge prohibited	Discharge prohibited
All other garbage including plastics, domestic wastes, cooking oil, incinerator ashes, operational wastes and fishing gear	Discharge prohibited	Discharge prohibited	Discharge prohibited
Mixed garbage	When garbage is mixed with or contaminated by other substances prohibited from discharge or having different discharge requirements, the more stringent requirements shall apply		

1 These substances must not be harmful to the marine environment.

2 According to regulation 6.1.2 of MARPOL Annex V, the discharge shall only be allowed if: (a) both the port of departure and the next port of destination are within the special area and the ship will not transit outside the special area between these ports (regulation 6.1.2.2); and (b) if no adequate reception facilities are available at those ports (regulation 6.1.2.3).

# Appendix H - NADF Management Guideline

WW MY AL I S 04 002  
Revision 1 November 2008



# **PETRONAS CARIGALI GUIDELINE FOR NON-AQUEOUS DRILLING FLUID MANAGEMENT**

**PETRONAS CARIGALI SDN BHD**

**Content**

**Foreword**

**Distribution List**

**Amendment Summary**

**Preface**

**Glossary/Abbreviation**

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**Section 2 Management of Non-Aqueous Drilling Fluid**

**Appendices**

**Appendix A Relevant Sections of Malaysian Laws**

**Appendix B Definition of BATNEEC**

**Appendix C Solid Control System and Cuttings Dryer**

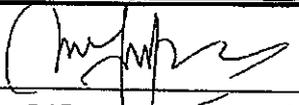
**Appendix D Reporting Requirement on NADF**

**FOREWORD**

Authority for original issue

**Issue Approval**

Issue of this document has been formally approved by:

Signature:	
Name:	<i>M Radzuan b Yusof</i>
Reference Indicator:	<i>CHSE</i>
Position:	<i>General Manager</i>
Date:	<i>5/1/09</i>

**Document Custodian**

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**AMENDMENT SUMMARY**

This sheet must be completed in detail at each revision once this document has been approved.

Details must include revision number, description and indication of which pages and paragraphs have been revised, date of revision approval, approvers title and signature.

Rev	Description	Date	Approver Title	Name
Rev 1	Original Document	November 2008	General Manager, CHSE Department	M Radzuan b Yusof

**Notes:**

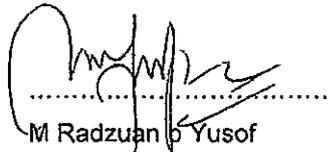
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**PREFACE**

This Guideline for Non-Aqueous Drilling Fluids (NADF) Management has been developed following the Department of Environment's (DOE) endorsement of PCSB's Guiding Principle statement. The Objective of this Guideline is to provide guidance to the proper management of NADF and its associated wastes in PCSB's operations.

Site specific procedures in managing NADF is to be made available and complied.



M Radzuan b Yusof

General Manager,  
Health, Safety & Environment Department,  
PETRONAS Carigali Sdn Bhd.

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**Glossary**

**Waste Generator** Waste generator refers to any person (PCSB and its contractors) involved in the management and operation of drilling activities (i.e. planning, operation and disposal of the used NADF and its wastes).

**Environmentally sensitive area**

Areas where special measures may be taken to protect the natural environmental / habitats which are exposed to a high level of vulnerability, e.g. marine park, mangrove, residential area, nesting area, coral reefs.

**Abbreviations**

<b>ASB</b>	Asia Supply Base
<b>BATNEEC</b>	Best Available Technology Not Encountering Excessive Cost
<b>HSE</b>	Health, Safety and Environment
<b>NADF</b>	Non-aqueous drilling fluid
<b>PAH</b>	Poly aromatic hydrocarbon
<b>SBM</b>	Synthetic based mud
<b>OBM</b>	Oil based mud
<b>WBM</b>	Water based mud
<b>DDR</b>	Drilling Department
<b>EQA</b>	Environmental Quality Act
<b>EEZ</b>	Exclusive Economic Zone

### References

1. PCSB Guiding Principles for the Use of Non-Aqueous Drilling Fluids (NADF)
2. Waste Management Guideline (PTS 60.3005), June 2006
3. Guidelines on The Management & Disposal of Wastes In Upstream Petroleum Industries, November 1994
4. The Requirement to Use Cutting Dryers On All PCSB Operations When Using SBM as a Drilling Fluid, DDR/MAL/POL/SBMFLUIDS/MAR2006
5. Environmental Quality Act, 1974
6. Exclusive Economic Zone Act, 1984
7. Environmental Data Collection User's Guide, The International Association of Oil and Gas Producers (OGP), <http://www.ogp.org.uk/pubs/342.pdf>
8. Minimum Environmental Management Standards Implementation Guide (PTS 60.3006), June 2007

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**Section 1**  
**INTRODUCTION TO NON-AQUEOUS DRILLING FLUID**  
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## 1. INTRODUCTION

Drilling operations requires drilling fluids to maintain pressure in the well. The fluids help to remove cuttings from the borehole while it cools and lubricates the borehole. It also protects permeable zones from damage. There are two primary types of drilling fluids i.e. water based fluids (WBFs) and Non-aqueous drilling fluids (NADFs).

Normal drilling operation practices is to use Water Based Mud (WBM) and avoid of NADF as much as possible. In the event that the well cannot be drilled with WBM due to technical reasons, then only NADF will be selected.

PETRONAS Carigali Sdn Bhd (PCSB) has established guiding principles for the use of non-aqueous drilling fluids (NADF) and disposal of related wastes. The guiding principle statement is as follow;

**“PCSB shall comply with the host country’s legislation for drilling waste discharge. Zero offshore discharge principle shall be practiced in sensitive environment. The BATNEEC approach can be considered only in cases where strict compliance is not possible due to technical constraints.”**

Implication of the above statement:

- Strict compliance to the relevant laws and requirement of the host country.
- When the law is unclear or subject to interpretations, assume the most stringent case.
- The definition of ‘sensitive environment’ shall be verified by EIA report conducted by Environmental consultant. E.g. shallow water environment <10m, habitats of endangered species and commercial breeding ground for shrimps, fishes etc. Only when the law cannot be met

due to technical constraints can the BATNEEC approach be applied

- Verification by Drilling and HSE experts shall be obtained when applying BATNEEC.

## 2. SCOPE OF GUIDELINE

The Guideline covers management, documentation and reporting of non-aqueous drilling fluid/mud used for the drilling of oil/gas wells at onshore and/or offshore facilities.

## 3. OBJECTIVE

To provide guidelines for waste generators to properly handle, store, treat, dispose, inventorise and report of used non-aqueous drilling fluid and its associated wastes.

## 4. CLASSIFICATION AND DEFINITION OF WASTE

NADF is also commonly known as Oil Based Mud (OBM) and Synthetic Based Mud (SBM). SBM describes any oil-base mud that has a synthesized liquid base. Some common synthetic base fluids include synthetic hydrocarbons, vegetable oils, esters, and ethers. Polymerized olefins are the frequently used synthetic hydrocarbons in SBM today, which include linear alpha olefins (LAO), straight internal olefins (IO) and poly-alpha olefins (PAO). This base fluid is then combined with viscosifiers, weighting material, and other additives to produce a stable useful drilling fluid.

OBM has high performance drilling characteristics, but may be toxic to the environment and persist in cuttings piles on the seafloor. Hence, SBM has been developed to provide similar drilling performance as OBM with the low persistence

---

and toxicity of Water Based Mud (WBM).

An environmental issue associated with drilling fluids is persistence of cuttings piles. The disposal of drilled cuttings and the mud adhering to the cuttings is a key issue. Different countries have different requirements for the control of NADF waste. PCSB shall comply at all times with the host country's legislation.

In Malaysia, NADF is specified as scheduled waste in the Environmental Quality (Scheduled Wastes) Regulations, 2005. Its handling and disposal should be properly managed in accordance with the above regulations and other relevant legislations (*Refer to Appendix A*).

## 5. CHARACTERISTIC OF WASTE

Drilling fluids are composed of a base fluid (water, diesel or mineral oil, or a synthetic compound), weighting agents (most frequently barite), bentonite clay (to help remove cuttings from the well and to form a filter cake on the walls of the hole), natural and synthetic polymers (to keep the mud in a fluid state), and various additives that serve specific functions.

The physical and chemical properties of NADF may differ according to its drilling usage. NADF are emulsions where the continuous phase is not water but a hydrocarbon liquid. This liquid is non-polar. Generally, it is viscous and dark brown in colour, and with varying chemical and oil content. NADF are currently categorized into three (3) groups as described in the tables below dependant on the base oils used to prepare the NADF.

The SBM type of NADF is extremely low in toxicity due to having low aromatic hydrocarbon content.

Table 1.1 Example of OBM Based on Group

TYPE	EXAMPLE
Group I - High aromatic content	Diesel, conventional mineral oil based fluids (paraffin, olefins, aromatics & PAHs > 0.35%).
Group II - Medium aromatic content	Developed from refining crude oil but distillation process is controlled to ensure PAHs <0.35%
Group III - Low to negligible aromatic content	Synthetic Hydrocarbon, highly processed mineral oils with PAHs <0.001%

Group I and II are commonly known as Oil Based Mud (OBM) and Group III as Synthetic Based Mud (SBM). SBM has the same desirable drilling properties of OBM but is free of polycyclic aromatic hydrocarbons and has lower toxicity, faster biodegradability, and lower bioaccumulation potential. SBM cuttings are less likely than OBM cuttings to cause adverse sea floor impacts. PCSB will not use OBM at any time and as such will only use Group III type base fluids.

Table 1.2 Classification of OBM

Classification	Base fluid	Aromatic (%)	PAH (%)
Group I	Diesel and Conventional Mineral Oil	>5.0	>0.35
Group II	Low Toxicity Mineral Oil	0.5 - 5.0	0.001 - 0.35
Group III	Enhanced Mineral Oil Synthetics (esters, olefins, linear paraffins)	<0.5	<0.001

## 6. HAZARDS

### 6.1 Health and Environmental Hazards

NADF may cause adverse health effects with prolonged skin contact or if accidentally ingested. Oil and chemical mixtures in the mud may contaminate the environment unless disposed of properly. The mud may deteriorate the water quality and is toxic to aquatic organisms.

### 6.2 Control of Hazards

- i. PCSB endeavors to adopt a policy of continuous improvement to meet the challenges of discharging NADF cuttings offshore. These include:
  - a. PCSB is to avoid use of NADF on any onshore operation. In the event that, due to technical reasons, the well cannot be drilled without the use of NADF a waiver must be obtained from DDR
  - b. Avoidance of the use of NADF on wells with deviations less than 45
  - c. Installation of cuttings dryers on all drilling units that are using NADF
- ii. To select a less toxic mud system. It is recommended to

refer to toxicity rating classification system when selecting mud system.

- iii. Strict compliance to the relevant laws and requirements of the host country. When the law is unclear or subject to interpretation, assume the most stringent case.
- iv. Prepare Environmental Management Plan (EMP) for drilling activities. The following information shall be incorporated in the EMP:
  - a) Technical justification / reason for using such particular fluid, e.g. formation characteristics, technical problems, geological sections where it is used, etc
  - b) Procedures for the use, transfer and disposal
  - c) Toxicity data
  - d) Biodegradation data
  - e) An estimate volume of base fluid and drilling mud to be used and discharged (an indication of the target amount – expressed as percentage (%) of dry weight of drilling fluid on cuttings)
- v. Zero offshore discharges principle shall be practiced in sensitive environments (*refer to glossary*). The 'sensitive environment' shall be verified by EIA report conducted by Environmental Consultant. E.g. shallow water environment <10m, habitats of endangered species and commercial breeding ground for shrimps, fishes etc
- vi. To apply BATNEEC approach. The use of cuttings dryers is considered BATNEEC Technology. (*Refer to Appendix 2 and 3*).
- vii. Personal protection equipment (PPE) should be worn at all times (minimum PPE are safety shoes, safety helmet, safety glass and rubber gloves). Refer to MSDS or CSDS

for specific or special PPE requirements

viii. Avoid food consumption while at work around drilling areas.

ix. Practice good hygiene. Washing and cleaning facilities as well as barrier cream should be provided at drill sites

## 7. EMERGENCY RESPONSE PROCEDURE

In the event of a spill on land, cordon off the spilled area and proceed with the clean up process. This would typically involve physical removal of the mud into tanks and containers.

For an offshore spill, monitor the spill and let it disperse and biodegrade naturally. Follow manufacturer's instruction/Material or Chemical Safety Data Sheet (MSDS/CSDS) and seek medical attention immediately in the event of personnel emergencies.

Drilling contractor shall prepare an Emergency Response Procedure (ERP) and bridging document to link its ERP with the PCSB ERP before the drilling operation.

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**Section 2**  
**MANAGEMENT OF NON-AQUEOUS DRILLING FLUID**  
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## 1. WASTE PRODUCTION

### 1.1 Sources

This waste originates from the drilling operations of exploration and production wells. The used NADF and drill cuttings are major waste streams from drilling operations.

### 1.2 Waste Management

The best waste management practices for handling the mud waste shall be adopted. The waste generators shall apply following practices simultaneously where possible. If not, select by its hierarchy;

#### 1.2.1 Reduction

- i. Use low toxicity NADF or other replacement mud (e.g. water based mud). Refer to toxicity rating classification system.
- ii. Where there is a need to use both WBM and NADF, minimize or optimize the use of NADF.

#### 1.2.2 Reuse and Recover

Separate mud from cuttings and reuse in drilling operations using the "Solid Control System" and subsequently a "Cutting Dryer" (*Refer to Appendix C*)

#### 1.2.3 Recycle

Return the mud to the supplier/manufacturer for recycling.

## 2. STORAGE

NADF should be stored in corrosion resistant containers (plastic drums) especially if storage is expected to be on long term basis.

- i. Containers should be stored at a designated area with proper signage
- ii. Storage containers should be clearly labeled
- iii. Periodically check the integrity of the containers for

- possible leakage
- iv. Appropriate spill kit should be in place.

### 3. TRANSPORTATION

Ensure the containers are securely fastened onto its transporting vehicle. Wood pallets are recommended for use when transporting NADF in drums.

### 4. TREATMENT AND DISPOSAL

#### 4.1 Treatment

Segregate mud from cuttings (as stated in Section 7.2.2) for reuse in drilling operations. For offshore drilling, the separated cuttings are disposed into the sea unless operation is classified as 'zero discharge' as determined by EIA.

#### 4.2 Disposal

- i. The fluid is recovered for re-use. The preferred disposal option of the used mud is recycling via suppliers and manufacturers.
- ii. Drill cuttings are disposed of by one of the three (3) options below:
  - a) Offshore discharge - cuttings discharged overboard from drilling vessel / platform after undergoing treatment by solids control equipment and cuttings dryer.
  - b) Offshore re-injection - cuttings are ground to fine particles and disposed of by injection into permeable subterranean formation (zero discharge case)
  - c) Offshore disposal - cuttings are collected and transported to shore for treatment and final disposal by land filling / farming, land spreading, injection or re-use.

Land farming of oil based mud would require approval from the relevant authority (zero discharge case)

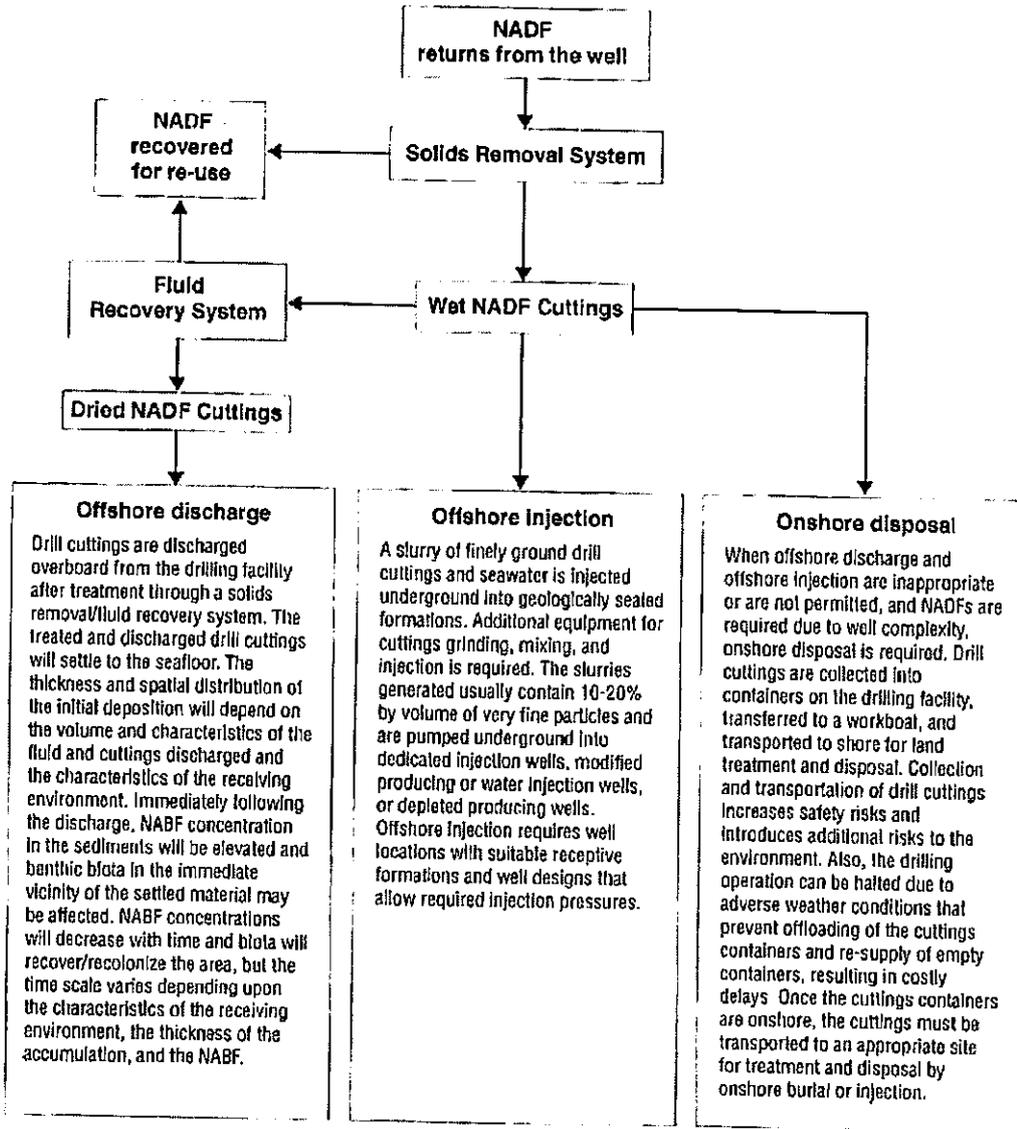


Figure 2.1: Flowchart of general NADF Waste Management Practice

## 5. RECORD AND REPORT

PCSB requirement is to report the NADF use in offshore operations to "The International Association of Oil and Gas Producers (OGP)" on a yearly basis (*Refer to Appendix D*).

The quantity of NADF used for drilling shall be recorded and reported to the DDR HSE Liaison upon completion of drilling activities.

DDR HSE Liaison shall consolidate and submit the report to DSE for further reporting to PCSB Corporate HSE (CHSE).

---

**Appendix A**  
**RELEVANT SECTIONS OF MALAYSIAN LAWS**

**Section 21 of EQA – Power to specify conditions of emissions, discharge, etc.** *“The Minister, after consultation with the Council, may by regulations specify the acceptable conditions for the emission, discharge or deposit of environmentally hazardous substances, pollutants or wastes or the emission of noise into any area, segment or element of the environment and may set aside any area, segment or element of the environment within the emission, discharge or deposit is prohibited or restricted”*

**Section 27 of EQA – Prohibition of discharge of oil into Malaysian waters**

*“No person shall unless licensed, discharge or spill any oil or mixture containing oil into Malaysian waters in contravention of the acceptable conditions specified under Section 21.”*

**Definition of “Malaysian waters” – EEZA 1984**

*“all waters comprising the internal waters, the territorial waters and the exclusive economic zone of Malaysia in which Malaysia exercises sovereign and exclusive rights.”*

**Definition of “Exclusive Economic Zone” – EEZA 1984**

*“an area beyond and adjacent to the territorial sea of Malaysia and, subject to subsections (2) and (4), extends to a distance of two hundred nautical miles from the baselines from which the breadth of the territorial sea is measured.”*

**Definition of “mixture containing oil”- EQA 1974**

*“a mixture with such oil content as may be specified by the Minister or, if such oil content is not specified, a mixture with an oil content of one hundred parts or more in one million parts of the mixture” – i.e. 0.01%*

**Definition of “oil”- EQA 1974**

*“a mixture with such oil content as may be specified by the Minister or, if such oil content is not specified, a mixture with an oil content of one hundred parts or more in one million parts of the mixture” – i.e. 0.01% crude oil, diesel oil, fuel oil and lubricating oil; and any other description of oil which may be prescribed by the Minister”*

**Definition of "Scheduled Waste"**

"any waste falling within the categories of waste listed in the First Schedule" of Environmental Quality (Scheduled Waste) Regulation 2005.

**Definition of Pollutant – EQA 1974**

*" any natural or artificial substances, whether in a solid, semisolid or liquid form, or in the form of gas or vapour, or in a mixture of at least two of these substances, or any objectionable odour or noise or heat emitted, discharged or deposited or is likely to be emitted, discharged or deposited from any source which can **directly or indirectly cause pollution** and includes any environmentally hazardous substances"*

## Appendix B DEFINITION OF BATNEEC

### **Best Available Techniques (BAT) and Best Environmental Practice (BEP)**

BAT is defined as *"the latest stage of development (state of the art) of processes, of facilities or of methods of operation, which indicate the practical suitability of a particular measure for limiting discharges, emissions and waste"*. The definition includes consideration of economic feasibility and the reliability of the technology, amongst others. BAT is not static and allowance is made in the definition for changes in technology, economic and social factors and scientific knowledge over time. Techniques are defined as including *"both the technology used and the way in which the installation is designed, built, maintained, operated and dismantled"*.

### **Best Environmental Practice (BEP)**

Best Environmental Practice (BEP) is defined as *"the application of the most appropriate combination of environmental control measures and strategies"*. The definition of BEP encompasses the consideration of a number of issues, including (amongst others):

- The development of codes of good environmental practice;
- Public access to information and product labeling;
- Saving of resources including energy;
- Recycling, recovery and reuse of resources and waste;
- Substitution by less polluting activities or substances; and
- Continual monitoring and reassessment of what constitutes BEP.

## Appendix C SOLID CONTROL SYSTEM AND CUTTINGS DRYER

### Solid Control System

The returned drilling mud and cuttings are circulated to a series of mud recovery and cleaning equipment that makes up the solid control system shown in Table 3-1 below. The clean mud will be reconditioned and re-circulated down-hole. The 'cleaned' drill cuttings, fine solids particles and residue drilling mud will be disposed overboard via a through flume, submersed in the water at approximately 12 m below the sea level.

### Description of Cuttings Dryer

- Cuttings coming out of the well will pass over vibrating screens that separate NADF and the cuttings, where about 13% is usually bound oil on the cuttings. In this process the cuttings are subjected to up to 8 "g" force.
- A cuttings dryer comprises a circular screen rotating at high speed. Some cases of bound oil being as low as 4% have been recorded
- A cuttings dryer can take these cuttings and submit them to up to 90 "g" force. In doing so the oil retained can be reduced to less than 6%.
- PCSB stipulates that cuttings dryers must be used at all times when NADF is being utilized.

Table 3.1: Solid Control System (Mud Circulation System)

Solid System	System Equipment Description
Shale Shaker System	2 sand traps
	Primary shale shaker Make – Derrick Type – Model 48 Flo-line, to manage 1500gpm mud flow. 2 different sizes of screens – screen sizes are selected to suit drilling & cuttings conditions.
	Secondary Shale Shaker Make – Rig Tech Type – VSM 300, to manage 1400gpm mud flow. 1 different size of screen - screen sizes are selected to suit drilling & cuttings conditions.
Desander System	Removed from the Rig
Desilter System	Removed from the Rig
Mud Cleaner System	Removed from the Rig
Decanting Centrifuges	Make – Brandt Type – HS-3400 Make – Derrick Vacu-Flow Type – TM 1000, 1200gpm
Degasser System	Make – Derrick Vacu-Flow Type – TM 1000, 1200gpm
Mud Gas Separator	Make – Promet Ship Type – Poor Boy type 42" diameter x ¾" wall thickness, 4" inlet, 10" gas vent pipe, 10' mud seal, 150 psi pressure test.
Flow Line Degasser	Make – Promet Ship Type – Poor Boy type 42" diameter x ¾" wall thickness, 4" inlet, 10" gas

Solid System	System Equipment Description
	vent pipe, 10' mud seal, 150 psi pressure test.
Trip Tank	Make – Ohara, 35bbbls capacity

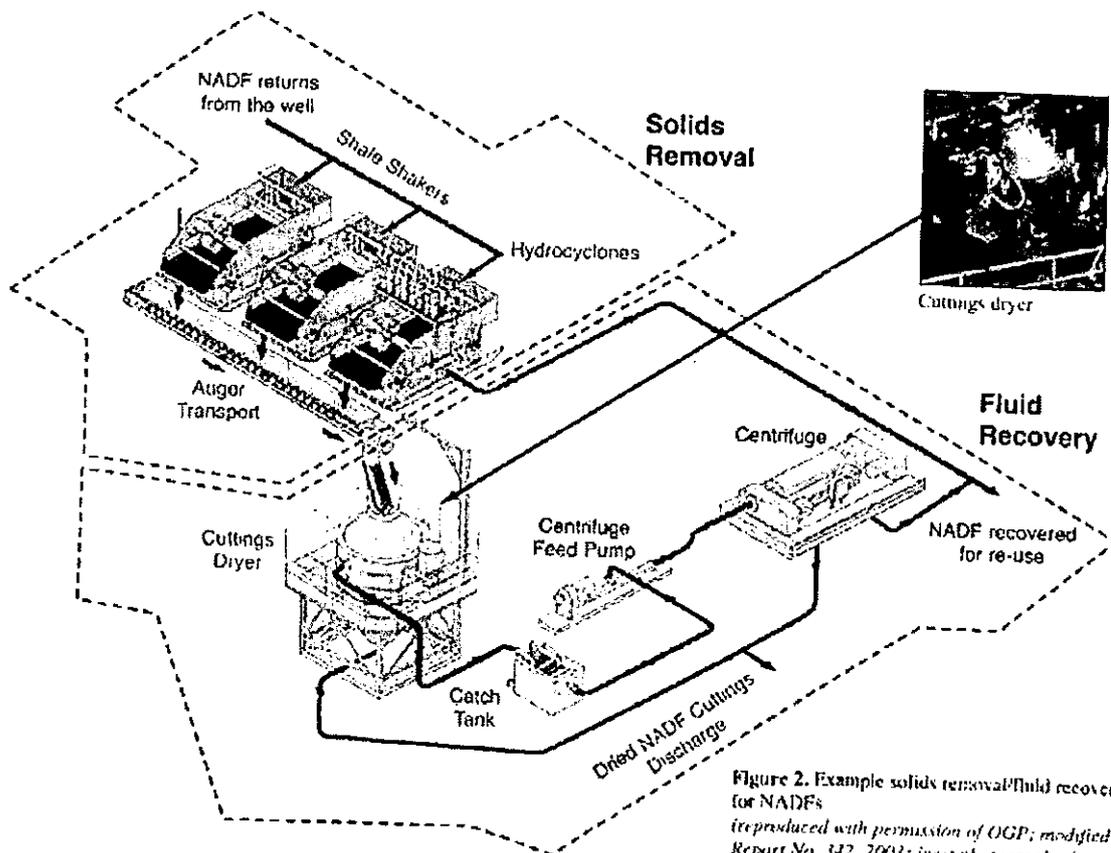


Figure 2. Example solids removal/fluid recovery system for NADFs  
 reproduced with permission of OGP; modified from OGP Report No. 342, 2003; inset photograph of cuttings dryer in service reproduced with permission of M I SWACO

**Appendix D**  
**REPORTING REQUIREMENT ON NADF**

**1. OGP's ENVIRONMENTAL DATA COLLECTION USER'S GUIDE (2006 Data)**

**4.2.8 Section 4** of the form is for reporting of any **NON AQUEOUS DRILLING FLUIDS (NADF) DISCHARGED WITH DRILL CUTTINGS TO THE SEA**. Only complete this section for **offshore** operations.

This data will not be combined with other produced water discharges collected in other sections.

The quantities to be recorded are the NADF portion of the discharged cuttings. Water-based mud (WBM) and their related cuttings are not to be taken into account. Mud or cuttings re-injected are also excluded, irrespective of the fluid system used for drilling.

Data to be entered may either be measured data or quantities estimated on the basis of experience.

For the purpose of this report, non-aqueous base fluids (NABF) are grouped according to aromatic hydrocarbon concentrations as follows:

<b>Classification</b>	<b>Base fluid</b>	<b>Aromatic (%)</b>	<b>PAH (%)</b>
Group I	Diesel and Conventional Mineral Oil	>5.0	>0.35
Group II	Low Toxicity Mineral Oil	0.5 - 5.0	0.001 - 0.35
Group III	Enhanced Mineral Oil Synthetics (esters, olefins, paraffin)	<0.5	<0.001

Because of concerns about toxicity, Group I cuttings are not discharged. Where transportation of cuttings to shore or injection of cuttings is possible, however, these fluids may still be in use.

Group III includes synthetic based fluids that are produced by chemical reactions of relatively pure compounds (e.g. esters) and can include synthetic hydrocarbons (olefins and paraffin). Highly processed mineral oils are also included (e.g. paraffin, enhanced mineral oil based fluid (EMBF)).

**WHEN REPORTING NAF ON CUTTINGS**

- Quantities of NADF discharged are to be reported in tonnes for wells completed in the reporting year
- Do not enter overall quantities of mud, but only the quantity of NADF

Indicate whether NADF discharge data are available for each group by entering 'yes' or 'no' in the boxes provided.

Enter the quantities in tonnes in the table for NADF discharged in Group I, Group II and Group III. Where the split between Groups is not known, enter the total NAF quantity as 'unspecified', and enter 'NDA' against Group I, II or III.

For offshore operations only:

- (i) Enter the **LENGTH OF WELLS DRILLED USING NADF, WITH NADF CUTTINGS DISCHARGES IN THE REPORTING YEAR, IN METRES**, i.e the length newly drilled using NAF hole with NAF cuttings discharges (not the total length of the wells in production drilled with NAF) in meters, and
- (ii) The **VOLUME OF CUTTINGS GENERATED USING NADF IN CUBIC METRES (m<sup>3</sup>) ASSOCIATED WITH REPORTED NADF DISCHARGES**. These data are required in order to normalize the quantities of NADF discharged with drill cuttings against the length of hole drilled with NADF.

**2. INFORMATION TO BE REPORTED TO DDR/HSE**

NADF discharged with drill cuttings to sea:

1. Which group of NADF was used?
2. What was the amount of NADF discharged (with cuttings) in tonnes?
3. What was the total length of E&P wells drilled using NADF, with NADF cuttings discharges (meters)?
4. What was the total volume of cuttings generated where NADF was used associated with reported NADF discharges (cubic meters)?

# Appendix I - Emergency Response



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## WEST VENCEDOR HSE CASE

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## Emergency Response

Project 0145047; RS-REP-11-072-209 Rev 1

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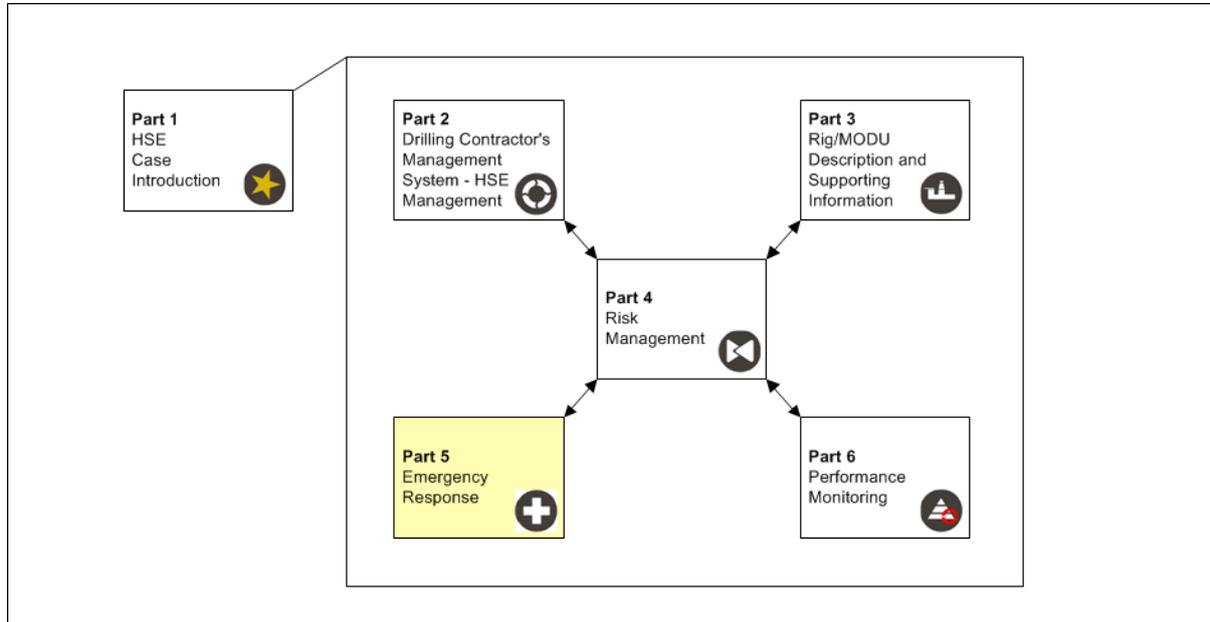
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## 5.0. INTRODUCTION

Part 5 of the HSE Case describes Seadrill's emergency response arrangement for the Rig.

To provide assurance that Seadrill is managing HSE risks effectively, HSE Case [Part 2 - Drilling Contractor's Management System - HSE Management](#), [Part 3 - Rig/MODU Description and Supporting Information](#), [Part 5 - Emergency Response](#), and [Part 6 - Performance Monitoring](#) are applied in conjunction with the structured risk management process described in [Part 4 - Risk Management](#).

### Interrelationship of HSE Case Parts



## 5.1. EMERGENCY RESPONSE MANAGEMENT

Emergency Response refers to the approach taken when managing an emergency. It is an essential part of the overall process of risk management within the HSE Case. Although every effort is made to prevent major accident events on board the Rig, these events still have the potential to occur and, if so, must be managed accordingly.

---

The emergency response philosophy, plan and analysis are three key elements of emergency response management discussed in this part of the HSE Case.

### 5.1.1 Emergency Response Philosophy

- **Details of emergency response policy.**
- **HSE Management objectives that reflect the Drilling Contractor's emergency response philosophy.**

Seadrill's emergency response actions are to be conducted to avoid and minimise losses according to the following priorities:

1. Save lives
2. Protect the environment
3. Protect the company's reputation
4. Minimise asset damage

This is primarily achieved through:

1. Commitment to emergency response plans and procedures
2. Properly trained and competent personnel at all levels of the organisation and at all locations
3. Planning and execution of operations based on best practice and the best available information

Emergency Preparedness includes all technical, operational and organizational aspects to establish measures for all 5 emergency preparedness phases:

1. Notification
2. Combating
3. Rescue
4. Evacuation
5. Normalization

The Corporate [Emergency Preparedness Drills DIR-00-0036](#) Directive details requirements for establishing effective emergency preparedness within Seadrill. This includes development of drills and exercises to develop training plans, then ensuring its regular practice and maintenance. Through effectively familiarizing all personnel with the Rig and emergency response roles and expectations, the emergency response priorities may be upheld in real emergency situations.

The Region [AME Onshore Contingency Plan PRO-00-0212](#) Procedure details requirements to ensure that Contingency Management is established in emergency situations as described in the Rig's Contingency and Emergency Plan. The onshore contingency plan specifies which measures are to be implemented onshore to handle a serious incident that Seadrill Africa Middle East region (AME) is responsible for, or which affects the company's employees or assets.

The Company has established a set of emergency contingency plans for use by the organisation in emergency situations. In the event of an emergency, AME's objective is to gain control as quickly as possible and normalise the situation.

The purpose of this plan is to provide all members of AME emergency response organisation with functional guide lines for which actions are to be implemented in an emergency.

The plan describes notification, mobilisation, organisation as well as internal and external lines of communication. The Contingency Manager decides if the Contingency Management procedure should be activated based on the type of the emergency situation and its seriousness. The Contingency Management team is set up and performs tasks in compliance with bridging documents with the operator/client and the Rig's Contingency Plan.

If the Contingency Manager activates the Contingency Management procedure, the reception area in the Seadrill Office, 18th Floor, Aresco Tower, Dubai is utilised as the emergency preparedness centre. Personnel with an emergency preparedness function according to the weekly duty list must be available via cell phone for communication and immediate response. If a member of the Contingency Management team is not available, it is his/her responsibility to appoint a substitute. Further, all members of the contingency organisation and their delegates must be qualified and competent to perform the tasks assigned. Competence is ensured by training, drills and exercises.

The Rig's annual plan for emergency drills for the Contingency Management team is verified by the Region's Audit Plan.

---

## 5.1.2 Emergency Response Analysis

- *Summary of the analyses that have been carried out with conclusions, including the preferred hierarchy of emergency response.*

## 5.1.3 Emergency Response Plan

- *Confirmation that the Emergency Response Plan contains relevant information from the emergency response analysis (See [Section 5.1.2 Emergency Response Analysis](#)).*
- *Description of the process for revising and updating the Emergency Response Plan.*
- *Details of the involvement of MODU personnel in the development and updating of the Emergency Response Plan.*
- *Details or reference to emergency procedures, including but not limited to the following:*
  - *Shallow Gas Blowout*
  - *Fire and Explosion*
  - *Mooring Failure*
  - *Extreme Weather*
  - *Collision with Another Vessel*
  - *Helicopter Crash into the Sea or onto the MODU*
  - *Rescue from Confined Space*
  - *Rescue from Heights*
  - *Search and Rescue for a Missing Person Onboard*
  - *Hydrogen Sulphide H<sub>2</sub>S*
  - *Health Incident (e.g., outbreak)*
  - *Well Control*
  - *Man Overboard*
  - *Loss of Stability or Structural Failure*
  - *Loss of Control in Transit*
  - *Foundation Failure*
  - *Evacuation and Abandonment of MODU*
  - *Emergency Notification*
  - *Medical Emergency Response, including preventive pandemic precautions*
  - *Total Power Failure*
  - *Spill Response*
  - *Any Other Site-Specific, Area or Location Emergency*

The Corporate [Emergency Preparedness Drills DIR-00-0036](#) Directive details requirements for the Rig and shore-based facility to establish a contingency plan, which is to consider the Rig's DSHAs. Requirements of the contingency plan are further discussed in [Section 5.1.1 Emergency Response Philosophy](#).

## 5.2. COMMAND AND COMMUNICATION

### 5.2.1 Command During Emergencies

- *A display of the command and control hierarchy in an emergency situation as it will be reflected on the muster list and station bill.*
- *Details of roles and responsibilities of key individuals including Drilling Contractor, Client and other Third Party personnel as appropriate in MODU specific Emergency Response Plans.*
- *Details of the key competence requirements for personnel with emergency command responsibilities and the method used to verify that these individuals maintain this competency.*
- *Details of the emergency control room facilities, equipment and documentation.*

Details of the command established onshore to provide support to the unit is provided in [Section 5.2.2 External Emergency Response Support](#).

Details of competency requirements for emergency response positions are detailed in [Section 2.2.4 Competence](#).

Roles and responsibilities of key internal personnel are detailed in [Section 2.2.2 Responsibilities](#).

The [West Vencedor Station Bill](#) details the command hierarchy, emergency procedure duties for supervisors and response team leaders, and general emergency muster and evacuation instructions for all personnel on board.

The Toolpusher is the on-scene commander with the overall responsibility for command of emergency situations. Additionally, the Barge Captain acts as the on-scene team leader at the emergency site for response.

The Toolpusher Office is the primary Emergency Command Center(ECC). If the ECC is not accessible during the emergency situation, the secondary ECC is the the drill floor derrick set (production platform). The Toolpusher Office is immediately adjacent to the Ballast Control Room; emergency equipment and controls within the ECC or Ballast Control Room are listed below. Further details are provided in [Part 3: Facility Description](#).

- BOP Remote Control Panel
- General Alarm Push Button
- Ballast Control Console ([Section 3.2.4.2 Ballast and Bilge Systems](#))
- Emergency Anchor Release Station ([Section 3.2.4.3.1 Mooring](#))
- Emergency Generator Control Stop ([Section 3.4.1.1 Emergency Power Details](#))
- HVAC Shutdown Panel ([Section 3.4.4.1 Automatic and Manual Shutdown](#))
- Internal Communications Cabinet, VSP Battery-less Telephone System, and Fire Alarm Acknowledgement button ([Section 3.4.6.1 Internal Communications](#))
- External Communication Equipment (Marine VHF Transceiver) ([Section 3.4.6.2 External Communications](#))
- Seawater Discharge Control Console ([Section 3.5.4.5 Helideck Foam System](#))

## 5.2.2 External Emergency Response Support

- **Description of the Drilling Contractor's external emergency response support arrangements.**
- **Details of arrangements for consultation and cooperation with other parties who have been identified as external emergency response support, (e.g., national coastguards, local (municipal) and regional authorities).**
- **Details of the arrangements for establishing and approving emergency response arrangements with clients.**
- **Arrangements for external emergency response support included in Emergency Response Plan ([See Section 5.1.3 Emergency Response Plan](#)).**
- **Details of arrangements for Drill and Exercises including external emergency response support ([See Section 5.3.2 Drills and Exercises](#)).**

The [Corporate Emergency Preparedness DIR-37-0053](#) Directive details requirements and responsibilities for the Seadrill strategic (Level 3) Emergency Response Team ERT. If the Level 3 ERT is activated, they are to meet at the Emergency Response Room (Building 11, Floor 2, Chiswick Park, London). Led by the ERT Manager, the Level 3 ERT manages:

- Media communications
- Customer relations
- Stake holder liaising and updating, including the Board, national government departments and regulatory authorities

Key responsibilities of the Level 3 ERT are detailed in the table below. The ERT consists of the following members:

- ERT Manager Corporate
- Emergency Coordinator
- Media contact
- Admin/CIM Assistant
- Support functions

### Level 3 ERT - Key roles and responsibilities

Role	Responsibility
------	----------------

<p>Level 3 ERT Manager</p>	<ul style="list-style-type: none"> <li>• Confirm receipt of initial notification</li> <li>• Confirm actions by first person in ERR</li> <li>• Confirm ERR is set up correctly</li> <li>• Confirm level 3 mobilised to level 2 ERT Manager and liaise closely, for information sharing and action point</li> <li>• Notify, Inform and update CEO</li> <li>• Ensure sufficient level 3 participants have been called out</li> <li>• Initiate and lead First meeting, as well as regular status meetings</li> <li>• Ensure that a Press Holding Statement is being prepared and is distributed as soon as possible</li> <li>• Approve release of Press Statements</li> <li>• Ensure continuous update on focus, actions and other relevant activities in level 2 ERT</li> <li>• Ensure that authorities are informed and updated</li> <li>• Brief the level 3 ERT on a regular basis</li> </ul>
<p>Emergency Coordinator</p>	<ul style="list-style-type: none"> <li>• Ensure reception/switch board is informed about the emergency situation, and know where to direct incoming phone calls</li> <li>• Ensure that authorities are notified (by level 2)</li> <li>• Ensure that all relevant parties (stakeholders) are notified according to notification matrix</li> <li>• Ensure that all initial actions taken by members of the Level 3 ERT are logged</li> <li>• Prepare for and participate in First meeting</li> <li>• Execute actions given during first meeting</li> <li>• Prepare for and participate in regular briefs</li> <li>• Support the ERT Manager as required</li> <li>• When necessary agree with level 2 where to send liaisons</li> <li>• Monitor the work done by support teams to evaluate need for actions from level 3, i.e: Company rep sent to evacuee reception centre, extra support needed from environmental , drilling / insurance/ legal / finance etc</li> <li>• Assist ERT Manager in ensuring that all functions are properly manned (Support and Duty Functions) Consider the need for additional and relief personnel</li> <li>• Take notes on the emergency to assist in any post incident investigation</li> <li>• Participate in debrief of ERT when relieved</li> <li>• Mobilise support functions in agreement with ERT Manager</li> </ul>
<p>Media Contact</p>	<ul style="list-style-type: none"> <li>• Prepare and participate in First and Status Meeting</li> <li>• Decide who to notify and mobilise relevant communications resources</li> <li>• Formulate and approve and distribute the Holding Statement and Press Release to             <ul style="list-style-type: none"> <li>• Media Response Team</li> <li>• Next of Kin Team</li> <li>• Reception</li> <li>• Relevant stakeholders</li> <li>• Other relevant internal resources</li> </ul> </li> <li>• Assess the media related consequences and establish a communication strategy together with the ERT Manager</li> <li>• Formulate key messages</li> <li>• Take part in initial stakeholder mapping</li> <li>• Coordinate the work needed to ensure a controlled and coordinated flow of reliable information.</li> <li>• Contact communications responsible at relevant stakeholders to coordinate media handling and information flow</li> <li>• Ensure correct and updated information on the emergency web update (link to CIM)</li> <li>• Advise and align messages with spokesperson</li> </ul>

Admin/CIM assistant	<ul style="list-style-type: none"> <li>• Set up and update CIM boards</li> <li>• Establish contact with Seadrill Technical /IT Support</li> <li>• Administer actions, tasks and notifications performed prior to and upon arrival in the ERR</li> <li>• Assist the ERT Manager upon request</li> <li>• Map availability of substitute personnel</li> <li>• Effectuate mobilisation of substitute personnel, according to instructions from ERT Manager</li> <li>• Order food and drinks on demand</li> <li>• Collect printouts and deliver to ERT</li> <li>• As requested, prepare email for distribution and information to all employees</li> <li>• As requested, activate Seadrill Emergency Web</li> </ul>
HR Advisor	<ul style="list-style-type: none"> <li>• Communicates with Level 2 HR Coordinator</li> <li>• Decide and mobilise company representative at reception area (i.e. hotel, heliport and hospital)</li> <li>• Represents Seadrill Management towards reception areas</li> <li>• As requested, notify Seadrill employees, with regular updates</li> <li>• Prepare for and participate in First and status meeting</li> <li>• In case of need of transport, tickets and accommodation arrange with Travel Agent</li> </ul>
Legal/ Finance/ Insurance/ Contract/ QHSE/ Operations support personnel	<ul style="list-style-type: none"> <li>• Advise level 3 ERT Relevant status at all time</li> <li>• Ensure that the team understands the potential of the incident</li> <li>• Maintain communication with respective team</li> <li>• Participate in status meetings</li> <li>• Be the respective specialist advisor in the level 3 ERT</li> <li>• As required, liaise with level 2 ERT organisation, or offshore rep</li> </ul>
Reception	<ul style="list-style-type: none"> <li>• Man the switchboard</li> <li>• Log incoming calls: Time, name of the caller, details of the message and who is informed and when.</li> <li>• On no account make any statement regarding the incident.</li> <li>• If called in (after office hours) make note of the time of arrival.</li> <li>• Ensure entrance control, until additional Security Guard arrives.</li> <li>• Restrict entry to designated personnel.</li> <li>• Be informed of the Contact Number to be issued as soon as these are released and available.</li> <li>• Inform the ERT as required and arrange escort for visitors from the Reception</li> <li>• Assist Strategic – level 3 team as requested</li> </ul>

In order to guide the emergency response, the ERT must consider how the situation affects various aspects including, but not limited to:

- People
- Environment
- Assets
- Investor Relation
- Shareholders
- Impact on customer/client
- Impact on suppliers
- Business interruptions
- Regulatory impacts

### 5.2.3 Communications

- **Summary of the communication systems, including back-ups, on the MODU (see [Section 3.4.6 Communications](#)).**
- **Description of the external emergency control centre(s) for MODUs.**

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The Corporate [Media Response Plan DIR-37-0041](#) Directive details requirements for communicating details of emergency situations to the media and other external stakeholders, including internal and client communication processes, in a manner that protects Seadrill's reputation. In order to conduct professional media communications, Seadrill maintains key communication objectives and principles:

- Ensure appropriate alignment and cooperation with the client
- Be an early responder and credible source of information
- Reduce speculation and inaccuracies in reporting
- Ensure consistent messaging
- Ensure proper processes are followed and approvals secured

The Directive defines the communication team's roles and responsibilities at Level 2 (Region) and Level 3 (Corporate). Both Levels' Emergency Response Teams must use the Crisis and Issues Management (CIM) communication tool to ensure that each role has access to consistent, relevant information to facilitate a more efficient and effective emergency response.

Additionally, the Directive details requirements for the media holding statement, press releases, updates, intranet/ internet publishing, and news conferences. Where applicable, the responsible party must use the pre-approved communication templates attached to the Directive. The Level 3 Media Contact is responsible for managing all media, internal and external communications during an emergency response. Level 2 provides continued communication support throughout the emergency, and is responsible for drafting initial holding statements and press releases. The CFO is responsible for notifying the relevant stock exchanges, if required. During low level alert incidents, Level 2, via the Regional SVP, manages communications. In general, the client is responsible for information disclosure as defined in bridging documentation.

Internal and external communication equipment on board the Rig is further discussed in [Section 3.4.6 Communication](#).

## 5.3. TRAINING FOR EMERGENCIES

### 5.3.1 Emergency Response Training

- ***Details of the Major Emergency Management training and refresher training requirements for the person in charge and his alternate(s).***
- ***Details of the emergency response training and refresher training requirements for key personnel (including personnel with fire fighting, pollution response, or medical treatment roles).***
- ***Reference to the competence assessment arrangements (see [Section 2.2.4 Competence](#)).***

Corporate requirements for emergency response training per Seadrill's Competency Assurance Program are defined in [Section 2.2.4.3 Competence Assessment and Records](#).

### 5.3.2 Drills and Exercises

- ***Details of the emergency response drills and exercises programme.***
- ***Details of the arrangements for monitoring and reviewing the effectiveness of the drills and exercises in establishing and maintaining the readiness of emergency response capabilities.***

The Corporate [Emergency Preparedness Drills DIR-00-0036](#) Directive details requirements for establishing effective emergency preparedness within Seadrill. This includes development of drills and exercises to develop training plans, then ensuring its regular practice and maintenance. The Directive defines the responsibilities, methods, and tools to be established on the Rig in order to ensure the Directive's objective.

The contingency plan for each rig and shore-based facility addresses potential major accident events in Defined Situations of Hazards and Accidents (DSHA), which are also determined and developed by each rig. The DSHAs, as well as the Ship Security Plan if applicable, guide the development of the Rig's annual training plan. The plan defines the frequency of specific drills and exercises on board. Preparation of the plan is based on the following expectation:

- Each DSHA will be covered within the year
- Security exercises are arranged every three months at minimum, according to ISPS Code, if applicable
- Personnel train and exercise in their deputy positions with a frequency that ensures knowledge and competence

Additionally, the plan requires training performance standards that are measured to ensure the plan's efficacy.

The Offshore Installation Manager (OIM) is responsible for ensuring that drills and exercises are conducted according to the plan, and that all drills and exercises are recorded and documented. Following each drill or exercise, a debrief session is held. Unsatisfactory conditions uncovered during the drill or exercise are registered in Synergi and tracked appropriately through close-out.

When training and exercises indicate deviation from emergency response procedures, or that specific requirements are not met, follow-up actions must be considered:

- Repeat the training or exercise
- Revision of the emergency response procedure
- Revision of the emergency response analysis

### 5.3.3 HSE Inductions

- **Reference to HSE Induction Programme (see [Section 2.2.4.5 Induction Programme](#)).**

The corporate [The Emergency Preparedness Drills DIR-00-0036](#) Directive details requirements to ensure that all personnel are familiar with the Rig, including evacuation routes, safe areas, use of emergency response equipment, actions expected in emergency response situations and the emergency response organisation. The Directive also ensures familiarity with both the internal and external emergency response organisation.

The corporate [Rig Introduction DIR-00-0090](#) Directive details requirements for the Rig's mandatory introduction programme. Everyone arriving on board for the first time, or anyone who has not been on board for the last twelve months, must complete the Rig introduction. The Directive defines requirements for roles and responsibilities for rig introductions, as stated in the table below.

#### Roles and Responsibilities for Rig Introduction

Roles	Responsibilities
Director of Operational Excellence	Responsible for establishing and maintaining a systematic approach to rig introduction and for updating and communicating changes in the Directive
Operation Manager	Responsible for defining the requirements in the divisional procedure
Rig Manager	Responsible for ensuring that the introduction process meets the mandatory required elements on his/her unit and also for monitoring compliance on all appropriate introduction requirements
OIM	Responsible for ensuring that the requirements set forth in the divisional procedure are communicated and implemented

The introduction is given so that all offshore personnel fully understand safety requirements on the Rig. This includes consideration of any potential language barriers. Completion of rig introduction is documented and signed off by the newcomer stating that he/she has undergone the introduction and understands its requirements fully.

## 5.4. TEMPORARY REFUGE ASSESSMENT

TR is assessed as an area that provides protection to personnel from the effects of an emergency that is beyond immediate control.

The concept of the TR is to allow for the controlled muster of personnel in a safe area during the evaluation of an emergency. Personnel may be required to remain in the TR during the implementation of procedures to control the emergency.

[Section 3.5.6 Temporary Refuge](#) further details the TR.

### 5.4.1 Temporary Refuge (TR) Concept and Description

- **Description of TR and associated evacuation and escape route locations and arrangements, including:**
  - **fire and explosion protection (internal and external);**

- **HVAC system, smoke and gas detection and shutdown arrangements;**
- **emergency lighting;**
- **facilities within the TR (e.g., control rooms, muster areas, first aid etc.);**
- **control and communication systems which are accessible from within the TR (e.g., BOP control panel, ballast control, etc.);**
- **personal protective equipment stored in TR; and**
- **access and egress routes to evacuation points.**

West Vencedor's emergency response philosophy does not include TR. The primary muster areas on the Rig are located at the lifeboat stations on the starboard and port side of the Tender on the pipe rack deck. Both areas are exposed to the atmosphere. PAGA speakers are located near the muster stations for personnel to receive directions (such as abandon ship) from the ECC. The [West Vencedor Fire Control and Safety Plan](#) displays the location of the muster areas, as well as the escape routes throughout the Tender. In general, there are two escape routes from all working areas on the Tender. All personnel on board are to be familiarised with the Fire Control and Safety Plan, and the escape routes through regular drills and exercises, as described in [Section 5.3.2 Drills and Exercises](#).

The emergency controls available in the ECC are described in [Section 5.2.1 Command During Emergencies](#).

## 5.4.2 Loss of the Temporary Refuge (TR) Integrity

Should the emergency situation render the TR unsafe, a secondary TR is provided or personnel may be given alternative directions from the level 1 Emergency Response Team.

The on-scene commander may direct personnel to an alternative muster station at the Bow Deck during incidents such as a fire on the helideck.

### 5.4.2.1 Major Incidents with the Potential for Immediate Impairment of the TR

- **A list of incidents with potential to defeat the integrity of the TR.**
- **Alternate actions and mustering areas, should the integrity of the TR or associated evacuation and escape route be lost or should the TR be inaccessible for some personnel.**

In order to assess the effectiveness of the emergency response it is necessary to evaluate the muster area's ability to provide an area of safety during realization of each MAE identified for the Rig as the ERT assesses and controls the situation. The muster area is deemed unsafe if it cannot perform its intended function. Impairment may be permanent, (e.g., structural failure) or temporary (e.g., high levels of thermal radiation/smoke for a fire of limited duration).

The major physical characteristics associated with an MAE which are capable of causing impairment are:

- Flame impingement
- Smoke ingress
- Flammable gas ingress
- Oxygen (O<sub>2</sub>) depletion/carbon dioxide (CO<sub>2</sub>) accumulation
- Heat impairment
- Explosions
- Capsizing/Foundering
- Loss of structural integrity of the rig

Should any of the identified major accident events occur, personnel could be instructed to take alternative actions as detailed in [Section 5.4.2 Loss of the Temporary Refuge \(TR\) Integrity](#).

### 5.4.2.2 Temporary Refuge Integrity Requirements

- **A requirement of how long the integrity of the TR and associated evacuation and escape routes must be maintained.**

## 5.5. DETAILS OF EVACUATION AND ESCAPE EQUIPMENT

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## 5.5.1 Evacuation and Escape Systems

- **Statement of compliance with regulatory requirements.**
- **Summary of evacuation and escape assessment including mustering and evacuation times.**
- **Arrangements for verifying the mustering and evacuation times used in the assessments (see [Section 5.3.2 Drills and Exercises](#)).**

The arrangements and details of the escape, evacuation and life saving equipment are provided in [Section 3.6: Evacuation and Escape Systems](#). Additionally, arrangements for drills on the Rig, including mustering and evacuation exercises, is provided in [Section 5.3.2 Drills and Exercises](#).

The Rig is equipped with life saving appliances and equipment sufficient to meet the requirements of IMO MODU Code. The arrangement and details of the evacuation, escape and life saving appliances and equipment can be found on the [West Vencedor Fire Control and Safety Plan](#) in [Appendix 3](#).

IMO signs are used to mark evacuation routes around the working and accommodation areas of the Rig. Emergency lighting is also provided for these routes and at the embarkation points for escape devices.

The primary means of escape is the use of a TEMPSC (lifeboat). The secondary means of escape is the use of inflatable life rafts.

There are four lifeboats on the Rig, two each port and starboard sides of the pipedeck rack, forward the accommodation block.

## 5.5.2 Means of Recovery to a Place of Safety

- **Statement of preferred means of evacuation.**
- **Description of the arrangements for rescuing personnel evacuating from the MODU.**
- **Description of the arrangements for rescuing personnel escaping in life rafts or from the water.**
- **Arrangements for developing and assessing client and location specific rescue arrangements.**
- **Arrangements for obtaining support from both the private and public sector.**
- **Estimated survival times in the sea and estimated recovery times from the sea for each reasonably foreseeable event likely to lead to the need for recovery or rescue from the sea. The margin between survival time and rescue time should be sufficient to clearly demonstrate there is a good prospect of recovery, taking into account the effects of uncertainty.**

In the event of a full tender evacuation, in an emergency, the preferred means of evacuation is the lifeboats. Use of life rafts or escape to the sea would be secondary and tertiary means. For precautionary evacuations, use of helicopters is the preferred means. Once personnel have evacuated the rig, recovering personnel to a place of safety relies greatly on a stand-by vessel in the immediate vicinity. Additionally, the Tender may move off location (e.g., in case of a blowout) using the emergency anchor release.

Location specific rescue arrangements and support, and the estimated survival times for personnel in the sea, vary with tender operating location. Additionally, arrangements for the stand-by vessel, support from private and public response organisations, and the means of recovery to a place of safety is described in the Emergency Response Section of the Bridging Document developed by the Client with input from Seadrill.

[Comments](#): 4 Comments by [Vencedor\\_ChiefElectrician](#) ...

<b>Risk level: Yellow</b>	<b>DSHA</b>	
<b>Title: Emergency Scenario - Fire and Explosion</b>		
		<b>Version: 1.01</b>

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## 1 Requirements

### 1.1 FIRE DETECTION & RESPONSE

The first responsibility of the individual discovering a fire is to activate the General Alarm and notify the Radio Room of location and situation.

Only after this action has been taken should the first responder:

- Check immediate area for casualties or for people overcome by smoke
- Consider what fire fighting actions are appropriate and safe for them to undertake
- If unsuccessful, seal off all openings feeding air to the area
- Remain at the scene of the fire, if possible, until fire team arrives
- Brief fire team on situation

### 1.2 SPECIAL RESPONSIBILITIES

If a fire breaks out or an explosion occurs, the On Scene Commander will activate the ECC and initiate emergency response in accordance with procedures. Any fire or risk of fire should be reported to the company Area Office in accordance with incident reporting requirements. The On Scene Representative will notify the Duty Manager at the operator's area office (and the Field Offshore Installation Manager regarding Platform status, if applicable).

Particular additional responsibilities for fire fighting are dependent on the location of the fire.

These locations are:

- A. Fire on the Platform/Drilling package
- B. Fire in the Engine room/SCR room
- C. Fire on the Tender

Risk level: Yellow	DSHA	
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### 1.3 FIRE RESPONSE

All principal fire response responsibilities, consistent with the rigs Emergency Organization hierarchy, are shown in the attached Action Plan sheet.

The following **DSHAs** are subject to additional detail and explanation:

#### A. Fire on the Platform/Drilling package

Where specific agreements exist and subject to bridging document reference, coordinated fire fighting teams may be designated for Platform / Drilling package fire response. This response capability is contingent on designated individuals being competently trained and qualified, appropriate fire teams equipment being available; and shall be ancillary to competent deluge and other fixed fire fighting systems being in place and serviceable.

This response capability or team designation does not refer to first responder actions using available portable fire fighting equipment as appropriate.

Refer to Procedure Rig Emergency Response PRO-04-1025 - PLATFORM FIRE TEAM and the attachment Fire Action Plan for designation of Platform Fire Team position holder responsibilities and required actions.

#### B. Fire in the Engine room/SCR room

Additional to general role and responsibilities described at Procedure Rig Emergency Response – MAINTENANCE TEAM, the following duties are specific to the following areas;

##### If the fire is in engine room:

*Mechanic shall:*

- Determine location and extent of fire.
- Ensure that all ventilation systems in the area are stopped and flaps closed.
- If danger of fire getting out of control, activate emergency fuel shut off valves.
- Inform OIM of intention to use Co2 system.
- Clear engine room of personnel.
- Close watertight doors and activate Co2 system.

##### If the fire is outside engine room :

*Mechanic shall:*

- Supervise maintenance of power.
- Open bilge sections as required.
- Report status of engine room and fire pumps to OIM.
- Immediately report to OIM if technical failure occurs or is likely to occur.

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**If the fire is in SCR room :**

*Electrician shall:*

- Determine location and extent of fire.
- Isolate electrical panels if necessary.
- Fight fire with portable extinguisher.
- Co-ordinate with Marine Section Leader on arrival of first fire team.
- If Danger of fire getting out of control, clear SCR room.
- Inform OIM of intention to use Co2 system.
- Close all doors and activate Co2 system.

**If the fire is outside SCR room :**

*Electrician shall:*

- Standby in SCR room.
- Report status to OIM.
- Shut off ventilation as required.
- Isolate power to affected areas as required by OIM/Marine Section Leader.
- Co-ordinate with Mechanic to supervise maintenance of power.

**C. Fire on the Tender**

Response to fire on the Tender shall be in accordance with Station Bill and Emergency Group designations as described in PRO-04-1025.

**1.4 ALL CLEAR & RE-ENTRY**

The authority to initiate the All Clear and Re-entry procedure lies with the OIM (OSC) in conjunction with the Marine Section Leader (OSTL). The OIM must satisfy himself that the following criteria have been met before the All Clear alarm signal is activated:

- The risk of re-ignition is eliminated.
- Flammable materials and equipment are removed from vicinity of the emergency.
- Rig and tender operating systems are secure and fully operational (fire & ballast pumps, gas detection, vents, power generation and air conditioning).
- The immediate vicinity of the emergency site is clear of smoke and properly vented.
- All personnel are accounted for and injuries are being treated by the Medic.

**2 Risk evaluation**

Risk shall be managed compliance to company procedures and policy, notably PTW, Housekeeping, Risk Management, Well Control and satisfaction of maintenance routines.

Risk level: Yellow	<b>DSHA</b>	
<b>Title: Emergency Scenario - Fire and Explosion</b>		
		<b>Version: 1.01</b>

### 3 Guidelines

#### 3.1 Breathing Device (SCBA) Procedures

Instructions for Putting on the Breathing Device:

1. Remove faceplate from case
2. Check cylinder gauge – it should read ‘FULL’
3. Grab bottom of cylinder
4. Lift over head and rest on back
5. Attach chest strap
6. Tighten up and pull shoulder strap tabs ‘OUT’
7. Fasten waist strap and pull tight. Tuck in ends of waist strap and shoulder harness.
8. Push shut-off button ‘IN’
9. By-pass must be closed
10. Open cylinder valve fully – Audio Alarm must ring.
11. NO air should flow from regulator.
12. Gauge reading must be within +/- 5% of cylinder pressure.
13. Open bypass. Listen for air. Close bypass
14. Close cylinder valve. Watch pressure gauge. Pressure must not drop more than 100 psi in 10 seconds.
15. Crack open bypass. Watch pressure gauge. Alarm must start to ring as needle enters red zone.
16. Hold face piece by straps. Put chin in first.
17. Pull Harness over head. Tighten neck then template strap. Tuck in ends of harness strap.
18. Cover inlet connection. Inhale and hold breath 10 seconds. Face piece should collapse and remain collapsed.
19. Take deep breath. Block inlet and exhale. Feel for rush of air if valve is stuck.
20. Open cylinder valve. Shutoff button must be ‘IN’. Engage ¼ turn quick disconnect to the faceplate. Test to verify proper engagement.
21. Inhale sharply to start air flow. Check by-pass again.

Risk level: Yellow	<b>DSHA</b>	
<b>Title: Emergency Scenario - Escape of Gases</b>		
		<b>Version: 1.01</b>

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**1 Requirements**

The escape of gases during drilling operations introduces additional hazards to the operation in two forms, one being in the form of Hydrocarbon gases which significantly heightens the fire / explosion risk to an unacceptable level, the other being the release of Hydrogen Sulphide (H2S) gas, which presents a risk to health through asphyxiation.

Fixed gas monitors are installed at pre-determined locations in order to provide early warning of such releases. Contractual requirements may supplement and add to these monitor locations.

Should drilling operations be conducted in a field where H2S gas is likely to be present in unacceptable concentrations, contractual conditions shall ordinarily require the operator to provide third party support and additional equipment (Breathing apparatus and detector stations) as a mitigating control for this environment.

**1.1 HYDROCARBON GAS ESCAPE RESPONSIBILITIES**

The OIM in conjunction with the Snr. Drilling Supervisor has overall responsibility for co-ordination of all response activities according to their judgment of the platform hydrocarbon gas escape situation.

Part of that response may include activation of the Emergency Command Centre and initiating the General Alarm for programmed crew reaction.

Should the circumstance not demand immediate activation of the ECC and General Alarm, the OIM shall continue to monitor the extent of the gas release danger and shall keep the Rig Manager informed of the situation and remedial steps being undertaken to control the release.

**GENERAL DUTIES:**

**OIM**

- Upon being notified of the presence of flammable vapours, estimate the hazard to personnel on the rig package and tender.
- Instruct on-duty Tourpusher to stop all ignitable activity on the rig and shut down drilling operations immediately.
- If situation is considered perilous, evacuate all non-essential personnel from the platform.
- Instruct key personnel (Tourpusher, Driller, Asst. Driller) to shut in the well & prepare to put on BA sets.

<b>Risk level: Yellow</b>	<b>DSHA</b>	
<b>Title: Emergency Scenario - Escape of Gases</b>		
		<b>Version: 1.01</b>

### ***Mechanic/Electrician***

The Mechanic and Electrician are responsible for the maintaining of power and running of other vital machinery. They shall keep the On Scene Commander (OIM) informed of equipment operational status.

On notification of the presence of gas around the Platform, they shall liaise with the OSC for direction on appropriate actions, including;

- Checking that ventilation fans and blowers are shut down to prevent gas being drawn below decks.
- Shutting down all non-essential machinery to eliminate sources of ignition.
- Supervising the closing of doors, hatches, flaps, fire dampers, report to OIM all actions being taken.
- Standing-by Electrician and prepare to disconnect.
- Assisting Marine Section Leader to disconnect from platform.
- Supervising shutdown procedure if abandonment is ordered.

### ***Marine Section Leader***

- On notification of presence of hydrocarbon gas, liaise with the OSC and OSR, for coordination of response.
- Instruct on-duty deck crew to assist to close doors, flaps, hatches, etc. as directed by himself or Mechanic / Electrician.
- Prepare to disconnect from Platform on instruction from the OSC.
- After disconnection, pull away from Platform in an upwind direction if possible.
- Liaise with OSC and OSR regarding abandonment contingencies.

### ***On Duty Tourpusher***

- Notify OSC and OSR upon presence of flammable vapours.
- Stop all ignition potential activity and shut down Drilling Operations immediately
- If situation is considered perilous, evacuate all non-essential personnel from the Platform.
- Co-ordinate with Driller and Assistant Driller, shut in well. (prepare to put on BA sets)
- Evacuate Platform; liaise with OIM for instructions on possible disconnection from Platform.

### ***Rig Administrator (Radio Operator)***

- On gas warning or alarm, contact standby boat by VHF radio – inform them of situation and warn to proceed / remain upwind.
- MF transmitter is not to be used until Gas situation is clarified and permission to transmit is granted by the OSC.
- Messages to shore are to be relayed by the standby boat.

Risk level: Yellow	<b>DSHA</b>	
<b>Title: Emergency Scenario - Escape of Gases</b>		
		<b>Version: 1.01</b>

## **1.2 H2S GAS ESCAPE RESPONSIBILITIES**

All rigs shall ordinarily have at least one H2S detection point as part of Tech Specs; this detection point/s is typically located at one of, all or a combination of the following locations;

- Bell nipple
- Flow Line
- Shale shaker
- Supply Purge Inlet
- Exhaust purge outlet
- MCC Room

This provision of a detection system is to enable hazard control and response to unrecognized or unanticipated **DSHAs** of toxic gas emission.

On any occasion where drilling is undertaken in a field where there exists a H2S risk as advised by the operator, the responsibility for provision of adequate detection points and associated response equipment shall ordinarily fall upon the operator unless specified otherwise.

The Operator contracted 3rd Party H2S contractor shall provide a full H2S Emergency Response Plan, which is aligned (through consultation) with rig emergency procedures and position responsibilities.

In the absence of this purpose developed Procedure and in response to a toxic gas release in circumstances outside of anticipated field risks, nominated personnel shall respond in the same manner as directed in Procedure Fire & Explosion.

Crew response shall be through normal emergency activation (general alarm and muster) at direction of OSC, however any alternative muster point will be verbally advised at primary muster location by the Muster Controller and announced over the PA system, as is determined appropriate at the time given the circumstances and wind direction (i.e. Helideck / inside accommodation etc.).

## **1.3 ALL CLEAR**

The authority to initiate the All Clear and Re-entry procedure lies with the OIM (OSC) in conjunction with the Marine Section Leader (OSTL). The OIM must satisfy himself that the following criteria have been met before the All Clear alarm signal is activated:

- The source of release is isolated and secured (well shut-in).
- Testing verifies that gas levels have reduced to safe & acceptable levels.
- Rig and tender operating systems are secure and fully operational (fire & ballast pumps, gas detection, vents, power generation and air conditioning).

<b>Risk level:</b> Yellow	<b>DSHA</b>	
<b>Title: Emergency Scenario - Escape of Gases</b>		
		<b>Version: 1.01</b>

## 2 Guidelines

### 2.1 Hydrogen Sulphide information

Physical Effects of H<sub>2</sub>S

- H<sub>2</sub>S has different physical effects of H<sub>2</sub>S at various levels of concentration.

Concentration ppm	Symptoms	Hazard and Result
1-5	Quite noticeable rotten eggs odour.	Can irritate lungs and eyes
5-10	Odour decreases as concentration increases. Can cause some eye irritation.	Can irritate lungs and eyes. At this level there are still no adverse health effects during an 8 hour shift, even after repeated exposure
15	Eye irritation coupled with some lung irritation. Odour still strong.	Quite irritant. However, personnel will not suffer, if each exposure duration is less than 15 minutes, less than four times a day, and with a minimum of 1 hour between exposures; and if the 10 ppm level is not exceeded between the exposures; during an 8 hour work shift
20	Increasing eye and lung irritation. Sneezing. Door is decreasing, however, still strong.	Maximum acceptable ceiling Concentration without protective equipment for one hour exposure, once during an 8 hour shift of a 40 hour work week
50	Increasing eye and lung irritation. Now, also throat irritation. Odour becoming nauseating, sickening, and sweet, before fading away as the ability to smell disappears	Acceptable maximum peak, permitted only once for a maximum duration of 10 minutes during an 8 hour shift, with no other measurable H <sub>2</sub> S exposure during that shift. Also specified as causing no noticeable adverse effects by an accidental release. Notice, however, that longer exposures (more than 8 hours) may lead to haemorrhage and death
70-500	Paralyses sense of smell in 3 – 5 minutes. Major and increasing irritation and pain of eyes, lungs, and throat. Faster respiration. Drowsiness after 15 – 30 minutes. At 150 – 400 ppm rapid loss of smell within 1 – 2 minutes. Dizziness. Difficult respiration and coughing. Burns eyes, throat, and lungs. Convulsions and potential vomiting	Olfactory nerve is paralysed. 150 – 400 ppm injurious – Victim needs prompt removal to fresh air if respiratory paralysis is to be avoided. Irreversible Pulmonary Oedema might result. 200 ppm for 30 minutes is lethal in 5% of the population. Hazardous level for personnel is set at 250 ppm by API.
500-700	Increasing dizziness. Loss of sense of reasoning and balance. Breathing problems within a few minutes. Severe coughing and quickly Unconscious when reaching 700 ppm and above. Prompt artificial resuscitation needed	Extremely dangerous. May produce Severe and permanent injury or death. Breathing will stop quickly, and death will result if not promptly artificially resuscitated. 600 ppm is defined as lethal by API standard. 700 ppm will cause instant knockdown
700-1000	Immediate unconsciousness.	Fatal in a couple of minutes

Risk level: Yellow	<b>DSHA</b>	
<b>Title: Emergency Scenario - Escape of Gases</b>		
		<b>Version: 1.01</b>

## **2.2 Breathing Device (SCBA) Procedures**

Instructions for Putting on the Breathing Device:

1. Remove faceplate from case
2. Check cylinder gauge – it should read ‘FULL’
3. Grab bottom of cylinder
4. Lift over head and rest on back
5. Attach chest strap
6. Tighten up and pull shoulder strap tabs ‘OUT’
7. Fasten waist strap and pull tight. Tuck in ends of waist strap and shoulder harness.
8. Push shut-off button ‘IN’
9. By-pass must be closed
10. Open cylinder valve fully – Audio Alarm must ring.
11. NO air should flow from regulator.
12. Gauge reading must be within +- 5% of cylinder pressure.
13. Open bypass. Listen for air. Close bypass
14. Close cylinder valve. Watch pressure gauge. Pressure must not drop more than 100 psi in 10 seconds.
15. Crack open bypass. Watch pressure gauge. Alarm must start to ring as needle enters red zone.
16. Hold face piece by straps. Put chin in first.
17. Pull Harness over head. Tighten neck then template strap. Tuck in ends of harness strap.
18. Cover inlet connection. Inhale and hold breath 10 seconds. Face piece should collapse and remain collapsed.
19. Take deep breath. Block inlet and exhale. Feel for rush of air if valve is stuck.
20. Open cylinder valve. Shutoff button must be ‘IN’. Engage ¼ turn quick disconnect to the faceplate. Test to verify proper engagement.
21. Inhale sharply to start air flow. Check by-pass again.

Risk level: Yellow	<b>DSHA</b>	
<b>Title: Emergency Scenario - Helicopter Crash on Deck</b>		
		<b>Version: 1.01</b>

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## 1 Requirements

A helicopter crash may not be confined to the Helideck. A helicopter making an emergency landing owing to mechanical failure and subsequent control difficulties could overshoot the Helideck and crash onto other areas of the Tender. A helicopter could also suffer catastrophic failure, resulting in the helicopters' inability to remain airborne or to make a controlled landing and could crash anywhere on the Tender.

### 1.1 RESPONSIBILITY

The On-Scene Commander (OIM) has overall responsibility and co-ordinates all activities according to his judgment of the total situation. He will issue calls for outside assistance if considered necessary, call a halt to all non-essential operations and order any OSV's (Offshore Supply Vessels) away from the Tender.

### 1.2 PREPARATIONS FOR EMERGENCY LANDING

If notice of intended emergency landing is received, the general alarm should be sounded to initiate the Emergency Response Organization.

PA system announcements shall be made advising the nature of the emergency and providing direction to muster at the alternative muster location. The Muster Controller and assisting personnel as delegated by the OSC shall redirect personnel from the primary muster location to the alternate muster location. Muster Marshall's shall maintain control and order of personnel at the Alternate location, in accordance with normal stipulated duties.

Given proximity to expected crash location (Helideck), all regular task designations in this area (e.g. Coxswain) shall join the muster and only resume designated responsibilities at the direction of the OSC, when deemed safe to do and if necessary. The Muster Controller shall remain at the Primary Muster location until re-direction of mustering personnel has been completed and shall then resume his normal assigned functions at the alternate muster location.

All uncollected t-cards at the primary muster location shall be removed and held by the Muster Controller upon departure to Alternate Muster location. In accordance with standard procedure, these cards shall be checked against the emergency team personnel notifications made to ETC and any identified missing personnel shall be notified to the ETC for information of OSC and assignment of search personnel.

Upon departure from the Primary Muster location, signage shall be displayed advising use of Alternate Muster location and also advice that T-cards are in possession of Muster Controller at Alternate location.

<b>Risk level: Yellow</b>	<b>DSHA</b>	
<b>Title: Emergency Scenario - Helicopter Crash on Deck</b>		
		<b>Version: 1.01</b>

***Nearest available Vessel***

Any vessel alongside shall be cast off immediately, however any vessel in the vicinity may be requested to assist in fire fighting using water cannons on bridge and or foredeck.

***On Scene Commander (OIM)***

- Undertake all normal responsibilities as designated for OSC
- Confirm that OSR, Operator Emergency Coordination Centre (ECC) and Area Office have been informed.
- Confirm with ETC that clinic is prepared for multiple casualties, Triage system in place and that the Medical Team are assembled with anticipated resources available.
- Direct Rig Admin (Radio Operator) to advise OSTL
- Direct Rig Admin (Radio Operator) to advise HLO to assemble Helideck Fire team

***On Scene Team Leader (Marine Section Leader)***

- Liaise with FT Leaders at FT Muster location regarding fire fighting and rescue operation roles and responsibilities, as support to the Helideck Fire Team.
- Liaise with the HLO at the Helideck regarding equipment & Helideck Fire Team preparations
- Ensure Helideck drainage is lined up overboard
- Safeguard area surrounding Helideck.
- Ensure that all personal are in a sheltered position at the time of landing.

***HLO (Helideck Fire Team Leader)***

- Account for Helideck Fire Team members and advise Radio Room of ID / headcount
- Brief Helideck Fire Team members regarding situation
- Check operation of Fire Monitor pump and foam inductor
- Line up monitors for application of foam to expected landing position
- Complete inspection and preparation of wheeled foam and dry power extinguishing units on Helideck.
- Direct the collection of back-up portable Dry Powder / Foam Fire Extinguishers as supplementary response equipment, for positioning at deck below Helideck.
- Delegate inspection and content check of Crash Box
- Ensure drain from Helideck is closed to enable capture of any escaping hydrocarbons within the drain system (in accordance with CAP437 – latest edition).

<b>Risk level:</b> <b>Yellow</b>	<b>DSHA</b>	
<b>Title: Emergency Scenario - Helicopter Crash on Deck</b>		
		<b>Version: 1.01</b>

All other Emergency Organization position holders shall respond in accordance with Station Bill delegations and the position duties as described in PRO-04-1025 Rig Emergency Response.

### **1.3 PROCEDURES ON CRASH LANDING**

By its very nature, a crash landing differs from an emergency (notified) landing in that while it is a contingency that is recognized as a potential outcome of an emergency landing, a crash landing is the uncontrolled and unexpected impact of the aircraft onto the Tender (not necessarily the Helideck). This event is more likely to occur during regular takeoff or landing with no advance warning as any other aircraft in difficulty will not attempt to land on the rig but will purposely ditch into the sea.

On the basis that the Helideck will be manned by the HLO, the Helideck Fire Team and Helideck Assistants, for either a notified Emergency Landing or as part of regular flight operations, response to a crash landing should be immediate and managed under the control of the Helideck Landing Officer (HLO) until the attendance of the OSTL, who will assume overall coordination of site response.

Any person observing a crash or other incident during take-off or landing that may develop into an emergency situation, will immediately inform the Radio Room, who will in-turn notify the OSC, activate the general alarm and advise the nature of the emergency over the P.A. system.

The HLO shall maintain communications with the helicopter pilot and follow all the instructions as required.

All Helideck Operations personnel shall ordinarily be in a protected position during Takeoff or Landing as a standard operating procedure.

Where possible following impact, the pilot will deploy onboard fire extinguishing agents through remote delivery mechanisms and provide directions to passengers on evacuation methods and path. Helideck Emergency Team members shall assist the evacuation of passengers from the aircraft at the direction of the HLO.

If requested or as demanded by the circumstances, the HLO shall initiate the lay down of foam to the Aircraft / Helideck and deploy rescue teams to undertake rescue from the aircraft.

The preservation of life shall be the primary responsibility of the emergency response team and this includes the safety of rescue team members.

<b>Risk level: Yellow</b>	<b>DSHA</b>	
<b>Title: Emergency Scenario - Helicopter Crash on Deck</b>		
		<b>Version: 1.01</b>

**Upon Crash Landing:**

***HLO (Helideck Fire Team Leader)***

- Activate Emergency Alarm system and advise Radio room of situation.
- Account for Helideck Fire Team members and advise Radio Room of ID / headcount.
- Maintain communications with Command Centre and provide status updates.
- Communicate with Aircrew and follow any directions given
- Apply foam on aircrew direction or if the immediate situation demands.
- Upon aircrew direction or if the immediate situation demands, apply (by Helideck Emergency Team members) portable fire extinguishing agents.
- Commence passenger evacuation on aircrew direction or if the immediate situation demands.
- Brief the OSTL (Marine Section Leader) and hand over the scene to his authority.
- Act as the OSTL assistant and maintain communications with the aircrew.

***On Scene Commander (OIM)***

- Undertake all normal responsibilities as designated for OSC
- Confirm that OSR, Operator Emergency Coordination Centre (ECC) and Area Office have been informed.
- Confirm with ETC (Off Duty Tourpusher at ECC) that clinic is prepared for multiple casualties and that the Medical Team are assembled with anticipated resources available.

***Emergency Team Leader (Off-duty Tourpusher)***

- Undertake all normal responsibilities as designated for ETC
- Establish contact with Fire Team leaders at FT Muster location and direct movement as relayed by OSTL.
- Establish contact with Medical Team and confirm readiness. Also confirm preparation for activation of Rig Triage System for management of multiple casualties (>3 casualties).

Risk level: Yellow	<b>DSHA</b>	
<b>Title: Emergency Scenario - Helicopter Crash on Deck</b>		
		<b>Version: 1.01</b>

***On Scene Team Leader (Marine Section Leader)***

- Liaise with the HLO at the Texas / Helideck and assume responsibility and management of the scene.
- Establish radio contact with the ETC regarding Fire Team deployment.
- Ensure Helideck drainage is closed to enable capture of escaping hydrocarbons.
- Facilitate effective and safe deployment of multiple Fire teams for personnel rescue and fire fighting response.

***All Personnel***

In any case of an emergency situation on the Helideck or involving a Crash Landing, the general alarm will always be activated, which will be followed by a P.A. announcement advising the actual situation and direction to move to the alternate muster location.

All emergency teams shall respond to the alarm in the normal manner and await direction from the ETC.

All other Emergency Organization position holders shall respond in accordance with Station Bill delegations and the position duties as described in this Manual. The only exception to this shall be a redirection of Lifeboat manning personnel (Coxswain and designated crew) by the ETC to join the muster group until otherwise directed via the Muster Controller.

All other personnel shall report to the alternative muster area and await direction. The Muster Controller and assisting personnel as delegated by the OSC shall redirect personnel from the primary muster location to the alternate muster location. Muster Marshall's shall maintain control and order of personnel at the Alternate location, in accordance with normal stipulated duties and provide headcount to the Muster Controller and/or OSC.

**1.4 NOTIFICATIONS**

***Rig Admin (Radio Operator)***

On notification of helicopter emergency or crash landing, he shall inform;

- Nearest available vessel
- Marine Control
- Helicopter Base
- Operators shore base
- Seadrill Area office

<b>Risk level:</b> <b>Yellow</b>	<b>DSHA</b>	
<b>Title: Emergency Scenario - Helicopter Crash on Deck</b>		
		<b>Version: 1.01</b>

**INFORMATION TO BE REPORTED SHOULD INCLUDE.**

- Helicopter type and call sign (if known)
- Number of personnel on board.
- Name of installation, tender and platform.
- Position of crash in relation to installation.
- Description of incident.
- Time of incident.
- Details if known of any injuries (note. names of injured persons not to be given over open communications).
- Weather conditions on scene.
- Action taken on scene.
- Action and assistance requested of Marine Control, shore base or other agencies.
- All messages should be logged with names of caller and receiver.

**1.5 ALL CLEAR**

The authority to initiate the All Clear signal lies with the OIM (OSC) in conjunction with the Marine Section Leader (OSTL). The OIM must satisfy himself that the following criteria have been met before the All Clear alarm signal is activated:

- The risk of re-ignition is eliminated.
- Flammable materials and equipment are removed from vicinity of emergency.
- Rig and tender operating systems are secure and fully operational (fire & ballast pumps, gas detection, vents, power generation and air conditioning).
- All personnel are accounted for and injuries are being treated by the medic.

Risk level: Yellow	<b>DSHA</b>	
<b>Title: Emergency Scenario - Helicopter Ditching</b>		
		<b>Version: 1.01</b>

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## 1 Requirements

### 1.1 RESPONSIBILITIES

If radio contact with an arriving helicopter is not obtained or is suddenly lost; and the aircraft cannot be observed by the time of its reported ETA, the Onshore Emergency Coordination Centre will immediately be notified by the OSC of the overdue helicopter.

If the helicopter, according to ETA, should be in the vicinity of the installation, the nearest available aircraft vessel shall be dispatched along the expected approach path. The coordination of this response shall be through the OSR and respective control centres (Helibase and/or Marine Control)

If the aircraft ditches within visual of the rig / installation, duties shall be undertaken as described in the following parts.

### 1.2 GENERAL DUTIES

#### On-Scene Commander (OIM)

Upon notification of an aircraft ditching (or imminently ditching) into the sea in the vicinity of the installation, the OSC (OIM) shall activate the ECC, facilitate the provision of notification to the Onshore Emergency Coordination Centre, Marine Control and Aircraft base; and notify the following personnel to attend for situation briefing;

- On-Scene Representative (Client Representative)
- Man Overboard Team Leader (Marine Section Leader)
- Medical Team Leader (Medic)
- Lifeboat Coxswains

The OSC shall coordinate an immediate response rescue operation with appropriate onboard rescue craft and / or Offshore Supply Vessel/s in the vicinity, if considered safe to do so.

If the location of ditching is not in the immediate vicinity of the installation but within visual, the OSC shall call upon any available helicopters in the area to approach the site of ditching, and relay a situation report to all parties preparing rescue efforts.

On receiving preliminary report of casualties from Marine Section Leader, the OSC shall inform the Onshore ECC and confirm Medivac requirements.

If further vessel support is required, the OSC will direct the launching of main lifeboats.

<b>Risk level: Yellow</b>	<b>DSHA</b>	
<b>Title: Emergency Scenario - Helicopter Ditching</b>		
		<b>Version: 1.01</b>

**Rig Admin (Radio Op):**

Upon activation of the ECC, the Rig Admin (Radio Op) shall make PA announcements for the designated Man Overboard Team to report to FRC and make preparations for launch.

He shall also;

- Note time, sea condition, current direction and speed, wind direction and speed.
- Make contact with designated Lifeboat crews to stand-by at lifeboats until further direction from Coxswain.

Undertake designated ECC duties as outlined in Rig Emergency Response Procedure PRO-04-1025.

**Marine Section Leader:**

The MOB Team Leader (Marine Section Leader) shall manage the on-site rescue response and is responsible for coordination of all vessels assigned to search and rescue in immediate vicinity of ditched aircraft.

He shall;

- Inform radio room when the FRC is ready for launching and advise any obstructions to launch.
- Maintain contact with the OSC and report response status at all stages.
- Supervise the emergency team to load adequate 'Crash Box' equipment (e.g. fire axes crowbars, fire extinguishers etc.) into the FRC and launch.
- Inform the OSC if further assistance through the launch of lifeboats is required.
- Relay to the OSC the extent of casualties, if possible to ascertain.

If the aircraft has ditched in close proximity to the installation, he shall establish a towline with the floating wreck in order to prevent its drift underneath the platform. If connecting a towline, the Marine Section Leader shall remain acutely aware of the wreck status should it begin to submerge and disengagement is required.

The Marine Section Leader shall also be aware of the possible risk of ignition of any aviation fuel spill and shall at all times, maintain the safety of his team and preservation of human life as the over-riding principal of operations.

All other positions shall undertake duties as directed by the On-Scene Commander or as required per Rig Emergency Response PRO-04-1025.

<b>Risk level:</b> <b>Yellow</b>	<b>DSHA</b>	
<b>Title: Emergency Scenario - Helicopter Ditching</b>		
		<b>Version: 1.01</b>

### **1.3 ALL CLEAR**

The authority to initiate the All Clear signal procedure lies with the OIM (OSC) in conjunction with the Marine Section Leader (OSTL). The OIM must satisfy himself that the following criteria have been met before the All-Clear alarm signal is activated:

- Risk of ignition of oil spill is eliminated or would not affect the safety of the platform and tender.
- Operators Oil Spill Response Team has taken the appropriate action and/or given the All Clear (if applicable).
- Rescue operation from tender (lifeboats & FRC) is completed.
- Risk of contact between tender / platform and wreckage is eliminated.
- All personnel are accounted for and injuries are being treated by the medic.
- Authorization has been received from Operator's Representative to continue operations.

<b>Risk level:</b> Yellow	<b>DSHA</b>	
<b>Title: Emergency Scenario - Damaged or Missing Auxiliary Vessel</b>		<b>Version: 1.01</b>

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## 1 Requirements

Should an Auxiliary or Offshore Supply Vessel not be observed at its reported ETA or within an appropriate time period, and if radio contact cannot be established between the tender and the vessel due, the Operator’s Marine Control Department will be informed of an overdue vessel. Efforts to establish radio contact shall be continued until contact is established or further information is received from the Operator On-Scene Representative (OSR).

### 1.1 RESPONSIBILITY

The master of the auxiliary vessel (e.g. Crew Boat / Offshore Supply Vessel) has overall responsibility for the safety of his vessel and personnel.

In the case of onboard emergency, the Captain of that vessel shall act in accordance with his emergency procedures.

If a vessel in the vicinity of the tender suffers serious damage and requests immediate assistance, the On-Scene Commander (OIM) shall activate the Emergency Command Centre with ECC assigned personnel, though the General Alarm SHALL NOT ordinarily be activated.

If weather conditions at the time of the emergency do not permit the launch of rescue craft from the tender, the OSC will alert the Operators Marine Control and advise co-ordination of immediate rescue efforts from offshore ECC. The OSC shall alert nearest available vessels and use the tender for the transfer and treatment of injured personnel and survivors.

### 1.2 GENERAL DUTIES

If a decision to mount a rescue operation from the tender is agreed, the following responsibilities will be discharged:

#### On-Scene Commander (OIM)

Upon notification of an auxiliary vessel in distress in the vicinity of the tender, the OSC (OIM) shall activate the ECC. He shall facilitate notification to the Onshore Emergency Coordination Centre (Operator), Marine Control and Aircraft Heli-base; and notify the following personnel to attend for situation briefing;

- On-Scene Representative (Client representative)
- Man Overboard Team Leader (Marine Section Leader)
- Medical Team Leader (Medic)

<b>Risk level:</b> <b>Yellow</b>	<b>DSHA</b>	
<b>Title: Emergency Scenario - Damaged or Missing Auxiliary Vessel</b>		<b>Version: 1.01</b>

- Rescue designated Lifeboat Coxswains

The OSC shall coordinate the immediate rescue operation utilizing appropriate rig rescue craft (FRC and Rescue designated Lifeboat) and / or Offshore Supply Vessel/s in the vicinity, if considered safe to do so.

The Crane Operator shall be delegated to report to the relevant crane, if not already in position.

On receiving a preliminary report of casualties from either the Vessel in distress, assisting OSV Captains or the attending MOB Team leader (Marine Section Leader), the OSC shall inform the Medical Team Leader, the Onshore ECC and commence notifications through the OSR for any confirmed Medivac requirements.

If further immediate vessel support is required, the OSC will direct the launching of the designated lifeboat if not already deployed.

**Rig Admin (Radio Op):**

Upon activation of the ECC, the Rig administrator (Radio Op) shall make PA announcements advising all crew of the situation. He shall also facilitate the attendance of the following personnel (per Station Bill designations) to their assigned emergency stations;

- Man Overboard Team - to report to FRC and make preparations for launch.
- Lifeboat crew members - to stand-by at lifeboats until further direction

He shall also;

- Alert any Stand-by or other vessel/s in the vicinity.
- Note time, sea condition, current direction and speed, wind direction and speed.
- Undertake designated ECC duties as outlined in PRO-04-1025 Rig Emergency Response
- Prepare direct communications link between the Onshore ECC and the OSC.

**MOB Team Leader (Marine Section Leader):**

The MOB Team Leader (Marine Section Leader) shall provide on-site rescue response through attendance in Rig Fast Rescue Craft; and provide regular information updates to the ECC.

He shall;

- Inform radio room when the FRC is ready for launching and advise any obstructions to launch.
- Ensure essential equipment is loaded (i.e. tow rope etc).

<b>Risk level:</b> <b>Yellow</b>	<b>DSHA</b>	
<b>Title: Emergency Scenario - Damaged or Missing Auxiliary Vessel</b>		
		<b>Version: 1.01</b>

- Inform the OSC if further assistance through the launch of rescue designated lifeboat is required.
- Relay to the OSC the extent of casualties, if possible to ascertain.

Note: the personnel manning rig rescue craft are deployed for the purpose of rescue of crew from the vessel in distress (or surrounding waters), if required. It is not their role or responsibility to board that vessel and / or participate in fire fighting or other activities additional to their rescue function and they shall not complicate matters further by doing so. The Captain of the Vessel in distress shall manage his emergency response in accordance with his vessel procedures and order abandonment as required.

**Emergency Team Coordinator (Off-duty Tourpusher):**

The ETC shall assist the OSC to manage and coordinate the assigned rescue vessels.

He shall;

- Oversight accurate log keeping by Rig administrator (Radio Operator)
- Manage deployment of additional rescue craft as required.
- In case helicopters are involved in the rescue efforts, oversight all activities on the Helideck under the control of the HLO
- Prepare to receive survivors and injured personnel

All other positions shall undertake duties as directed by the On-Scene Commander or as required per Rig Emergency Response position delegations stipulated in Procedure Rig Emergency Response PRO-04-1025.

<b>Risk level:</b> <b>Yellow</b>	<b>DSHA</b>	
<b>Title: Emergency Scenario - Man Overboard</b>		
		<b>Version: 1.01</b>

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**1 Requirements**

**1.1 RESPONSIBILITY**

Upon notification of a man overboard, the On-Scene Commander (OIM) has overall responsibility for co-ordination of all rescue activities according to his judgment of the situation.

Personnel responsibilities for the emergency response to a man overboard are directed in the Station Bill.

If the man overboard is not recovered or is lost out of sight, the OSC will immediately notify onshore Emergency Coordination Centre for external agency assistance in Search & Rescue efforts. During the activation period of this assistance, the OSC shall continue a systematic search of the immediate area of last sighting.

**1.2 GENERAL DUTIES**

**All Personnel**

When observing someone fall overboard or in the water, shout “Man Overboard” repeatedly. Regardless of proximity to structure, the spotter shall still throw the nearest life ring and marker out and keep the man in sight. He shall have radio room notified immediately by alerted crew and shall not leave his lookout station until instructed to do so.

**On-Scene Commander (OIM)**

Upon the notification of Man-Overboard, the OSC (OIM) shall ensure the General Alarm has been activated, activate the ECC, facilitate the provision of notification to the Onshore Emergency Coordination Centre, Marine Control and Aircraft base; and notify the following personnel to attend the ECC for a situation briefing;

- On-Scene Representative (Client representative)
- Man Overboard Team Leader (Marine Section Leader)
- Medical Team Leader (Medic)
- Lifeboat Coxswains

If the Man overboard is visible from the Tender, the OSC shall immediately task the Rig administrator (Rig Clerk - or other nominated person) to attend the Helideck with VHF Radio

<b>Risk level: Yellow</b>	<b>DSHA</b>	
<b>Title: Emergency Scenario - Man Overboard</b>		
		<b>Version: 1.01</b>

and rig binoculars to provide location information direct to search teams and ECC. This tasking shall assume 'watch' responsibilities from the person originally making the sighting.

If the Man overboard is not visible from the Tender, the OSC shall facilitate the delivery of VHF Radio and Binoculars to a suitable person in best position (e.g. Platform) to maintain sight of the MOB.

Regardless of circumstance, the OSC shall instruct the On Duty Tourpusher to initiate lookout from suitable vantage point and commence relay of location information as primary provider or as secondary to Tender lookout.

The OSC shall coordinate the rescue operation with onboard rescue craft and / or Offshore Supply Vessel/s in the vicinity, as safe to do so.

If the MOB is lost out of sight, the OSC shall immediately notify the Onshore ECC and liaise with participating OSV Captain/s regarding the determination of search area and effective search pattern allocations until directed otherwise.

If further vessel support for search efforts is required, the OSC will order launching of delegated lifeboats and seek further OSV support.

If helicopter assistance is allocated for search operations, he shall ensure preparation for Helideck operations, for landing to offload passengers if required.

Upon recovery and on receiving a preliminary report of the man-overboard medical status from the MOB Team Leader (Marine Section Leader), the OSC shall inform the Onshore ECC and confirm any Medivac requirements.

Upon the completion of headcount and accountability for all personnel (including identification of the Man overboard if unknown), the OSC shall at his discretion, cease the alarms and dismiss the muster. This dismissal shall not include the Coxswains and Lifeboat crews who shall remain on station.

**Rig administrator (Radio Op):**

Upon activation of the ECC, the Rig administrator (Radio Op) shall activate the General Alarm and make PA announcements announcing the nature of the emergency. He shall also make announcements for the designated Man Overboard Team to report to the Rescue Craft and make preparations for launch.

He shall also;

- Note time, sea condition, current direction and speed, wind direction and speed.
- Make contact with nearby OSV's and advise situation. These vessel/s shall be requested to immediately attend the location of MOB to assist rescue efforts.
- Undertake designated ECC duties as outlined in Rig Emergency Response PRO-04-1025

<b>Risk level:</b> <b>Yellow</b>	<b>DSHA</b>	
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**Emergency Team Coordinator (Off-duty Tourpusher):**

The ETC shall assist the OSC to manage and coordinate the rescue.  
He shall;

- Advise Fire Team leaders (and fire teams) to immediately join muster
- Advise Maintenance Team leaders (and team members) to immediately join muster
- Receive headcount information from Muster Controller and on-duty Tourpusher
- If helicopters are involved in the rescue efforts, oversight all activities on the Helideck under the control of the HLO
- Maintain contact with lifeboat Coxswains regarding incident status
- Maintain contact with the Medical Team
- Oversight accurate log keeping by Rig Admin (Radio Op)

**Marine Section Leader:**

The MOB Team Leader (Marine Section Leader) shall manage the on-site rescue response and is responsible for coordination of all vessels assigned to the search and rescue.

He shall;

- Complete radio checks with Radio Room and Lookout
- Inform radio room when the Rescue Craft is ready for launching and advise any obstructions to launch.
- Maintain contact with the ECC and report response status at all stages.
- Inform the ECC if further assistance through the launch of lifeboats is required.
- Relay to the ECC the extent of any injury, if possible to ascertain.

***Nearest Available Vessel***

The Rig Admin (Radio Operators) shall provide notification of man-overboard to nearby vessels, upon which the Captain shall alert his crew, post lookouts, man floodlights and spotlights as necessary, and prepare for launching of the OSV Rescue Craft. The Captain shall approach the indicated location of the MOB and maintain contact with the Tender radio room and MOB Team leader (in Tender Rescue craft) for directions as to the location of MOB and coordination of rescue operations.

On sighting the Man-Overboard, the OSV Bridge shall endeavor to keep the MOB in view and assist in rescue as best determined by the Captain, in consultation with the OSC.

All other positions shall undertake duties as required per Rig Emergency Organization delegations as stipulated in PRO-04-1025.

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**1.3 ALL CLEAR**

The authority to initiate the All Clear signal lies with the OIM (OSC) in conjunction with the Marine Section Leader (OSTL). The OIM must satisfy himself that the following criteria have been met before the All Clear alarm signal is activated:

- Full headcount and accounting for all personnel has been accomplished.
- The man overboard has been recovered and the FRC / lifeboat has returned to the tender.

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<b>Title: Emergency Scenario - Loss of Well Control</b>		
		<b>Version: 1.01</b>

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## 1 Requirements

Well Control emergencies are managed in consultation with operator procedural requirements and generally follow agreed flow-charts of actions and responsibilities, as stipulated in contractual bridging documentation.

In the absence of such guidance, the following principles shall be adhered to:

### 1.1 ON BOARD ACTIONS

The potential losses in terms of human life, property, petroleum reserves and ecological damage are immense so every person on Seadrill Tenders shares a responsibility for the prevention of blowouts. Training is an essential part of our blow-out prevention measures. In a drilling emergency as for normal drilling operations, the On Scene Commander (OIM) is in overall control of procedures to control the well.

### 1.2 PHASE 1 CONDITIONS: WELL CONTROL ALERT

Will be declared when the pressure imbalance is of a magnitude that requires an extraordinary response and the initiation of well control procedures to restore the well to normal conditions. In addition to well control response, the following concurrent activities shall also be undertaken;

- All personnel will be informed of the Well Control Alert via the P.A. system.
- Suspension of all Hot Work
- Client Rep is to be informed of conditions and kept informed of proceedings.

#### 1.2.1 General Duties: Well Control Alert

##### *OIM (On-Scene Commander)*

- On being notified of serious irregularities as to Well Control, assess situation and evaluate potential hazards in co-operation with the Client Rep
- Supervise Well Control Procedures
- Instruct the Marine Section Leader to make the appropriate announcement over the P.A. system
- Suspend all Hot Work
- Suspend all non-essential operations

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***Marine Section Leader (On-Scene Team Leader)***

- On notification from OIM ensure all personnel are informed of the situation by announcement over P.A. system.
- Prepare for emergency disconnect from platform
  - Emergency Disconnect Team assembly
  - Emergency Disconnect Tools preparation and allocation
- Ensure that lifeboats are in a state of readiness for launching
- Await direction from OSC

***Mechanic/Electrician***

- Assemble as part of Emergency Disconnect Team
- Electrician disconnect non-essential cables in electric bridle and prepare for disconnect.
- Take precautions to prevent power overload.
- Take directions from OSC
- Supervise the closing of doors and hatches as required

***On-Duty Tourpusher (assisted by Driller)***

- After having shut in well, inform OIM and assist in well control procedures.

**1.3 PHASE 2 CONDITION: WELL CONTROL EMERGENCY**

This phase will be declared when doubt exists as to whether Well Control can be restored by available means, or when the malfunction of equipment elevates the potential risk to an unacceptable level.

- When a Well Control Emergency is declared, the General Alarm will be sounded and information regarding the nature of the emergency shall be given over the P. A. system.
- The Onshore ECC is to be notified for immediate assistance (this will be through the On Scene Representative to the On Duty officer)
- The On Scene Commander (OIM) will commence planning contingencies for partial evacuation if required.

**1.3.1 General Duties: Well Control Emergency**

***OIM (OSC)***

- Supervise Well Control Procedure in co-operation with Client Rep.
- Evacuate non-essential personnel from the Platform.
- Instruct Marine Section Leader to initiate General Alarm and crew muster
- Instruct Marine Section Leader to stand-down Tender Fire Teams to muster
- Instruct Marine Section Leader to assemble Emergency Disconnect (Breakaway) Team from mustered personnel

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- Instruct on-duty Tourpusher to prepare Drill crew for Emergency Disconnect from Platform end
- Liaise with Client Rep to inform Production Control Centre to shut in platform.

***Marine Section Leader (OSTL)***

- Initiate General alarm on instruction from OIM
- Respond to General Alarm and stand-down Fire Teams to Muster
- Assemble Emergency Disconnect Team and provide headcount and identification list to Muster Coordinator
- Attend Emergency Disconnect location with Disconnect (Breakaway) Team

***Mechanic & Electrician***

- Maintain management of Engine Room and electricity supplies through allocated personnel, per General Alarm Response requirements
- Standby for assistance with emergency disconnect from platform
- Form part of Emergency Disconnect (Breakaway ) Team

**1.4 PHASE 3 CONDITIONS: WELL CONTROL FAILURE**

Phase 3 will be declared when it is evident that the well is out of control, it represents an imminent danger to the platform integrity and the prospects of regaining control are small or non-existent.

- The OSC (OIM) will, in consultation with the Marine Section Leader and Client Rep, determine timings for implementation of Emergency Disconnect contingencies and/or the abandonment of the Tender.
- All personnel will be evacuated from the Platform to the Tender prior to the emergency disconnect and pull back. A complete headcount at muster location and break-away team location shall be undertaken and all personnel accounted for prior this disconnect direction given by the OSC.

**1.4.1 General Duties: Well Control Failure**

***OIM***

- Liaise with Client Rep and evaluate situation
- Shut in well and lock down rams
- Direct Emergency Disconnect from platform
- Evacuate all personnel from Platform to join muster
- Direct re-headcount and account for all personnel
- Instruct Marine Section Leader to pull Tender away from Platform

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***Marine Section Leader***

- Allocate Anchor Winch duties in preparation for pull-back from Platform contingency
- Pull Tender away from Platform on direction of OIM (upon platform evacuation and headcount completion).

***Mechanic/Electrician***

- Assist Marine Section Leader to disconnect from platform.
- Prepare for shutdown procedure in case of abandonment

**1.5 GENERAL ASSIGNMENT OF RESPONSIBILITY**

***Well Control Operations:***

The OSC is in charge of all operations as to the controlling of the well and all related activities. He will work in close co-operation with the On-Scene Representative (Client Rep) and manage all allocated emergency teams through the contingency organization at the ECC.

***Abandonment Preparatory Measures:***

The Marine Section Leader is in charge of all operations concerning preparations of rescue craft and lifesaving equipment, preparations for emergency disconnect from platform, preparations for partial or total evacuation and the notification of standby vessels for assistance as required.

***Technical Support:***

The Mechanic and Electrician are in charge of all operations as to the maintenance of power and site assistance to the Marine Section Leader for disconnect from platform activity.

**2 Risk evaluation**

Risk of catastrophic loss exists in any non-compliance with the requirements set out in the corporate Well Integrity and Well Control manual, with control measures directed through this procedure integral to managing any loss of control incident. A failure in knowledge and familiarization with this emergency response procedure will expose a rig to unacceptable risk.

**3 Document control and references**

TMS DIR-00-0109 - Well Integrity and Well Control

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## 1 Requirements

Any Abandonment activity shall ALWAYS be preceded by the activation of the General Alarm (and full normal response to that alarm). If there is no fire emergency team requirement, those teams and all associated emergency teams shall be stood down by the OSTL and a direction to join the muster shall be given.

Generally, an abandon tender order will only be given when the integrity of the vessel has been seriously compromised and to remain onboard presents an unacceptable risk, justifying the taking to lifeboats and leaving the Tender unmanned. The safety of lives is paramount.

While some circumstances may justify a staged abandonment where all non-essential personnel are evacuated and essential personnel remain with remaining lifeboat access for subsequent abandonment, this shall be the exception rather than the rule. Abandonment activity is properly undertaken as a single coordinated event, under the command of the OSC, enabling all lifeboats (or other craft as necessary) to remain as a cohesive unit at sea in order to maximize survivability, visibility and to provide contingency back-up to individual units.

If circumstances and time permit, evacuation may be undertaken using external support means i.e. OSV's and/or Helicopters. Evacuation (as opposed to abandonment) in these cases shall also be subject to the coordination of the Onshore ECC but the OSC shall continue to monitor emergency conditions with onboard abandonment contingencies in a state of readiness should the situation change rapidly.

### 1.1 RESPONSIBILITY

The On-Scene Commander (OIM) has overall responsibility for co-ordination of abandonment activities according to his judgment of the situation.

Personnel responsibilities related to abandonment are directed in the Station Bill.

The OSC in consultation with the OSR will issue emergency messages and notifications. He will give directions to any external vessels / aircraft rendering assistance and co-ordinate any associated transfer operations.

For onboard abandonment activity, the OSC shall give the final verbal direction to abandon vessel, upon confirmation of all personnel accounted for and lifeboats loaded.

### 1.2 GENERAL DUTIES

If the general alarm has been sounded previously and damage control activities are being carried out, orders for implementation of shut-down procedures will be given prior to the "Abandon Ship" alarm being activated.

Emergency response activities will also be discontinued prior to abandonment instructions being initiated. The OSC will determine the most effective modes of abandonment based on

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actual conditions and available escape routes. While the loading of escape craft shall take place upon activation of the Abandon alarm, the actual launching of lifeboats and/or life rafts shall take place ONLY on the On-Scene Commanders (or delegates) direct verbal command.

Specific to the Abandonment phase of the emergency and additional to standard Rig Emergency Response duties per PRO-04-1025, the following position holders shall also undertake the following responsibilities:

On-Scene Commander (OIM)

Upon the determination that tender abandonment has become necessary, the OSC shall:

- Direct that abandonment notification be made to Onshore ECC.
- Issue SHUT-DOWN directions to the Emergency Team Coordinator (Off Duty Tourpusher) for relay to the On-Duty Tourpusher, On-Scene Team Leader (Marine Section Leader) and the Maintenance Team (Electrician / Mechanic).
- Monitor the shut-down / water-tight securing process until advice from each party responsible of final status via ETC.
- Confirm Emergency Teams and Platform personnel mobilized to Muster point
- Issue direction to Rig Admin (Radio Op) to activate Abandon Ship alarm (notifying all to 'prepare to abandon').
- Issue situation status notification (damage / personnel) to Onshore ECC and confirm abandoning tender.
- Confirm critical ships documents are collected by the OSTL or his delegate
- Confirm the final loaded headcounts
- Issue verbal command to launch lifeboats (or other craft as required)
- Coordinate at-sea lifeboat collaboration and support

Rig Administrator (Radio Operator):

Upon the notification of imminent abandonment status, the Rig Admin shall:

- Note time, sea condition, current direction and speed, wind direction and speed.
- Undertake communications as directed by the OSC
- Activate the Abandonment Alarm as directed by the OSC
- Join the muster upon direction from the OSC

Emergency Team Coordinator (Off-duty Tourpusher):

The ETC shall assist the OSC to manage and coordinate the Shut-down and water-tight securing process, in addition to the mobilization of Emergency Teams and the Platform crew (if safe to do so) to the Muster area.

He shall;

- Advise the On-Scene Team Leader to secure the emergency site, account for all Fire Team members and to deploy to join the muster.
- Confirm Shut-Down checklists and commencement of this process with the On-Duty Tourpusher, the OSTL (Marine Section Leader) and the Maintenance team (Electrician & Mechanic).

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- Receive final Shut-down / Water-tight status report from Team leaders and relay to the OSC.
- Assist OSC as required prior to abandonment

On-Scene Team Leader (Marine Section Leader):

The On-Scene Team Leader shall coordinate the securing of the emergency scene; accountability for all personnel assigned and management of his Shut-down activities, in coordination with the Maintenance team and the ETC.

He shall:

- Complete shut-downs and water-tight securing in accordance with checklist
- Confirm completion status to ETC
- Account for all personnel assigned
- Join the muster
- Collect or facilitate collection of critical ship documents

*Maintenance Team:*

The Maintenance Team (Electrician and Mechanic) shall coordinate the shut-down of their respective equipment, in coordination with the OSTL and the ETC.

They shall:

- Complete shut-downs and water-tight securing in accordance with checklists
- Account for all personnel assigned
- Confirm completion status to ETC
- Join the muster

### **1.3 LOSS OF TEMPSC (LIFEBOAT)**

SOLAS regulations require that the Tender carry a 100% POB capacity in lifeboats on each side of the tender (or if ABS dispensation provided, accommodated through additional life raft capacities).

Should any lifeboat become unserviceable, the OSC shall coordinate through the Muster Controller, re-distribution of assigned personnel to the remaining lifeboats (and/or life rafts if required).

This same contingency shall be applied should the Lifeboat boarding area become unserviceable preventing lifeboat access.

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## **1.4 USE OF LIFERAFTS**

All tenders shall have life rafts positioned to allow free and unhindered fall to the ocean, in compliance with SOLAS requirements. They shall be positioned as per the vessel Safety Plan, on launching frames and fitted with painters and hydrostatic release devices.

The painter line shall always be affixed to a secure anchor point and operating instructions shall be available in pictograph or bi-lingual format at the location.

### **Inflation**

Activate the release mechanism and drop the container to the ocean, pull the painter and the raft will inflate automatically.

### **Boarding**

Rope ladders permanently positioned at the handrails adjacent to raft launch areas shall be used to access life rafts. Should the circumstances prevent use of provided ladders, personnel shall jump into the water nearby to rafts and shall not jump directly into the raft, unless at a height above the raft floor of less than 1.5m.

Care must be taken for other personnel whether in the water or in the raft, should this action be necessary.

### **Actions after Boarding**

Disengage from the tender (untie or cut painter) and couple life rafts together where safe to do so.

### **Righting Capsized Life Rafts**

If the Liferaft inflates in an inverted position, a single person shall right the raft by turning the raft into the wind and climbing onto the CO2 cylinder using the handholds provided, leaning back until the raft comes over.

This individual shall then swim from under the raft, staying on their back while doing so.

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<b>Title: Emergency Scenario - Uncontrolled Drift</b>		
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## 1 Requirements

Generally, a case of uncontrolled drift is most likely to be experienced when the tender is under tow, following the parting of the towline. On all other occasions (when moored), such an eventuality is unlikely due to the 8-point mooring system unless associated with weather of such a magnitude as to cause subsequent anchor line failures until there is complete failure (though such a weather circumstance shall ordinarily be subject to other relevant emergency response well prior to reaching this stage of line failure).

If the Tender does become adrift in normal conditions, the priority shall be resumption of control through re-attachment. Any escalation to Abandonment Procedures shall only be undertaken after assessment that re-attachment to the tow vessel cannot be achieved (in time to avert assessed risks) and the charted drift route places the Tender in potential imminent danger of collision with fixed installations or landfall.

Controlled evacuation using external air and sea support craft shall be the first priority, with use of TEMPSC (Totally Enclosed Motor Propelled Survival Craft) lifeboats in an abandonment situation as the last resort.

### 1.1 GENERAL

#### Parted Towline / Calm Weather

- a) Person discovering shall immediately inform the OIM / Operator representative.
- b) Notify the towing vessel.
- c) Set lights/shapes for vessel not under command.
- d) Notify all other vessels and installations in vicinity.
- e) Inform Rig Manager. (Client Rep: Operators Area Office)
- f) Inform Marine Control.
- g) Bring towboat close to tender – recover and reconnect towline.
- h) If boat cannot come in close enough to transfer lines, use the line throwing apparatus to shoot a line to the boat, pass a 3/4 inch painter, which will be used to get an air hoist line across. The air hoist line can then be used for subsequent transfer of towline
- i) If unable to recover and reconnect the towline, attempt to connect a temporary nylon mooring line to hold tender steady into the weather. Reconnect towline when weather conditions allow
- j) Continue tow.

#### OR (if unable to re-connect the tow-line)

- a) Sound General Alarm
- b) Estimate direction and speed of drift.

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<b>Title: Emergency Scenario - Uncontrolled Drift</b>		
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- c) Commence contingency planning for evacuation of all non-essential personnel (if external means of evacuation are available).
- d) Consider deployment of a sea anchor or dropping of 2 anchors.
- e) Continue with effort to get tow line (or temporary nylon mooring line) onto an AHV (bollard pull capacity - 80T Tender / 100T Semi-Tender)
- f) If on likely collision course with an installation or other structure, commence evacuation of all personnel. If evacuation by external rescue craft is not possible or time does not permit, abandon by lifeboats (refer and comply with Abandonment procedure 5.8 in its entirety).
- g) Leave emergency generator running on abandoned tender.

#### **Complete Mooring Failure / Bad Weather.**

This contingency should only be relevant upon the emergence of a severe locally developing storm (that has not developed through the normal trigger points allowing breakaway and tow to sheltered area), that is of such a nature to impact mooring integrity. The likelihood of such an eventuality is low and any local storm development shall prompt an immediate field reaction at the highest response level and still allow tow away from storm front and to a safe location.

If such actions are not able to be taken and mooring lines fail;

- a) Sound General Alarm and activate the onboard ECC
- b) Commence planning to evacuate all non-essential personnel (if external means of evacuation are available).
- c) Estimate direction and speed of drift.
- d) Set navigation lights/shapes for vessel not under command.
- e) Provide information to Marine Control (or equivalent) as far as can be established on:
  - Name of unit.
  - Present situation.
  - Position and time.
  - Cause of situation.
  - Estimated direction of drift and estimated speed.
  - Precautions taken.
  - Potential Hazards.
  - Assistance required.
  - Intentions.
- f) Continue with effort to get tow line (or temporary nylon mooring line) onto an AHV (bollard pull capacity - 80T Tender / 100T Semi-Tender)
- g) If on likely collision course with an installation or other structure, commence controlled evacuation of all personnel. If evacuation by helicopter is not possible or time does not permit, abandonment by lifeboats (refer and comply with Abandonment procedure in its entirety, inclusive of all responsibilities) shall be undertaken.

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If the Tender is adrift and unable to reconnect to the tow boat or establish connection with a stand-by boat, additional to the above responses, the OIM shall also direct the following;

- Secure all cranes and equipment.
- Close all watertight doors and vents except those still needed for ventilation.
- Get information on water depth and bottom condition from towboat, or any other vessel, in case anchors have to be dropped.
- If evacuation becomes necessary, close all remaining watertight doors and vents, shut down main engine and start emergency generator.
- Leave emergency generator running on abandoned tender.

## **1.2 DROPPING ANCHORS**

If water depth is not more than 350ft. and no pipelines are in the area, one anchor, or in bad weather, two anchors should be lowered to keep the Tender stern into the wind.

This should be done with appropriately determined anchors to keep the accommodation structure downwind, as it presents the most wind resistance.

One anchor should be lowered first by winching it down to approx. 50ft. off bottom. Then dropped, paying out approx 500 ft. of line under light tension, while lowering the second anchor and dropping it in the same manner after approx. 500ft. have been paid out on the first anchor. Then line can be paid out under increasing tension until approx. 2500ft. have been paid out on the first dropped anchor. At that point, tension should be equalized and the drums dogged.

Compass heading should be recorded at the time anchors are dropped and subsequent movement or 360 Deg. turns recorded in the direction they occurred.

If the Tender does turn significantly in the wind, tension will have to be equalized again on anchor lines.

## **1.3 SPECIAL PRECAUTIONS**

### **“LLOYDS OPEN FORM”**

Lloyds standard form of salvage agreement, “No cure no pay” is usually called “Lloyds open Form”. When the OIM engages a vessel for assistance, he should, if at all possible, contact the Rig Manager prior to agreeing to contracts like “Lloyds open Form”. However the OIM is the one to judge the situation and make the final decision whether such contact with Rig Manager or head office is possible under the circumstances.

If “Lloyds open Form” is agreed to by wireless, the following terms are to be used:

- Accept salvage service on basis Lloyd’s standard form.
- No cure no pay-stop acknowledge repeating foregoing.

(Note: if the OIM is forced to accept absurd conditions due to imminent peril, the court may invalidate or disregard such conditions.)

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**1 Requirements**

**1.1 GENERAL**

Reliable weather forecasting is essential for safe operations in the offshore marine environment. Although weather forecast services are established in most areas through operator arrangement and are subject to provision of regular weather forecasts, there still exists the real possibility of sudden and unpredicted deterioration of weather conditions.

If violent or abnormal weather is predicted, or indications of severe deterioration of weather conditions are observed, the OIM will, in cooperation with the Marine Section Leader and the Client Representative, decide on necessary actions in response to situation at hand.

All information shall be evaluated and if warranted, timely precautionary action shall be taken before the situation becomes critical and response measures have to be undertaken under hazardous circumstances; or have become impossible to put into effect.

The primary response to an escalating threat within set alert zones shall always be to disconnect and tow away from the weather system in order to minimize risk to life and assets. If local weather conditions develop quickly within the vicinity of the Rig, the On Scene Commander may declare a Phase 4 Alert without declaring a Phase 1, 2, 3 alert. In general, the Alert Phase System assumes that the weather systems will move through each Phase trigger point thus allowing action to be taken in an ordered manner. However, since no two storms are ever identical, this **DSHA** does not always occur.

Therefore, case by case response actions must be implemented consistent with the threat as the formation of violent weather can be a slow process requiring several days, or a local rapidly developed one with a well formed eye developing within 12 hours or less.

For locally developing storms, it must be understood that these can escalate to typhoon status very quickly. These locally developing storms expand explosively within 12 to 16 hours in some operating areas (e.g. Gulf of Thailand).

If conditions are of an immediate severe nature with no ability or opportunity to tow away, the Rig Manager shall be informed immediately in order to arrange for external assistance and evacuation if possible. Contingency preparations shall be undertaken in order to prepare for

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the possible requirement to abandon the Tender should circumstances and conditions necessitate. If this action is necessary then Abandon Tender procedures shall be adhered to.

Communication between the OSC and the Client Representative is essential to ensure that there is a clear understanding regarding the level of emergency and abnormal weather condition response actions required.

## **1.2 WEATHER ALERTS**

Where Typhoon Response Procedures are in existence through Bridging Document or by cooperative development with the Operators, these plans shall naturally take precedence. In circumstances where no such emergency plans exist, the following guidelines shall be used to gauge response requirements and prevent loss of life and assets.

### **Phase 1: Condition Green**

Comes into effect when a tropical depression or a severe storm is within 400 nautical miles of the location.

### **Phase 2: Condition Grey**

Comes into effect when a tropical depression or a severe storm is within 350 nautical miles of the location.

### **Phase 3: Condition Yellow**

Comes into effect when a tropical depression or a severe storm is within 300 nautical miles of location.

### **Phase 4: Condition Red**

Comes into effect when a tropical depression or a severe storm is within 250 nautical miles of location.

## **1.3 WEATHER ALERT RESPONSE**

### **Phase 1: 400 Nautical Miles - Condition Green**

Operations shall continue while monitoring the threat.

#### **OIM:**

The OIM shall consult the Marine Section Leader and Client Representative to review the tender condition and operational status.

They shall decide on:

- Imposing restrictions on certain activities.
- Preparation for cessation of operations
- Planning for possible suspension of drilling operations.
- Planning for evacuation of non-essential personnel if required.

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Further preparatory activities may be:

- Commence securing of deck load and stored equipment.
- Check operation and readiness of emergency equipment
- Checking availability of supplies, i.e. mud, water, food, fuel.
- Lay down of drill pipe from the derrick.
- Secure cranes
- Check hatches and vents free of obstructions
- Calculate ballast for maximum stability.

**Phase 2: 350 Nautical Miles, Condition Grey**

***OIM***

- Consults with the Client Representative regarding the securing of the well.
- Consults with the Client Representative regarding evacuation of non-essential personnel if required.

***Marine Section Leader***

- Communicates with Operator’s Marine Control and the assigned Boat Captain, to formulate a plan to pull (or drop) anchors and initiate tow.
- Establishes tow route and safe haven details in consultation with Operator Marine Control.

***Assistant Marine Section Leader / Crane Operator***

- Continues to secure equipment and confirm all safety equipment in state of readiness.

**Phase 3: 300 Nautical Miles, Condition Yellow**

***OIM***

- Instruct Tourpusher / Driller to take steps to secure the well as per plan and in agreement with Client Representative.
- Brief the Emergency team leaders on situation and advise impending activation of General Alarm in order to establish headcount (emergency response teams and lifeboat crews to be directed to join muster).
- Evacuate all personnel from the platform
- Direct the activation of the General Alarm.
- Establish Headcount and when satisfied, sound all-clear alarm.
- Upon establishment of accurate headcount, initiate controlled breakaway and disconnect from the platform.

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***Marine Section Leader***

- Communicate with Marine Control and Boat Captains.
- Pull anchors and if unable to, slip lines (or if unable, cut lines).
- Connect tow bridle to designated tow vessel.

**Phase 4: 250 Nautical Miles, Condition Red.**

Tender should be underway and on tow-route away from heavy weather before this trigger point is reached.

Tow rig to safe area (safe area will have to be determined according to the predicted path of the storm).

***OIM***

- Will inform Area Manager of the situation and the possibility that outside help may be required for evacuation of personnel.
- Will have tender ballasted for maximum stability.
- Will use all available means to further tie down all deck loads.
- Will have all watertight doors and vents closed (Battened down)
- To consult with Boat Captain on planned actions safe area or the possibility to head out to open water if too close to shore with out sufficient water towards the lee or to hold tender into the weather without headway until the storm has passed.
- Will consider dropping anchors if necessary to avoid beaching or collision.
- Will consider slipping the towline rather than breaking the tow gear, if the possibility is indicated (in consultation with OSV Captain). Anchors would be dropped prior to slipping towline to avoid uncontrolled drift.
- Will request all possible help to evacuate personnel if storm cannot be avoided.

**If the weather system develops locally and does not allow a staged preparation and ability to tow from the location, evacuation of non-essential personnel shall be initiated in consultation with the Client Representative, if external resources are available.**

**Should circumstances prevent evacuation and necessitate the abandonment of the tender, all actions shall be in accordance with procedure MOORING FAILURE and / or ABANDON TENDER as applicable.**

***1.4 LIST OF ESSENTIAL PERSONNEL***

- |                            |                                |
|----------------------------|--------------------------------|
| • OIM (On Scene Commander) | • Electrician                  |
| • Marine Section Leader    | • STO                          |
| • Tourpusher (on-duty)     | • Rig Administrator (Radio Op) |
| • Mechanic                 | • Medic                        |

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Should a staged evacuation of personnel be undertaken, all personnel other than listed above shall be consider non-essential and will form the passenger lists for the evacuating means (vessels or helicopters).

Nominated Essential Personnel shall be the last personnel evacuated, following completion of all abandonment preparation.

Regardless of responsibilities imposed upon these individuals, the completion of these tasks shall not involve unnecessary risk to life or take precedence over evacuation directives.

### **1.5 SPECIAL PRECAUTIONS - LIGHTNING STORM**

The guideline for restricting perforating operations in relation to the probability of lighting occurring is as follows

<b>WEATHER FORECAST PROBABILITY OF LIGHTNING (%)</b>	<b>PROBABILITY OF LIGHTNING RISK</b>	<b>DESCRIPTION OF PERFORATING STATUS</b>
0-60%	NIL TO MODERATE	SAFE, UNLESS LOGGING ENGINEER ADVISES OTHERWISE
60-90%	HIGH	AT DISCRETION LOGGING ENGINEER AND COMPANYMAN
90-100%	VERY HIGH	UNSAFE CEASE OPERATION

Note:

The above probabilities of lighting indicate the lightning risk for a time period stated in the weather forecast, in an area of 25 miles radius around the center of a thunderstorm. The probability of an offshore installation within such an area being struck by lightning is lower than the figure quoted.

OIM in consultation with Client Representative will restrict operations according to the operating guidelines. If lightning risk is very high, cease all derrick operations.

### **1.6 VIOLENT WEATHER WHILE UNDER TOW**

If violent, or abnormal weather is predicted for the course of the tow, all efforts should be made to avoid the area by towing to and waiting out the storm in a safe area or changing course out of the way of the predicted storm path.

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## 2 Risk evaluation

Risk shall be managed through agreed Typhoon plans and strict response procedures, including leading edge trigger points and tow / evacuation resources.

### 2.1 Definitions

#### Trigger Point

A term used to designate when a specific action is to begin. The center position of a Tropical Depression will be the TC position reference until the R35 radius position can be reported. The primary trigger point to begin evacuation actions is at Phase 2 when the R35 Radius (storm leading edge) is at the Typhoon Tracking Map 550 nm ring or when the typhoon track assessment calculation requires a time based sooner trigger point.

#### Tropical Storm Terms

A tropical cyclone is a low-pressure weather system in which the central core is warmer than the surrounding atmosphere. “Tropical Cyclone” is a generic term for low-pressure systems with a defined wind circulation, born over tropical, or sometimes subtropical, waters. Tropical depressions, tropical storms, hurricane, and typhoons are all tropical cyclones.

A typhoon’s life cycle passes through four distinct stages, tropical disturbance, tropical depression, tropical storm and finally a typhoon. All are classified as tropical cyclones.

#### Tropical Disturbance (1st Stage)

Often the earliest stages of a tropical cyclone. Normally an organized area of thunderstorms that forms in the tropics and persists for more than 24 hours. Low pressure might form at the surface, but winds remain below 30 mph.

#### Tropical Depression (2nd Stage)

When a tropical disturbance develops circulation (rotation around a center of low pressure), it is designated a tropical depression. Tropical depressions contain maximum sustained 1-minute winds near the surface of 33 knots or less.

#### Tropical Storm (3rd Stage)

A tropical cyclone is given a name once it reaches tropical storm status. Tropical storms contain maximum sustained 1-minute winds at 34 to 63 knots.

#### Typhoon (4th Stage)

Typhoons have sustained 1-minute winds at 10-meter elevation of at least 64 knots. However, winds in most typhoons can become much stronger.

Typhoons are categorized on a scale of 1 to 5 based on their wind speed, barometric pressure, and resultant destructive potential.

#### R-35 Radius

The R-35 Radius is the location (position) of the leading edge of the Tropical Cyclone measured from the center of where the wind speed is 35 knots and therefore classified as a tropical storm. The weather forecasts from Weather Service will stipulate the R-35 position and relationship to the Chevron Tracking Map declared phase.

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## 2.2 Local Weather Observation Report Form

DATE:	LOCATION:
Time: (LOCAL)	REPORTED BY:
TYPHOON ALERT PHRASE	
WIND SPEED (KNOTS)	_____
WIND DIRECTION (DEGREES)	_____
TEMPERATURE (DEGREE °C)	_____
BAROMETER (mb)	_____
VISIBILITY (NAUT.MILES)	_____
CLOUD BASE (FEET)	_____
WEATHER (SEE BELOW)	_____
SEA HEIGHT (METERS)	_____
SEA DIRECTION (DEGREES)	_____
SWELL HEIGHT (METERS)	_____
SWELL DIRECTION (DEGREES)	_____
SWELL PERIOD (SECOND)	_____
FOR HELICOPTER REPORTING ONLY:	
A) HELIDECK CLEAR (YES/NO)	_____
B) ROLL OF UNIT (DEGREES)	_____
C) PITCH OF UNIT (DEGREES)	_____
OTHER COMMENTS	

Weather is a general description of condition at the time of observation such as: clear sky - partly cloudy - overcast sky - drizzle - continuous rain – Squalls - thunder - lightning

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## 2.3 Helicopter Limits for Flying in Adverse Weather

### WIND SPEED LIMITS

Operational Classifications	Windspeed (knots)	Notes
Routine Operations	22-43	Note 1
Max. gusting Wind Speed (45Knots) for rotor engagement	45	
Marginal Operating Conditions Based on forecast, actual weather, trend and Helicopter Operator, it may be necessary to suspend normal flying operations.	53-59	Note 2 Note 3
Out of limits for routine flying	60-71	Note 4

**Note:**

1. Rotor engagement and shutdown marginal at 35-40 kt wind speed on some models.
2. Wind conditions may still be within helicopter limits though over most rotor engagement limits.
3. In emergency, at Captain's discretion, rotors may be engaged at wind speeds above normal limit.
4. Helideck mean wind speed of 60 kts is max for flying operations and PAX safety.

### Pitch, Roll and Heave Limits

The pitch and roll figures are half amplitude related to the vertical. Heave is in meters	Pitch / Roll / Heave (m) Degrees / Degrees / Meters			
		Day/Night	S61	S76
Semi-submersible (includes semi-sub cane and lay barges.	Routine	Day	3/4/5	4/5/5
		Night	3/3/5	4/5/5
	Emergency	Day	7/7/8	10/10/8
		Night	5/5/7	7/7/7
Large Ships (e.g. drill ships, converted tankers, non-semisub crane / lay barges, jack-ups on the move.)	Routine	Day	3/4/5	4/5/5
		Night	3/3/5	3/4/5
	Emergency	Day	7/7/8	10/10/8
		Night	5/5/7	7/7/7
Small Ships with Helideck on stem of midships	Routine	Day	3/3/5	3/4/5
		Night	3/3/3	3/3/3
	Emergency	Day	5/5/5	7/7/7
		Night	4/4/4	5/5/5
Small Ships with Helideck on stem of midships	Routine	Day	3/4/5	4/5/5
		Night	3/3/5	3/4/5
	Emergency	Day	5/5/5	10/10/8
		Night	4/4/4	7/7/7

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## 2.4 Typhoon Track Assessment Calculation

Theoretically, any alert radius is given in hours and not as a distance, because it varies with the vortex's velocity. In all cases, the storm shall be monitored using a "Critical Path Calculation". This calculation will allow the Storm Committee to deal with the situation based on a few key pieces of information.

Using the following formula the critical path calculation can be made to determine the distance to the storm front when securing and evacuating operations should begin.

$$M = (S + E + C + H) \times V$$

- M** Represents the distance in nautical miles from location to the leading edge of the storm (35 knot radius).
  - S** Surface Operating Time, number of hours to finish operations in progress.
  - E** Evacuation time, number of hours to complete evacuation from the offshore unit to Shore Base in weather conditions which allow safe operations for the transfer of personnel.
  - C** Contingency time, number of hours to allow for increase in the approaching velocity of the storm, for delays in securing the operations (well), equipment failures or miss-runs with down hole equipment and failure of evacuation equipment.
  - H** Maximum contingency time, number of hours to evacuate personnel during daylight.
- (Note:** The fundamental difference between vessel evacuations as opposed to helicopters is that vessels can operate - transfer personnel & sail - safely at night).
- V** Velocity of the storm, in nautical miles per hour, is representing the expected maximum forward speed of the front. The speed of a typhoon can vary up to fifteen (15) knots.
  - M** Represents the distance in nautical miles, where the critical path is reached and Typhoon Evacuation procedures commenced. The point of measurement is to the perimeter of the storm that the 35-knot (R35) radius can be expected.

**2.5 Storm Speed of Travel Conversion Table**

	<b>KNOTS</b> NAUTICAL MILES PER HOUR	<b>MPH</b> MILES PER HOUR	<b>KPH</b> KILOMETERS PER HOUR	<b>MPS</b> METERS PER SECOND
<b>DEPRESSION</b>	5.0	5.8	9.3	2.6
	10.0	11.5	18.5	5.1
	15.0	17.3	27.8	7.7
	20.0	23.0	37.1	10.3
	25.0	28.8	46.3	12.9
<b>TROPICAL STORM</b>	34.0	39.2	60.0	17.5
	35.0	40.3	64.9	18.0
	40.0	46.1	74.1	20.6
	45.0	51.8	84.0	22.0
	49.0	56.4	90.8	25.2
<b>SEVERE TROPICAL STORM</b>	50.0	57.6	92.7	25.7
	55.0	63.0	101.9	28.3
	60.0	69.1	111.2	30.9
<b>TYPHOON</b>	64.0	74.9	118.6	32.9
	65.0	77.0	120.4	35.0
	70.0	80.6	129.7	36.0
	75.0	86.4	139.0	38.6
	80.0	92.1	148.2	41.2
	85.0	97.9	157.5	48.0
	90.0	106.0	166.8	46.3
	95.0	109.4	176.0	48.9
	100.0	115.2	185.3	51.5
	105.0	120.9	194.6	54.1
110.0	126.7	208.0	56.6	

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## 2.6 Beaufort Wind and Sea Classification Table

(For an effective height of 0 m above sea level)

Beaufort Number	Descriptive Term	Mean Wind Speed Equivalent		Deep sea Criterion	Probable mean wave height* in meters
		Knots	m/sec		
0	Calm	<1	0 - 0.2	Sea like a mirror	--
1	Light Air	1 - 3	0.3 - 1.5	Ripples with the appearance of scales are formed, but without foam crests	0.1 (0.1)
2	Light breeze	4 - 6	1.6 - 3.3	Small wavelets, still short but more pronounced; crests have a glassy appearance and do not break	0.2 (0.3)
3	Gentle Breeze	7 - 10	4 - 5.4	Large wavelets; crests begin to break; foam of glassy appearance, perhaps scattered white horses	0.6 (1)
4	Moderate breeze	11 - 16	5.5 - 7.9	Small waves, becoming longer; fairly frequent white horses	1 (1.5)
5	Fresh breeze	17 - 21	8.0 - 10.7	Moderate waves, taking a more pronounced long form; many white horses are formed (change of some spray)	2 (2.5)
6	Strong breeze	22 - 27	10.8 - 18	Large waves begin to form; the white foam crests are extensive everywhere (probably some spray)	3 (4)
7	Near Gale	28 - 33	19 - 17.1	Sea heaps up and white foam from breaking waves begins to be blown in streaks along the direction of the wind	4 (5.5)
8	Gale	34 - 40	17.2 - 20.7	Moderately high waves of greater length; edges of crests begin to break into spindrift; foam is blown in well-marked streaks along the direction of the wind	5.5 (7.5)
9	Strong gale	41 - 47	20.8 - 24.4	High waves; dense streaks of foam along the direction of the wind; crests of waves begin to topple, tumble and roll over; spray may affect visibility	7 (10)
10	Storm	48-55	24.5 - 28.4	Very high waves with long overhanging crests; the resulting foam, in great patches, is blowing dense white streaks along the direction of the wind; on the whole, the surface of the sea takes a white appearance; the tumbling of the sea becomes heavy and shock-like; visibility affected.	9 (12.5)
11	Violent Storm	56 - 63	28.5 - 32.6	Exceptionally high waves (small and medium sized ships might be for a time lost to view behind the waves); the sea is completely covered with long white patches of foam lying along the direction of the wind; everywhere the edges of the wave crests are blown into froth; visibility is affected	11.5 (16)
12	Hurricane	64 and over	32.7 and over	The air is filled with foam and spray; sea completely white with driving spray; visibility seriously affected	14 (--)

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## 2.7 Tropical Storm Knowledge Reference

### Tropical Storms

Tropical Cyclones (TC) also known as Tropical Revolving Storms (TAS), are migratory low-pressure systems, which form over tropical or sub-tropical oceans. They are characterized by having a definite closed circulation, and by possessing a core of warm moist air. The terms "**Tropical Revolving Storm**" and "**Tropical Cyclone**" are generic, i.e. they do not imply any particular intensity.

Tropical Cyclones are sub-divided into the following classifications, based upon the **Maximum sustained one minute mean wind speed** near the core:

#### **Tropical Depression**

Maximum sustained wind speeds 33 knots or less.

#### **Tropical Storm**

Maximum sustained wind speeds between 34 and 47 knots.

#### **Severe Tropical Storm**

Maximum sustained wind speeds between 48 and 63 knots.

#### **Typhoon**

Maximum sustained wind speeds between 64 and 129 knots.

#### **Super Typhoon**

Maximum sustained wind speeds 130 knots or greater.

### Information of Tropical Revolving Storms

#### **Necessary Conditions**

The following conditions have been shown as necessary for the development of Tropical Revolving Storms:

- An underlying ocean with surface temperatures above 26 deg. C.
- A pre-existing area of horizontal wind convergence in the lower levels of the atmosphere (typically in a tropical disturbance).
- Small wind speed and direction changes with height (wind shear) through the atmosphere to a height of 35 to 40 thousand feet.
- A basically unstable atmosphere, allowing the formation of Cumulonimbus clouds.
- A location not within 4 degrees of the equator.
- Season.

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**Storm Tracks**

In the Northern Hemisphere, TRS tend to move almost westwards at first, then more northwestwards. If they move north of 20 degrees north, they may then re-curve and accelerate towards the northeast. (See Fig. 1.)

**Note:** This is a general direction of movement. Actual movement of a particular TRS may be quite erratic, both in direction and speed. In addition, the TRS may intensify or decline depending on the environmental conditions into which it moves.

**Extent**

Tropical Revolving Storms vary greatly in their extent, with diameters ranging from about 60 to almost 1000 nautical miles. Most are between 100 and 500 nautical miles in diameter.

**Weather**

A typical feature of Tropical Revolving Storms is the associated spiral rain bands, in the case of Severe Tropical Storms and Typhoons. These bands become intense towards the storm center, torrential rain, thunder and lightning and winds to hurricane force commonly occur, together with violent squalls and sudden shifts in wind direction. The flying spray raised by the winds combines with the torrential rain to cause extreme reduction of visibility.

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## 1 Requirements

### 1.1 GENERAL

Deteriorating seaworthiness is primarily brought on by Structural failure caused by impact and rupture of the hull (in its various forms), either through collision with vessels or other floating objects, or with fixed installations (in circumstances of being adrift or losing anchors). This impact may result in deteriorating sea-worthiness as stability and buoyancy levels will be affected.

Immediate actions shall be an assessment of the damage and severity, with a determination made as to level of risk to seaworthiness and subsequently to life. This determination shall be made with a cognizant understanding of the potential for conditions worsening, taking into account the scope of damage, the ability to isolate without detrimental effect on stability, the ability to repair without risk to life and an appreciation of the weather conditions existing and expected.

Should this assessment identify an unacceptable potential risk to life, immediate actions shall be undertaken to prepare for the abandonment contingency (refer to **DSHA – Abandon Tender**), which includes activation of the General Alarm and all subsequent responses.

### 1.2 DAMAGE ABOVE THE WATERLINE

In the event that the Tender is damaged due to collision, structural failure or other impact above waterline level, the following steps shall be taken:

- Locate the area of damage and assess repair requirements, if possible.
- Isolate the damaged compartments, checking that all personnel have been evacuated
- Clear announcement to be made over the PA system advising of the situation and areas to remain clear of.
- On direction of the OIM (and Client Representative), the drill crew shall secure the well and prepare to assist with a disconnection if determined as required.
- The Marine Section Leader shall check the trim of the Tender and verify whether there has been any intake of water. He shall adjust the vessel draft and trim to keep the damaged hull section as far above the waterline as is safely practicable.
- Anyone requiring entry to an isolated space (for inspection or repair) shall only do so under the control of the Marine Section Leader (or his delegate). This area shall be treated as a confined space, with all entry precautions adhered to, including maintenance of a personnel entry / movement log and stand-by watch personnel. Established lines of

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communication shall be tested and maintained on a strict schedule with the Stand-by person.

- Call the standby boat to keep the vessel close to the Tender on the Lee side as a contingency precaution for evacuation of non-essential personnel if determined as required.
- Depending on circumstances and if a disconnection has been performed, it may be necessary to move the Tender away from the Platform and into the prevailing weather.

### **1.3 DAMAGE BELOW WATERLINE**

Should a collision occur that results in a structural damage to the extent that the vessel starts to take on water, either through the single hull section, or in the case where the double hull has been damaged, the following actions shall be initiated:

Immediate action will include:

- Locate the area of damage and assess situation.
- Advise the Operator's Duty Officer (onshore)
- If the damaged compartment is a diesel tank (or other chemical), provide full details of chemical type and volume lost (or potential for loss) to the Duty Officer.
- Isolate the damaged compartments, checking that all personnel have been evacuated. Anyone requiring entry to the affected isolated space (for inspection or repair) shall only do so under the control of the Marine Section Leader (or his delegate). This area shall be treated as a confined space, with all entry precautions adhered to, including maintenance of a personnel entry / movement log and stand-by watch personnel. Established lines of communication shall be tested and maintained on a strict schedule with the Stand-by person.
- Clear announcement shall be over the PA system advising of the situation and the areas to remain clear of.
- On direction of the OIM (and Client Representative), the Drilling crew shall secure the well and prepare to assist with a disconnection if determined as required.
- The Marine Section Leader shall check the trim of the Tender and verify whether there has been any intake of water. He shall adjust the vessel draft and trim to keep the damaged hull section as far above the waterline as is safely practicable.
- Call the standby boat to keep the vessel close to the Tender on the Lee side as a contingency precaution for evacuation of non-essential personnel if determined as required.

If the situation is assessed as serious and it is doubtful that flooding or damage can be contained, actions shall be taken to:

- Activate the General Alarm to effect muster, headcount and preparation for Abandon Tender, if necessary.
- Initiate the Disconnection procedures (Precautionary or Emergency), as determined necessary through assessment of circumstances and in consultation with the Client

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Representative. This should include pull-back of the Tender away from the Platform to decrease risk of damage to Platform.

- Commence planning for a controlled evacuation of all non essential personnel via support vessels and aircraft support (if safe to do so). If these resources are no available, or part-evacuation is only achieved, full Abandon procedure and associated critical personnel shall be maintained until abandonment directed or stood-down.
- Tie down loose items on deck to limit shifting.

If loss of freeboard is putting any or all survival craft or other evacuation facilities in jeopardy, the OIM shall proceed with an Abandon Tender response immediately. This shall be undertaken in compliance with procedures outlined in **DSHA** – Abandon Tender.

## **1.4 STABILITY MEASURES**

If damage causes failing stability, immediate actions should be taken to counterbalance the overturning moment, even when decreased stability is estimated to be within margin of damage stability condition.

Appropriate measures are:

- Maintain maximum pump rate from damaged compartments.
- Flooding of tanks/compartments opposite to damaged area, if pumping facilities have become inoperable.
- Closing and sealing of all watertight doors and air vents to damaged area to delay flooding by creating air pillows in damaged compartments.
- Release of anchor tension.
- Re-distribution of deck loads.
- Dumping of mud pits or other payload.
- Jettison of deck cargo but be aware of submarine pipelines

### ***Retaining Buoyancy***

If the combined effect of damage and consequent corrective measures to retain sufficient stability causes severe loss of buoyancy, the OIM shall consider;

- Complete battening down procedure to retain buoyancy of watertight compartments.
- Discharge of ballast not upsetting righting forces.
- Dumping of payload from mud pits, bulk storage tanks.
- If water is shallow, consider ballast down till the pontoons rest on the seabed (if applicable). However, this is an option that can cause serious structure damage and shall apply only when capsizing is imminent and all other means have failed.

### ***Variable Loads include:***

- Drill pipe, Drill collars, other tubulars on deck. Other movable loads on deck.
- Consumables, e.g. casing Mud, Cement and Fuel

Prior to any redistribution of variable loads, it is important to calculate the implications on the vertical centre of gravity (VCG or KG).

The actual kg weight should be compared to the maximum allowable kg for the relevant condition and draught and must never be allowed to exceed this value.

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If under tow in damaged condition, towing speed should be reduced to reduce stress.

### ***1.5 SPECIAL PRECAUTIONS - DISCHARGING***

In suppressing progressive vessel flooding, the pumping capacity must be utilized to maximum effectiveness.

Pump capacity should first be allocated to those compartments which have suffered the least damage, then against the next smallest leakage and so on up to the limit of the pumping capacity, so as not to waste capacity on damage that is beyond its ability.

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**1 Requirements**

**1.1 RESPONSIBILITY**

The Dive Operations supervisor retains overall responsibility and coordinates all activities according to his judgment of the total situation. He will issue any emergency messages, advise notifications to be dispatched and determine the need for external assistance. The OIM and Tender personnel will cooperate and offer all assistance possible.

**1.2 GENERAL**

When diving is to be carried out on the platform or from the Tender, the Dive Operations Supervisor is obliged to submit a copy of their Emergency Response Plan to the On-Scene Commander (OIM), allowing examination and agreement of bridging provisions between the Diver Operation Emergency Response Plan and the Tenders Emergency Response Procedures. The agreed bridging elements between both organizational plans and acknowledgements of primacy of command and respective procedures shall be formally recorded and all affected personnel fully apprised of any impact or change to standard procedures.

In the case of an incident, injury, or illness the OIM will act in close cooperation with the Client Representative and the Dive Operations Supervisor, in accordance with the agreed response procedure.

When notified of incident, injury, or illness, the OIM shall:

- Provide the Dive Operations Supervisor and his staff with all required personnel, medical and any other equipment support.
- Suspend all activities that conflict with the emergency response operation.
- Provide the Rig Manager with situation update.
- Seek any external assistance as requested by the Dive Operations Supervisor, in cooperation with the Client Representative and established response procedures.

**1.3 IMMEDIATE RESPONSE**

**Assessment**

On notification of irregularities, the OIM shall consult the Dive Operations Supervisor as to the:

- Nature of incident, injury or illness.

Risk level: Yellow	<b>DSHA</b>	
<b>Title: Emergency Scenario - Diving Medical Emergencies</b>		
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- Demand for manpower, equipment or other services.
- Need for special services and support from the Tender, Shore base resources or from other vessels.

***Initial support***

On assessment of the situation, the OIM shall:

- Immediately direct the Tourpusher to the site
- Assemble the Medical Team.
- Notify the Standby boat of situation and place onto high alert (if available).
- Suspend all operations that may conflict with the emergency response operations.

***Communications***

Establish direct communication link from the Dive operations location to:

- Tender radio room.
- Medic on board.
- Client Rep.

Restrict all non-essential communications.

***Incident***

Any response to an emergency shall be undertaken consistent with the agreed response procedures and agreements in respect to primacy of command and actions taken.

This may be per the Diving Company Contingency Plans, the Rig Emergency Response Procedure or the agreed combination of both through bridging documentation.

***Fatality***

Additional to response as outline above, required notification of appropriate local Government Regulatory Authorities shall be managed by the Dive Operations Group.

***Equipment Preservation***

In the event of a fatality and tender personnel are involved with recovered dive related equipment, all actions will be undertaken under the supervision of the Dive Supervisor. As a general guide, the following rules should be kept in mind:

- When the breathing apparatus is recovered, it should be handled no more than is required to remove it from the diver.
- On no account are any closed valves to be opened.
- Close any control valve noting the number of turns required to close each valve and record.
- Close and seal the mouth piece cock if fitted.
- Seal the counter lung and counter lung relief valve fitted.
- Make notes on condition of breathing set and associated equipment.

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- The breathing apparatus should not be stripped.

## **1.4 DIVING MEDICAL EMERGENCIES**

In the event of a diving medical emergency that is beyond the capability of the on-site Dive Team specialist or the Tender Medical resources, necessary action shall be requested from the ERP nominated Diver Emergency Service or agreed regional or operator medical specialist contacts.

## **1.5 DIVER EMERGENCY SERVICE**

### **Australasia / SE. Asia:**

The Hyperbaric Medicine Unit of the Royal Adelaide Hospital, Australia, provides a 24 hour medical specialist cover of the Divers Emergency Service telephone service. This emergency service can be accessed from any worldwide location by calling:

Within Australia (Toll Free) 1800 088 200

Outside Australia +61-8-8212 9242

This service is funded by the Divers Alert Network, S.E. Asia Pacific, a non-profit diving safety organization based in Melbourne, Australia. The service primarily acts as a consultation service for diving-related emergencies.

### **United States:**

Using the DAN Emergency Hotline - +1-919-684-44326

This service is funded by the Divers Alert Network and the number is answered at the switchboard of Duke University Medical Center, Durham, North Carolina. .

**Tell the operator you have a diving emergency.** The operator will either connect you directly with DAN or have someone call you back at the earliest possible moment.

DAN's medical staff is on call 24 hours a day, 365 days a year, to handle diving emergencies such as decompression sickness, arterial gas embolism, pulmonary barotraumas, or other serious diving-related injuries.

### **United Kingdom:**

Divers Emergency Service U.K.

24 HR DCI (Decompression Illness) Helpline: U.K. 07740 251635

## **2 Risk Evaluation**

Risk shall be managed through bridging document and agreed response procedures in place by Diving contractors

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**1 Requirements**

**1.1 RESPONSIBILITY**

The OIM (On-Scene Commander) has the overall responsibility and coordinates all activities according to his judgment, with close communication with the Client Representative on board.

The OSC will authorize all emergency messages and notifications dispatched, and in consultation with OSR will determine the need for external assistance. He shall also keep the Rig Manager informed of the development of the situation. The designated Contingency Organization roles and responsibilities shall be utilized as required.

**1.2 IMMEDIATE RESPONSE**

***First Responder***

- Assess situation / obvious injuries
- Direct immediate notification of the Radio Room and attendance of Medic
- Provide immediate first aid
- Preserve the scene

***Medic attending***

- Establish direct communication with designated contact Doctor (whether operator designation or through company assignment), if situation requires further advice or medication authorizations.
- If a designated Doctor is not available, Client Base or ISOS should be alerted for assistance in obtaining professional advice. The Medic shall have priority access for communications.
- If more site medical capacity is urgently needed, efforts shall be made to obtain assistance from medical personnel on other nearby locations.
- In case of urgency, alert nearest helicopter and request standby for urgent service.

***On-Scene Commander***

- Advise Client Representative
- Advise Rig Manager

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- On advice of Medic, commence communications for authorization and facilitation of external assistance or medivac requirements

### **1.3 MEDIC RESPONSE GUIDELINES**

#### ***Information required by advising Doctor***

- patient's age
- nature and extent of injuries
- pulse, respiration rate
- temperature
- area and type of pain
- significant symptoms, general condition
- medicine administered, available on board and
- treatment given

#### ***Treatment on board***

If the advising Doctor determines that the onboard capabilities and supplies are adequate for the injury or situation, specific instructions as to treatment and medication should be confirmed by email or fax if possible.

#### ***Transfer to shore***

If onshore medical treatment is required and a decision to transfer the patient to hospital is reached, the Medic shall agree with the Doctor as to:

- Urgency of transfer operation
- Transportation arrangements
- Notification of hospital
- Ambulance service from heliport
- Medical escort of patient
- Preparation of patient for transportation

Responsibilities for the completion of these individual taskings shall be clearly determined and documented by the Medic. Any taskings made the responsibility of the Medic shall be communicated to the OSC (OIM) immediately.

#### ***Doctor's attendance on board***

If more advanced medical treatment is required but the patient is determined unfit for transportation, the Medic shall agree with the Doctor as to:

- Urgency of onshore medical personnel attendance offshore
- Measures to be undertaken pending the onshore medical personnel attendance
- Special equipment required for this further treatment
- Specific drugs required for further treatment

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***Situation Contingencies***

If the number of casualties, the nature and extent of the injuries, limited transportation capacities, adverse weather conditions, damage to helideck or other unfavourable conditions exist, the On-Scene Commander shall, in consultation with the OSR and onshore resources (and onshore ECC if activated), determine the most effective response or combination thereof.

These responses may include;

- Transfer of medical team from shore to nearest L.Q.
- Alternative modes of transportation
- Additional assistance from shore (Civilian / Military)

***Information to Onshore Switch***

All communications shall be through the On-Scene Commander and the agreed onshore contact point or onshore ECC.

***Particulars of notification***

In all cases where request for transfer of medical cases by helicopter is forwarded, pre-determined and agreed protocols shall be followed.

In the absence of specific protocols, the following information should be supplied:

- Name and position of platform
- Number of patients
- Number of stretcher cases
- Degree of urgency
- If medical escort is required
- State of landing facilities
- Weather conditions

***Information on treatment provided offshore***

In all cases where the patient is transferred to the hospital or other units, the following information as to first aid treatment given to the patient should be provided.

Treatment given, particularly psychotropic drugs or scheduled drugs, together with amounts and times when administered.

Times when tourniquets, splints, compress bandages were applied.

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## **1.4 SPECIAL CASES**

### ***Fatalities***

In the case of a fatality, the body should not be moved until permission from the Police is obtained. If the body has to be moved, the location and positioning of the body should be recorded (photographed and position marked) before other actions are taken.

In the case where the patient is pronounced dead before requested assistance reaches the scene, all emergency response arrangements shall be cancelled immediately.

Inform the Operator and Area Manager of the name and personal records for the deceased, cause of death, and other circumstances. Request information as to police investigation, measures to be taken and further prospects.

Transfer of body to shore and further arrangements are to be initiated by Operator and Seadrill Rig Manager.

### ***Contagious disease***

In the absence of a regional response plan and the occurrence of a case of a contagious disease or epidemic:

- Obtain onshore advice on treatment and precautions through designated Medical referral centre
- Establish isolation of affected personnel and Medic
- Establish hygiene procedures
- Suspend all crew changes and personnel movements
- Assess impact of any personnel absence and ability to maintain operations

### ***Food Poisoning***

- Instruct the Camp Boss to close the mess room and kitchen temporarily.
- Have the Rig Medic check what the affected personnel have eaten, identify commonalities and identify the likely source of outbreak.
- Inspect the suspected food items (prepared and stored) and sample / dispose of.
- Have the Rig Medic and Camp Boss inspect the remaining food, kitchen and catering staff for any unhygienic condition.
- Inform base of the situation and, if necessary, request external medical assistance.

## **1.5 INVESTIGATION REQUIREMENTS**

In all cases of death, an investigation will be conducted by the local police authorities.

A separate investigation will always be conducted by an assigned Seadrill Investigation Team.

<b>Risk level:</b> <b>Yellow</b>	<b>DSHA</b>	
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## **1.6 MULTIPLE CASUALTIES - TRIAGE**

### **Principles of Triage:**

There are two types of triage.

- When the number of patients and the severity of their injuries do not exceed the capacity of you and your facility to cope with. All patients with life-threatening problems and multiple-system injuries will be treated (first) while the less serious remainder will still all be treated (later).
- The second type of triage needs to be applied when the number of patients and the severity of their injuries exceed both the rig medics' capability and the capacity of the rig medical facility to cope with. In a mass-casualty situation you first treat patients who have the greater chance of survival with the lesser expenditure of time, equipment, supplies, and personnel.

Patients who are dying, who have life-threatening problems or multiple system injuries may not be treated and many less serious or lightly-injured patients will not be treated either.

Triage means you sort the casualties into the triage categories – and that is all you do. You must classify not only according to severity of injuries, but to what can be provided in terms of personnel and equipment at the time.

Remember that “patients have fronts and backs and rights and lefts”; and that the most obvious injury may not be the one which is the threat to life. Confusing these two issues is the most common mistake made by all involved in a mass casualty situation.

### **Response:**

Upon hearing the general alarm, the Medical Team will assemble at the hospital in accordance with the Station Bill and Rig Emergency Response requirements. Instruction will be given by the onboard E.C.C. if the Medical team is required to be dispatched to any other location.

If a multiple casualty situation exists (generally more than 3 casualties), a Casualty Control Centre will be established at a pre-determined location, which provides ease of access to the Clinic and subsequent evacuation if required. Each rig shall nominate such a location and clearly specify this location on the ECC Emergency Response Board.

Each rig will also determine separate casualty areas, each accordingly marked and assigned to the four principal Casualty Categories (Priority 1 / Priority 2a & 2b / Priority 3 / Priority 4).

The Rig Medic will assess the condition of each patient and depending on the casualty condition, will tag (with Triage tag) to identify the patient, injuries assessed and treatment provided or required. These coloured tags will serve as indicators to stretcher teams as to patient destination, in addition to being record keeping aids and as well as for monitoring purposes.

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**The Triage Categories and Triage Labels are:**

**Priority 1 – RED Tag**

Needs immediate treatment and evacuation.

- Severely injured, in need of urgent medical care
- Urgent, quick, simple and minimal treatment
- Stabilize prior to transportation

Generally these patients should be treated first: they are critical but probably can be saved.

This condition might be demonstrated by the following conditions;

- Shock usually associated with loss of consciousness
- Severe open or closed chest injuries
- Severe abdominal injuries
- Major fractures
- Burns, associated with respiratory compromise or 3rd degree > 10% of BSA or 2nd second degree > 30% BSA.

**Priority 2a – YELLOW or ORANGE Tag**

Significant injuries but condition can wait

Urgent treatment required, but can be stabilized at the site with appropriate life support measures.

This group includes:

- Back injuries - with or without spinal cord injury
- Moderate blood loss
- Conscious head injuries (GCS>12)
- Burns without respiratory compromise, or 3rd degree over < 10% BSA, or 2<sup>nd</sup> degree over < 30% of BSA.

**Priority 2b – YELLOW (with BLACK Stripe) Tag**

Patient unlikely to live and extensive medical care will jeopardize survival of other casualties

Urgent treatment is required - but you can delay their treatment and evacuation so that others may live as their potential or actual injuries will consume too many resources.

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**Priority 3 – GREEN Tag**

Non-Urgent intervention. Less serious. Still need further treatment and management. Can be attended by first aiders under consultation of the medic.

Regardless of injuries sustained, these patients can wait for treatment and transport. People in this group may be the most vocal about their pain and psychological trauma and are usually the (largest) group that have limb injuries (fractures / dislocations), plus / minus lacerations, first degree burns, and multiple contusions and abrasions.

**Priority 4 – BLACK Tag**

**Dying or Dead**

If still living, expectant that not likely to survive.

This category includes;

- Those apparently dead whose injuries will almost certainly lead to their death (they usually have a GCS of 1-3):
- Burns - second and third degree > 60%, coupled with other major injuries
- Severe head injuries with brain exposed
- Severe chest injuries with no respiration.

While not easy, the Black Tag group should be moved to one side and the dying made as comfortable as possible while those with survivable injuries are attended to.

**Quick Guide:**

A 'quick guide' for individuals who are involved in a Multiple Casualty Incident (MCI) is as follows;

- Anyone who does not breathe with simple airway manoeuvres has a Black Tag (can't justify time spent)
- Anyone who can walk is assigned a Green Tag (can wait the longest)
- Anyone who cannot walk but can obey commands and has a radial pulse and a respiratory rate less than 30 breaths per minute, is assigned a Yellow Tag (can wait – stabilize priority and come back to after red tags)
- Anyone else has either a Red Tag (immediate help) or a Yellow Tag with Black Stripe (prognosis not good and unjustifiable use of limited resources – stabilize and come back to after Red & Yellow)

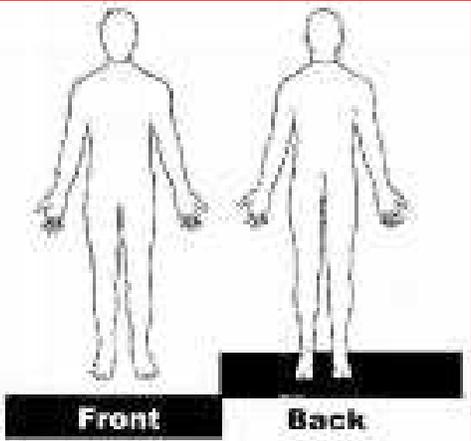
Risk level: Yellow	DSHA	
Title: Emergency Scenario - Medical Reponse and Triage		Version: 1.01

### 1.7 TRIAGE TAGS

#### Priority 1

Red Label - immediate treatment and evacuation.

- Severely injured, in need of urgent medical care.
- Urgent, quick, simple, minimal treatment.
- Stabilize prior to transportation.

<h2>Priority 1</h2> <p>Name: _____</p> <p>Age: _____</p> <p>Injuries:</p> <p># _____</p> <p># _____</p> <p># _____</p> <p><b>Urgent – Immediate Treatment and Evacuation</b></p> <p>Transport: _____</p> <p>Destination: _____</p>	<div style="text-align: center;">  </div> <div style="text-align: center;">  </div> <ul style="list-style-type: none"> <li>• Uncontrolled Respiratory Problems</li> <li>• Cardiac Arrest</li> <li>• Severe Blood Loss</li> <li>• Unconscious</li> <li>• Severe Shock</li> <li>• Open Chest or Abdominal Wounds</li> <li>• Burns Involving Respiratory Tract</li> <li>• Several Major Fractures</li> </ul>
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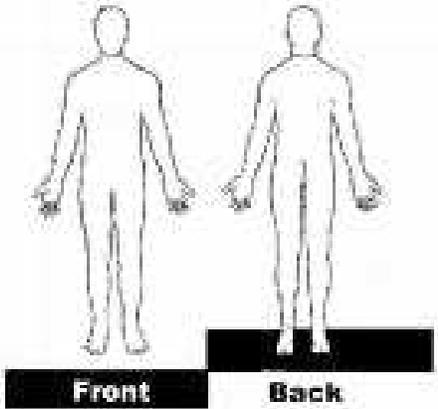


Risk level: Yellow	DSHA	Seadrill
Title: Emergency Scenario - Medical Reponse and Triage		Version: 1.01

**Priority 2a**

Yellow Label -Urgent but may delay treatment and evacuation

Significant injuries - condition can wait.

<p><b>Priority 2a</b></p> <p>Name: _____</p> <p>Age: _____</p> <p>Injuries:</p> <p># _____</p> <p># _____</p> <p># _____</p> <p><b>Urgent but may delay treatment – No ABCD problem.</b></p> <p>Transport: _____</p> <p>Destination: _____</p>	<p style="text-align: center;"><b>Seadrill</b></p> <div style="text-align: center;">  <p>Front      Back</p> </div> <ul style="list-style-type: none"> <li>• Severe Burns</li> <li>• Spinal Column Injuries</li> <li>• Moderate Blood Loss</li> <li>• Conscious with Head Injuries</li> </ul>
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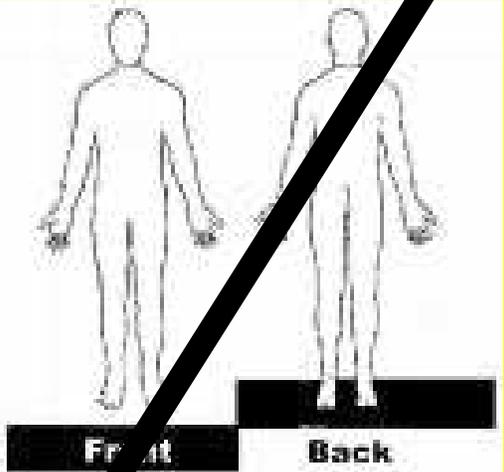


Risk level: Yellow	DSHA	
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**Priority 2b**

Yellow Label with Black stripe, Urgent but delay treatment and evacuation so that others may live.

Extensive medical care will jeopardize survival of other casualties.

<p><b>Priority 2b</b></p> <p>Name: _____</p> <p>Age: _____</p> <p>Injuries:</p> <p># _____</p> <p># _____</p> <p># _____</p> <p><b>Urgent but delay treatment and evacuation - will consume too many resources</b></p> <p>Transport: _____</p> <p>Destination: _____</p>	 
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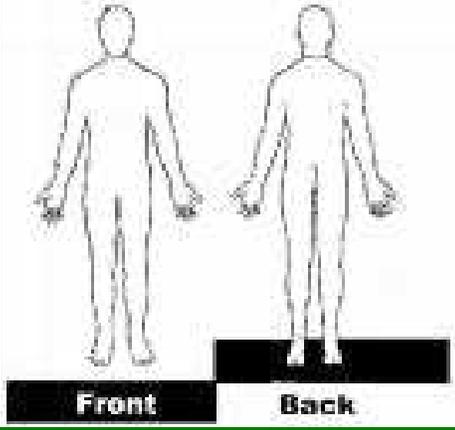


Risk level: Yellow	DSHA	
Title: Emergency Scenario - Medical Reponse and Triage		Version: 1.01

**Priority 3**

Green Label - Non-urgent, delayed treatment and evacuation

- Walking wounded/Psychologically wounded.
  - Minor injuries but capable of walking. Hospital admission unlikely.
- OR
- Uninjured but psychologically damaged.
  - Urgent counselling may be necessary.

<p><b>Priority 3</b></p> <p>Name: _____</p> <p>Age: _____</p> <p>Injuries:</p> <p># _____</p> <p># _____</p> <p># _____</p> <p><b>Non Urgent – Walking wounded</b></p> <p>Transport: _____</p> <p>Destination: _____</p>	 <div style="text-align: center;">  <p><b>Front</b>      <b>Back</b></p> </div> <ul style="list-style-type: none"> <li>• Minor Fractures</li> <li>• Contusions - Abrasions</li> <li>• Minor Burns</li> </ul>
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Risk level: Yellow	DSHA	
Title: Emergency Scenario - Medical Reponse and Triage		Version: 1.01

**Zero Priority**

**Black Label – Dead or Imminent**

- For the dead or those with prognosis of imminent death by virtue of the severity of the injuries suffered.
- Medical officer must certify death on card.

<p><b>Priority 4</b></p> <p>Name: _____</p> <p>Age: _____</p> <p><u>Certified Dead</u></p> <p>By Who (print name):</p> <p>_____</p> <p>Time Certified Dead:</p> <p>_____ hrs</p> <p><b>Delayed – Deceased or imminent</b></p> <p>Transport _____</p> <p>Destination _____</p>	
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<b>Risk level:</b> <b>Yellow</b>	<b>DSHA</b>	
<b>Title: Emergency Scenario - Medical Reponse and Triage</b>		
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**REAR OF EACH TAG**

The rear of each tag shall be identical in format, allowing concurrent notes by Medic to be made as assessment and prioritization made

Time of first triage: _____HRS
Treatment Given
Reasons for delay (2 <sup>nd</sup> priority only)

Risk level: Yellow	<b>DSHA</b>	
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**1 Requirements**

Spill incidents are classified into those events that can be contained onboard the Tender and Drilling package and those that can't. In the majority of situations, overboard spill response is managed by the client and this is normally reflected in the bridging document.

This procedure deals with those incidents that can be managed from onboard the Tender or Drilling Package.

The range of onboard events can include liquid and bulk solid loss of containment. Additionally, generation of gas through chemical interaction is another consideration. However, for the purposes of this procedure, *Environmental Incident* shall refer to events relative to solid or liquid material only.

This procedure should be read in conjunction with the site specific SOPEP Manual.

**1.1 GENERAL DUTIES**

**OIM**

- Upon being notified of a spill, liaise with the Marine Section Leader and Department Supervisor (if affected) regarding situation.
- Brief Client Representative of circumstances
- Attend spill location and assess the hazard to personnel on the rig package and tender.
- Oversight Spill Response Team actions (led by Marine Section Leader on Tender / Tourpusher on Drilling Package).
- Coordinate with the Client Representative, any external response / assistance for any overboard spill outside the scope of the Tender
- Make report to authorities in accordance with regulatory requirements

<b>Risk level:</b> <b>Yellow</b>	<b>DSHA</b>	
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***Marine Section Leader***

On notification of spill, assemble Spill Response Team (On-Duty Roustabouts) and attend scene. Actions shall follow the guidelines provided in this procedure, summarized as;

- Identification of Chemical (obtain MSDS)
- Contain spill
- Treat spill
- Absorb spilt material
- Clean-up site and dispose of used spill kit absorbent gear

***On Duty Tourpusher***

Notify OIM and OSR upon any spill from the drilling operation on the Platform. Actions shall follow the guidelines provided in this procedure, summarized as;

- Identification of Chemical (obtain MSDS)
- Contain spill
- Treat spill
- Absorb spilt material
- Clean-up site and dispose of used spill kit absorbent gear

***Rig Administrator (Radio Operator)***

- Notify Medic of situation and advise to stand-by in hospital
- On direction of OIM / OSR, contact the standby boat and inform them of overboard spill situation, location of spill and request for preparation if spill dispersal assistance is required.

**1.2 RESPONSE GUIDELINES**

**All principal spill response responsibilities, consistent with the Rig’s Emergency Response Organization hierarchy, are shown in the attached Spill Response Chart (refer Section 3.4: Exhibit 1).**

As with any emergency response, each individual event needs to be assessed on its own individual circumstances. Once a spill has been identified, the relevant MSDS shall to be referred to so that the risks can be assessed accurately and precise information is identified. The particular risks (foreseen and unforeseen) arising could include toxic gas vapour, not to disperse with water etc. The Chemwatch program can also be referenced for response guidelines and the provision of bilingual resources for response team briefings.

**1.3 IDENTIFICATION OF SPILL**

Once a spill has been detected, move away from the immediate area and alert the Radio Room.

Items to include in the initial report should include

- Location of spill: The immediate area to where the spill is
- Source of spill: Where the spill is emanating from

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- Nature of spill: What type of chemical
- Amount of spill: An estimate of quantity (i.e. 2cm deep – 2m x 2m)
- Characteristics: Type of smell / colour / physical appearance

These details will assist in determining an appropriate response. Once the radio room has been contacted, if practicable, contact the Area Authority and advise him of the same details.

#### **1.4 PERSONAL PROTECTIVE EQUIPMENT**

When responding to a spill, refer to the MSDS for the minimum level of response attire and any precautions that need to be considered when responding.

For detailed description of PPE and required standards, please refer to TMS Procedure PRO-04-1051 'Personal Protective Equipment'.

#### **1.5 RESPONSE EQUIPMENT**

Response kits need to be readily available to respond to any potential incident.

These Response Kits shall at a minimum be positioned on the Pipe Rack deck and in the Sack Store Room.

Additional spill kits shall be located at rig discretion.

#### **1.6 SPILL CONTAINMENT**

The first step in spill containment is to isolate the spill which is achieved by shutting down the equipment feeding the spill and then deploying appropriate containment measures.

The spill response kits on board are designed to contain spills of a minor nature. If a spill is in excess of the capabilities of the response kits, every effort is to be made to prevent the travel of the chemical overboard. This can be achieved through the utilization of plugs in overboard drains and the use of pumps to transfer a spill into a temporary storage container such as a tote tank or appropriate storage medium.

Where a spill has occurred below deck it needs to be identified where bilge drains are routed.

#### **1.7 TREATING THE SPILL**

If the spill is highly reactive such as caustic or acid, measures need to be taken to neutralize it so that worker safety isn't compromised. As part of the process when chemicals are introduced into operations neutralizing agents should be identified and be available on board.

#### **1.8 ABSORBING THE SPILL**

Once a spill has been treated, (if needed) it can be absorbed or retained in an appropriate vessel for future disposal.

#### **1.9 CLEAN-UP OF THE SPILL**

Cleanup requires that no residual contaminant is left that may cause personnel injury or pollute the environment at a later stage. Cleanup requires that the area is thoroughly cleaned and that any absorbent material is marked as contaminated and disposed of appropriately (note: the clean-up kit drums can be used as a secure containment and disposal container for contaminated material).

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As with any incident the first priority is the safety of personnel and then protection of equipment and the environment.

Upon the detection of any spill, the person who identified the spill is to immediately notify the Rig Administrator (Radio Op) who will notify the OIM. If the reporting person is aware of the source of the spill, this information should also be reported.

### **1.10 SITE SPECIFIC RESPONSE PROCEDURES**

In addition to the general response guidelines the following **DSHAs** are subject to additional detail.

#### Engine Room

Shutdown engines if there is a possibility of igniting any spill which could include a ruptured day tank.

Shutdown bilge system to prevent any spill been pumped overboard

#### Sack Room

Determine from chemical inventory if there are any incompatible chemicals in close proximity to the spill.

Shutdown bilge system to prevent any spill going overboard.

#### Warehouse

Determine from chemical inventory if there are any incompatible chemicals in close proximity to the spill

Shutdown bilge system to prevent any spill going overboard.

#### Pipe deck

Identify spill source

If required insert drain plugs

#### Cranes / Hydraulic items at Height such as TDS

Reduce leakage to air as the dispersal footprint will be amplified due to height above deck

#### Spill Overboard

Immediately shutdown the source of the spill

Advise standby vessels who can apply an appropriate medium to minimize the environmental impact

### **1.11 SPECIAL PRECAUTIONS**

Any spill of a flammable material requires that all hot work is shutdown.

Ventilation should be shutdown to prevent transfer of flammable vapour to non intrinsic areas such as the accommodation.

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## **1.12 CONTACTS FOR REPORTING SPILLS**

The IMO Maritime Safety Circular MSC-MEPC.6/Circ.5 current edition provides a list of local contacts who shall be advised of any spills to sea. This circular is located in the Site Specific SOPEP Manual.

Additionally all spills shall be reported to the company Area Office in accordance with incident reporting requirements. The On Scene Representative will notify the Duty Manager at the operator's area office (and the Field Offshore Installation Manager).

## **2 Guidelines**

### **2.1 Definitions**

#### **Primary Containment**

An area where liquids or solids are normally stored e.g. fuel tanks, tote tanks and drums

#### **Loss of Containment**

Any situation where a solid or liquid has escaped from it's primary area of containment.

#### **Bunding**

A raised area or lip around an item that is used to prevent a spill from spreading outside of that immediate area.

#### **Secondary Containment**

The system in place to contain a spill once the primary containment has been defeated.

#### **MSDS**

Material Safety Data Sheet

#### **SOPEP**

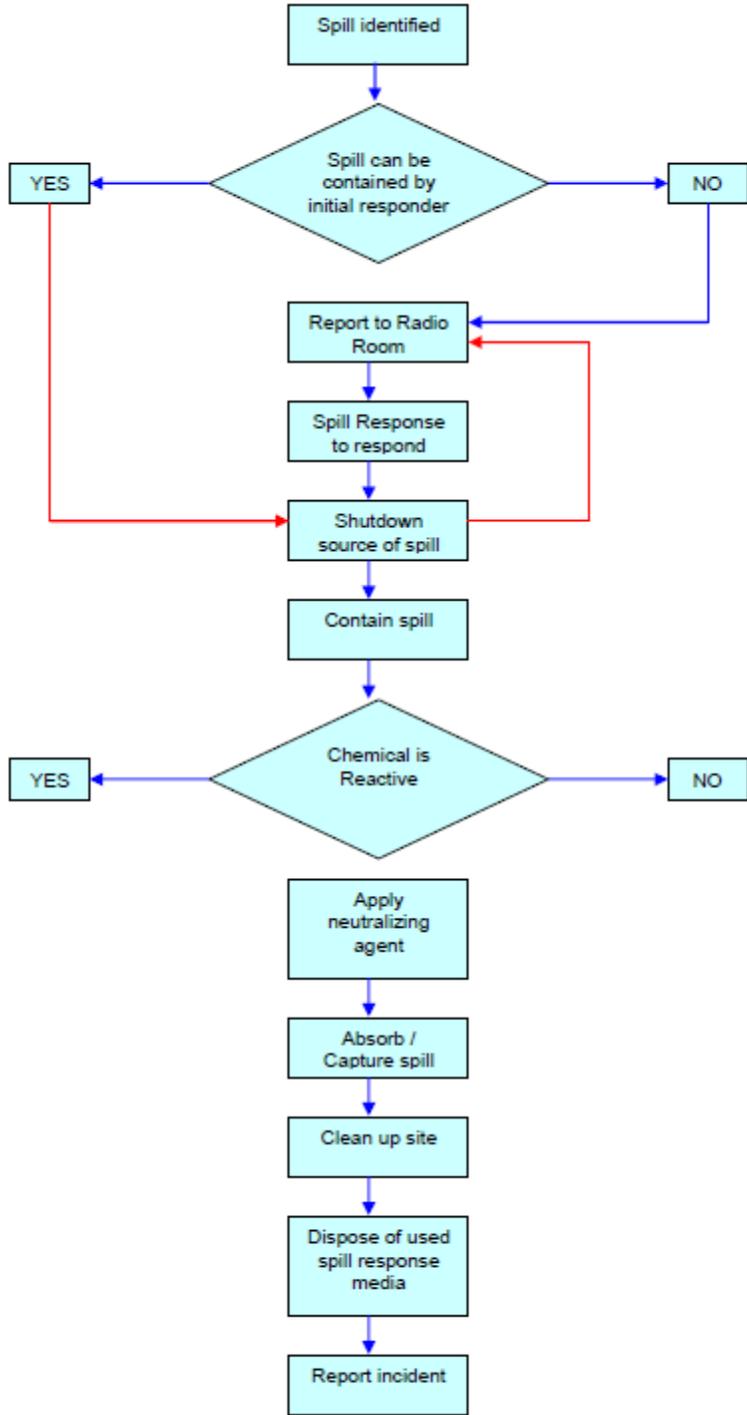
Shipboard Oil Pollution Emergency Plan

#### **Spill**

Loss of Containment

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**2.2 Exhibit 1 - Spill Response Chart**



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### **3 Document Control and References**

- Site Specific SOPEP Manual
- Applicable MSDS
- Chemwatch Program
- IMO Maritime Safety Circular MSC-MEPC.6/Circ.5

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## 1 Requirements

### 1.1 GENERAL INFORMATION

The term *radiation* describes the process of emitting electromagnetic energy in the form of particles or waves. *Radiation* also refers to the particles or waves that are given off in the process

Radiation can be **ionizing** or **non-ionizing** (ionizing radiation being the type impacting offshore operations via radioactive sources and which presents a danger to health)

Ionizing radiation releases charged particles when it collides with material, including human tissue. This is the property that makes ionizing radiation hazardous to humans.

Extreme doses of radiation to the whole body (around 10 sievert and above), received in a short period, cause so much damage to internal organs and tissues of the body that vital systems cease to function and death may result within days or weeks. Very high doses (between about 1 sievert and 10 sievert), received in a short period, kill large numbers of cells, which can impair the function of vital organs and systems. Acute health effects, such as nausea, vomiting, skin and deep tissue burns, and impairment of the body's ability to fight infection may result within hours, days or weeks. The extent of the damage increases with dose.

These effects are called 'deterministic' effects and will not be observed at doses below certain thresholds. By limiting doses to levels below the thresholds, deterministic effects can be prevented entirely.

Deterministic health effects refer to effects that are fatal or life threatening, or result in a permanent injury (e.g. severe burns) which reduces quality of life.

A source is referred to as 'dangerous' if, under conditions that are not controlled, it could give rise to exposure sufficient to cause severe deterministic health effects. Picking up a dangerous source is particularly hazardous. Analyses of historical emergencies show that severe deterministic health effects have resulted from holding or carrying (e.g. in a pocket) a dangerous source for just a few minutes. Therefore, efforts must be made to prevent the handling of possible radioactive material. However, limited periods of time (a few minutes) spent near a very dangerous source e.g. for life saving purposes, should not result in severe deterministic health effects.

Ionizing Radiation is present within drilling operations as the active element of a radioactive source, used by service company personnel in their Logging tools.

The individual storage devices for these sources provides sufficient shielding to enable handling and loading into tools by suitably qualified personnel. Storage, when the source is not in use, is within approved and secured radioactive substance containers, displaying

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signage and warnings in accordance with IAEA requirements and located in an area allowing a 3m exclusion zone.

**1.2 PRINCIPLES OF RESPONSIBILITY**

While this procedure addresses emergency response contingencies in respect to protection of our personnel and assets, it does not include or assume responsibility for the following:

- Procedural direction for radioactive equipment transport
- Procedural direction for radioactive equipment handling
- Procedural direction for radioactive equipment retrieval
- Procedural direction for radioactive equipment abandonment
- Procedural direction for radioactive equipment alternative shielding
- Risk Assessment and Job Safety Analysis addressing source handling
- Specialized and professionally developed Emergency Response guidelines relative to radioactive source exposure, damage or dispersion

The related Service Company having use of any Radioactive source onboard has a responsibility to have available these plans and procedures, also being able to produce these documents to the Client Representative and the OIM on demand.

The transport and handling of radioactive substances under all circumstances, is based upon the directives of the International Atomic Energy Agency regulations.

The Service Company Engineer responsible for radiation sources onboard shall keep a record of those sources, keep it as current and ensure storage is strictly maintained in compliance with required international standards.

All movements of radioactive sources shall be reported to the Client Representative and the OIM.

If a transport container is lost overboard, retrieval efforts should be made immediately and shall be the responsibility of the affected service company and the operator. These efforts shall be subject to control and management under the procedures of the service company holding responsibility for the material.

Any irregularities pertaining to sources shall be reported immediately to the Client Representative.

**1.3 SITE RESPONSIBILITIES**

Person discovering the breach or witnessing damage

- Immediately raise the alarm with immediate work crew and supervisor

Supervisor in charge of work area affected

- Notify Radio Room of nature of emergency and exact location
- Immediately impose the minimum isolation requirements and evacuate from the immediate area all non-essential personnel
- Move any injured persons to safe zone and isolate

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#### On-Scene Commander (OIM)

- Facilitate activation of the General Alarm if nature of radiation source exposure warrants that response (e.g. explosion and dispersal into air)
- Taking into account the location of the breach or damage to a radioactive source, determine the most appropriate refuge area for confinement of affected or all personnel.
- Liaise with the Client Representative and Service Company responsible for update and plan of action, including external specialist support.

#### Medic

Must immediately obtain specialist advice from designated onshore medical support contact.

This advice should include:

- Treatment measures
- Protective measures for medic and other first aid attending personnel
- Isolation requirements
- Transport requirements and preparation needs

#### Client Representative

Liaise with On-Scene Commander and Service Company Engineer in charge.

Advise onshore Operator Management for activation of onshore ECC

Fulfill designated responsibilities as part of onboard Contingency Organization

### **1.4 IMMEDIATE RESPONSE TO SOURCE EXPOSURE**

If the source becomes exposed through damage to the shielding container, do not touch the object and evacuate the immediate area and prevent access (i.e. secure the area). Maximize the distance that people are from the object (for guidance, the radiation dose rate and danger is significantly reduced in most cases by retreating a distance of at least 5 m). As a general rule, the area within a minimum radius of 10 meters from the exposed source should be barricaded and warning signs erected

If the source cannot be located, all areas suspected of being exposed to radiation shall be evacuated.

If the source is damaged in such a manner that there is a risk of dispersion into the atmosphere, total evacuation of the location should be considered.

### **1.5 GENERAL RESPONSE TO SOURCE EXPOSURE**

On any occasion of a radioactive material release onboard, concurrent with any immediate response at the site of release, the On-Scene Commander (OIM) shall activate the General Alarm to affect a muster of all crew, enabling accountability of personnel location and communication of the situation to all.

The assembled crew may be relocated to an area considered to provide better overall safety from exposure, at the direction of the On-Scene Commander.

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**1.6 FIRE OR DISPERSION RESPONSE**

In the event that a storage device containing radioactive sources becomes involved in a fire, normal fire fighting procedures may be followed (the use of water sprays onto the container will assist in preventing damage to the shielding material).

The use of fire-fighting clothing and respiratory protection, particularly when exposure to contaminated smoke and fumes are possible, will assist in preventing contamination of personnel. On completion of fire fighting, the personnel should remove and isolate this clothing and equipment, after which personnel should have a thorough shower.

Clothing or equipment thought to be contaminated should be submitted to authorities. Any site where contamination is possible shall be blocked off until the area has been checked and cleared by qualified third party personnel.

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**1 Requirements**

**1.1 GENERAL**

Criminal Acts or sabotage on board the drilling rig shall be reported immediately to the Rig Manager and the Client Representative.

All rigs operate within a particular regional entity and the laws of that country shall always apply to any unlawful event.

On receipt of a report of any criminal act (e.g. theft / assault / damage / arson etc.), the OIM will inform the Client Representative and carry out a preliminary investigation to establish fact.

Information to be established at this time should include:

- Nature and exact time of incident.
- If injury to personnel has occurred.
- Estimated cost of damage / loss
- Any immediate action taken:
  - Has a person(s) responsible for the criminal activity, if known, been identified.
  - Collection or possession of any evidence by any person.

The OIM, the Rig Manager and the Client Representative will consult on the severity of the incident and formally request the attendance of appropriate local authorities either directly or via the Operator’s onshore duty officer as required.

If a matter is of a level of seriousness that requires involvement of local legal authorities, the actions taken onboard shall only be to secure any relevant scene/s and to preserve or gather any evidence if there is risk of loss or contamination. All investigation responsibilities shall fall on the appropriate authorities and they shall take action as determined.

**1.2 IMMEDIATE RESPONSE**

The preservation of life shall always take precedence over crime scene preservation, however careless or unnecessary interference shall be avoided. In the case of a fatality at the site, the deceased should not be moved until permission from the police is obtained or appropriate securing of evidence and recording of the scene is carried out.

Any scene of serious crime subject to local authority attendance and investigation shall be made safe and secured from all entry.

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### ***Securing of Evidences***

In case of a serious crime, the OIM shall secure all evidence in a manner that either maintains it in-situ under senior supervision (unless required to be moved in order to preserve life), or guarantees a chain of evidence for collected items and provides for that evidence to be solely under his control and access.

He shall also maintain a log of all items secured, including details of such item/s, time & date of seizure and signatory acknowledgement of this secure status.

If the police confirm early attendance, the scene of the crime should be preserved and all activities suspended. If the scene is exposed to weather, plastic sheets or tarpaulins should be applied to prevent deterioration or damage to physical evidence. In cases of fatality, the deceased should not be moved and shall be covered with suitable material.

All objects collected as evidence should be kept stored in separate packing to prevent contamination. Clothes should be dried thoroughly and kept in paper bags. Each object must be marked for identification and reference made to any plan compiled of the crime scene, as to location where found.

If clothing from any suspect/s is removed and it bears relevance to the incident in question, it shall be secured for later examination by the relevant local authorities (held as physical evidence by the OIM).

If police are unable to provide early attendance, or the scene cannot be left in-situ for safety reasons, the scene shall be recorded through both media (camera / video), in addition to accurate drawings showing location of pertinent items or evidence and reflecting measurements accurately locating all such items at the scene.

This collection of evidence shall also extend to the media (camera / video) recording of any injuries to a victim, should the crime be against a person. Should such a victim change clothes, the OIM shall collect the discarded clothing and treat as physical evidence under his direct control and secure possession.

### ***Suspects***

If an individual is identified as implicated in any serious crime (whether person or property related), that person shall be kept under close surveillance or detained as the situation justifies or the seriousness of the event requires, pending advice from the appropriate authorities.

The following should be taken into consideration when determining the level of control to be imposed upon any suspect;

- Nature or ferocity of the crime
- Risk of influencing witnesses or accessories
- Risk of contamination / destruction of evidence
- Probability of resuming criminal activity
- Evasion of authorities

If circumstances demand or as directed by the local authorities, immediate movements to and from the rig shall be suspended until authorities arrive at the scene and direct otherwise.

Noted observations of physical and mental state should be made by the OIM.

Acts of punishment or revenge upon any detainee shall not be tolerated and the OIM shall take all actions required to prevent any such event.

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### ***Assistance***

The OIM shall notify police either directly or through the Operator's on-duty officer and request advice as to further procedures.

If in doubt as to whether the law has been violated, police should be consulted.

## **1.3 ACTIONS IN A FOREIGN PORT**

### ***Notification of Authorities***

If the tender is in a foreign port, within foreign territory or on location on a foreign continental shelf, the local police should be notified of crime committed, either directly or through the assigned Agent's Office.

If doubts arise as to whether the matter should be referred to the police for official investigation, the Rig Manager should be consulted. If police investigation is dependant on a formal filing of charge, the OIM shall consult the Rig Manager as to further action.

### ***Information Required***

When notifying police, the following information should be provided:

- Nature and time of crime
- Injuries to persons
- Precautions taken as to suspects
- Other Measures taken

Also, relevant information as to name of Operator (if relevant), present location, location of Area Office, identity of local agent and next port of call, shall be provided.

## **1.4 EXTERNAL REPORTING CRITERIA**

### ***Incidents to be reported***

- All crimes of violence
- All intentional acts of damage or sabotage
- Thefts of significance.
- All cases of fire raised by wilful act.
- All accidents entailing fatalities or significant damage to the environment.
- Use or possession of drugs, narcotics or weapons.

## **1.5 EXCLUSION ZONE BREACH**

A 500m exclusion zone is normally maintained by the Operator in the area around the platforms.

Any unidentified vessel, craft or airborne vehicle, which enters the tenders anchor pattern, should be challenged. The identity should be established by name, call sign and port of registry.

A radio call should be made on appropriate frequency and the intruder ordered out of the zone. If no contact can be established, the standby boat should be called to challenge and escort the vessel out of the zone.

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If the intruder shows reluctance, or refuses to leave the safety zone, nearest marine operations centre should be notified and requested to dispatch a coastguard or navy unit to the site. This action shall be taken by the Operator, who maintains responsibility for all actions taken in response to such a breach

### **1.6 BOMB THREAT**

It is probable that any bomb threat would be received onshore, whilst an act or threat of terrorism could come from a number of sources either onshore or offshore. All threats must be taken seriously and be reported immediately to the local authorities.

It is essential that as much information as possible be obtained concerning the threat and a detailed record be maintained of all such communications received.

A radio room log of all messages sent and received shall also be kept.

Following the involvement of appropriate professional civil and/or military authorities, actions as directed by these organizations shall be undertaken.

Rig and Operator management shall facilitate all activities as required to comply with relevant authorities directions. This may include searches or rig evacuation.

### **1.7 VESSEL SECURITY FROM EXTERNAL THREAT**

Threats to vessel security through direct assault or attempts to board shall be managed under the Ship Security Plan (if applicable).

The Ship Security Plan is a CONFIDENTIAL document, kept in locked storage and accessible only to the CSO, the SSO, the OIM and the Marine Section Leader.

#### **Designated Security personnel (per B.13.1/2/3 ISPS Code):**

- The Company Security Officer (CSO) shall be the Head of QHSE.
- The Ship Security Officer (SSO) shall be the onboard Safety Training Officer.
- The Deputy Ship Security Officer (SSO) shall be the rig HSE Manager

#### **Ship Security Plan review:**

The Ship Security Plan shall be subject to annual Review by the SSO, who shall report the result to the CSO.

#### **Alternative Muster Location – Security Emergency:**

While the General Alarm shall always direct personnel to the Primary Muster Locations, circumstances shall allow for the re-direction of personnel to an alternative Muster Location as required by the circumstances.

While the normal Emergency Alternative Muster Location is at the Bow deck, the activation of a Security Emergency shall require the following Muster location designation;

Lifeboat 1 & 3 – Recreation Room

Lifeboat 2 & 4 – Briefing Room

The OSC shall issue instructions to the ETL, for advice of the Muster Coordinator and Marshalls, of the Alternative Muster location requirement.

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The OSC shall also issue instructions to the Maintenance Team to secure applicable Restricted Areas in order to secure and maintain essential services to the vessel and personnel.

## **2 Risk Evaluation**

Risk shall be managed through compliance with the Ship Security Plan if applicable and otherwise response in accordance with this procedural guide.

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## 1 Requirements

This procedure specifically addresses the actions required to prevent danger to crew and damage to assets from floating hazards that represent a threat to the Tender or the installation. This floating hazard may be powered vessels not under control (or responding), drifting vessels or other significant current-borne debris.

### 1.1 GENERAL

Any unauthorized vessel apparently travelling on a collision course or approaching within the tenders anchor pattern shall normally prompt actions as described in **DSHA** – Criminal Acts – Exclusion Zone Breach. If the vessel appears to be drifting, fails to respond to radio call (not under control or on deliberate course), or it is established that the vessel is suffering complete loss of propulsion power, immediate contingency activities shall be undertaken to avert collision with the Tender or the Installation.

The primary action shall always be to establish communication with the subject vessel, enabling the gathering of all available information and allowing a sound assessment of the situation to be made.

### 1.2 RESPONSE CONTINGENCY

#### Drifting Vessels

Any drifting vessel is expected to implement their existing relevant vessel emergency plans before the situation develops into a threat to other vessels or installation. This action should generally include the dropping of anchor (if appropriate) or deployment of sea anchor, in addition to notification of vessels and installations in the immediate area.

Upon the threat developing to the Tender, the immediate contingency shall be the engagement of field stand-by vessels (OSV's) to attach a tow line to the distressed vessel and establish control. If time precludes this action, attending supply vessels shall push the subject vessel onto a clear drift course, to allow time for establishment of a tow line.

#### **Rig Administrator (Radio Op)**

- Establish and maintain radio contact with drifting vessel
- Advise Marine Control
- Advise stand-by vessels
- Activate General Alarm as directed by the OIM

#### **OIM**

- Shall assess the situation, level of risk and liaise with Client Representative.
- Decide course of action in consultation with Client Representative and supply vessel Captain/s.
- Advise Rig Manager of situation

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***Client Representative***

- Shall liaise with Marine Control and direct available supply vessels to location
- Shall establish contact with the On-Call officer and initiate the onshore ECC.
- Maintain situation updates to ECC
- Fulfill OSR contingency organization duties

If a drifting vessel fails to respond to radio communication attempts and the vessel maintains a course presenting a threat, the OIM shall take all reasonable action to establish contact or control of that vessel. This may include deployment of supply vessel/s to attempt to make close quarter contact with the vessel and bridge. If no supply vessels are immediately available, the deployment of the rescue craft may be undertaken, pending assessment of risk to the boat crew and proximity of drifting vessel.

If impact is unable to be avoided, response shall generally be in accordance with **DSHA – DETERIORATING SEAWORTHINESS** and / or **DSHA – ABANDON TENDER**. The preservation of life shall take precedence over all other considerations and appropriate steps shall be taken to achieve this.

The OIM retains the discretion to evacuate all non-essential personnel and retain a Damage Control Team onboard. Upon abandonment of damage control activities, this team shall affect all abandon vessel preparation steps (e.g. emergency shut-downs / water-tight doors / hatches etc.). These remaining personnel shall have an established means of evacuation available that is not threatened by any potential collision event. This decision shall only be taken upon consultation with the Rig Manager.

***Vessel Under Power***

The response to the approach of a vessel under power shall be initially undertaken in the same manner as that outlined for drifting vessels. The primary need is to establish contact and then warn the vessel off its collision course. If contact cannot be made, then immediate intervention by supply vessels is critical.

Pending the type and size of the vessel on collision course, if the supply vessel/s is unable to raise contact or safely effect a change of course to the vessel through physical interference, the OIM shall immediately initiate Abandon Tender procedures.

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## 1 Requirements

It is expected that any structural failure to a platform will be preceded by emergency situations subject to separate response procedures (e.g. Fire & Explosion / Loss of Well Control / Mooring Failure or Marine Collision).

The response and reporting requirements of any such procedural implementation shall take precedence over those outlined as follows, which moreso caters for situations where other circumstances covered in this manual do not apply.

### 1.1 GENERAL

In the event of damage to or failure of platform structure, the OIM shall take all required actions to safeguard personnel and company property / assets.

### 1.2 INFORMATION REPORTED

Supplementary to any other procedural response, the following data and authorities shall be included in notification activities;

- Name and location of Platform
- Number of personnel involved
- Description of damage, loss include life saving equipment
- Cause of damage or loss
- Weather conditions at scene
- Details of any injuries
- Restrictions on helicopter operations
- Action taken on installation
- Assistance requested of shore base or other agencies

### 1.3 ACTIONS TAKEN

In the event of damage or failure of platform structure that places the safety of personnel at unacceptable risk, the OIM shall immediately undertake the following actions;

- Assess extent of damage and effect on integrity of structure.
- Activate the offshore Emergency Command Centre.
- Initiate the 'Abandon Tender' procedural response.
- Maintain personnel at muster, ascertain full headcount and keep lifeboats at a state of readiness.
- Initiate the 'Emergency Disconnect' procedure under the control of the Marine Section Leader

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- Secure the well.
- Effect a complete evacuation of personnel from the Platform.

If the integrity of the Tender vessel is not in danger of compromise and can be pulled back on anchors to a clear position, the following actions shall be supplementary to the immediate response procedure (which includes ECC activation and muster);

- Pull back on anchors to a safe position.
- Man the anchor release mechanisms for Platform orientated anchors.

If the integrity of the Tender is compromised and assessed as an unacceptable risk to remain onboard, onboard personnel shall be removed to a place of safety either through evacuation or abandonment, depending upon the circumstances and the resources available at the time.

Evacuation shall be coordinated through the onshore ECC, using resources as deployed or allocated by them. The rig ECC shall facilitate personnel lists as assigned to the nominated vessel or aircraft. These manifests shall accompany the passengers and a copy electronically transmitted to the onshore ECC.

Personnel nominated for emergency team roles on the Station Bill shall be considered critical staff and shall be maintained onboard until final transport resources are allocated.

If evacuation (part or whole) is not possible and circumstances demand personnel abandon the Tender, Emergency **DSHA** – Abandon Tender, shall be adhered to.

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## 1 Requirements

### 1.1 GENERAL

Disconnection from the Platform is a critical task and subject to specific rig Detailed Instruction and TBRA. These documents shall describe in detail the Emergency Disconnection (Breakaway) team delegations, step-by-step actions and safety precautions required.

There are a number of circumstances that call for a disconnection from the platform, primarily to safeguard assets from damage but also to minimize risk of injury to personnel.

These circumstances include:

- Worsening weather conditions or severe weather condition warnings
- A broken anchor line
- A well control problem
- An uncontrollable platform fire

These disconnections are undertaken as either:

- A Precautionary or Planned Disconnection
- An Emergency Disconnection

Precautionary disconnections are carried out to minimize the risk of injury to personnel and damage to property assets (both the tender and the platform).

An Emergency disconnection is carried out under extraordinary circumstances, where a serious risk to life and assets is imminent.

Regardless of the circumstances, the General Alarm shall always be activated and precede any Disconnection response (Precautionary or Emergency). This shall be undertaken in order to assemble all personnel at muster points, facilitating the efficient assembly of the Emergency Breakaway Team under the control of the Marine Section Leader (On-Scene Team Leader) and also determining a full headcount (accounting for all personnel on Platform and on Tender).

Typically, a disconnection response will include the pull-back of the tender and/or the isolation of the Platform through removal of the Personnel Access Ramp (to prevent damage) and a decision will be made by the OIM in consultation with the Client Representative regarding well management strategies and Drilling crew status (i.e. remain on platform or evacuate to Tender).

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		<b>Version: 1.01</b>

## **1.2 DISCONNECTING FOR PRECAUTION**

While a detailed rig specific response shall be described in the relevant rig Detailed Instruction, the following outline is provided as a general summary. This description does not replace the Rigs Detailed Instruction but provides a general guideline should no other reference be available:

- Driller and Rig Crew trip to shoe or take other necessary actions depending on time available to secure well.
- Secure well by installing safety valve and closing the effective rams; and / or make up top drive.
- Mechanic and Electrician on standby ready to assist disconnect.
- BOP Remote Control Hose can be disconnected (upon well confirmed secure).
- Tender crew proceed to disconnect and drop all service lines except 1 main mud hose, main 3" air hose and air supply to production facilities.
- When Driller is finished with power then Electricians proceed to disconnect the bridle, and the small rig floor air tugger is connected to the retrieving line ready to snatch the bridle from the tender hanger.
- All service hands and non-essential crew shall evacuate to the Tender.
- The weather conditions will then be monitored to decide if a complete disconnection is necessary.
- The one mud hose has been left connected, as fluid can generally be pumped to the standpipe manifold for distribution to trip tank or mud tank using one of the mixing pumps as a charge pump.
- If undertaking a complete disconnection, then the remaining service lines are dropped after the standby compressor has been started by Production Personnel or Assistant Driller. Leave the main air line unit last.
- The bridle is lifted from the hanger on the tender by the small air tugger.
- The access bridge is retrieved. Tender is moved out and main air line and Production air line dropped if necessary.
- Drillers and Assistant Drillers are to familiarize themselves with the start up and switch over for the compressor or alternative nitrogen supply to Platform Emergency Shutdown System.

## **1.3 DISCONNECTING FOR EMERGENCY**

While a detailed rig specific response shall be described in the relevant rig Detailed Instruction, the following outline is provided as a general summary. This description does not replace the Rig Detailed Instruction but provides a general guideline should no other reference be available:

Note that action steps in this guideline are very much dependent upon anticipated time available for disconnection and the type of emergency being faced.

- The principle objective is to disconnect without incurring crew injury.
- The secondary objective is to disconnect the electrical bridle, then the service lines - the electrical bridle takes precedence over the mud and cement hoses.
- Driller and crew secure the well on direction from Tourpusher (activate the E.S.D. if required) and at Tourpusher's direction move to their muster stations at the BOP deck to assist in Disconnect requirements on the Platform side.

<b>Risk level:</b> <b>Yellow</b>	<b>DSHA</b>	
<b>Title: Emergency Scenario - Disconnect From Platform</b>		
		<b>Version: 1.01</b>

- The emergency disconnect will then be conducted under the supervision of the Marine Section Leader (Tender) and On-duty Tourpusher (Platform), under direction from the ECC.
- All non-essential service personnel are to be sent to the Tender if the Personnel Access Bridge / Ramp is still usable.
- Emergency Disconnection (Breakaway) Team commences disconnection with priority on the electrical bridle.
- Bridle is released to platform side by use of the air hoist system.
- Service and fluid lines are released if time permits, otherwise will be forcibly parted under tension as Tender pulls back.
- The Personnel Access Bridge / Ramp shall be raised following evacuation of all personnel (or as otherwise determined by the OIM)

During rough weather periods the mud tank should be kept full of the fluid that is being used in trip tank and the hoses and fittings available to gravity feed from trip tank or mud tank to the wellhead annulus if necessary.

## 2 Risk Evaluation

Risk shall be managed through quality Detailed Instruction for disconnection step-by-step activity, additional to Emergency Drill activity that is subject to critique and continual improvement.

# **Appendix J - Medical Emergency Response Plan**



**MEDICAL  
EMERGENCY  
RESPONSE  
PLAN (MERP)**

**WEST VENCEDOR  
YETAGUN-A, MYANMAR**

REVISION 01 (SEADRILL CORPORATE DOCUMENT)  
VERSION 11 (WEST VENCEDOR)

***CORPORATE (SEADRILL) COMPREHENSIVE MEMBERSHIP  
ACCESS: 14ACPA000107***

THIS DOCUMENT IS NOT A PRIMARY EMERGENCY RESPONSE GUIDE AND DOES NOT INCLUDE RESPONSIBILITIES FOR, NOR ALL NECESSARY ACTIVITIES RELATING TO PRIMARY OFFSHORE INCIDENT MANAGEMENT.

This MERP document applies to the West Vencedor and will be applicable while the rig is drilling at Yetagun-A, Myanmar

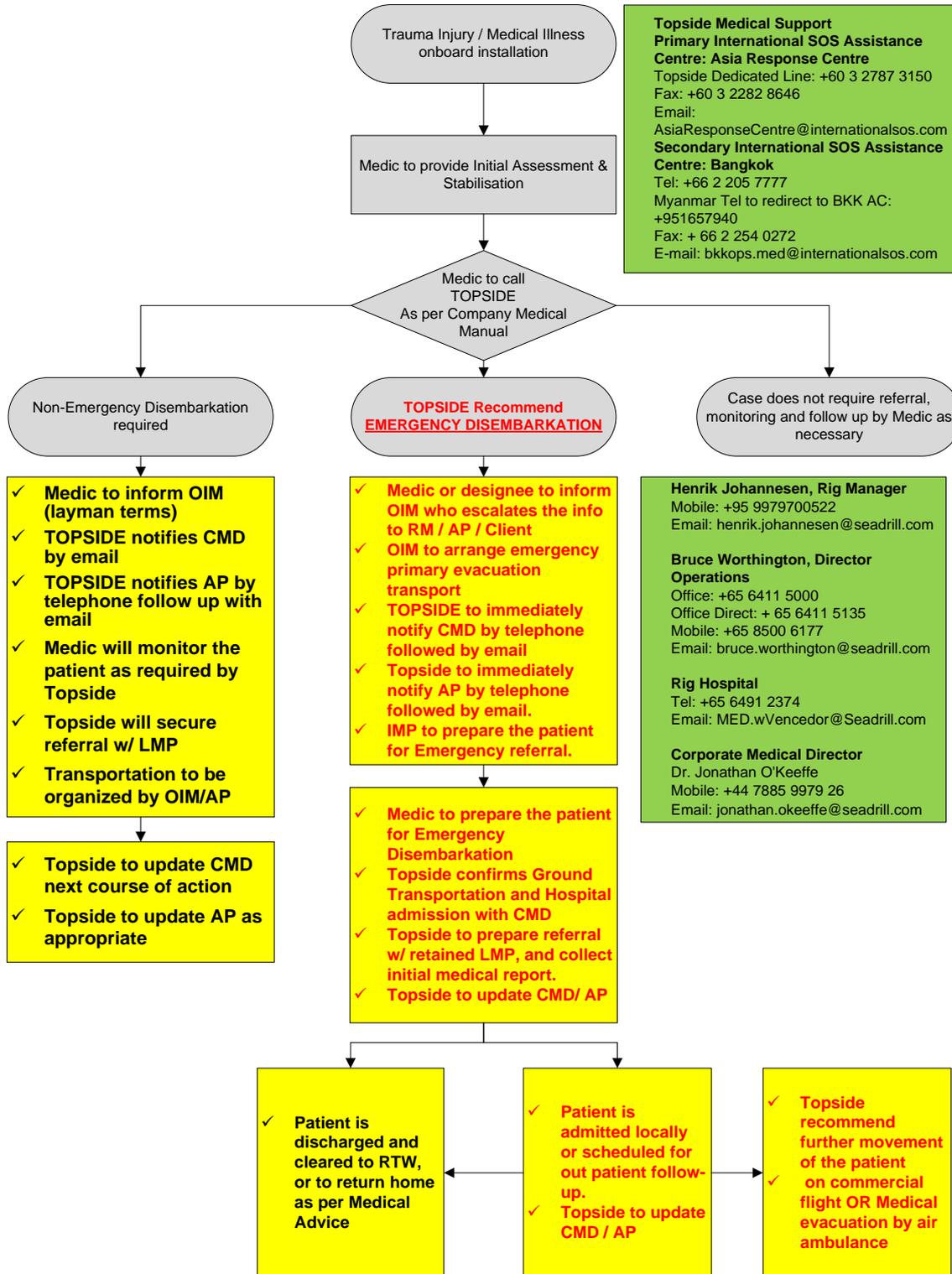
Revisions 01

Version	Date:	Description
1.0	30 Oct 2015	Location Myanmar
2.0	20 Nov 2015	Secondary AC to BKK
3.0	31 Dec 2015	CMD Change
4.0	18 Jan 2016	AP4 change
5.0	2 Feb 2016	AP1 change
6.0	17 Feb 2016	Additional no. for BKK AC
7.0	26 Feb 2016	AP1
8.0	6 Apr 2016	AP1
9.0	25 May 2016	Notifications
10.0	28 Jun 2016	AP1
11.0	20 July 2016	NOC – Addition of Jason Heng

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  - 2.3. Topside Medical Support
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4. CONTACT INFORMATION
5. RIG LOCATION
6. SUPPORT SERVICES
7. MEDICAL PROVIDERS INFORMATION
8. Additional notes

## 1. MEDICAL CASE ASSESSMENT & MANAGEMENT PROTOCOL



**Topside Medical Support**  
**Primary International SOS Assistance Centre: Asia Response Centre**  
 Topside Dedicated Line: +60 3 2787 3150  
 Fax: +60 3 2282 8646  
 Email: AsiaResponseCentre@internationalsos.com  
**Secondary International SOS Assistance Centre: Bangkok**  
 Tel: +66 2 205 7777  
 Myanmar Tel to redirect to BKK AC: +951657940  
 Fax: + 66 2 254 0272  
 E-mail: bkkops.med@internationalsos.com

**Henrik Johannesen, Rig Manager**  
 Mobile: +95 9979700522  
 Email: henrik.johannesen@seadrill.com

**Bruce Worthington, Director Operations**  
 Office: +65 6411 5000  
 Office Direct: + 65 6411 5135  
 Mobile: +65 8500 6177  
 Email: bruce.worthington@seadrill.com

**Rig Hospital**  
 Tel: +65 6491 2374  
 Email: MED.wVencedor@Seadrill.com

**Corporate Medical Director**  
 Dr. Jonathan O'Keeffe  
 Mobile: +44 7885 9979 26  
 Email: jonathan.okeeffe@seadrill.com

RM: Rig Manager  
 Medic: Installation Medical Person  
 LMP Local Medical Provider  
 OIM: Offshore Installation Manager  
 CMD: Corporate Medical Director  
 DHSE: Director of HSE  
 AP: Authorised Person  
 RTW: Return to Work

## 2. RESPONSIBILITIES

### 2.1. Installation Medic

- The term “Medic” used below refers to the Medical Team onboard the Installation.
- MEDIC to provide first aid and initiate/ provide medical treatment in line with the Seadrill Offshore Medical Services Manual. MEDIC to contact the on-duty Topside Physician via telephone or telemedicine as per the Topside escalation criteria to review the case and obtain necessary direction.
- MEDIC to ensure that the OIM is notified of the incident.
- MEDIC to immediately brief the Offshore Installation Manager (OIM) if a medical disembarkation is recommended by Topside Physician.
- MEDIC to prepare the patient for evacuation if disembarkation is required.
- MEDIC to send completed Notification of Case (NOC) document to Topside Medical Support

Note. The MEDIC will complete corresponding Patient Handover Reports and Update the Medical Activity Log for any patient case, as per Seadrill Offshore Medical Services Manual.

### 2.2. Offshore Installation Manager or his designee

- In charge of arrangements for medical evacuation as advised by/discussed with the Topside Medical Support (or the MEDIC in the event of a communication breakdown), the OIM will coordinate evacuation with shore management (including the Operator/Client as locally required by contract).
- Obtain injured/ill person's name, brief description of injuries and description of incident, or individual medical condition.
- Provide necessary assistance to Installation Medic.
- Notify the Rig Manager as soon as possible. Report the incident as defined in the Health Management System Directive.

### 2.3. Topside Medical Support

- Provide medical advice to the MEDIC and assistance over the phone.
- Escalate to and discuss with Seadrill Corporate Medical Director for final approval and guidance. Notify Seadrill Corporate Medical Director of cases as per below notification instructions and escalate cases for discussion where required.
- Topside Physician will advise whether adequate treatment may be provided onboard or if the patient should be transported to hospital and if a medical escort will be required (Emergency or Non-Emergency Disembarkation).
- Liaise with the Authorized Person and CMD to monitor the situation and coordinate the medical disembarkation.
- Confirm arrangements for ground transportation and referral/ admission to the preferred medical provider.
- Medically monitor and update CMD (medically) and Authorized Person..
- Review with CMD any need for secondary evacuation and notify/ update Authorized Person accordingly.

- Topside will activate the nearest Assistance Center for onshore assistance where required.

#### **2.4. Shore-Based Rig Management**

- Review and coordinate the logistical aspects of the medical disembarkation with Topside Medical Support and CMD.
- Authorize medical provider to guarantee medical expenses and/or activate necessary resources for (international) repatriation or evacuation in liaison with CMD
- Escalate as necessary to next level of management. (rig manager to OPS Directors - regional HSE)
- Ensure handover between medical providers where applicable, and copy OIM, MEDIC, CMD and DHSE.

### **3. SPECIAL CIRCUMSTANCES**

#### **Fatalities**

In case of fatality, the deceased shall not be moved until permission is granted by local authorities. Further movement to be coordinated by medical provider in liaison with rig management.

#### **Non-Seadrill Personnel**

In the event that a non-Seadrill employee becomes ill or injured offshore, and is in need of medical care, their medical needs, emergency or otherwise, shall be managed the same way as for any Seadrill employee. Once onshore the employees employer takes over the responsibility for further medical management, unless otherwise agreed upon with Seadrill. When necessary escalate to CMD.

Rig Management will notify in a timely manner the non-Seadrill employee company's point of contact of the situation and will be informed of where the patient will be medically evacuated to.

Rig management to inform International SOS.

## 4. CONTACT INFORMATION

<b>International SOS Topside Assistance Centre</b> <b>Primary International SOS Response Centre: Asia Response Centre</b> Topside Dedicated Line: +60 3 2787 3150 Fax: +60 3 2282 8646 Email: <a href="mailto:AsiaResponseCentre@internationalsos.com">AsiaResponseCentre@internationalsos.com</a>
<b>Secondary International SOS Assistance Centre: Bangkok</b> Tel: +66 2 205 7777 Fax: + 66 2 254 0272 Myanmar Tel to redirect to BKK AC: +951657940 E-mail: <a href="mailto:bkkops.med@internationalsos.com">bkkops.med@internationalsos.com</a>

Authorised Person	
<b>Primary AP Henrik Johannesen, Rig Manager</b> Mobile: +95 9979700522 Email: <a href="mailto:henrik.johannesen@seadrill.com">henrik.johannesen@seadrill.com</a>	<b>Backup AP Bruce Worthington, Director Operations</b> Office: +65 6411 5000   Office Direct: + 65 6411 5135 Mobile: +65 8500 6177 Email: <a href="mailto:bruce.worthington@seadrill.com">bruce.worthington@seadrill.com</a>
<b>Additional 1 Mike Will, HSSEQ Head of Department AP Region</b> Office: +65 6411 5120 Mobile: +65 9296 1765 Email: <a href="mailto:Mike.Will@seadrill.com">Mike.Will@seadrill.com</a>	<b>Additional 2: Alex Mosen, Senior Vice President</b> Office: +65 6411 5150 Mobile +65 9661 8535 Email: <a href="mailto:alex.mosen@seadrill.com">alex.mosen@seadrill.com</a>

Notifications
<p><b>Notifications (Medical) to Dr. Jonathan O’Keeffe, Seadrill Corporate Medical Director</b></p> <p>Tel: +44 20 8762 8226 Mobile: +44 7885 9979 26 Email: <a href="mailto:jonathan.okeeffe@seadrill.com">jonathan.okeeffe@seadrill.com</a></p> <ul style="list-style-type: none"> <li>• For ALL cases, a written medical notification needs to be sent to Dr O’Keeffe.</li> <li>• Telephonic notifications to be made to Dr. O’Keeffe for                             <ul style="list-style-type: none"> <li>○ Emergency Disembarkations</li> <li>○ Non-Emergency Disembarkations for possibly work related conditions</li> </ul> </li> <li>• Email Medical Notification to follow all telephonic notifications</li> </ul> <p><b>In the absence or unavailability of Dr. O’Keeffe, notification should be given to Dr. Lars Petersen</b></p> <p>Tel: +31 20 8200 346 Mobile: +31 62 4172 359 Email: <a href="mailto:lars.petersen@internationalsos.com">lars.petersen@internationalsos.com</a></p> <p><b>Copy Dr. Regis Garrigue, Regional Medical Director (also Seadrill Health Partner in Asia) on ALL medical notifications by email (E-mail: <a href="mailto:Regis.Garrigue@internationalsos.com">Regis.Garrigue@internationalsos.com</a>; Contact: +84 988 524 006)</b></p> <p><b>Notification to Seadrill Authorized Persons (APs) – Non Medical:</b></p> <p>Telephonic notifications to be given to AP (Rig Manager) for ALL disembarkations, emergency AND non-emergency</p> <p>Email notifications for disembarkations to be sent with attached template to:</p> <ul style="list-style-type: none"> <li>- Primary AM</li> <li>- Backup AM</li> <li>- Additional 1</li> <li>- Additional 2</li> <li>- Jason Heng, Regional HSE Manager <a href="mailto:jason.heng@seadrill.com">jason.heng@seadrill.com</a></li> <li>- Neil Forrest, Corporate Director QHSE: <a href="mailto:neil.forrest@seadrill.com">neil.forrest@seadrill.com</a></li> <li>- Copy Dr Jonathan O’Keeffe</li> </ul>

## Rig Contact Details

### Offshore Installation Manager

Tel: +65 6491 2373

Mobile: n/a

Email: [oim.wVencedor@seadrill.com](mailto:oim.wVencedor@seadrill.com)

### Radio Room

Rig Tel: + 65 6491 2375

Email: [RAD.wVencedor@Seadrill.com](mailto:RAD.wVencedor@Seadrill.com)

Radio: MF/HF Marine Transceiver, 2182KHz

### Rig Hospital

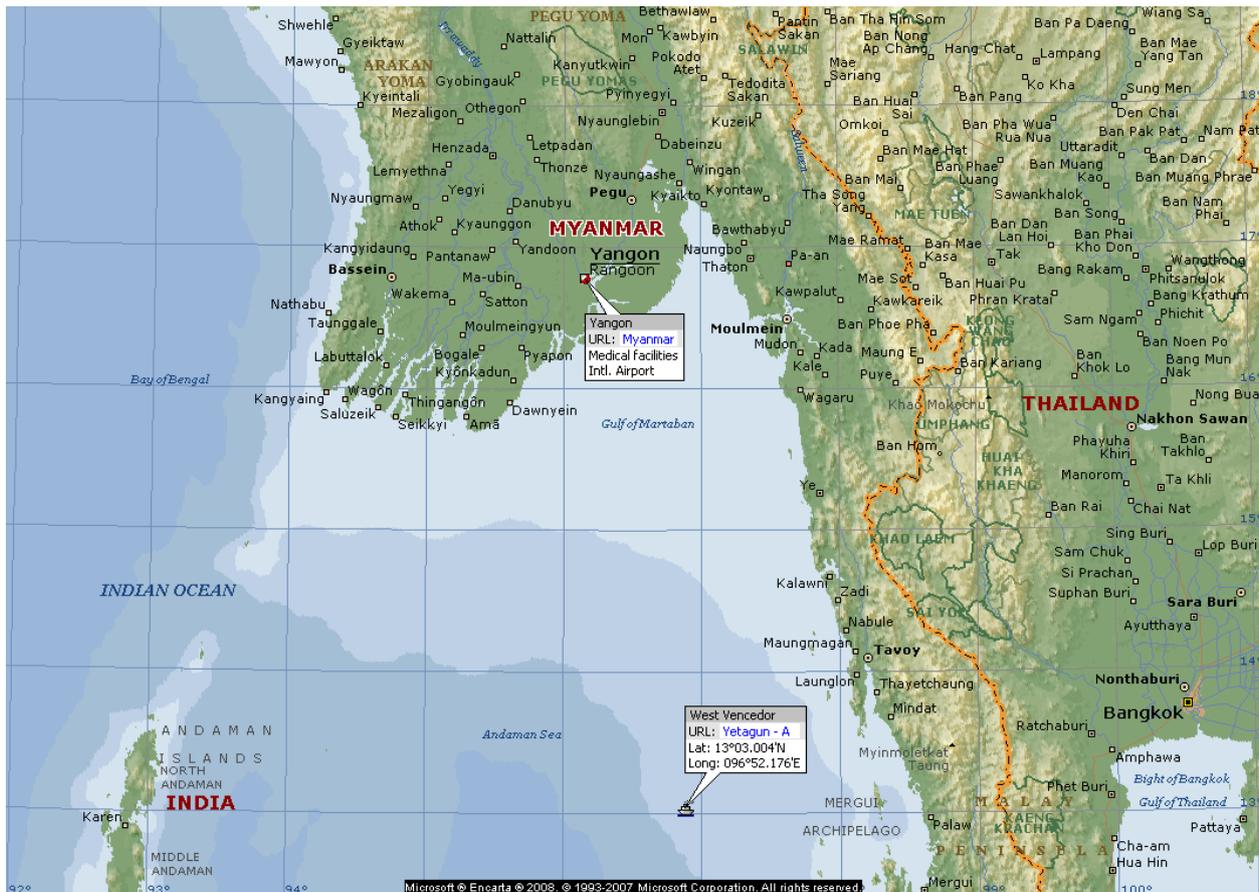
Tel: +65 6491 2374

Email: [MED.wVencedor@Seadrill.com](mailto:MED.wVencedor@Seadrill.com)

## 5. RIG LOCATION

### Map

13°03.004'N, 096°52.176'E



### Patient Handover Point: Yangon Airport

(Seadrill client's helicopters based in Kanbauk and Yangon along with a fixed wing aircraft. Depending on severity of case patient may be directly flown to Yangon via helicopter)

**6. SUPPORT SERVICES****Helicopter information****For Myanmar (contracted by Seadrill, Petronas is the Operator)**

Company name. Heli Union

Type. AW 139 / F-HUGF

Provider. Myanmar (Petronas)

Activation time 1hr daylight &amp; night time (heli take-off after first notification)

Medical Configuration (AW139 Air Ambulance) 1 stretcher with 6 seats available / max 2 stretchers with 2 seats available

Helicopter AW139 12 pax + 2 crew

**MRCC Ayeyarwaddy (Myanmar Navy) (to be activated by Seadrill if needed)**

+95-313-1650 +95-1202-417

Email: [mrcc.yangon@mptmail.com.mm](mailto:mrcc.yangon@mptmail.com.mm)**Ground Ambulance****Yangon, Myanmar****Intl.SOS Clinic Yangon**

Tel: +95 1 657922

**Asia Royal Hospital**

Tel: + 95 1 538055 / 1 503243 / 1 503261

**Emergency Ambulance Service Foundation (EAS)**

Tel: + 95 9 421060999 / + 95 9 421063999

+ 95 9 421072999 Mob: + 95 9 5153174

**Pun Hlaing Hospital**

Tel: +95 16 84 325 / +959 735 00 569

**7. MEDICAL PROVIDERS INFORMATION****LMP****Yangon, Myanmar****Name: International SOS Clinic Yangon**

Address: Inya Lake Hotel, 37, Kaba Aye Pagoda Road, Yangon, Myanmar

Tel: +95 1 657 922 / Mobile phone: + 95 9420 114 536 Fax: + 95 1 667 866

**Name: Pun Hlaing Hospital**

Address: Pun Hlaing Golf Estate Avenue, Hlaing Thayar Township, Yangon, Myanmar

Tel: +95 1 684 325 / +95 973 500 569 Fax:+95 1 684 324

**Name: Asia Royal General Hospital**

Address: No 14, Baho Street, Sanchaung Township, Yangon Myanmar

Tel: +95 1 538 055 / 503 243 / 503 261 Fax: +95 1 537 296

**Airport information**

Name: Yangon International Airport  
Location: Yangon, Myanmar  
Hours of operation: 24 hours  
Airport of entry: Yes  
Tel: +95 1 533 015

**8. ADDITIONAL NOTES**

**Acronyms:**

AP: Authorized Person  
CMD: Corporate Medical Director  
LMP: Local Medical Provider  
OIM: Offshore Installation Manager  
DHSE: Director of Health, Safety and Environment  
NOC: Notification of case (and subsequent updates per protocol)

# **Appendix K - Cyclone Emergency Response Plan**

095/003/008 - Myanmar Operation Cyclone Response Plan

Rev. 0 October 2008

# **MYANMAR OPERATION CYCLONE RESPONSE PLAN**

REVISION- 0

-2008-

**FOREWORD**  
**Authority for Revision 0 Issue**

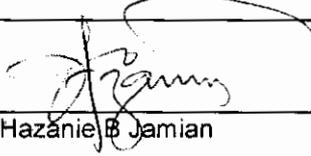
**Issue Approval**

Issue of this document has been formally approved by:

Signature	:	
Name	:	Mohd Zaini Mohd. Yunus
Position	:	General Manager PC Myanmar (Hong Kong) Limited
Date	:	27/10/08

**Issue Agreement**

Agreement for issue of this document was made by the following:

Signature	:	
Name	:	Hazanie B Jamian
Position	:	Senior Manager (Production) PC Myanmar (Hong Kong) Limited
Date	:	24/10/08.

**Document Custodian**

The following person has been assigned as the document custodian:

Signature	:	
Name	:	Edward Zan
Position	:	HSE Manager PC Myanmar (Hong Kong) Limited
Date	:	23 October 2008.

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05	Senior Manager, Production Department	PCML- Yangon
06	Senior Manager, Reliability, Integrity and Engineering Department	PCML - Yangon
07	Manager, Maintenance Engineering Department	PCML – Yangon
08	Manager, Subsurface Integrity Department	PCML - Yangon
09	Manager, Planning Department	PCML- Yangon
10	Manager, Government Affairs, Public Relations and Administration Department	PCML- Yangon
11	Manager, Supply Chain Management Department	PCML- Yangon
12	Manager, Human Resource Management Department	PCML- Yangon
13	Manager, Finance	PCML- Yangon
14	Manager, HSE	PCML- Yangon
15	Offshore Installation Manager	PCML- Yetagun
16	Pipeline Site Manager	PCML- POC/MS
17	Unit Superintendent	PCML - FSO
18	Country Manager	PETRONAS – Myanmar

**AMENDMENT SUMMARY**

This sheet must be completed in detail at each revision once this document has been approved.

Details must include revision number, description and indication of which pages and paragraphs have been revised, date of revision approval, approver's title and signature.

Rev	Description	Date	Approver Title	Signature
0	Original issue	September 2008	GM	

- Notes:
- (1) Document Custodian to update Amendment Record as and when amendments/new revisions are received.
  - (2) For description of amendment the Document Custodian should indicate correction, modification, and update or deletion issue.
  - (3) Where part amendments are issued, the relevant page(s) will be identified with a lower case letter in the revision status line in the header.
  - (4) Revision will be issued to the persons identified on the distribution list.
  - (5) Proposal for changes in the document (revision requests) shall be forwarded in writing to the Document Custodian for review, approval and distribution.

**PREFACE**

This MO Cyclone Response Plan has been developed to provide guidelines and duties and responsibilities of both offshore and onshore personnel of PC Myanmar (Hong Kong) Limited (PCML) in managing the tropical disturbance in the weather pattern on any PCML facilities within Myanmar.

The Natural Disaster Response Plan provides, amongst other, the following:

- the organization within PCML, charged with the responsibility for operationalizing the Response Plan;
- the various level of emergencies, as well as the required action plan that need to be put in place

This Plan shall be revised from time to time as required to ensure that changes in the Emergency Response organisation are correctly documented and any deficiency highlighted in the emergency situations or emergency exercises are correctly addressed.

Should any deficiencies are experienced or needed for improvement in users acceptability be identified, these should be brought to the attention of Custodian by completing the standard revision request form.

Any proposed changes are to be submitted to:

**HSE Department  
PC Myanmar (Hong Kong) Limited  
Yangon, Myanmar**

**ABBREVIATION AND ACRONYMS**

OIM	Offshore Installation Manager
POB	Persons on board
YET - A	Yetagun Platform A
YET – B	Yetagun Platform B
ECC	PCML Emergency Co-ordination Center
TRS	Tropical Revolving Storms
MSE	PCML, Health, Safety and Environment Department
MPD	PCML, Production Department
MSC	PCML, Supply Chain Department
MHI	Myanmar Helicopter International
MEDIVAC	Medical Evacuation - the evacuation of injured or sick person(s) who require medical attention
PCSB	Petronas Carigali Sdn. Bhd.
PCML	PC Myanmar (Hong Kong) Limited

PREFACE

SECTION 1: INTRODUCTION

SECTION 2: WEATHER FORECASTING & CLASSIFICATIONS

SECTION 3: RESPONSIBILITIES

SECTION 4: NOTIFICATION AND COMMUNICATION

SECTION 5: MANDATORY REQUIREMENTS

SECTION 6: OFFSHORE DECISION MAKING AND EVACUATION

APPENDIX 1: SCALE OF THE CYCLONE INTENSITY

APPENDIX 2: ALERT LEVEL

**SECTION 1  
INTRODUCTION**

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1.2 SCOPE	8
1.3 RESPONSIBILITY	8
1.4 LIABILITY AND INDEMNITY	8
1.5 PROPOSAL FOR CHANGES TO THIS DOUMENT	8

- 1. INTRODUCTION** Tropical Storms for the purpose of this Manual is defined as a tropical disturbance in the weather pattern, considered to be of such intensity potential as to cause activation of the tropical storm alert system.
- 1.1 PURPOSE** The General Plan for PCML operations, hereinafter known as the "MO CYCLONE RESPONSE PLAN" outlines the contingency measures required when conducting offshore (off the Coast of the Myanmar) and onshore operations in areas affected by TRS. The measures are prescribed in decreasing order of priority:
- a. To ensure the safety of personnel
  - b. To minimize damage to the facilities
  - c. To permit the continuation of production as safety can be maintained.
- The intention of the Plan is to coordinate the responses in the event of a TRS.
- 1.2 SCOPE** This PLAN covers:
- Yetagun Production Platform
  - FSO
  - Drilling Rigs (during drilling)
  - Tankers for off-loading
  - Tugs, Supply/Standby vessels
  - Surveillance Vessels and chasing boats
  - Survey/Seismic vessels
- 1.3 RESPONSIBILITY** HSE Manager is the custodian of this document. He is responsible to periodically review, update and modify the document contents and distribute them to control copy holders of the document
- 1.4 LIABILITY AND INDEMNITY** This document contains practices meant for the sole use by PCML. Unauthorized use of this document shall be at the user's own risk. PCML shall not be liable to any loss or damage to life, property and the environment arising from then use of the documents.
- 1.5 PROPOSAL FOR CHANGES TO THIS DOUMENT** This document shall be reviewed annually by the Custodian. All Users shall be responsible for reviewing and making any recommendations for change. The manual will also be updated as a result of all post-incident review processes and as a result of information gained from annual training exercises.
- Recommendations arising from the annual review will be submitted to PCML management for discussion and approval by April 1 of each year. Minor updates may be made by the Custodian at any time during the year.

SECTION 2

WEATHER FORECASTING & CLASSIFICATIONS

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2.2 STORM CLASSIFICATION	10
2.3 STORM CATEGORY	10
2.4 FEEDBACK	11

**2 WEATHER FORECASTING & CLASSIFICATIONS**

**2.1 GENERAL**

A tropical weather pattern may develop from a depression and increase in intensity/severity until it reaches into a full blown Tropical Cyclone

The facility is considered threaten anytime there is tropical storm within 660 nm of the facility.

**2.2 STORM CLASSIFICATIONS**

CLASSIFICATIONS OF CYCLONE	WIND SPEED
1. Tropical Disturbance	<28 Knots
2. Depression	28 – 33 Knots
3. Moderate Tropical Storm	34 – 47 knots
4. Severe Tropical Storm	48 – 63 knots
5. Tropical Cyclone	64 – 85 knots
6. Intense Tropical Storm	86 – 119 knots
7. Very Intense Tropical Storm	>120 knots

**2.3 STORM CATEGORY**

Category	Average Wind	Strongest Wind Gust	Possible Implications
0	< 20 knots	-	Normal Operations
1	20 – 30 knots	> 30 knots	Wave 2 – 3m Dangerous for lifting operations Dangerous to boat transfer
2	30 – 50 knots	> 50 knots	Wave > 3m Dangerous to small boats Dangerous to all marine activities Possible parting of mooring line Possible Equipment Damage Possible Power and Communication Breakdown Unable to evacuate by boat
3	50 – 70 knots	-	Dangerous to all activities Unable to evacuate by Helicopter
4	> 70 knots	-	Wide spread destructions

**2.4 FEEDBACK**

The OIM will ensure continuous feedback to PCML - ECC of actual weather conditions at a frequency according to Alert levels.

**SECTION 3**

**RESPONSIBILITIES**

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### 3 PREPARATION FOR STORM CONDITION

In spite of having an increased number of weather stations, improved meteorological techniques, there is still the possibility of an unpredicted weather.

During an impending storm condition, all facilities and worksites are expected to:

- (a) Appraise activities and consider the influence it can have on the operations.
- (b) Review all normal operations carefully to ensure that no critical operation is carried on, which cannot be completed before it may become necessary to commence evacuation.
- (c) Ensure appropriate pre-planned evacuation procedure is suited to each circumstance.

#### 3.1 PRE-STORM PREPARATION AT FACILITY

Person in charge of facility shall ensure the followings;

- Make required/needed modifications or repair to withstand maximum wind and wave.
- Send un-required materials and equipments to storage or disposals.
- Ensure required equipments are secured.
- Ensure emergency equipment are operational (e.g. check helideck lighting)
- Advise on impending situation and seriousness to site personnel.
- Alert PCML-EMT and others who are within their jurisdictional control.
- Instruct personnel to secure all systems and cease work.
- Confirm and gazette areas that are or maybe affected.
- Liaise with other installations and seek support.
- Review all storm preparations with all site personnel.
- Consider evacuate non-essential personnel or all.
- Calculate the time relevant to location and update at least every 12 hours.

#### 3.2 CATEGORY 1 PREPARATION

Person in charge of facility shall ensure the following;

- Beacon light to be functional
- Helideck lights are working and emergency siren is working
- Test emergency system. (fire pump, water pump)
- Verify supply or quantity of fuel.
- Verify your quantity & supply of food.
- Securing facility.
  - (a) Check water tight integrity
  - (b) Secure equipment not in use

- (c) Cover all electrical equipment that are not in use
- (d) Remove all loose items at open area
- (e) Ensure facilities have sufficient fuel for 7 days
- Inform all relevant parties (e.g vessels) that Category 1 is in effect.
- Review evacuation plan with personnel.
- Establish maximum wind condition acceptable for evacuation by helicopter.
- Check on limitation of vessels and helicopter.
- Monitor storm conditions.
- Check Radio Communications & ensure batteries are fully charged.

Note: On Scene Commander to inform IC on impending bad weather condition and activation of Category 1 preparation.

**EMT Responsibilities**

- Ensure Category 1 preparations are done by field personnel.
- IC to communicate and update EMT members.
- Request Fugro for more frequent weather update.
- To track weather movement using internet.

**3.3 CATEGORY 2  
PREPARATION**

Person in charge of facility shall ensure the following;

- Ensure all Category 1 preparations are in place.
- Category 2 preparation started before the storm forecasted to reach the facility in 48 hours.
- To do mustering at Shelter area and await further instruction from PIC.
- Confirm personnel listing and initiate tagging personnel
- Initiate food and water rationing if necessary.
- Advise relevant parties on Category 2 situations and to implement necessary actions.
- Advise vessels to depart locations and seek shelter.
- Alert IC on any activities unachievable action.

Note: HSE Liaison (when ECC activated) is responsible for tracking of storm movement and advise storm activities.

**EMT Responsibilities**

- Ensure HSE Liaison tracking direction, speed, intensity of the TRS.
- Activate ECC.
- Inform Helicopter service provider to be on standby for potential evacuation of personnel.
- Maintain open communications with Locations

**3.4 CATEGORY 3  
PREPARATION**

- Ensure all Category 2 preparations are in place.
- Category 3 preparation started before the storm forecasted to reach the facility in 36 hours.
- Secure facilities and initiate shutdown if necessary.
- Secure and lock important documents.

- Precautionary evacuation.
- Plan for abandonment.
- Alert IC on any activities unachievable action.
- Inform IC of the status of evacuation and when can be completed.

**EMT Responsibilities**

- Continue render assistance to facilities.

**3.5 CATEGORY 4  
PREPARATION**

- Ensure all Category 3 preparations are in place.
- Initiate total abandonment of facilities.
- Inform IC on departure time from locations.

**EMT Responsibilities**

- Continue to track storm updates.

**SECTION 4**  
**NOTIFICATION AND COMMUNICATION**

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4.5 ORANGE (DANGEROUS)	18
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**4. NOTIFICATION AND COMMUNICATION**

**4.1 ALERT AND WARNING**

The decision to declare an impending Tropical Storm Category and Alert Level rests with the PIC. Notification shall be made to PCML - IC.

Once the warning is received the Incident Commander will notify:

- EMT HSE LIAISON (to carry out tracking and monitoring of storm movement); and
- Other parties according to PCML Emergency Response Plan.
- In cases where communications with PCML EMT-IC is not possible, the PIC shall use alternative communication route (via marine vessel, POC/MS, Dawei Office, etc).
- PIC shall make reference to Section 2 - WEATHER FORECASTING & CLASSIFICATIONS for guidance.
- Activation of EMT members (by IC) shall be made as and when appropriate.
- Details on Alerting and Reporting protocol as per recorded at appendix Figure A4.1 below.

**4.2 ALERT LEVEL**

In this plan there are Four (4) Alert Levels base on the maximum radius (the distance from the facility) of the approaching storm. Details are appended below.

Once a Tropical Storm is detected and is classified as Category 2 (refer to Section 2.3), the following Alert level will be applied (refer to Table 1 below)

**TABLE – 1 SUMMARY ON ACTION AT DIFFERENT ALERT LEVEL**

DISTANCE (NM)	LEVELS	ACTIVITIES
560-660	GREEN	<ul style="list-style-type: none"> <li>▪ Inform &amp; stop personnel from embarking</li> <li>▪ POB on full alert</li> <li>▪ ERT on standby</li> <li>▪ Inform EMT</li> <li>▪ Stop non-routine works</li> <li>▪ Weather tracking frequency: every 12 hours</li> </ul>
460-560	YELLOW	<ul style="list-style-type: none"> <li>▪ Evacuate non-essential personnel : Visitors, Ad-hoc personnel, Trainees</li> <li>▪ Weather tracking frequency: every 6 hours</li> </ul>
310-460	ORANGE	<ul style="list-style-type: none"> <li>▪ Evacuate essential personnel: except core discipline personnel to remain, selected ERT member, Medic.</li> <li>▪ Controlled shut in of wells and prepare for shutdown</li> <li>▪ Weather tracking frequency : every 3 hours</li> </ul>
<310	RED	<ul style="list-style-type: none"> <li>▪ Make Safe</li> <li>▪ Total shutdown and abandonment</li> </ul>

- 4.3 GREEN ALERT  
(PRECAUTIONARY)**
- Green alert signals that a Tropical Storm has its centre located **within 660 nautical miles** from the facility. At Green Alert status the requirements are:
- Inform PCML - IC of impending storm.
  - HSE Liaison to initiate tracking of storm.
  - IC to consider mobilizing PCML - EMT members.
  - Initiate tagging of personnel at facility.
  - Plan for precautionary evacuation of Personnel.
  - Consider suspension of non-routine work and secure facility.
- Notes: Refer to Section 3 – Responsibilities and Action Planning and Appendix 2 – Process Flow and Response Actions.  
**HSE Liaison** to conduct tracking of storm every 12 hours.
- 4.4 YELLOW ALERT  
(PREPARE)**
- Yellow alert signals that a Tropical Storm has its centre located within 460 -560 nautical miles from the facility. At Yellow Alert status the requirements are:
- Update PCML - IC on prevailing weather at location.
  - HSE Liaison to continue to update PCML - IC and PIC. (location, direction and distance from various PCML facilities)
  - Consider mobilizing PCML - EMT members.
  - Evacuate non-essential Personnel from location
  - Suspend non-routine works and secure facility.
- Notes: Refer to Section 3 – Responsibilities and Action Planning and Appendix 2 – Process Flow and Response Actions.  
**HSE Liaison** to conduct tracking of storm every 6 hours.
- 4.5 ORANGE ALERT  
(DANGEROUS)**
- Orange alert signals that a Tropical Storm has its centre located within 310 - 460 nautical miles from the facility. At Orange Alert status the requirements are:
- Update PCML - IC on prevailing weather at location.
  - HSE Liaison to continue to update PCML - IC and PIC. (location, direction and distance from various PCML facilities)
  - Initiate full mobilization of PCML - EMT members.
  - Evacuate essential personnel from facility, with core discipline personnel to remain.
- Secure facility, control shut in of wells and prepare for shutdown. Joint decision required by PIC, PCML - IC, and PCML Management to suspend operation and fully evacuate the facility.
- Notes: Refer to Section 3 – Responsibilities and Action Planning and Appendix 2 – Process Flow and Response Actions.  
**HSE Liaison** to conduct tracking of storm every 3 hours.
- 4.6 RED ALERT  
(DESTRUCTIVE)**
- Red alert signals that a Tropical Storm has its centre located less than 310 nautical miles from the facility. At Red Alert status the requirements are:

- Update PCML - IC on prevailing weather at location and arrangement made.
- HSE Liaison to continue to update PCML - IC and PIC. (location, direction and distance from various PCML facilities)
- Initiate shutdown of facility and group remaining personnel.
- Secure facility and implement total abandonment.

Notes: Refer to Section 3 – Responsibilities and Action Planning and Appendix 2 – Process Flow and Response Actions.

**HSE Liaison** to conduct tracking of storm hourly.

**SECTION 5**

**MANDATORY REQUIREMENTS**

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## 5 MANDATORY REQUIREMENT

The following requirements are mandatory during Cyclone season.

### 5.1 POB MONITORING AND REPORTING

After a crew change, the PS shall report immediately the POB of their facility to PCML - EMT.

To facilitate the administration of a precautionary evacuation and facility abandonment the following applies:

- (a) At "Green and Yellow Alert" level, all non-essential personnel shall be evacuated. Personnel under the categories are visitors, ad-hoc personnel and those that are considered non essential by PIC.
- (b) At "Orange Alert" level all essential personnel shall be evacuated. Personnel under the category are those engaged in Production and Operation related activities.
- (c) Those are required to implement Emergency Response Activities shall be evacuated at Red Alert. Personnel to be evacuated last (Red Alert level) are PIC and remaining ERTs.

### 5.2 OFFICE ORGANIZATION

#### PCML OFFICE YANGON

Emergency Co-ordination Centre' (ECC) will be manned according to the PCSB Emergency Response Duty Roster.

#### DAWEI STATION

Station Manager and Radio Operator to be on standby since the "GREEN ALERT" level is declared.

#### CONTRACTORS

Respective Contractor's Emergency Response Team will Be manned according to their Emergency Response Plan.

### 5.3 EMERGENCY EXERCISE

A drill, confirming logistical preparedness and communication lines must be held annually. (Where as possible should be done prior to adverse weather condition).

### 5.4 FACILITIES

- Minimise major maintenance and inspection works.
- Maintain high level of sea fastening of loose equipment.
- Keep chemical & fuel storage tanks at secure levels of minimum 14 days autonomy.
- Maintain food and water at secure levels minimum 14 days.

### 5.5 DRILLING RIG

- Verify well securing plan.
- Ensure all necessary tools for securing the well are available and ready.

- Maintain a high level of sea fastening of loose equipment/satellite domes.
- Advise captain of supply vessel for back loading requirements.
- Maintain food, water and fuel at secure levels of minimum 7 days autonomy.

**5.6 MARINE VESSEL**

- All safety and towing equipment shall be made good to ensure Vessels' specified performance; capability and equipment level are met during the TRS season.
- All vessels arriving at the field for off-loading activities shall be accomplished as soon as possible.
- All support vessels shall have a minimum amount of fuel to sustain 7 days of operations.
- The support vessel will leave the field upon permission by PIC.

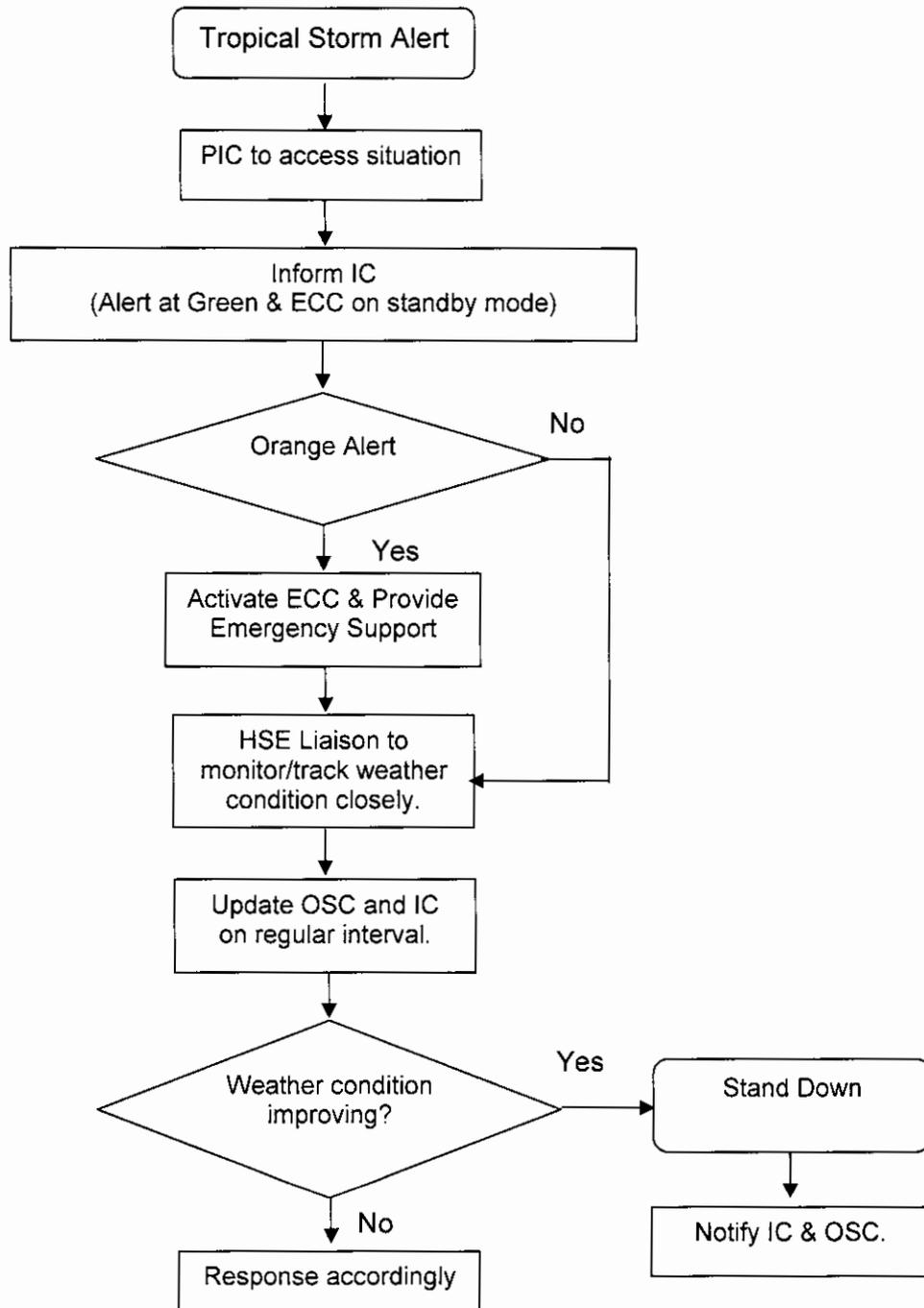
**5.7 CONSTRUCTION BARGES**

- Anchor handling vessels are standby.
- Maintain high level of sea fastening of loose equipment on board.
- Under SIPROD or SIMOP the construction barge shall leave location or anchor up.
- Maximum amount of fuel for minimum 14 days of operations.
- Maintain food, water and fuel at secure levels of min, 14 days autonomy.

**5.8 REMAINING**

- A check of the facility according to the specific Tropical Storm Response Procedures shall be made by the Production Manager in liaison with the Incident Commander.
- Any adverse findings shall be reported to PIC and PCML management for immediate follow up.
- Re-manning shall be decided by the PIC in consultation with IC and Production Manager.

Appendix 1



## Appendix 2 Contact Lists

<b>PCML Yangon Office</b>		
#16 Shwetaung Kyar (Golden Valley Road) Bahan Township Yangon	Switchboard Tel: Switchboard Tel: Fax: Inmarsat:	515011 (11 lines) 526411 (4 lines) 525698, 525684 +873 151 0230
<b>PCML Yetagun FSO/Yetagun Platform/Yetagun POC/Yetagun Metering Station</b>		
For telephone connection to the PCML Yetagun facilities from outside the PCML Yangon office, dial the PCML Yangon Switchboard (see above) and ask to be connected to the required facility.		
INCIDENT COMMANDER	Ext: 3170 (ECC) DL: 525696 (ECC) H/P (As per weekly roster)	525698
OPERATIONS CHIEF	Ext: 3143 (ECC) OPS - 09 519 3872 DRL - As per wkly roster FSO/SBM - 09 5109612	525698
PLANNING CHIEF	Ext: 3172 (ECC) 09 519 4187 (h/p)	525698
LOGISTICS CHIEF	Ext: 3173 (ECC) 09 519 4253 (h/p)	525698
FINANCE & HR CHIEF	Ext: 3141 (ECC) 09 519 4513 (h/p)	525698
HSE & LIAISON OFFICER	Ext: 3171 (ECC) 09 519 4569 (h/p)	525698
MEDICAL COORDINATOR	Ext: 3142 (ECC) 09 519 1907 (h/p)	525698
COMPUTER OPERATOR	09 519 4571 (h/p)	525698
LOCAL & TRAVEL COORDINATOR	Ext: 3174 (ECC) 09-519 4573 (h/p)	525698
MYAT ZAW AYE AVIATION COORDINATOR	515011 ext: 3063 09 80 20704 (h/p) 666238 (hse)	525698
AUNG HTOON THAKAYTA BASE COORDINATOR	515011 ext: 3121 703350 (h/p)	525698
IT ENGINEER	09 519 4984 (h/p)	525698
TELECOMM ENGINEER	09 519 4670 (h/p)	525698
PCML DRIVER	515011 ext: 3271	

CONTRACTORS REPRESENTATIVE	09 992 7950 (Team Energy) 09 5109612 (SBM) 09 501 2972 (TideWater) 09 80 21905(CHI) 09 99 22169 (ELPL)	
<b>YETAGUN FSO</b>		
SUPERINTENDENT / OIC	6201 +873 330-808-510	6202 +873 330-808-512
<b>SWAN TIDE</b>		
MASTER	+873 762-468-010	+873 762-468-011
<b>PANTHER TIDE</b>		
MASTER	+873 762-830-167	+873 762-830-169
<b>DAWEI</b>		
DAWEI BASE STATION PCML AIRPORT OFFICE	(059) 21107 (059) 21992	(059) 21041
<b>TOTAL MYANMAR E&amp;P</b>		
YANGON HEAD OFFICE	650977/ 650989/ 660466	650478/ 650479
<b>JOINT VENTURE PARTNERS</b>		
MOGE OFFICE	221058 / 221049	246892
U MYINT HTAY MOGE MD	664732 (Ygn:hse)	067 403187 (Res:) 067- 411056 (Off;) 067- 411125 (Fax)
U MYO MYINT OO MOGE DIRECTOR (OFFSHORE)	542728 (Ygn :hse)	067- 411009 (Res) 067 411331(Off) 067- 411330 (Fax)
NIPPON OIL	+813 3502 1708	+ 813 3501 2692

PTTEPI	+662 537 4000 (Bkk) 652 700/ 704, 706, 708	+662 936 3049 (Bkk) 667 783 (Ygn)
<b>EMBASSIES</b>		
MALAYSIAN EMBASSY	220248 / 220249	221840
BRITISH EMBASSY	370863 / 370864	370866
US EMBASSY	379880 / 370965	256018
THAI EMBASSY	226721 / 226728	221713
SINGAPORE EMBASSY	559001	559002
SOUTH AFRICAN EMBASSY	+662 253 8473 - 6	+662 253 8477
INDONESIAN EMBASSY	254465 / 254469	254468
AUSTRALIAN EMBASSY	251810/251797	246159
<b>HOTELS IN YANGON</b>		
GOLDEN HILL TOWERS	558556, 558558	558557
SEDONA HOTEL	666900	666911, 666833
MICASA APARTMENT	650933	650950
SAKURA APARTMENT	525001	525002
MARINA APARTMENT	650651	650630
INYA LAKE RESORT	662857	665964
TRADERS HOTEL	242828	242800

CHATRIUM HOTEL YANGON	544500	544400
<b>OTHERS</b>		
SOS/AEA CLINIC	667877, 667871	667866
INTERNATIONAL SCHOOL (ISY)	512793 / 512795	525020
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# **Appendix L - Adverse Weather Emergency Response Plan**

# **MYANMAR OPERATION ADVERSE WEATHER RESPONSE PLAN**

REVISION 0

-2008-

**FOREWORD**

**Authority for Revision 0 Issue**

**Issue Approval**

Issue of this document has been formally approved by:

Signature	:	
Name	:	Mohd Zaini Mohd. Yunus
Position	:	General Manager PC Myanmar (Hong Kong) Limited
Date	:	

**Document Custodian**

The following person has been assigned as the document custodian:

Signature	:	
Name	:	Edward Zan
Position	:	HSE Manager PC Myanmar (Hong Kong) Limited
Date	:	

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06	Senior Manager, Reliability, Integrity and Engineering Department	PCML - Yangon
07	Manager, Maintenance Engineering Department	PCML – Yangon
08	Manager, Subsurface Integrity Department	PCML - Yangon
09	Manager, Planning Department	PCML- Yangon
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11	Manager, Supply Chain Management Department	PCML- Yangon
12	Manager, Human Resource Management Department	PCML- Yangon
13	Manager, Finance	PCML- Yangon
14	Manager, HSE	PCML- Yangon
15	Offshore Installation Manager	PCML- Yetagun
16	Pipeline Site Manager	PCML- POC/MS
17	Unit Superintendent	PCML - FSO
18	Country Manager	PETRONAS – Myanmar

**AMENDMENT SUMMARY**

This sheet must be completed in detail at each revision once this document has been approved.

Details must include revision number, description and indication of which pages and paragraphs have been revised, date of revision approval, approver's title and signature.

<b>Rev</b>	<b>Description</b>	<b>Date</b>	<b>Approver Title</b>	<b>Signature</b>
0	Original issue	June 2008	GM	

- Notes:
- (1) Document Custodian to update Amendment Record as and when amendments/new revisions are received.
  - (2) For description of amendment the Document Custodian should indicate correction, modification, and update or deletion issue.
  - (3) Where part amendments are issued, the relevant page(s) will be identified with a lower case letter in the revision status line in the header.
  - (4) Revision will be issued to the persons identified on the distribution list.
  - (5) Proposal for changes in the document (revision requests) shall be forwarded in writing to the Document Custodian for review, approval and distribution.

## **PREFACE**

This Natural Disaster Response Plan is developed to provide guidelines to PC Myanmar (Hong Kong) Limited (PCML) in managing the effect of the Natural disaster like tropical disturbance in the weather pattern or earth quake on any PCML facilities within Myanmar.

The Natural Disaster Response Plan provides, amongst other, the following:

- the organization within PCML, charged with the responsibility for operationalizing the Disaster Response Plan;
- the various level of emergencies, as well as the required action plan that need to be put in place

This Plan shall be revised from time to time as required to ensure that changes in the Emergency Response organisation are correctly documented and any deficiency highlighted in the emergency situations or emergency exercises are correctly addressed.

Any proposed changes are to be submitted to:

**HSE Department  
PC Myanmar (Hong Kong) Limited  
Yangon, Myanmar**

**ABBREVIATION AND ACRONYMS**

OIM	Offshore Installation Manager
Company Representative	The representative of PCML at the field/site e.g. Field Superintendent for Ruby Field, Drilling Supervisor for Drilling Rig, Company Representative on board at surveillance vessel etc.
POB	Persons on board
YET - A	Yetagun Platform A
YET – B	Yetagun Platform B
ECC	PCML Emergency Co-ordination Center
TRS	Tropical Resolving Storms
MSE	PCML, Health, Safety and Environment Department
MPD	PCML, Production Department
MSC	PCML, Supply Chain Department
MHI	Myanmar Helicopter International
MEDIVAC	Medical Evacuation - the evacuation of injured or sick person(s) who require medical attention
PCSB	Petronas Carigali Sdn. Bhd.
PCML	PC Myanmar (Hong Kong) Limited

PREFACE

SECTION 1: INTRODUCTION

SECTION 2: MANDATORY REQUIREMENTS THROUGHOUT TYPHOON SEASON

SECTION 3: TROPICAL RESOLVING STORMS (TRS) ALERT LEVELS

SECTION 4: ALERT NOTIFICATION

SECTION 5: RESPONSIBILITIES

SECTION 6: OFFSHORE DECISION MAKING AND EVACUATION

SECTION 7: REMANNING AFTER TRS ALERT

SECTION 8: WEATHER FORECASTING

APPENDIX 1: SCALE OF THE CYCLONE INTENSITY

APPENDIX 2: ALERT LEVEL

## 1.0 INTRODUCTION

The tropical cyclones-variously defined as hurricanes, typhoons, and cyclones-regularly impact human populations and periodically produce devastating weather-related natural disasters. The destructive forces of cyclonic winds, inundating rains, and storm surge are frequently accompanied by floods, tornadoes, and landslides.

Typhoon/ Tropical Revolving Storms for the purpose of this Manual is defined as a tropical disturbance in the weather pattern, considered to be of such intensity potential as to cause activation of the typhoon alert system.

The General Plan for PCML operations, hereinafter known as the “ADVERSE WEATHER RESPONSE PLAN” outlines the contingency measures required when conducting offshore off the Coast of the Myanmar and onshore operations in areas affected by TRS. The measures are prescribed in decreasing order of priority:

- a. To ensure the safety of personal
- b. To minimize damage to the facilities
- c. To permit the continuation of production as safety can be maintained.

The intention of the Plan is to coordinate the responses in the event of a TRS.

This covers:

- Yetagun Production Platform A & B
- FSO
- Drilling Rigs (during drilling)
- Tankers for offloading
- Tugs, supply/Standby vessels
- Surveillance Vessels and chasing boats
- Survey/seismic vessels

### 1.1 DEFINITIONS

For the purposes of the Plan the following definitions apply:

#### 1.1.1 Tropical Disturbance (TD)

A tropical weather pattern that has potential to develop into a TRS, the first indication is that a TRS may be forming.

#### 1.1.2 Tropical Revolving Storm (TRS)

The words TYPHOON or STORM mean a “Tropical Revolving Storm” (TRS). Severity levels covered by a TRS are as follows:

- Tropical depression: Winds are less than 34 knots
- Tropical storm: Winds are between 34 and 47 knots
- Severe tropical storm: Winds are between 48 and 63 knots
- Typhoon: Winds are 64 knots and above
- Super typhoon: Winds are 128 knots and above

**1.1.3 Edge of Storm**

EDGE OF STORM means the furthest point from the center where wind speeds are 34 knots or above.

**1.1.4 Monsoon season:**

The monsoon usually lasts from middle of May till end of October, most predominant in June to September (amounting to 91 .9 %). Wind speed in this monsoon is usually 12-20 knots (40-60%). Tropical depression and storm usually build up in Adman sea in early May and last part of the monsoon.

**1.2 TROPICAL CYCLONES: CHARACTERISTICS AND FORMATION**

Tropical cyclones are low-pressure weather systems that develop over the warm waters of the oceans, typically between the latitudes of 30° N and 30° S (1,2,5,6). Cyclonic systems rotate counter clockwise in the Northern Hemisphere and clockwise in the Southern Hemisphere. Tropical systems evolve through a life cycle that includes the successive stages of tropical wave, tropical disturbance, tropical depression, and tropical storm (table1). Depending upon geographic locale, tropical cyclones with wind speeds surpassing 74 miles/hour (118 km/hour) are termed "hurricanes" in the North Atlantic, the Caribbean, the Gulf of Mexico, the eastern North Pacific, and the west coast of Mexico; "typhoons" in the western Pacific; and "cyclones" in the Indian Ocean and Australasia (1).

**Stages of development of a tropical cyclone**

Stage	Description
Tropical wave	A trough of low pressure in the trade-wind easterlies.
Tropical disturbance	A moving area of thunderstorms in the tropics that maintains its identity of 24 hours or more
Tropical depression	A tropical cyclone in which the maximum sustained surface wind is ≤ 38 miles/hour (≤ 61km/hour; ≤ 33 knots)
Tropical storm	A tropical cyclone in which the maximum sustained surface wind ranges from 39 miles/hour ( 62km/hours;>33 knots) to 73 miles/hour (117 km/hour;<64 knots)
Hurricane/ typhoon/ cyclone	A tropical cyclones in which the maximum sustained surface wind is ≥ 74 miles/hour (≥ 118km/hour; ≥ 64 knots)

### 1.3 TRS RESPONSE OBJECTIVE

In the case a TRS approaching the Yetagun field, the aim of the response is to achieve the following objectives, according to “alert” level in force.

No.	Location	Plan
1.	Yetagun Platform A & B	Secure the systems, down-manned (?unmanned)
2.	FSO	Systems secured, down-manned (?unmanned)
3.	Field support vessels	Sailing away from the Field Area on a course to avoid the storm or to a safe harbour, possible with part of Yetagun/FSO/Drilling rig crews.
4.	Off-take tankers	Released and sailing away from the Field Area
5.	Surveillance Vessels and chase boat	Sailing away from the area on a course to avoid the storm or to a safe harbour

**In the case of TRS developing locally in the vicinity of the Field a RED ALERT may be notified without declaring the green / yellow levels. In such a case the objectives and priorities remain unchanged, but the sequence of implementation will be coordinated depending on the circumstances.**

In such event the Typhoon Securing Procedure shall be followed as closely as possible.

### 1.4 ADVERSE WEATHER EMERGENCY PLAN PREPARATION AND REVISION

- The responsibility to approve the Typhoon Emergency Procedures lies with the General Manager – PCML.
- The responsibility to prepare and update the Typhoon emergency Procedures lies with the MSE.
- The responsibility to declare an “Alert” condition lies with the OIM being the Person In Charge, in consultation with the Production Manager.

## 2.0 MANDATORY REQUIREMENTS THROUGHOUT TYPHOON SEASON

The following requirements are mandatory during typhoon season

### 2.1 POB MONITORING AND REPORTING

After a crew change, the OIM & Unit Superintendent of FSO shall report immediately the POB of their facility to Incident Commander of PCML's ECC.

Evacuation of the Personnel, it will be depending on the alert level of the storm. To facilitate the administration of any evacuation of personnel that may be required, the "typhoon category" must be indicated for each person as follows:

Alert Level	POB Grouping	Action Plan
Green Alert	V	All visitors evacuated.
Yellow Alert	A	Personnel on Board not essential for Operation of the facility shall be evacuated
Orange Alert	B	Personnel on Board required for process/utility operation shall be evacuated To complete offloading and evacuate offloading personnel and release tanker
Red Alert	C	Only skeletal crew remain on board

### 2.2 SUPPLY VESSEL

All available supply vessels shall be put on stand-by and directed according to the level of Alert. In case of an **immediate Red Alert** (Red Alert to be notified without declaring the green/yellow Alert) supply vessels shall be directed as follows:

- The supply vessel as standby in the Yetagun field, shall be mobilised to evacuate to a safe harbour all visitors, POB Grouping "A" and "B" coded personnel if evacuation using helicopters is not feasible.
- Any spot chartered supply vessel if so required will sail to the field for assistance / demobilization duties.

### 2.3 OFFICE ORGANISATION

PCML office Yangon

Emergency Co-ordination Centre' (ECC) will be manned according to the PCML Emergency Response Duty Roster

Contractor:

Respective Contractor's Emergency Response Team will be manned according to their Emergency Response Plan

**2.4 TYPHOON EMERGENCY EXERCISE**

- A typhoon drill, confirming logistical preparedness and communication lines must be held prior to commencement of the typhoon season.

**2.5 HELICOPTERS**

- Helicopter crews to be arranged to permit the evacuation by helicopter the number of passenger according to the POB at the location within 24 hrs.
- Helicopter maintenance shall be scheduled to ensure that one helicopter (Kanbauk Based or Yangon Based) is ready for take off at all times and a 2<sup>nd</sup> helicopter ready for take off within 3 hours notice

**2.6 Yetagun FSO**

- Optimise draft/trim conditions.
- Minimise effect of free surface effect on stability conditions
- Avoid major maintenance routines and inspections.
- Maintain a high level of sea fastening of loose equipment / satellite domes.
- Maintain food, water and fuel at secure levels of min, 14 days autonomy.

**2.7 Yetagun A & B platform**

- Avoid major maintenance routines and inspection.
- Maintain high level of sea fastening of loose equipment.
- Keep chemical & fuel storage tanks at secure levels of min. 14 days autonomy.

**2.8 DRILLING RIG (if any drilling activity)**

- Verifies well securing plan
- Ensure all necessary tools for securing the well are available and ready.
- Maintain a high level of sea fastening of loose equipment / satellite domes.
- Advise captain of supply vessel for back loading requirements
- Maintain food, water and fuel at secure levels of min, 14 days autonomy.

For every drilling activity in Myanmar, a detail plan for Typhoon Response Procedure for each Drilling Rigs must be developed before mobilizing the rig to Myanmar territory.

## 2.9 MARINE VESSELS

- All safety and towing equipment shall be made to ensure vessels specified performance, capability and equipment level during the forthcoming typhoon season.
- All the supply vessel arriving at the field, offloading shall be accomplished as soon as possible, in order to clear deck ready for evacuation duties.
- All vessels shall have the maximum amount of fuel to supply the offshore facility for a minimum 15 days of operations.
- The vessel will not leave the field until the relief vessel has arrived with clear deck for evacuation duties.

### 3.0 TRS ALERT LEVELS

There are four levels of Alert Levels as detailed below. In the paragraphs below the **maximum** radius for each Alert level is given, the normal approach direction.

#### 3.1 GREEN ALERT (SAFE)

Green alert signals that a TRS has its centre located within 660 nautical miles of the offshore facility and has a potential to increase in its strength and moving towards Yetagun location.

The Green Alert status triggers:

- The activation of the PCML's ECC team.
- The evacuation of all visitors.
- The suspension of non-routine work on board the Yetagun A & B, and FSO
- If there is any drilling activities, suspend all long program or sensitive operations such as casing running, complete run or BOP running but the final decision is under the responsibility of the Drilling Supervisor in cooperation with OIM if the drilling activity is at Yetagun A. If the drilling activity is in any other location, with drilling team manager and Incident Commander.
- The FSO and platform Typhoon Emergency check list procedure: GREEN ALERT (refer to FSO Typhoon Response Procedure).
- The activation of the helicopter "ready to take off" status.
- Ready to sail "in port" of a spot (chartered) supply vessel.
- Weather forecasts / typhoon tracking charts frequency increased to every 12 hrs.

**Notes:** Apart from listed above actions, normal operations in the field will be maintained.

#### 3.2 YELLOW ALERT (PREPARE)

Yellow alert signals that a TRS has its centre located between 460 and 560 nautical miles of the offshore facility.

The Yellow Alert status triggers:

- The evacuation of "A" class personnel from the offshore facility.
- The release of any tanker calling at the terminal.
- The FPSO and Platforms Typhoon Emergency check list procedure: YELLOW ALERT (refer to FPSO Typhoon Response Procedure).
- **Weather forecasts / typhoon tracking charts frequency increased to every 6 hrs.**

### 3.3 ORANGE ALERT (CRITICAL PHASE)

Orange alert signals that a TRS has its centre located between 310 and 460 nautical miles of the offshore facility.

The orange Alert status triggers:

- The Typhoon Response Plan: ORANGE ALERT
- Termination of an export operation and release of the export tanker
- The evacuation of POB Group “B” personnel from the Yetagun Platform
- Evacuation of POB Group “B” personnel from FSO
- **Weather forecasts / typhoon tracking charts frequency increased to every 6 hrs**

### 3.4 RED ALERT (FINAL ALERT PHASE)

Red alert signal that a TRS has its centres located within 310 nautical miles of the offshore facility.

The Red Alert status triggers:

- The Typhoon Response Plan: RED ALERT.
- Stop production.
- Rapid completion of all outstanding work as specified earlier Alert levels.
- **Weather forecasts / typhoon tracking charts frequency increased to every 3 hrs.**
- Full evacuation of the facility has to be a joint decision by the PCML’s Incident Commander, the Production Manager, the OIM and the unit superintendent of FSO. The decision has to be justified based on received weather reports forecasting for the extreme weather.

#### 4.0 ALERT NOTIFICATION

The decision to declare a TRS alert rests with the OIM in liaison with Production Manager

The notification is first made by telephone, followed by e-mail and faxed to:

- Incident Commander of PCML's ECC duty team for necessary support
- Production Manager for necessary coordination with other stake holders (PTT, TEPM, Partners, Host Government)
- Pipeline Site Manager for chopper preparedness
- Unit Superintendent of FSO for necessary preparation and evacuation

**In case communications with shore by telephone is not successful, call should be made through HF radio through Radio Operator. In case of all means of communication are out of order, the OIM has the authority to declare and enter into the next TRS alert level(s)**

## 5.0 RESPONSIBILITIES

### 5.1 OIM

- Declaration/notification to PCML's ECC in liaison with the Production Manager
- Enforcement of the MO Adverse Weather Response Plan.
- Co-ordination of evacuation of personnel.
- Co-ordination with all marine operations.
- Co-ordination with FSO Unit Superintendent
- Develop, review, update and implement the Site Typhoon Emergency Procedure.

### 5.2 FSO Unit Superintendent (e.g. Field Superintendent/Drilling Supervisor etc.)

- Liaise with OIM.
- Co-ordinates securing of facilities /personnel evacuation/platforms securing.
- Develop, review, update and implement the Site Typhoon Emergency Procedure.

### 5.3 Drilling Superintendent

- Liaise with OIM, XD and DD in Yangon
- Co-ordinates securing of well /personnel evacuation/platforms securing.
- Develop, review, update and implement the Site Typhoon Emergency Procedure.

### 5.4 MASTER OF MARINE VESSELS

- Responsible for the safety of their vessel, crew and passengers.
- Liaise with the OIM.
- Monitoring POB of personnel evacuated to shore, or to secure safe facility offshore.
- Develop, review, update and implement the Site Typhoon Emergency Procedure.

### 5.5 PCML's ECC

- Response according to PCML Emergency Response Plan
- Co-ordination with respective main contractor such as TNS, Aquatic, UE, SMART etc. for the evacuation of offshore personnel.
- Provide resources required for effective evacuation of offshore personnel.

**5.6 Production Manager**

- Endorse/approve the declaration/notification by the OIM
- Enforcement of the MO Adverse Weather Response Plan.
- Endorse/Approved evacuation of personnel.
- In case of postponement of cargo transfer (offloading), to negotiate with the tanker's owner or chartered for a mutual agreement to cover the delay, or to claim against insurance accordingly.

## 6.0 EVACUATION PROCEDURE

In normal circumstances the TRS alert evacuation procedure calls for helicopter evacuation of all personnel as per prepared sequence.

In unforeseen circumstances, evacuation by boat may be considered.

When considering evacuation of personnel the following shall be kept in mind:

- Even in an early stage, weather conditions may be such that it becomes impossible to undertake the safe evacuation of personnel by helicopter and/or boat.
- In worsening sea conditions, wave and swell heights are very difficult to estimate, especially from height above sea.
- When using a personnel basket, particular attention must be paid to the relative motion between the facility and supply vessel.
- Daylight transfer is always preferable in marginal weather conditions.
- The limitations of helicopter operations wind speed wise. For floating units, pitch and roll limits are additional restrictions.
- The weather limitations, especially during dark hours of using helicopters.

**Notes:** in case of communications breakdown, the OIM has the authority to decide on different Alert levels.

### EVACUATED PERSONS ONSHORE

Once personnel of contractors have been evacuated to shore or to a secure facility offshore then it is the responsibility of the respective contractor, as their employer, to keep contact with the PCVL's office and to ensure personnel will be ready to return to the field when instructed.

Reception of PCVL's personnel is under the responsibility of the Duty Manager. Personnel reception, transport and accommodation will be arranged through PCVL's office or VTSB.

Personnel shall stay available "at call" to return to the field during the various Alert phases as deemed necessary by the Area Operations Manager.

**7.0 AFTER TRS ALERT**

- Order of priority for mobilizing back the personnel shall be decided by the OIM and Unit Superintendent of FSO in liaison with Production Manager.
- A check of the facility according to the specific Site Typhoon Response Procedures shall be made by the OIM and Unit Superintendent of FSO..
- Any adverse findings shall be reported to Production Manager for immediate follow-up.
- In case of evacuation of all POB and the plant has been shut down during the Typhoon, assessment team lead by OIM/Unit Superintendent should be mobilized first for proper assessment. Upon satisfaction by the team leader, the mobilization of the reset of the crew will be commenced as above.

## **8.0 WEATHER FORECASTING**

In normal operations, daily weather forecast (12 hourly) for Yetagun offshore is received from FUGRO. Daily weather of Yetagun field is monitored by Radio Operator on duty of Yetagun Platform. For Adverse Weather Response, a special arrangement will be made to request FUGRO on the formation of Tropical Cyclone and her direction of movement and the potential of moving toward the field.

If a tropical disturbance or a TRS develops or enters within 660 nautical miles range of the field, weather forecasts, to include tracking charts will be transmitted as frequent as PCML needs (according to the alert level).

Communication with FUGRO Centre has to be made available on a 24 hrs basis.

### **8.1 DISPATCHING & ONWARDS DISTRIBUTION**

Bulletins are transmitted from FUGRO Centre by e-mail or at request by fax

During the TRS, the weather forecast will be further distributed to all the relevant personnel.

### **8.2 FEEDBACK**

The OIM will ensure feedback to PCML's ECC of actual weather conditions at a frequency according to Alert levels.

Appendix 1

The Scale of Cyclone intensity

Category	Wind Speed			Storm surge		Central pressure (mbar)	Expected Damage
	miles/hr	km/hr	knots	feet above normal	m above normal		
1	74-95	119-153	64-82	4-5	1.2-1.8	≥980	No real damage to building structures. Damage primarily to unanchored mobile homes, shrubbery, and trees. Some coastal road flooding and minor pier damage.
2	96-110	154-177	83-95	6-8	1.9-2.7	965-979	Some roofing material, door and window damage to buildings. Considerable damage to vegetation, mobile homes, and piers. Coastal and low-lying escape routes flood 2-4 hours before arrival of center. Small craft in unprotected anchorages break moorings.
3	111-130	178-209	96-113	9-12	2.8-3.9	945-964	Some structural damage to small residences and utility buildings, with a minor amount of curtain wall failures. Mobile homes are destroyed. Flooding near the coast destroys smaller structures; larger structures are damaged by floating debris. Terrain continuously lower than 5 feet (1.5m) above sea level may be flooded inland for 8 miles (13 km) or more.
4	131-155	210-249	114-135	13-18	4.0-5.5	920-944	More extensive curtain wall failures, with some complete roof structure failures on small residences. Major erosion of beach. Major damage to lower floors of structures near the shore. Terrain continuously lower than 10 feet (3.1m) above sea level may be flooded, requiring massive evacuation of residential areas as far as 6 miles (10km) inland.
5	>155	>249	>135	>18	>5.5	<920	Complete roof failure on many residences and industrial buildings. Some complete building failures, with small utility buildings being blown over or away. Major damage to lower floors of all structures located less than 15 feet (4.6m) above sea level and within 500 yards (457 m) of the shoreline. Massive evacuation of residential areas on low ground within 5-10 miles (8-16 km) of the shoreline may be required.

## Appendix 2

## Alert Level

DISTANCE (in miles)	LEVEL	ACTIVITIES
560-660	GREEN	<ul style="list-style-type: none"> <li>▪ Evacuate non-classified personnel: visitors, electric loggers, geologist, painters, catering staff, etc...</li> <li>▪ Stop non-routine works.</li> <li>▪ Weather tracking frequency: every 12 hours</li> </ul>
460-560	YELLOW	<ul style="list-style-type: none"> <li>▪ Evacuate Class "A" personnel: warehouseman, Mud people, Directional driller, Surveyors, Trainees, Utility...</li> <li>▪ Weather tracking frequency: every 6 hours</li> </ul>
310-460	ORANGE	<ul style="list-style-type: none"> <li>▪ Evacuate Class "B" personnel: Instrument tech, Pro. Operators, Cargo Operator, ETC..</li> <li>▪ Secure deck cargos</li> <li>▪ Weather tracking frequency: every 3 hours</li> </ul>
<310	RED	<ul style="list-style-type: none"> <li>▪ Evacuate Class "C" personnel: the remaining crew onboard: FS, OIM, Maint. Sup., Pro. Sup., OSS, Motorman, Electrician, Radio operator, Medic, ...</li> <li>▪ Stop operation/ abandon drilling unit.</li> <li>▪ Weather tracking frequency: every 1 hours</li> </ul>

# Appendix M - Oil Spill Response Plan



**PETRONAS**

**PCML  
OIL SPILL RESPONSE  
PLAN**

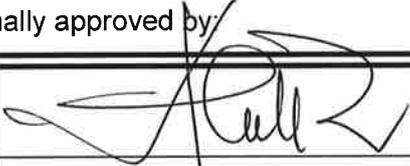
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**FOREWORD**

Authority for original issue

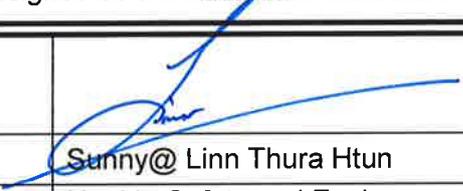
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## 1. Introduction

### 1.1. PCML Operations

PC Myanmar (Hong Kong) Limited (PCML) is a wholly owned subsidiary of PETRONAS INTERNATIONAL CORPORATION LIMITED (PICL). The company was originally incorporated by Premier Oil on 21<sup>st</sup> July 1989 under the name of Premier Petroleum Myanmar Limited (PPML). In November 2003, PCML took over the operatorship of the Yetagun.

Yetagun Gas Field, which is located in Block M12, M13 and M14, is currently the only producing field in Myanmar Operations. It was developed and commenced production on 7<sup>th</sup> May 2000. The field contains a proven reserve of 3.2 Tcf of natural gas, and is currently producing about 460 MMscf/day of natural gas and 12,500 bbl/day of condensate.

Condensate produced from the Yetagun gas field is routed to a Floating Storage Offloading unit for storage and export via a 2.5 km, 6 inches flexible pipeline. The FSO is capable of storing up to 610,000 barrels of condensate.

Dry gas from the Yetagun platform is sent to Kanbauk, known as POC, via a 182 km, 24 inches pipeline. The landing pressure ranges is approximately 92 – 125 bars. The gas is subsequently sent, at a reduced pressure, to the Metering Station, which is 68 km away at the border between Myanmar and Thailand. The current design capacity of Metering Station is 460 MMscf/day.

There is an airstrip at Kanbauk (Ohnpinkwin) where PCML's Helicopter is based to service the offshore operation and emergency response.

There is a jetty in the Heinze Channel which is used to bring supplies for the POC and to transport items from the POC warehouse to the offshore operation.

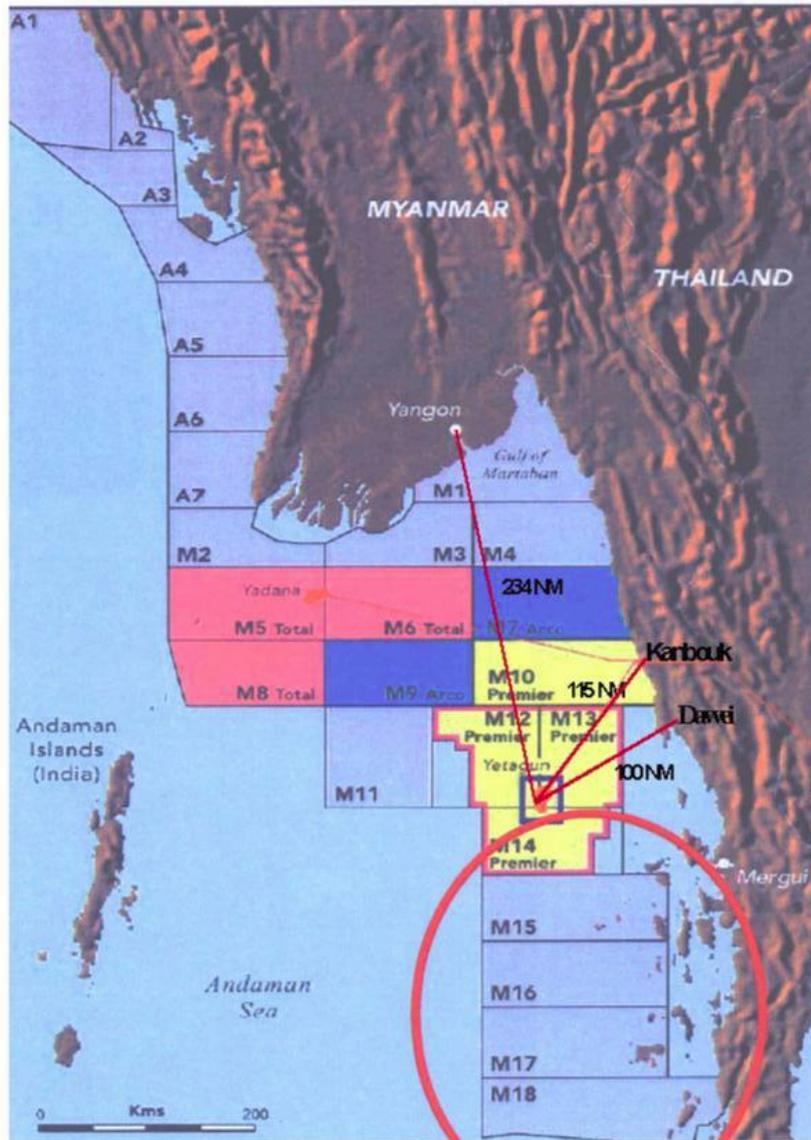


Figure 1.2: LAYOUT OF MO OFFSHORE YETAGUN GAS FIELD

Table 1.1: List of PCML Installations

Installation	Type
Yetagun A	Drilling/wellhead platform
Yetagun B	Living quarters/production platform
Yetagun C	Booster compressor platform
FSO	Floating Storage and Offloading
POC	Onshore Pipeline Operating Centre
MS	Onshore Metering Station
ROW	68 km Onshore Pipeline Right of Way

This Oil Spill Response Plan (OSRP) has been prepared for the above operations in accordance with the international best practice guidelines of the International Maritime Organization (IMO) and International Petroleum Industry Environmental Conservation Association (IPIECA). Federal and State requirements and regulations are also taken into account. The OSRP has been developed taking into account the oil spill risk profile, Tier 1, Tier 2 and Tier 3 response arrangements, and in accordance with national and international legislative requirements. It has been designed to interface with PETRONAS' existing emergency response framework.

All PCML EMT and ERT personnel are required to be familiar with this Plan.

## 1.2. Purpose

The primary purpose of this OSRP is to establish effective emergency procedures to respond to oil spill affecting the operations of PCML to:

- (a) ensure minimal adverse effect to the environment,
- (b) minimize the spread of hydrocarbons,
- (c) provide the tools to identify the most appropriate response tactics,
- (d) protect sensitive areas; and
- (e) mitigate negative effects.

The OSRP:

- a) Describes the expectations, scope and content of the oil spill response and management systems for PCML;
- b) Provides guidance to the PCML Emergency Management Team (EMT) for the response to, and control of, a hydrocarbon spill associated with the operations in PCML;
- c) Identifies the way in which the overall response in PCML will be coordinated;
- d) Sets out roles and responsibilities of key personnel;
- e) Identifies internal and external sources of support, assistance and resources to aid response;
- f) Describes local response strategies and organisations; and
- g) Defines internal and external notification procedures, response organisations, resources and personnel.

This OSRP is used mainly for condensate or diesel spill incident caused by PCML Operations within the area of Yetagun field where PCML is the operator of the Production Sharing Contract (PSC). In case that Oil Spill occurs beyond the Response Area, the OSRP should be used flexibly in line with PCML's business activities.

The scope of this OSRP covers all installations and facilities managed by and/or operated for PCML including but not limited to the drilling rig, wellhead platforms, FSO, supply vessels and infield pipeline. It focuses primarily on the response to the condensate or diesel spill.

Exploration drilling activities will have a specific Oil Spill Response Plan develop and which will bridge with PCML OSRP.

### 1.3. Scope of Document

This OSRP covers spills of oil associated with PCML operations including;

- **Drilling & Production:** Oil spills arising from development drilling and production activities.
- **Field Support:** Oil spills arising from activities involving the field support vessels.
- **Port Spills:** Oil spills from the supply/ logistics base port, SBMs, wharfs/jetties.

This plan is part of the MO Emergency Management Plan. The Emergency Response (ER) manual must be referred to in any emergency inclusive of an oil spill. It provides details of the management philosophy utilised by PCSB when defining the organisation and resources used in the response to an emergency and details the overall responsibilities required to handle effectively any emergency which may arise.

This document is linked either **directly or via bridging documents** to:

- **ENVIRONMENTAL CONSERVATION LAW 2012, The Pyidaungsu Hluttaw Law No. 9 / 2012**
- **PORT PLAN** – Port oil spill contingency plan arrangements for FSO.
- **PETRONAS CRISIS AND EMERGENCY MANAGEMENT PLANS (CEMP)** – PETRONAS has a number of internal documents that should be used in conjunction with this OSRP. These include the Corporate Crisis Management Plan. A number of additional, parallel documents have also been prepared by PETRONAS which include Incident Notification Guidelines, and Accident Reporting and Notification Procedures.

#### 1.4. Structure of Document

This OSRP is a single volume document comprises six main sections along with Appendices, organized in line with PCSB-CEMP. The plan consists of the following sections:

- I. The preliminary pages cover acronyms and abbreviations, guidelines for changes and revision.
- II. Section 1, contained the Introduction, detailing the purpose and scope of the plan. It also introduces assumption planning and emergency response framework.
- III. Section 2 discussed the Emergency Organization, describing the integration of response and mitigation actions and organizational relationship. This section covers the summary of emergency responsibilities of each emergency management team member. It describes specific planning roles and preparedness responsibilities.
- IV. Section 3, described the Roles and Responsibility, covers the duties of the team members. It describes specific activities and action plans for the EMT.
- V. Section 4, entitled Call-out, Mobilization and Communication, which cover the overview of notification and mobilization protocols for the emergency management teams.
- VI. Section 5, described the Pre-Incident Action Plans, covers the action checklist for the EMT. The checklists should be referred to during an oil spill incident to ensure the essential actions are being taken.
- VII. Section 6, described the Training, Exercises and Review, covers the competency required of the ERT, EMT and Support Groups. It also specifies the review requirements of the OSRP to ensure that the necessary improvements are adequately addressed.

## 1.5. National Legislative Framework

### 1.5.1. Environmental Conservation Law 2012, The Pyidaungsu Hluttaw Law No. 9/2012

- (a) To implement the above law;
- (b) To lay down the basic principles and give guidance for systematic integration of the matters of environmental conservation in the sustainable development process;
- (c) To emerge a healthy and clean environment and to conserve natural and cultural heritage;
- (d) To reclaim ecosystems as may be possible which are starting to degenerate and disappear;
- (e) To manage and implement for decrease and loss of natural resources and for enabling the sustainable use beneficially;
- (f) To implement for promoting public awareness and cooperation in educational programmes
- (g) To promote international, regional and bilateral cooperation
- (h) To cooperate with Government departments, organizations, international organizations, non-government organizations and individuals

### 1.5.2. Other National Legislations

Other national legislations that address marine pollution are:

- I. The Oil Field Act 1952
- II. The Factories Act 1951
- III. Law Relating to The Fishing Rights of Foreign Fishing Vessels, 1989
- IV. The Myanmar Marine Fisheries Law, 1990
- V. The Freshwater Fisheries Law ,1991

## **1.6. Related International Conventions**

Myanmar acceded and implemented several key international conventions relating to prevention and control of oil pollution from ships namely MARPOL 73/78, OPRC 1990, CLC 1992 and Fund 1992 under the umbrella of the international Maritime Organization (IMO).

### **1.6.1. MARPOL 73/78**

International Convention for the Prevention of Marine pollution from ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL) 73/78), and it entered into force on 2 October 1983 (Annexes I and II is compulsory). The convention includes regulations aimed at preventing and minimizing pollution from ships – both accidental pollution and that from routine operations and currently includes six technical Annexes:

- I. Regulation for the Prevention of Pollution by Oil
- II. Regulation for control of Pollution by Noxious Liquid Substance in Bulk
- III. Prevent of Pollution by Harmful substances Carried by Sea In Packaged Form
- IV. Prevent of Pollution by Sewage from Ships
- V. Prevent of Pollution by Garbage from Ships
- VI. Prevention of Air Pollution From Ships

### 1.6.2. International Convention on Oil Pollution Preparedness, Response and Cooperation 1990 (OPRC 1990)

This Convention establishes preparatory methods for contingency plan, reporting procedures for oil, technical cooperation within the region or internationally, and the promotion of research and development in the area of oil spill management among the state parties. The Convention has the following key elements at its heart:

- (a) precautionary and preventative measures are important in the avoidance of oil pollution in the first instance;
- (b) prompt and effective action is essential to minimize possible damages in the event of pollution;
- (c) contingency planning needs to be emphasized and the role of the oil and shipping industries should be included within these plans;
- (d) the need for mutual assistance, international cooperation and information exchange (on response capabilities and reporting incidents);
- (e) the “polluter pays” principle; and
- (f) the importance of related international instruments on liability and compensation, including the 1992 Civil Liability Convention (CLC 1992) and the 1992 Fund Convention.

The OPRC Convention has 19 articles and 10 Resolutions covering both administrative and technical aspects. In summary, these call for Parties to carry out the following actions in relation to oil spill contingency planning:

- (a) ships, port and oil industry facilities posing a risk of oil spills should have oil pollution emergency plans, under the coordination of a national contingency planning for major incidents;
- (b) there should be clear oil pollution reporting procedures;
- (c) reports of oil pollution should be properly assessed and all States whose interests may be affected informed; national and regional systems for preparedness and response should be developed, including the designation of competent national authorities and the compilation of national contingency plans;
- (d) provision should be made for the supply of technical support and equipments to Parties requesting assistance to combat spills;
- (e) the necessary legal and administrative measures should be taken to facilitate customs and immigration procedures in an emergency, where outside assistance has been mobilized;
- (f) technical cooperation between Parties should be active in the field of training, planning, research and development; and
- (g) Parties should work together with the oil and shipping industries to establish suitable pollution combating equipment stockpiles and training programmes.

**1.6.3. International Convention on Civil Liability for Oil Pollution Damage 1992 (CLC 1992)**

The 1969 CLC entered into force in 1975 and lays down the principle of strict liability (i.e. liability even in the absence of fault) for tanker owners and creates a system of compulsory liability insurance. Claims for compensation for oil pollution damage (including clean-up costs) may be brought against the owner of the tanker which caused the damage or directly against the owner's P&I insurer. The tanker owner is normally entitled to limit his liability to an amount which is linked to the tonnage of the tanker causing the pollution. The Convention requires ships covered by to maintain insurance or other financial security in sums equivalent to the owner's total liability for one incident.

The Convention applies to all seagoing vessels actually carrying oil in bulk as cargo, but only ships carrying more than 2,000 tons of oil are required to maintain insurance in respect of oil pollution damage. This does not apply to warships or to other vessels owned or operated by a State and used for the time being for Government non-commercial service. On May 30, 1996 the 1992 protocol came into force. It widened the scope of the Convention to cover pollution damage caused in the exclusive economic zone (EEZ) or equivalent area of a State party. The Protocol covers pollution damage as before but environmental damage compensation is limited to costs incurred for reasonable measures to reinstate the contaminated environment. It also allows expenses incurred for preventive measures to be recovered even when no spill of oil occurs, provided there was grave and imminent threat of pollution damage.

#### **1.6.4. International Convention on the Establishment of an International Fund for Compensation of Oil Pollution Damage 1992 (FUND 1992)**

International Convention on the Establishment of an International Fund for compensation for Oil Pollution Damage was adopted at a conference held in Brussels in 1971. It is supplementary to the 1969 Civil Liability Convention.

The purposes of the Fund Convention are:

- (a) To provide compensation for pollution damage to the extent that the protection afforded by the 1969 Civil Liability Convention is inadequate.
- (b) To give relief to ship owners in respect of the additional financial burden imposed on them by compliance with safety at sea and other conventions.
- (c) To give effect to the related purposed set out in the Convention.

Under the first of its purposes, the Fund is obliged to pay compensation to the victims of oil pollution damage who are unable to obtain adequate or any compensation from the ship owner or his guarantor under 1969 Convention. Victims of oil pollution damage may be compensated beyond the level of the ship owner's of liability. However, the Fund's obligations are limited so that the total payable for victims by the ship owner and the fund shall not exceed 30 million SDR (about US\$41million) for any one. In effect, therefore the fund's maximum liability for each incident is limited to 16 million SDR (under 1971 Convention – limits were raised under the 1992 Protocol). The Convention contains provisions on the procedure for claims, rights and obligations, and jurisdictions.

On May 30, 1996 the 1992 Fund Protocol came into force. As was the case with the 1992 Protocol to the CLC convention, the main purpose of the Protocol was to modify the entry into force requirements and increase compensation amounts. The scope of coverage was extended in line with the 1992 CLC Protocol. The 1992 Protocol established a separate, 1992 International Oil Pollution Compensation Fund, known as the 1992 Fund.

## **1.7. Interface with Other Plans**

Where there is site specific plan or related Standard Operating Procedures (SOPs) at state, Myanmar Operations to facilitate effective implementation of response measures the PCML OSRP will interface with these plans.

### **1.7.1. Requirements for Emergency Response Procedures**

Operator of premises involved in activities such as oil exploration, production, refining, bringing in oil tanker into Myanmar, involved in bunkering and to ship transfer of oil or any other activity that poses potential oil spill threat regardless type or quantity of oil handled must have in place their Emergency Response Procedures (ERP) or Contingency Plans. These plans should also identify resources available in terms of equipment and trained personnel for the purpose of immediate response in case of emergency. Refer to guideline on Preparation of Tier 1 Contingency Plan.

Operators of such premises should also ensure that their plans supplement the PCML OSRP and these plans identify available OSR resources within the proximity of their business in case the need for external assistance arises. Initiation of regular joint oil spill response exercises between the private and public sector is encouraged.

## 1.8. Risk Assessment Process

Evaluating oil spill risks requires consideration of three factors:

- Hazard identification - identification of risk activities/ operations where spills can occur. The potential spill scenarios for the current operation will be dictated by a whole range of operational factors, weather conditions, reservoir characteristics and fuel inventories on the rig.
- Probability – an evaluation of the probability/likelihood of a spill occurring calculated using historical data and the data relevant for a specific location and the organisation.
- Consequence – an assessment of the potential consequences should a spill occur, taking into account oil type, location, etc.

The analysis of probability and consequence allows scenarios to be categorised in terms of risk using a standard Risk Assessment Matrix (RAM). Probability and consequence can be expressed in a number of different ways. For the purposes of the current Risk Assessment, the following basis has been applied which is adapted from the standard PETRONAS approach to risk assessment (**Figure 2.1**).

IMPACT		Severity	1	2	3	4	5
			Insignificant	Minor	Moderate	Major	Catastrophic
		People	Slight Injury	Minor injury	Major Injury	Single Fatality	Multiple Fatalities
		Asset	Slight Damage	Minor Damage	Local Damage	Major Damage	Extensive Damage
		Environment	Slight Impact	Minor Impact	Localized Impact	Major Impact	Massive Impact
		Reputation	Slight Impact	Limited Impact	Considerable Impact	Major National Impact	Major International Impact
LIKELIHOOD	E Almost Certain	Happens several times per year at location	E1	E2	E3	E4	E5
	D Likely	Happens several times per year in company	D1	D2	D3	D4	D5
	C Possible	Incident has occurred in our company	C1	C2	C3	C4	C5
	B Unlikely	Heard of incident in industry	B1	B2	B3	B4	B5
	A Remotely likely to happen	Never heard of in industry	A1	A2	A3	A4	A5

**Figure 2.1: PCSB Risk Assessment Matrix**

Descriptions on the probability/likelihood and the severity/impact to environment and reputation are presented in **Table 2.1**, **Table 2.2** and **Table 2.3** respectively.

**Table 2.1: Assessment of the Probability/Likelihood of Spills**

<b>Likelihood/ Probability</b>	<b>Rank</b>	<b>Definition</b>
<b>Not Applicable/ Extremely remote</b>	<b>A</b>	Never heard of in E&P Industry
<b>Slight, Low/ Remote</b>	<b>B</b>	Heard of incident in the E & P industry or can occur in OPU
<b>Unlikely</b>	<b>C</b>	Has occurred in OPU or can occur at Division
<b>Possible</b>	<b>D</b>	Has occurred at Division or can occur at location
<b>Likely</b>	<b>E</b>	Has occurred at location

Table 2.2: Assessment of the Severity/Impact of Spills on Environment

IMPACT ON ENVIRONMENT	
Severity	Description (Meet one OR all of the criteria)
1 Insignificant	<ol style="list-style-type: none"> <li>Spill/leak causing negligible impact to local environment, contained within the secondary containment and does not reach water and soil, and no volatilization to atmosphere.</li> <li>Noise, air emission, discharges not exceeding company or legislative limits.</li> </ol>
2 Minor	<ol style="list-style-type: none"> <li>Spill/leak contained within secondary containment: <ul style="list-style-type: none"> <li>causing volatilization to atmosphere</li> <li>causing limited contamination of soil or water within the containment area</li> <li>causing non-permanent impacts to the environment</li> </ul> </li> <li>Noise, air emission, discharges not exceeding legislative limit but exceeding company limit (where available).</li> <li>No immediate cumulative and/or delayed effect.</li> </ol>
3 Moderate	<ol style="list-style-type: none"> <li>Spill/leak causing limited contamination to soil or water outside the secondary containment but remain contained within facility perimeter (for onshore operation)** OR resulting in Potential Consequence A, B or C below.</li> <li>Noise, air emission, discharges not exceeding company or legislative limits OR resulting in Potential Consequence A, B or C below.</li> </ol> <p>Note: Potential Consequence A. Cumulative and/or delayed environmental impact B. Short term recovery action &lt;1 month C. Rehabilitation period &lt;6 months</p> <p><i>**For offshore operation, spill/leak into marine environment but limited potential contamination to marine water.</i></p>
4 Major	<ol style="list-style-type: none"> <li>Spill/leak spreading outside the facility perimeter, managed to be contained/recovered but causing major contamination OR resulting in Potential Consequence A, B or C below.</li> <li>Noise, air emission, discharges exceeding legislative limit with <u>possible prosecution</u> OR resulting in Potential Consequence A below.</li> </ol> <p>Note: Potential Consequence A. Immediate effect with serious damage to environment B. Medium term recovery action (1-3 months) C. Rehabilitation period 6-12 months</p>
5 Catastrophic	<ol style="list-style-type: none"> <li>Spill/leak spreading outside the facility perimeter, causing massive contamination OR resulting in Potential Consequence A, B or C below.</li> <li>Noise, air emission, discharges resulting in legal prosecution with possible shutdown of facility, OR resulting in Potential Consequence A below.</li> </ol> <p>Note: Potential Consequence A. Severe environmental damage B. Long term recovery action (&gt;3 months) C. Rehabilitation period &gt;12 months</p>

Table 2.3: Assessment of the Severity/Impact of Spills on Reputation

IMPACT ON REPUTATION	
Severity	Description (Meet one OR all of the criteria)
1 Insignificant	<b>Slight Impact</b> <ul style="list-style-type: none"> <li>Public awareness may exist, but there is no public concern.</li> </ul>
2 Minor	<b>Limited Impact</b> <ul style="list-style-type: none"> <li>Local public concern or complaints.</li> <li>Local media and/or local political attention with potentially negative impact for company operations.</li> </ul>
3 Moderate	<b>Considerable Impact</b> <ul style="list-style-type: none"> <li>Regional public concern. Extensive adverse attention in local media.</li> <li>National media and/or regional political attention resulting in negative impact on company operations.</li> <li>Adverse stance of local government and/or action Groups.</li> </ul>
4 Major	<b>National Impact</b> <ul style="list-style-type: none"> <li>National public concern. Extensive adverse attention in the national media.</li> <li>Regional/national policies with potentially restrictive measures and/or impact on grant of licences**</li> <li>Mobilisation of pressure or action groups.</li> </ul>
5 Catastrophic	<b>International Impact</b> <ul style="list-style-type: none"> <li>International public attention. Extensive adverse attention in international media.</li> <li>National/international policies with potentially severe impact on access to new areas, grants of licences** and/or tax legislation.</li> </ul>

## 1.9. Associated Risk

Major environmental impacts from oil spills generally occur in near shore coastal regions where extensive marine biota exists. Although the risk of a large-scale accidental oil spill is extremely low at the Yetagun field, it is necessary to identify possible environmental impacts and required mitigation measures in the event of such an incident.

### 1.9.1 Sources of Spill

The most likely sources of spills are:

**Fuel transfer and storage** – Spills may occur during refueling activities as a result of hose rupture, coupling failure, or overfilling of tanks. Leaking and rupture (however remote) may also occur. The volume of fuel spillage in these situations is likely to be small and further minimized by continued monitoring, secondary containment, and prompt shutdown;

**Well testing** – Drill stem testing, although of limited duration, could result in small spills of oils. These will be contained on the bounded deck of the platform and will drain to drain – tanks for recovery;

**Condensate transfer** – Typical causes of accidental spills are pipeline rupture or connection failure. Continuous monitoring and the installation of automatic shut-off devices on pipelines will reduce the chance and the amount of this type of spill;

**FSO related spills** – Overfilling, bunkering (hose rupture, coupling failure), offloading (hose rupture, coupling failure), and in an extreme case, tank rupture. Continued monitoring and prompt shutdown will limit these spills to a minimum amount (except in the extreme case when a total failure of the tanker occurs);

**Maintenance** – The spillage of lubricant or fuel oils could occur during maintenance work on the platforms and the FSO;

**Fire or explosion** – Fire or explosion at the platforms or the FSO could result in a major oil spill. Strict regulations and high standards of safety equipment, servicing, maintenance, and training serve to ensure that fire and explosion are extremely rare events;

**Shipping accidents** – Failure of oil or fuel tanker during shipping or mooring may result the release of either part or all of the tanker contents. Implementation of standard operating procedures, continuous monitoring and strict personnel training will minimize the chance of a shipping accident.

### 1.9.2 Probability of Oil Spill

It is not possible to describe all oil spill scenarios; therefore, this OSRP sorts out the most important situations. Oil could be spilled or released from the Yetagun Field as a result of accidents, equipment failures or procedural irregularities with surface or subsurface equipment.

Oil spill scenarios were referenced to the Environmental Impact Assessment document. Potential oil spill scenarios for PCML operations in the Yetagun field include the following: **(see also Table 3.1)**

The most destructive accident and spill scenarios at Yetagun field are related to condensate spills from the FSO and the rupture of the fuel storage tanks. The greatest potential impact, but with very low probability, is for a severe accident causing a major condensate spill. A tanker collision, FSO capsizing, or similar event could cause a major spill of condensate. A worst case scenario would involve a full FSO or tanker containing 610,000 bbl of condensate.

Table 3.1 Potential Oil Spill Scenarios

Condensate Pipeline	FSO	Platform/Drilling Rig	Standby/Supply Vessel
<p><i>Loss of condensate pipeline inventory to sea:</i></p> <p>Maximum loss: 6,440 bbl.</p> <p>6,440 bbl = [(12 hrs night shift x 520 bbl/hr) + (200 bbl at 6" x 2 km condensate pipeline)]</p> <p>520 bbl/hr = Train 1 (260 bbl/hr) + Train 2 (260 bbl/hr)</p> <p>Though highly unlikely, it may be caused by boat incidents, such as trawling, collisions, anchor drop etc.</p>	<p><i>Loss of condensate to sea (four cases):</i></p> <ol style="list-style-type: none"> <li>Hose disconnection during offtake – 30 sec. to shutdown, maximum loss 200 bbl;</li> <li>Ship collision – loss of one of the cargo tanks in the back (5P or 5S); maximum loss 40,000 bbl;</li> <li>Ship sinks with full load – though highly unlikely (given the specific gravity of the cargo), it may result in the loss of 610,000 bbl;</li> <li>Explosion/fire – in the extreme case, the entire cargo (full load 610,000 bbl) could be lost.</li> </ol> <p><i>Spillage of fuel:</i></p> <ol style="list-style-type: none"> <li>Fuel loss during transfer – maximum 100 bbl</li> <li>Storage tank failure – maximum loss not to exceed 5,000 bbl</li> </ol>	<p><i>Spillage of fuel:</i></p> <ol style="list-style-type: none"> <li>Fuel loss during transfer – maximum 100 bbl</li> <li>Storage tank failure – maximum loss not expected to exceed 3,000 bbl during drilling, 5,000 bbl during production.</li> </ol> <p><i>Spillage of drilling mud:</i></p> <ol style="list-style-type: none"> <li>Mud tank rupture – maximum loss 2,500 bbl</li> </ol>	<p><i>Spillage of fuel:</i></p> <ol style="list-style-type: none"> <li>Fuel loss during transfer – maximum 100 bbl</li> <li>Storage tank failure – maximum loss not expected to exceed 3,600 bbl during operation</li> <li>Ship collision – loss of the cargo tanks in the back; maximum loss 1200 - 3600 bbl</li> <li>Ship sinks with full load – though highly unlikely (given the specific gravity of the cargo), it may result in the loss of 3,600 bbl;</li> </ol>

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## 2. Oil Spill Response Organisation

### 2.1. General

This OSRP has been developed taking into account the PCML’s organisational structure and how it interfaces with the company’s Emergency Response Manual and Incident and Crisis Management Plans. A summary of the general organisational structure for PCML operation is shown below (1).

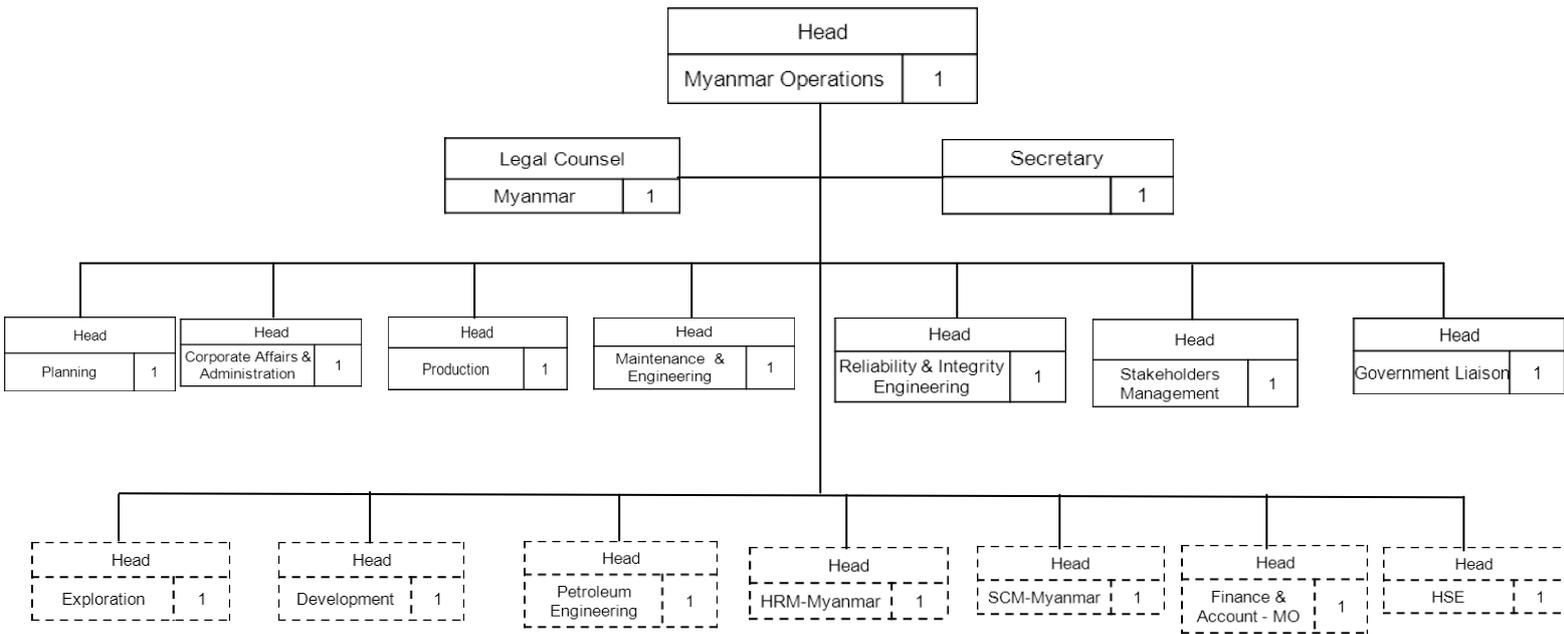
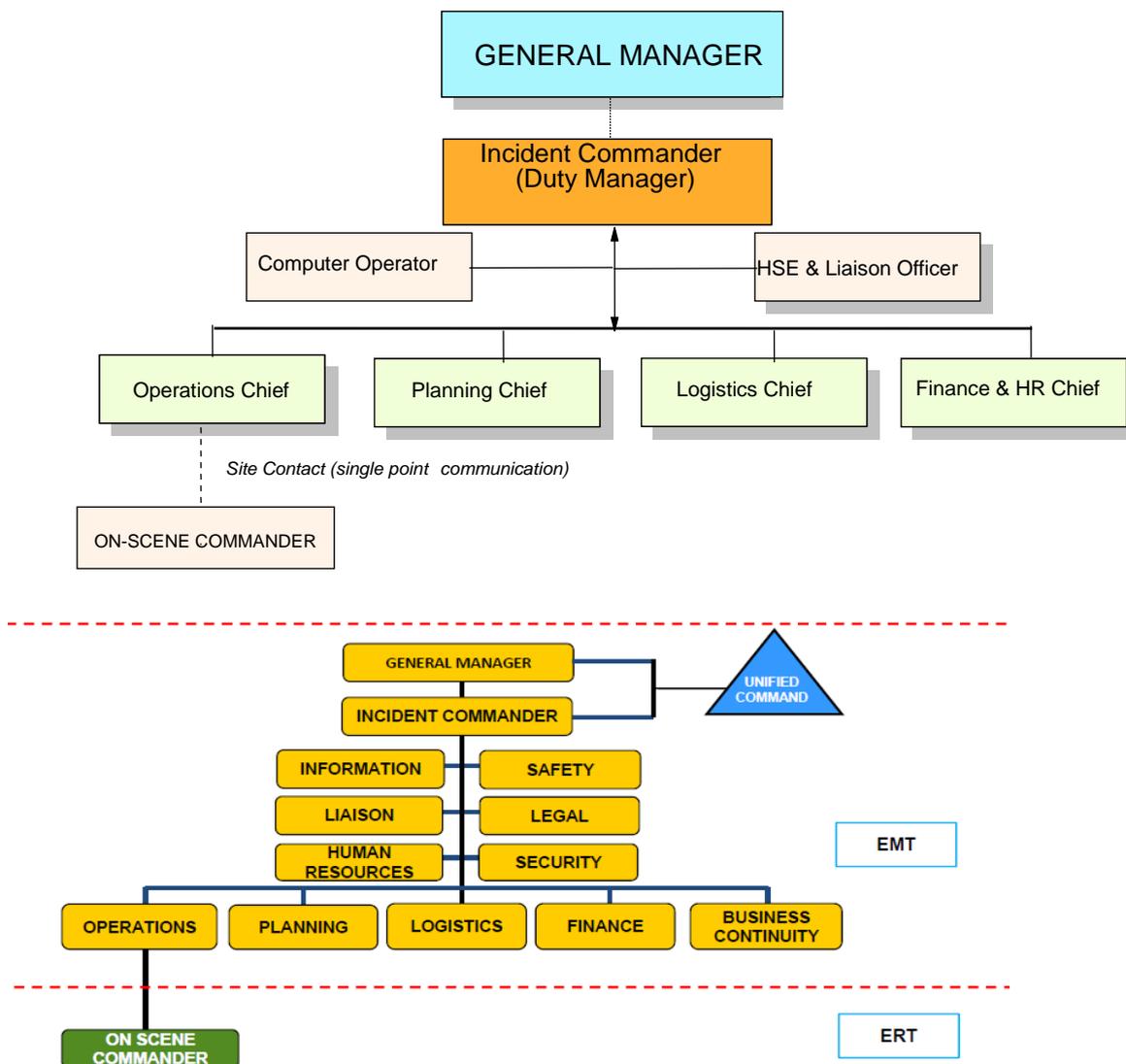


Figure 2.1: PCML Organisation Chart

2.3. PCML Emergency Organisation

PCML has limited resources but in the event of an emergency situation would adopt an organisational structure based on the Incident Command System (ICS) as shown below in **Figure 2.2**. The personnel listed above would together form the framework for the PCML Emergency Management Team (EMT) and site-based Emergency Response Team (ERT). The Emergency Coordination Centre (ECC) is located the PCML office in Yangon.

PCSB has established an ECC in the Head Office in Kuala Lumpur, Malaysia.



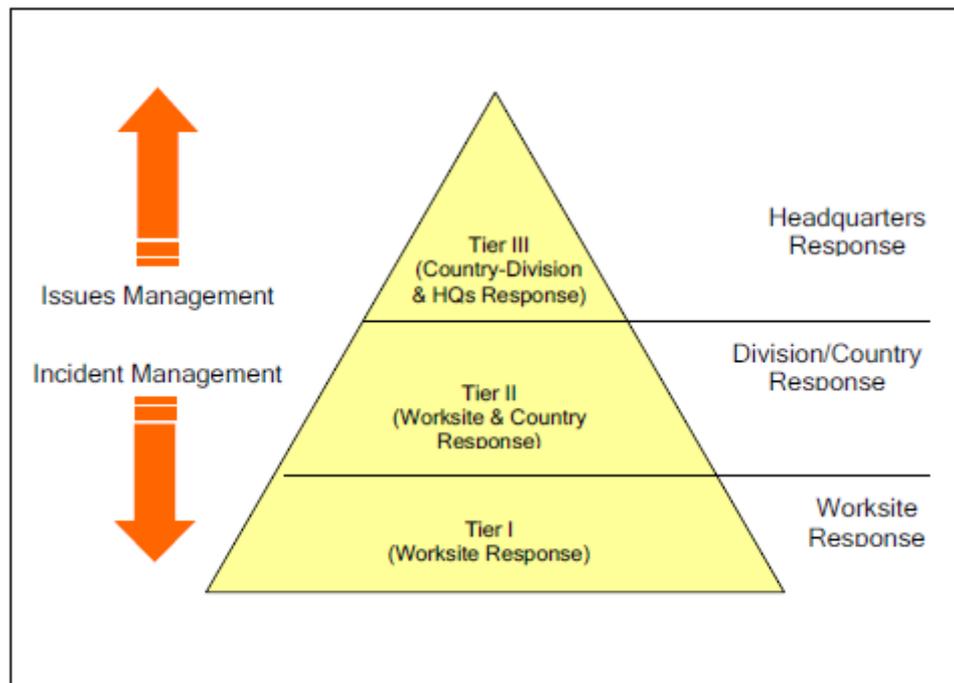
**Figure 2.2: PCML Emergency Organisation**

The Emergency Organisation will be manned based on the weekly duty roster.

The **OSC** would initially report the spill to the Incident Commander. Thereafter, when the ECC has been established, the **OSC** would report via the Operations Chief who would in turn keep the Incident Commander fully appraised. The

Incident Commander will provide the interface between the EMT in PCML and the CMT at PETRONAS Carigali Head Office, Kuala Lumpur.

The ICS structure is extremely flexible and can be partially activated in the case of minor spills (Tier 1) or expanded in the event of a full blown emergency (Tier 2 or Tier 3). The PETRONAS philosophy with regard to dealing with oil spills of different sizes/ severity is outlined in **Figure 2.3**.



**Figure 2.3: PETRONAS Response Levels**

### 2.2.1 TECHNICAL SUPPORT TEAM

Technical Support Team may include PCML staff who are not occupied in the ECC and other personnel who are trained in the Oil Spill Response technique, especially in the beach cleaning etc.

In addition to other technical advisors, the Technical Support Team may include the On-site Commander, Beach Cleaning Advisor and Beach Cleaning Group Leader and Strike Team Leader.

### 2.2.2 PCSB HEADQUARTER

The PCSB HQ EMT will normally be mobilized in the event of a major emergency and will be responsible for technical and safety advice, and supply of resources beyond the capabilities of PCML EMT. The duties and responsibilities can be outlined as follows:

- Notify COMCEN PETRONAS
- Provide advice on safety and technical matter.
- Coordinate the approval of press release.
- Make corporate decisions.

## 2.4. Oil Spill Incident Management

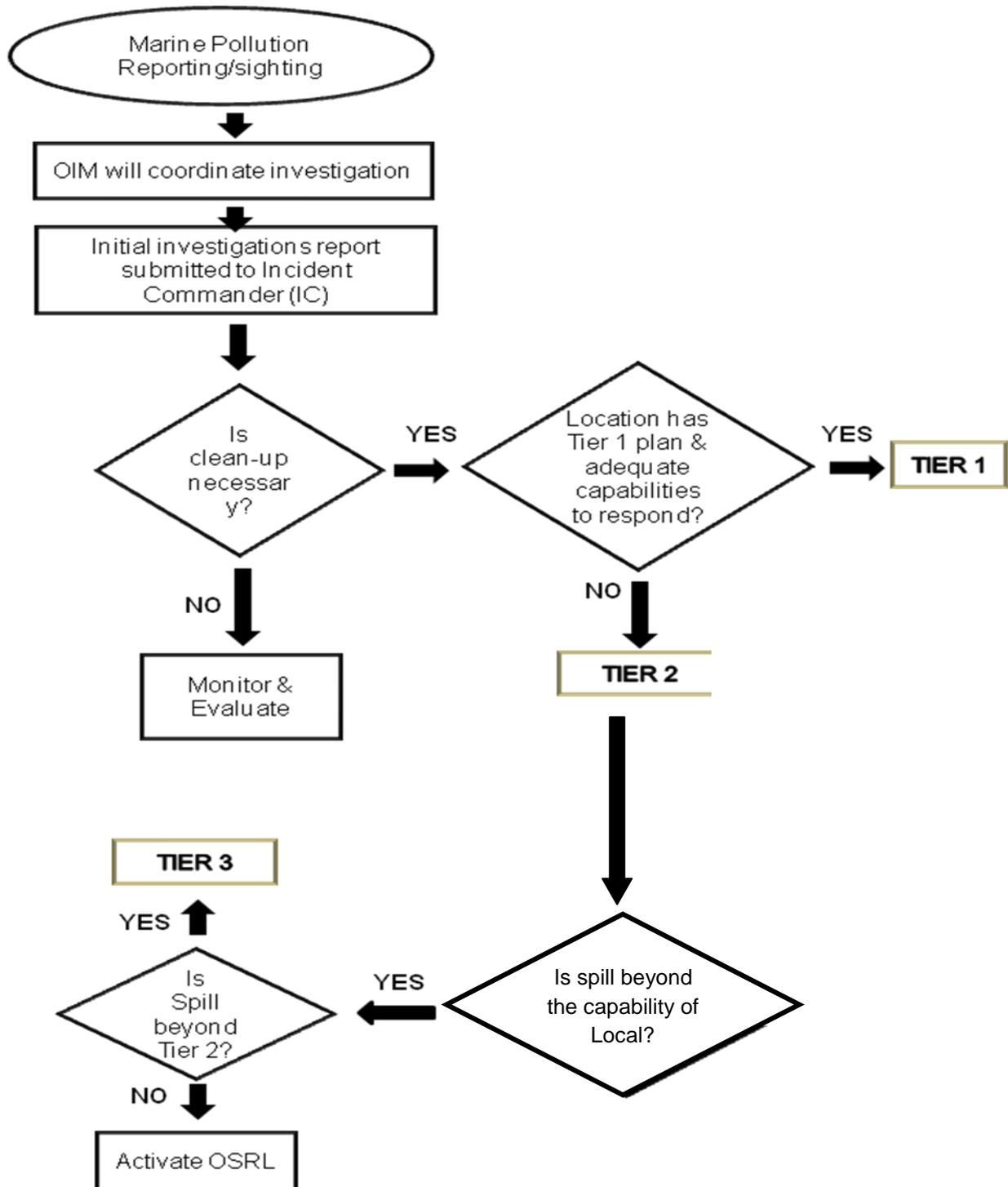
### 2.4.1. Tier Assessment Criteria

The purpose of the three Tier levels (see **Table 2.1**) is to establish, as soon as possible, what is the correct level of response needed to combat the spill. The severity of the spill depends on the size and complexity of the response and the potential consequences for people, environment, assets and reputation.

**Table 2.1: Tier Assessment Criteria**

Tier 1	Spills which can be dealt with using local, in-house resources.	
	<ul style="list-style-type: none"> <li><input type="checkbox"/> Spill can be easily managed using on-site oil spill response resources</li> <li><input type="checkbox"/> Source of spill has been stopped</li> <li><input type="checkbox"/> Spill contained</li> <li><input type="checkbox"/> Spill likely to naturally dissipate</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Day time release</li> <li><input type="checkbox"/> Oil is moving away from the coastline or not moving to sensitive areas</li> <li><input type="checkbox"/> &lt;5 barrels</li> </ul>
Tier 2	Spills that require mobilisation of oil spill response resources from established service providers.	
	<ul style="list-style-type: none"> <li><input type="checkbox"/> Danger of fire or explosion</li> <li><input type="checkbox"/> Concentrated oil accumulating in close proximity to the drilling rig/vessel, onshore storage tank, etc.</li> <li><input type="checkbox"/> Possible continuous release</li> <li><input type="checkbox"/> Tier 1 resources overwhelmed, requiring additional resources</li> <li><input type="checkbox"/> Night time or poor visibility</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Heavy fuel or crude oil</li> <li><input type="checkbox"/> Oil spill is moving towards the coastline/inland waterway</li> <li><input type="checkbox"/> Oil predicted to impact sensitive areas (e.g. water intakes, fisheries, tourist areas)</li> <li><input type="checkbox"/> Local/National media attention</li> <li><input type="checkbox"/> 5-1000 barrels</li> </ul>
Tier 3	Spills which require the mobilisation of national resources.	
	<ul style="list-style-type: none"> <li><input type="checkbox"/> Actual or potentially serious threat to life, property, industry</li> <li><input type="checkbox"/> Tier 2 resources overwhelmed, requiring the mobilisation of government- owned and/or national resources international oil spill response contractor(s)</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Significant shoreline impact</li> <li><input type="checkbox"/> Potential to impact neighboring countries</li> <li><input type="checkbox"/> International media attention</li> <li><input type="checkbox"/> &gt;1000 barrels</li> </ul>

PCML tiered response system flowchart is shown in **Figure 2.4**.



**Figure 2.4: PCML Tiered Response System Flowchart**

#### 2.4.2. Tier 1 Spills

Spill that can be controlled in-house using PCML own resources (equipment and personnel) less than 5 **barrels but not occurring at sensitive area**.

#### 2.4.3. Tier 2 Spills

The response capability will be provided primarily by the sources of equipment, materials and personnel in Yangon and sources from others operators, contractors and service providers. Incidents of this level would, in most cases, involve not only SERT but also all or parts of the Emergency Management Team (EMT), based in Yangon.

#### 2.4.4. Tier 3 Spills

In addition to all the resources of PCML and PCSB HQ, the response equipment would be provided by OSRL.

#### 2.4.5. End of Emergency

The end of the emergency will be declared in a different way depending on the Tier:

- For Tier 1 oil spills, the On-Scene Commander will order the closure of oil spill response operations. The OSC will also be responsible for informing the Incident Commander and all personnel that had been involved or notified, that the emergency has terminated.
- For Tier 2 oil spills, the Incident Commander will order the termination of oil spill response operations. The Incident Commander will also be responsible for informing all personnel and organisations that had been involved or notified, that the emergency has terminated.
- For Tier 3 oil spills, the end of the emergency will be declared by the Head of Country.

The “End of Emergency” will be declared when any of the following circumstances occurs:

- All resources affected by the spill have reverted to the agreed status;
- It is not effective to continue pollution fighting or cleanup operations.

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### 3. Roles and Responsibilities

#### 3.1. Incident Commander

The Incident Commander is overall in charge of the management of the oil spill response at PCML and is responsible for directing key personnel, for authorising, or obtaining authorisation of, any funds required for materials, equipment, contract services or specialist personnel necessary to bring the oil spill under control.

Among the other responsibilities of the IC are:

- (1) Assess the situation and/or obtain a briefing from IC.
- (2) Determine incident objectives and strategy.
- (3) Establish the immediate priorities.
- (4) Establish an appropriate organization.
- (5) Ensure planning meetings are scheduled as required.
- (6) Approve and authorize the implementation of an Incident Action Plan.
- (7) Ensure that adequate safety measures are in place.
- (8) Coordinate activity for all ECC Core Team members.
- (9) Approve requests for additional resources or for the release of resources.
- (10) Notify relevant authorities and PCSB management of the incident.
- (11) Update PCSB management and authorities of the spill and cleanup activities.
- (12) Authorize release of Holding Statement the news media.
- (13) Order the termination/demobilization of the incident when appropriate.
- (14) Prepare Cost Analysis Report and third party damage claims.

### 3.2. Operations Chief

The Operations Chief is responsible for managing all tactical operations of the oil spill incident. The tactical resources include:

- (a) Ground or surface-based tactical resources
- (b) Aviation (Air) resources ( i.e. helicopters and fixed-wing aircraft)
- (c) Staging Areas

The Operations Chief reports to the Incident Commander.

Among the other responsibilities of the Operations Chief are:

- (1) Immediately establish direct contact with the On-Scene Commander at the installation/site.
- (2) Obtain clear and concise details as to the nature and seriousness of the emergency and in particular details of any casualties.
- (3) Verify total number of personnel on board the installation/site and their status/disposition.
- (4) Determine what assistance is required by the On-Scene Commander at the installation/site e.g. additional manpower, Oil Spill Recovery Equipment, vessel, medical assistance, etc.
- (5) Assign appropriate resources to activate the Ground tactical team, Aviation tactical team and establish Staging areas.
- (6) Maintain open line communication with the On-Scene Commander at the installation/site throughout the duration of the emergency.
- (7) Keep the Incident Commander fully informed of the developing situation and advice accordingly.
- (8) Maintain an accurate log of all key events during oil spill emergency.
- (9) Update Planning Chief and Logistic Chief of Operations activities.

**3.3. Offshore On-Scene Commander**

The Offshore On-Scene Commander is responsible for implementing and coordinating oil spill response activities at sea in collaboration with local authorities, boat captains, offshore production operations and contractors.

The Offshore On-Scene Commander reports to Operations Coordinator.

Among the other responsibilities of the Offshore On-Scene Commander are:

- (1) Establish offshore command base for clean-up activities.
- (2) Assess the marine and weather conditions and develop action plan accordingly.
- (3) Mobilise mechanical recovery and boat spraying equipment and vessel, and initiate early response to protect sensitive areas.
- (4) Supervise the offshore oil recovery and boat dispersant spraying operations.
- (5) Assess and request for sea transportation facilities for manpower and equipment required during cleanup operation.
- (6) Arrange for sampling of spilled oil and delivery of samples as per approved procedure.
- (7) Work closely with local government authorities coordinating at site.
- (8) Maintain incident log, update Operations Chief and prepare progress report.

### 3.4. Onshore On-Scene Commander

The Onshore On-Scene Commander is responsible for implementing and coordinating oil spill response activities on the shoreline in collaboration with local government authorities and contractors.

The Onshore On-Scene Commander reports to Operations Chief.

Among the other responsibilities of the Offshore On-Scene Commander are:

- (1) Manning on-site Incident Command Post (ICP) / Staging Area for shore cleanup activities once established and activated by EMT.
- (2) Assess the affected areas and collection of local information.
- (3) Assess the shoreline / onshore situation and develop containment and cleanup plan in collaboration with Operations Chief.
- (4) Quantify onshore cleanup equipment and manpower requirement and initiate an early response.
- (5) Supervise the onshore oil recovery and beach cleanup operations.
- (6) Supervise the transportation and disposal of recovered oil and wastes.
- (7) Work closely with local authorities, technical specialist and Environmental Advisor to achieve effective cleanup operations.
- (8) Maintain incident log, update Operations Chief and prepare progress report.

### **3.5. Planning Chief**

The Planning Chief is responsible for managing all information relevant to the incident. He/She collects, evaluates, processes and disseminates the information.

The Planning Chief also supervises, organizes and coordinates technical specialist support.

The Planning Chief reports to the Incident Commander.

Among the other responsibilities of the Planning Chief are:

- (1) Collecting, analyzing, and displaying situation information as the incident develops.
- (2) Circulate regular information updates; every 1 - 2 hours initially.
- (3) Prepare full chronological report including extent of oil contaminated areas, environmental damage, method used in containing and cleanup of the spill.
- (4) Prepare daily and weekly reports to Management.
- (5) Secretary to all oil spill coordination meetings.
- (6) Provide general secretarial support to oil spill response team.
- (7) Preparing and distributing the Incident Action Plan,
- (8) Exercise overall responsibility for the coordination of technical supports requirement and activities.
- (9) Keeps the Incident Commander informed of significant issues affecting the Planning Section and Log Keeping.

### 3.6. HSE & Liaison Officer

The HSE & Liaison Officer is responsible to develop and recommend measures for assuring personnel safety and to assess and/or anticipate hazardous and unsafe situations. And also responsible to liaise with related government agencies and other companies on behalf of Incident Commander and relevant local authorities as per Essential Notification Matrix.

The HSE & Liaison Officer reports to the Incident Commander.

Among the other responsibilities of the HSE & Liaison Officer are:

- (1) Appoints Safety Officers at each worksite.
- (2) Analyzes unsafe incidents and recommend corrective measures.
- (3) Provide health, safety and environment advice as required.
- (4) Notify PCSB HQ Incident Commander, relevant local authorities as per Essential Notification Matrix.
- (5) Solicit additional equipment and supplies requirements from outside companies and associated as per Call-Out Procedure.
- (6) Advise Incident Commander on impending issues e.g. public complaints, grievances, and notices from relevant authorities.

### 3.7. NOK & Media Officer

The NOK & Media Officer is responsible to develop and obtain approvals for releasing the information to the media, to response team, and other appropriate agencies and organizations.

The NOK & Media Officer reports to the Incident Commander.

Among the other responsibilities of the NOK & Media Officer are:

- (1) Collect and screen information.
- (2) Prepare draft holding statement and press releases for review by Incident Commander and forward approved releases to HQ ECC for approval by PCSB MD/CEO and President PETRONAS.
- (3) Disseminate approved media statements to appropriate agencies and organizations.
- (4) Organize Press Conference as necessary.
- (5) Respond to enquiries from media and public.

### 3.8. Finance & HR Chief

The Finance & HR Chief is responsible for managing all financial and administrative aspects of the oil spill cleanup activities.

The Finance & HR Chief reports to the Incident Commander.

Among the other responsibilities of the Finance & Admin Chief are:

- (1) Ensuring the accurate recording of daily personnel time and equipment time records.
- (2) Maintain a file of injuries and illnesses associated with oil spill cleanup, including all written witness statements.
- (3) Records all costs data, analyzes and prepares estimates of cleanup costs, and maintains accurate records.
- (4) Manages all financial matters pertaining to vendor contracts, leases and fiscal arrangements.
- (5) Establishes local sources for equipment and supplies; equipment rental agreements; and processes all billing invoices.
- (6) Call out and activate relevant ECC support team members as appropriate
- (7) Make adequate arrangements for catering, media receptions, land transport, accommodation for onshore and offshore clean-up personnel as required.
- (8) Monitor and record expenses of all resources deployed for the clean-up operations; i.e. equipment, manpower, vehicles.
- (9) Arrange immigration formalities for relevant personnel from outstation / overseas.
- (10) Arrange for adequate facilities for local labour force (shelter, toilet, food / drink, hygiene, washing / cleaning).
- (11) Facilitating accommodation and travel arrangement for affected personnel and government formalities and providing back-up facilities for the clean-up operations such as travel/accommodation, media reception area, catering and other sanitation facilities at the various locations.

### 3.9. Logistics Chief

The Logistics Chief is responsible on all matters related to logistics and resources, which include the following:

1. Facilities: setup, maintenance and demobilization of all incident support facilities i.e. Command Post, Incident Base, other facilities such as feeding, sleeping, sanitation.
2. Ground support: maintenance, servicing and fueling of all mobile equipment and vehicles. Transportation of personnel, supplies and equipment.
3. Communications: develop communication plans, installation and testing of communication equipment and facilities, distribution and maintenance of communication equipment.
4. Supplies: ordering, receiving, processing, disbursement, servicing and storing of all oil spill response related equipment and resources (including food).
5. Food services: supply of food throughout the entire incident duration, including to all remote locations.
6. Medical services: develop procedures for medical emergencies, provide medical aid.

The Logistics Chief reports to the Incident Commander.

Among the other responsibilities of the Logistics Chief are:

1. Assess the emergency situation and determine the adequacy of logistics response resources.
2. Establish communications with logistics service providers, when appropriate.
3. Identify available resources – aircraft, road transports, and materials and arrange for mobilization and movement of those resources as planned.
4. Obtain additional resources from other oil companies/operators, if necessary.
5. Activate equipment load-out and vessel mobilisation.
6. Monitor and record daily all resources deployed for the cleanup operations i.e. material handling equipments, vessels, manpower, land transportation, aircraft.
7. Update EMT regularly on all the resources deployed to site.

### 3.10. Computer Operator

The Computer Operator is responsible for maintaining an accurate written record of all the information and actions carried out by the EMT within the ECC. The Computer Operator reports to the Planning Chief.

Among the other responsibilities of the Computer Operator are:

- (1) Update Event Log Sheet with the latest information (ensuring information is current, neat and legible)
- (2) Maintain a dated and timed record of EMT information, actions and communications
- (3) Commence a time record for key information about the incident including:
  - Record the EMT members present
  - Record the latest status on the Status Board
  - Record actions to be taken
- (4) Record Briefings and Time Outs
- (5) Collate all personal logs ready for incident review and provide to Incident Commander.

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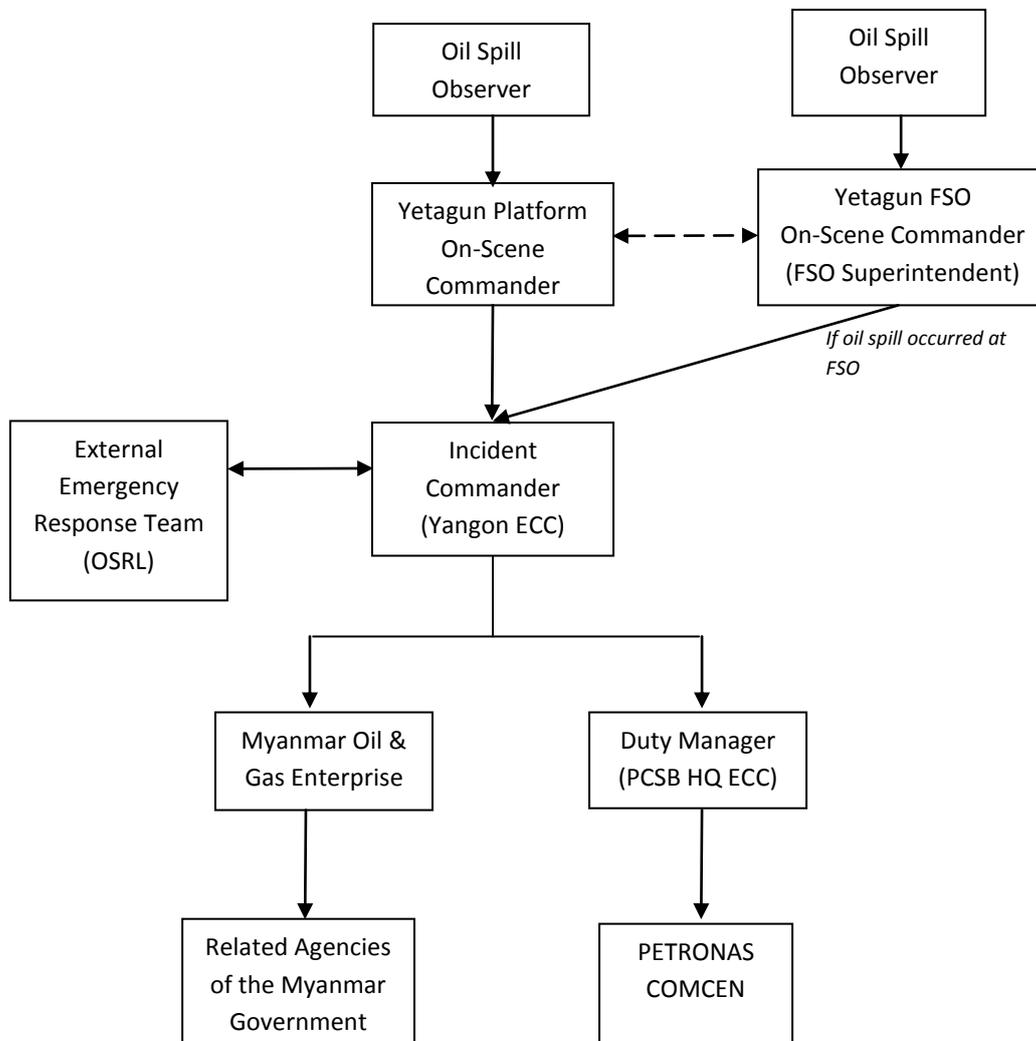
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#### 4. Call-Out, Mobilization and Communication

##### 4.1. Alert/Notification Procedure

For oil spills at offshore and onshore, **Figure 4.1** describes the initial notification, key actions and flow of information. Oil spills, irrespective of size or level (Tier 1 to Tier 3) will follow the same internal notification process to the Incident Commander in PCML and Kuala Lumpur.

**Figure 3.4 Emergency Organization Structure**



#### **4.1.1. Authorisation of Oil Spill Incident Notification**

Only the On-Scene Commander or a person appointed by him shall authorise transmission of oil spill incident notification. However, in a distress situation, the non-availability of these designated persons shall not prevent the Radio Operator, at his discretion, from sending any appropriate notification relating to an oil spill incident.

All oil spill incident notification shall use the Initial Notification Form (INF) (see **Appendix 4.0**). The Pollution Report (POLREP) Form (see **Appendix 4.1**) shall be used when more detail information will be required.

#### **4.1.2. Oil Spill Incident Notification Routing**

All oil spill incident notification from the installation, drilling rig or vessel shall be addressed to the PCML Incident Commander.

#### **4.1.3. Notification to Authorities**

The parties to be notified will depend on the magnitude and environmental sensitivity of affected area.

Every oil spill incident shall be reported as per PETRONAS Carigali Incident Notification Matrix as displayed in the ECC. Any oil spill onto inland waters, sensitive areas categorized as Tier 3 shall be reported (using the best available means) to MOGE.

The list and contact numbers of relevant authorities to be notified is as per **Appendix 4.2**.

## 4.2. Mobilization Procedure

The following mobilisation procedures will be followed for Tier 1, Tier 2 and Tier 3 oil spills.

### 4.2.1. Tier 1 Oil Spill Response Mobilisation Procedure

During Tier 1 incidents (**Figure 4.2**), the initial response will be dealt with by the OIM at offshore installations, who will activate the ERT (see list in **Appendix 4.3**) and mobilize Tier-1 oil spill response equipment on the installation stockpile (**Appendix 4.4**). The installations are equipped with spill kits which may include (as a minimum):

- (a) oil spill dispersant at offshore installations,
- (b) absorbent booms, absorbent pads, heavy duty oily waste bags and PVC gloves .

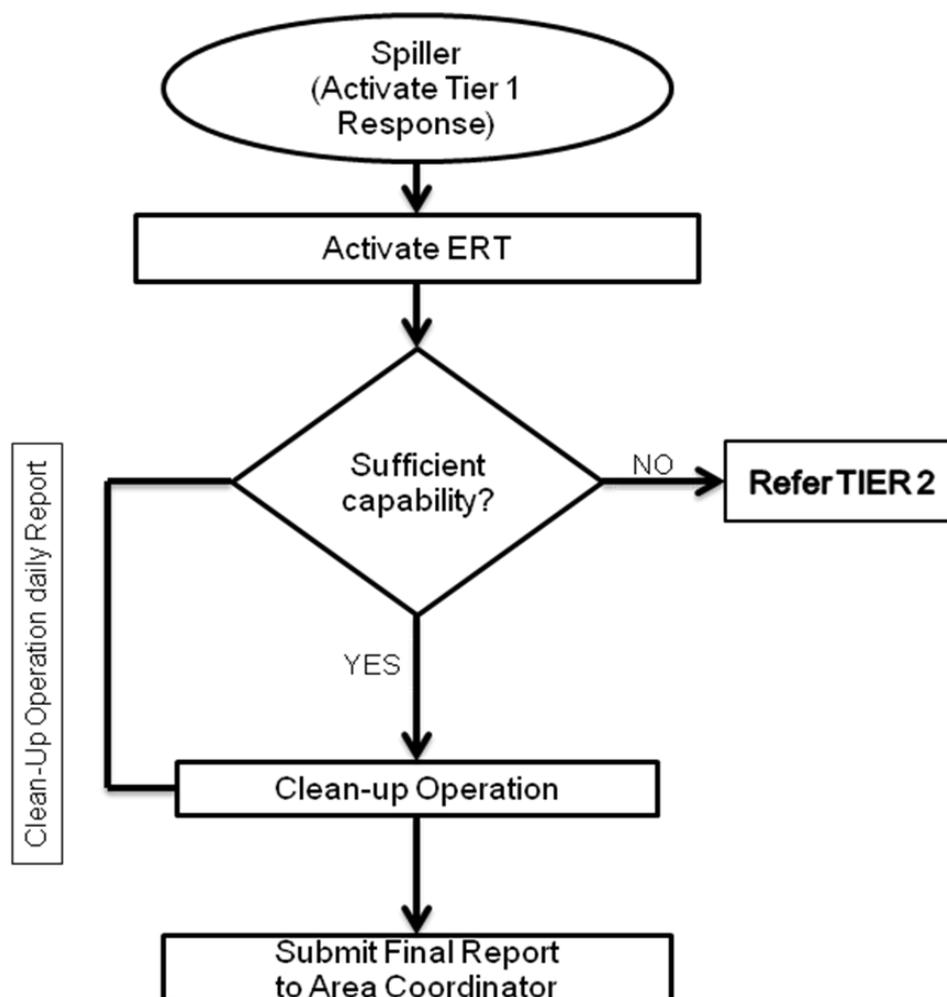


Figure 4.2: Tier 1 Oil Spill Response Mobilisation Procedure

4.2.2. Tier 2 Oil Spill Response Mobilisation Procedure

In the case of Tier 2 spills, ECC at PCML (i.e. EMT) will be mobilized (**Figure 4.3**). The **OSC** will contact the Incident Commander and request additional resources and agree on the appropriate level of response to the incident. The Incident Commander will liaise with the Operations Chief who will then arrange mobilisation of additional resources. A Staging Area will be established to provide front-line support in managing the Tier 2 response effort.

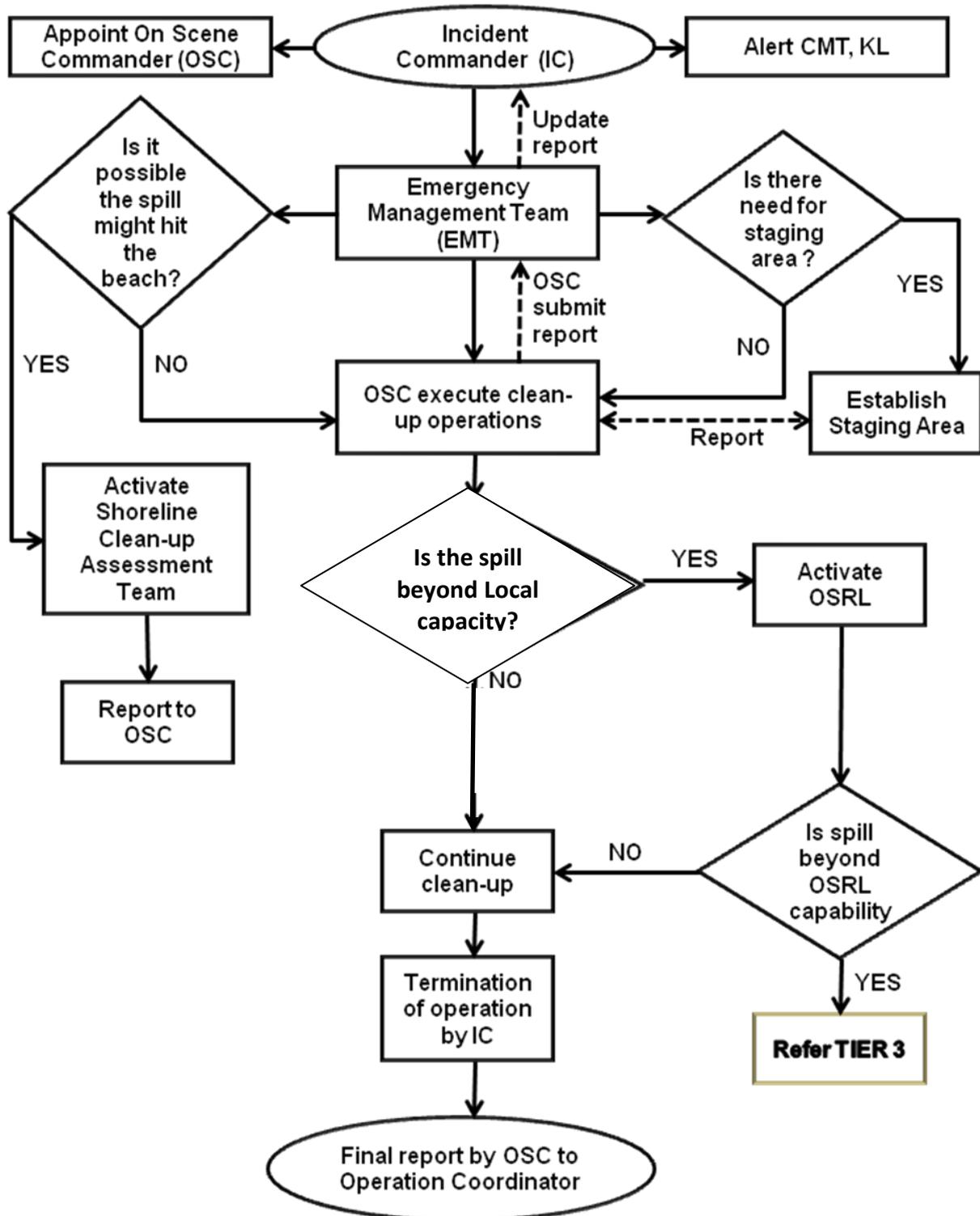


Figure 4.3: Tier-2 Response Flowchart

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As a minimum the **OSC** should provide SITREPs to the Incident Commander on a daily basis.

For all spills, the OSC must notify the Incident Commander immediately. The Incident Commander will continue to provide regular updates and liaise with the CMT /EMT in Kuala Lumpur regarding the extent or further escalation of the emergency.

### 4.2.3. Tier 3 Oil Spill Response Mobilisation Procedure

Alert PCSB HQ ECC, PETRONAS COMCEN and Myanmar Government via MOGE.  
Call in additional resources to protect far field environmentally sensitive areas, other vessels and installations.

Consider environmental survey if coastal resources threatened.

Government may call in own resources depending on size and behavior of spill.

OSRL can be notified by the authorised persons using:

- a) Form OSRL 025: Mobilization Authorisation Form (**Appendix 4.6**)
- b) Form OSRL 027: Notification Form (**Appendix 4.7**).

The list of other agencies that can be contacted for assistance during an oil spill is listed in **Appendix 4.5**.

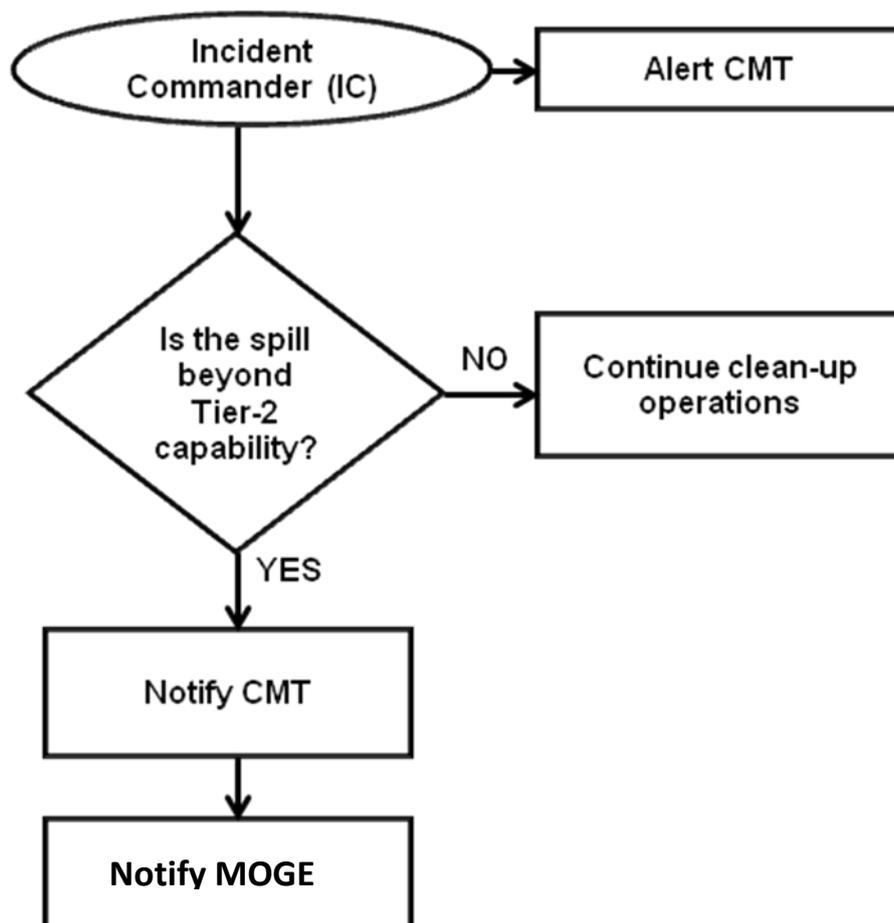


Figure 4.4: Tier 3 Response Flowchart

The Incident Commander will ensure that the authorities (i.e. MOGE) have received a Pollution Report (POLREP) form (**Appendix 4.1**), who will also subsequently send Situation Report (SITREP) (**Appendix 4.8**) to provide updates on a regular basis.

#### 4.2.4. Assistance to OSRL

In the event of a Tier 3 mobilisation, PCML would be required to provide assistance with some aspects of logistical support, customs documentation, transportation (the types of vehicles and boats required), and the number of manpower needed, will rely on PCML to ensure that the requirements are met. **Table 4.1** below shows the typical assistance required during Tier-3 mobilization.

**Table 4.1: Typical assistance requirements in Tier-3 mobilization**

Action	Assistance Required
Flight	<ul style="list-style-type: none"> <li>• Liaise directly with the Local Authority to obtain over-flight clearances and landing rights</li> <li>• Liaise with Department of Civil Aviation (DCA) to obtain trans-boundary over-flight flight clearance and landing rights.</li> <li>• Meet the flight (equipment will normally be accompanied by a Response Specialist). Aviation Logistics Executive to arrange for airport clearance, ground support services e.g. dispersant loading point, re-fueling, post- &amp; pre-flight checks/maintenance, waste management, etc.</li> </ul>
Customs and Immigration	<ul style="list-style-type: none"> <li>• Liaise directly with the Customs to obtain emergency clearance on the importation and re-exportation of the oil spill response equipment.</li> <li>• Arrange emergency clearance for immigration / visas for personnel</li> </ul>
Unloading	<ul style="list-style-type: none"> <li>• At the airport, PCML to provide:               <ul style="list-style-type: none"> <li>○ Ground handling equipment</li> <li>○ Hi-loader</li> <li>○ Forklifts (low mast for unloading from aircraft )</li> <li>○ Local agents to carry out aircraft unloading</li> </ul> </li> <li>• Transport to Site</li> <li>• PCML will be expected to arrange and to assist with:               <ul style="list-style-type: none"> <li>○ Trucks for transport</li> <li>○ Loading of equipment onto transport</li> <li>○ Provision of secure storage</li> <li>○ Control and tracking of equipment</li> </ul> </li> </ul>

Action	Assistance Required
On Site Operations	<ul style="list-style-type: none"> <li>• PCML to pre defined equipment lay-down points, identify a pool of vessels of opportunity to draw from and obtaining the necessary approvals for dispersant application.</li> <li>• <i>Oil Spill Response Limited</i> will provide: <ul style="list-style-type: none"> <li>○ Technical expertise and services</li> <li>○ Daily reports on activities and costs</li> <li>○ Management of own personnel and decisions on duration of duty periods</li> </ul> </li> <li>• PCML will arrange: <ul style="list-style-type: none"> <li>○ Food, accommodation and transport for <i>Oil Spill Response Limited</i> personnel.</li> </ul> </li> </ul>
De-mobilisation	<ul style="list-style-type: none"> <li>• <i>Prepare demobilization plan:</i> <ul style="list-style-type: none"> <li>○ In use / standby decision</li> <li>○ Onsite cleaning</li> <li>○ Return freight by air or sea</li> </ul> </li> </ul>

### 4.3. Government Agencies for Spill Response

In the event of any oil spill it is necessary to notify the Myanmar Government. Unless specifically advised otherwise, the only government agency to be notified will be the Myanma Oil & Gas Enterprise (MOGE) who is the official operator of each PSC (Production Sharing Contract).

MOGE require to be notified immediately of any incident. Initial contact should be by telephone or radio. This should be followed up by fax as soon as possible. When cleared by the PCML General Manager, the EMT's HSE & Liaison Officer on duty who has the necessary contact numbers will initiate contact with MOGE.

MOGE will then contact any other government agencies required i.e. police, medical, military, customs, immigration etc. Where required, MOGE should be asked to assist in dealing with other government agencies for issues such as arranging clearance for emergency flights, immigration matters and liaison with the Armed Forces if required.

**NB: It is important that MOGE are the first external party to be contacted in an emergency situation.**

#### **4.4. Termination / Demobilization Procedure**

When the end of emergency has been declared, the following actions should be taken:

- Withdrawal of personnel and material.
- Evaluation of the emergency incident and creation of reports and statistics.
- Design and implementation of a Recovery Plan for the affected area, if necessary
- Post-spill environmental monitoring to verify that the spill did not have long-term effect on any sensitive natural or social areas.

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## 5. Pre-Incident Action Plan

### 5.1. Generic Response Guidelines

This section contains operational guidance for various oil spill response strategies that may be deployed to mitigate a potential oil spill. Please refer to **Appendix 5.1 – Oil Spill Response Guide** for further information. **Table 5.1** below summarises the generic response guide for the different spill types. .

**Table 5.1: Generic Response Guidelines**

Response Strategy	Spill Type				Level of Response
	Crude	Diesel/ Condensate	Water Based Drilling Mud	Utility Oils, i.e. hydraulic, lubricating or base oil	
Evaluate and Monitor	✓	✓	✓	✓	Tier 1
Allow to Evaporate		✓			Tier 1
Offshore Containment and Recovery	✓	Diesel likely to evaporate readily both off and near shore*	WBM likely to disperse and dilute through water column	✓	Tier 1/ Tier 2
Chemical Dispersion	✓	✗	✗	✓	Tier 2/ Tier 3
Shoreline Protection	✓ If oil threatens shoreline	Diesel likely to evaporate readily both off and onshore. A shoreline response is unlikely	WBM likely to disperse and dilute through water column. Monitor and evaluate is the only probable strategy.	✓ If oil threatens shoreline	Tier 2/ Tier 3
Shoreline Clean-up	✓ If impacts shoreline			✓ If oil impacts shoreline	Tier 2/ Tier 3
In-situ Combustion	✓	✗	✗	✗	Tier 3

#### Key

✓ = Recommended      ✗ = Not Recommended

\* = If oil does persist then containment and recovery will become the response strategy.

5.2. Response Guide Flowchart

Following any oil spill scenario, **Figure 5.1** provides a guide in initiating the appropriate response strategy.

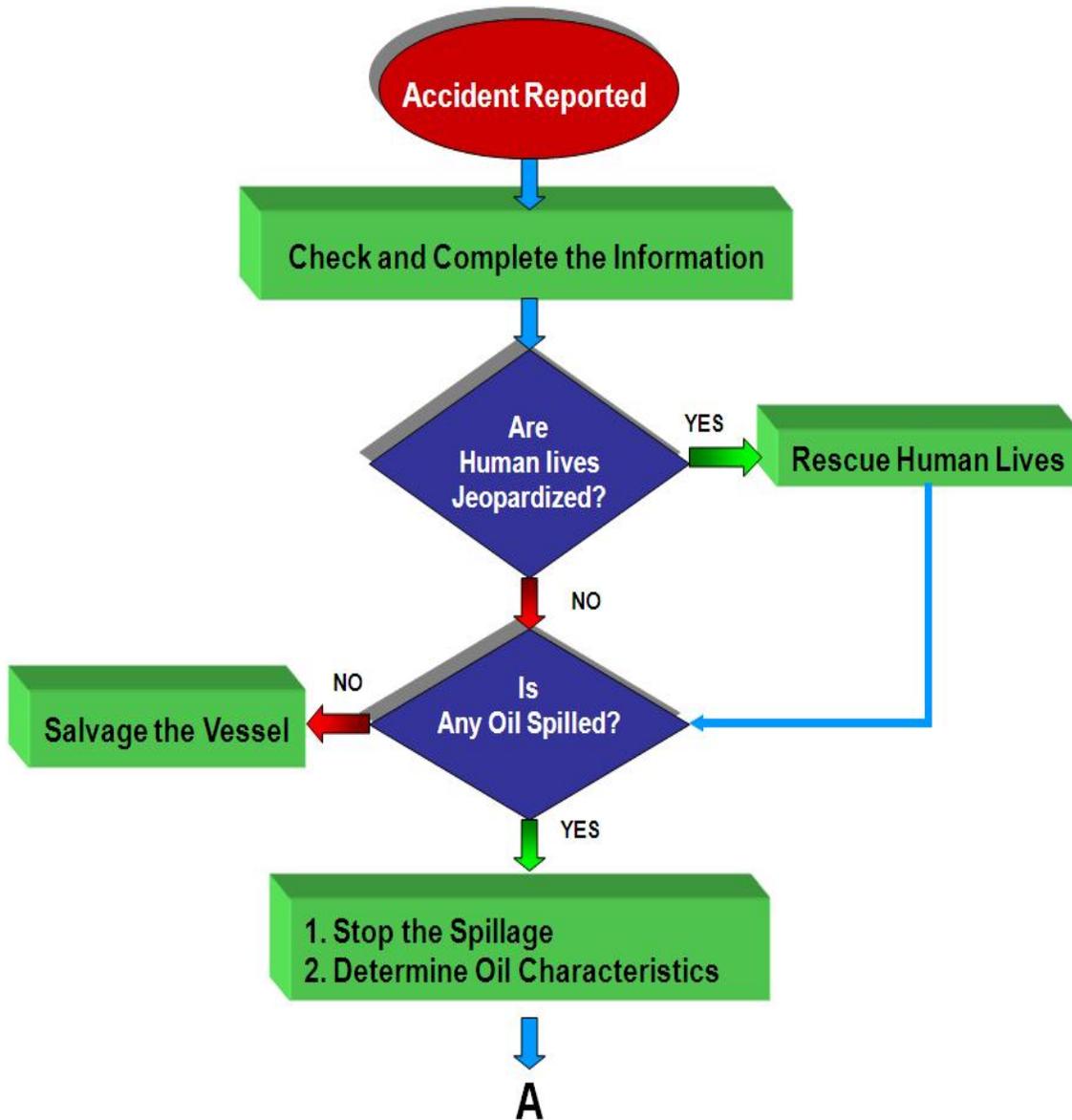


Figure 5.1A: Response Guide Flowchart

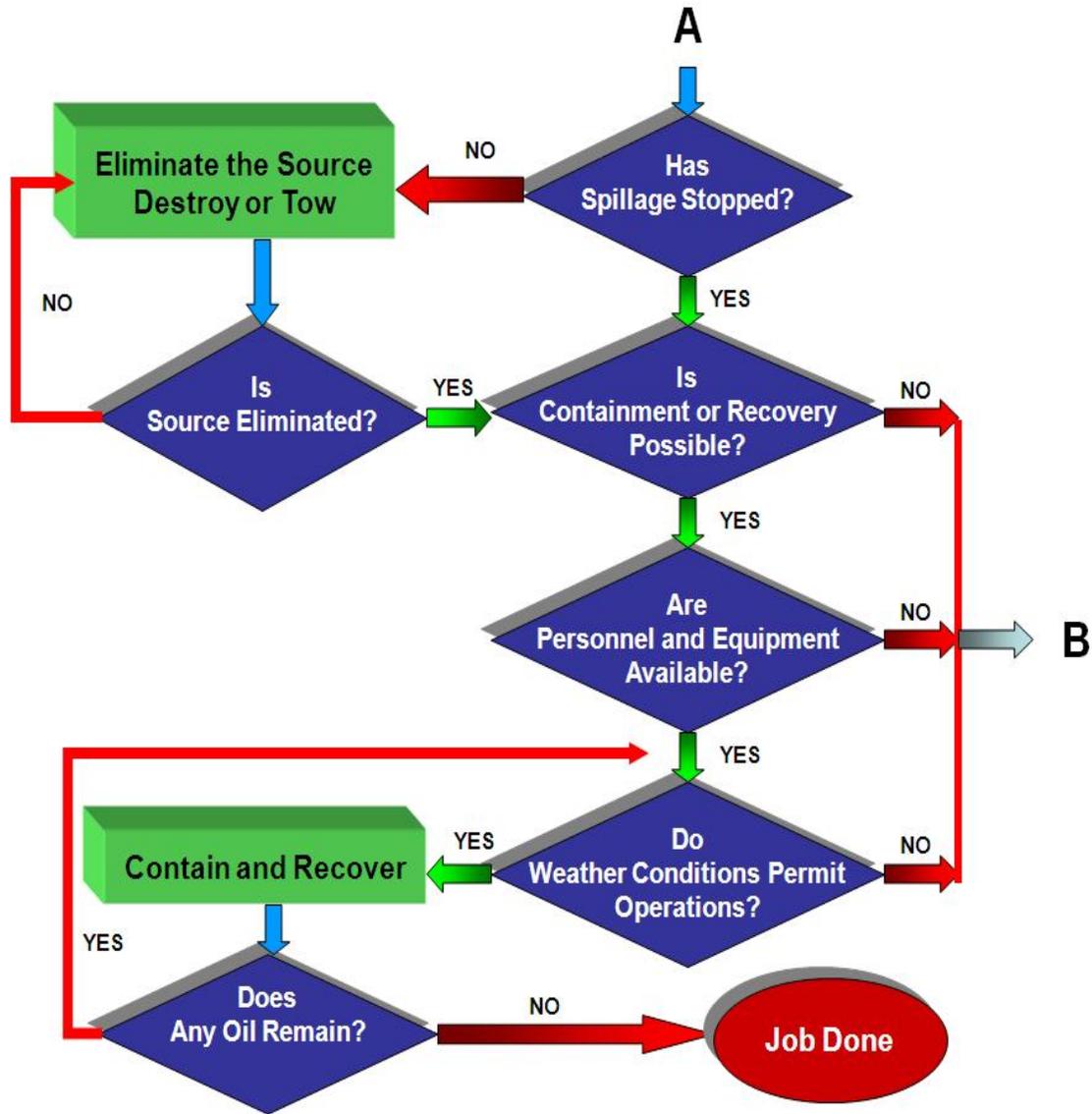


Figure 5.1B: Response Guide Flowchart

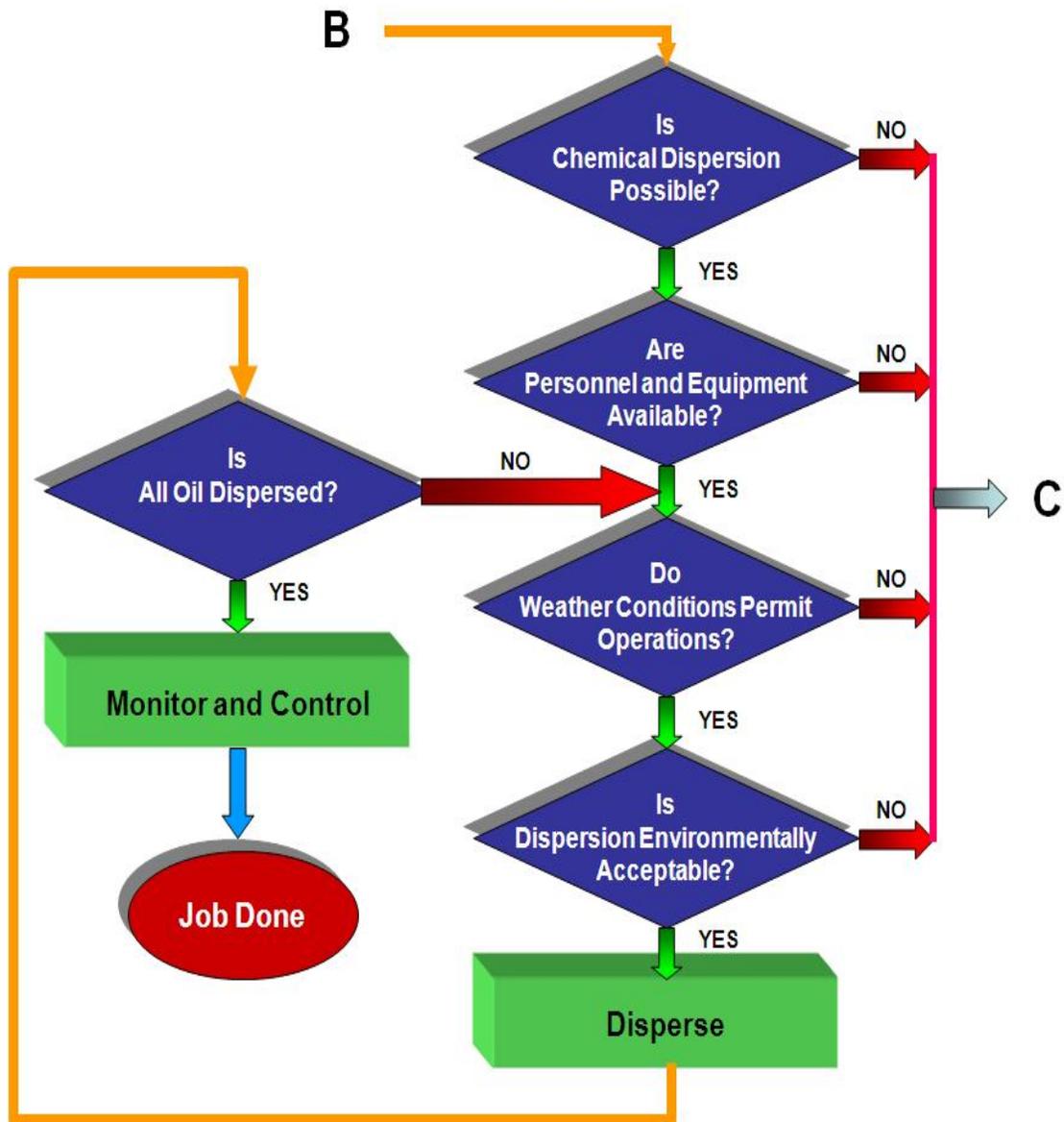


Figure 5.1C: Response Guide Flowchart

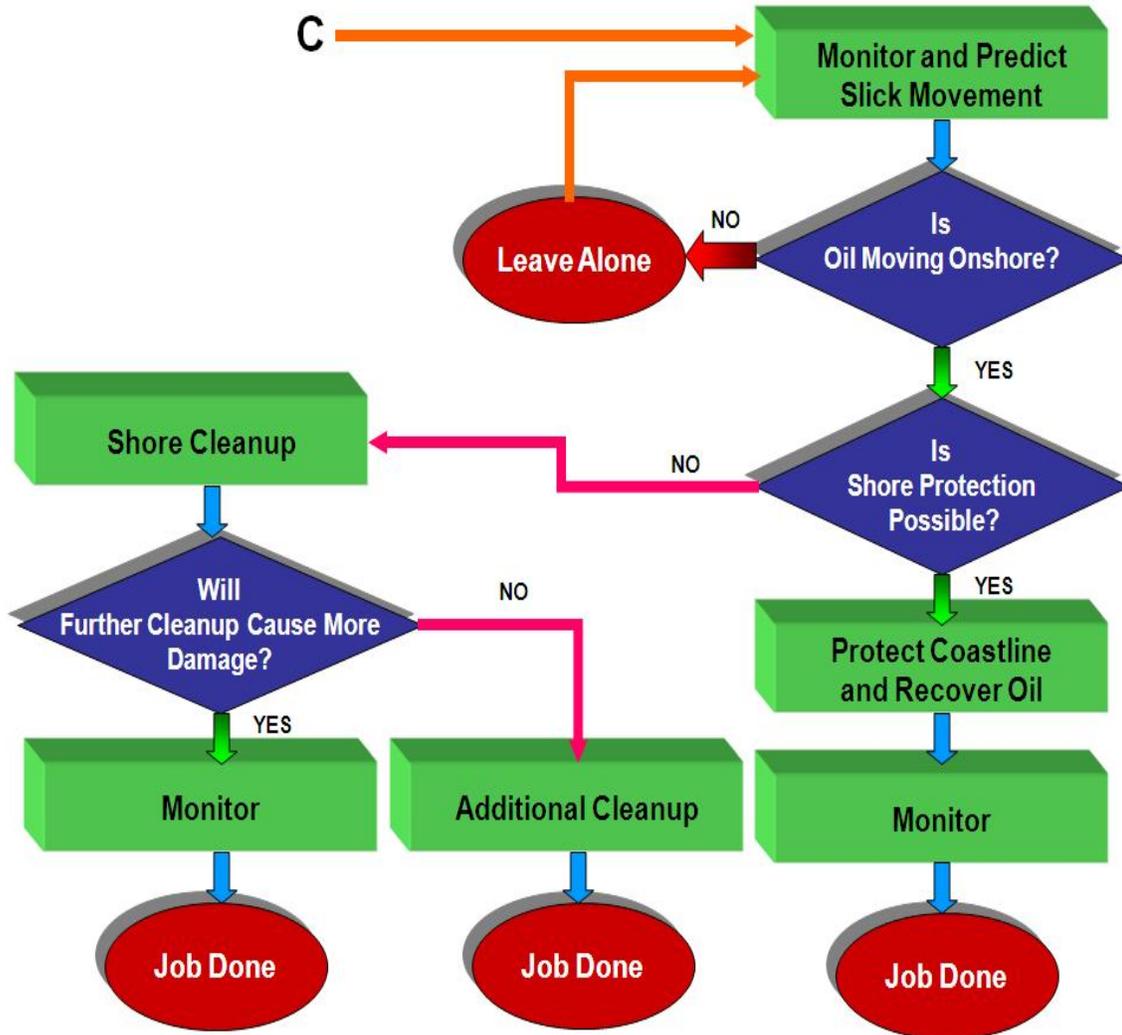


Figure 5.1D: Response Guide Flowchart

### 5.3. Action Checklists

Action Checklists have been compiled for key individual's in the EMT. These action checklists act as a quick reference for the key actions that should be taken by these key individuals during the initial stage of a response.

#### 5.3.1. Spill Observer

SPILL OBSERVER	
Reports to: Dependent upon location of spill observer: Onboard installation - Control Room and PIC Onboard Vessel – Vessel Master	
Step	Actions
<b>Initial Actions</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> <b>ENSURE SAFETY IS FIRST PRIORITY</b></li> <li><input type="checkbox"/> Raise the alarm as soon as possible by verbal means e.g. radio or in person</li> <li><input type="checkbox"/> Inform the installation Control Room / OIM / Vessel Master of the incident and provide as much information as possible:               <ul style="list-style-type: none"> <li><input type="checkbox"/> Location of pollution incident.</li> <li><input type="checkbox"/> Source of spill.</li> <li><input type="checkbox"/> Extent of spill.</li> <li><input type="checkbox"/> Time of incident.</li> <li><input type="checkbox"/> Potentially hazardous situations/equipment.</li> </ul> </li> <li><input type="checkbox"/> If trained and safe to do so, take reasonable actions to stop the source of the spill until relieved by suitable/ competent individual.</li> <li><input type="checkbox"/> If unsafe to remain at spill site, leave and instruct other personnel to evacuate the hazardous area.</li> <li><input type="checkbox"/> Start a <b>Personal Log</b> and record time and details of own actions and own decisions.</li> </ul>
<b>Further Actions</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> If safe to do so, continue monitoring the spill, keeping the <b>OSC</b> informed until the Damage Control Team arrives.</li> <li><input type="checkbox"/> Be prepared to direct the Damage Control Team to the spill.</li> <li><input type="checkbox"/> If trained and if required, assist the Damage Control Team.</li> </ul>
<b>Final Actions</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> After the incident, take part in the debriefing</li> <li><input type="checkbox"/> Provide recommendations based on observations made during the response.</li> </ul>

## 5.3.2. Offshore On-Scene Commander (OSC)

<b>OFFSHORE ON-SCENE COMMANDER (OSC)</b>	
<p><b>Coordinates the tactical offshore oil spill response activities.</b>  <b>OIM/ Vessel Master assumes OSC position for spills in water.</b>  <b>Reports to: Operations Chief.</b></p>	
Step	Actions
<b>Initial Actions</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> <b>ENSURE SAFETY IS FIRST PRIORITY</b></li> <li><input type="checkbox"/> OIM assumes role of <b>OSC</b> if spill enters water, regardless of size.</li> <li><input type="checkbox"/> Make an initial assessment of the incident.               <ul style="list-style-type: none"> <li><input type="checkbox"/> Spill source and cause</li> <li><input type="checkbox"/> Type of hydrocarbon</li> <li><input type="checkbox"/> Size and location</li> <li><input type="checkbox"/> Injuries</li> <li><input type="checkbox"/> Hazards</li> </ul> </li> <li><input type="checkbox"/> If the volume of condensate/ diesel/oil spilt is unknown, estimate the maximum volume which may have spilt and assume 'worst case scenario'</li> <li><input type="checkbox"/> Mobilise the Damage Control Team, brief the team of the situation.</li> <li><input type="checkbox"/> Start a Personal Log and record time and details of own actions and own decisions</li> <li><input type="checkbox"/> Arrange for offshore oil samples to be collected and sent for analysis</li> <li><input type="checkbox"/> Authenticate the reported emergency details by speaking with the original Observer and obtain full details of the incident</li> <li><input type="checkbox"/> If the spill or leak is from a vessel, provide guidance to the Vessel Master on taking action to stop operations and move the vessel to safety</li> <li><input type="checkbox"/> If the spill leak is from an onshore operation, cordon off the area (i.e. Port operations)</li> <li><input type="checkbox"/> Decide on whether to discontinue or cease operations</li> <li><input type="checkbox"/> Decide if there is a need to evacuate an area</li> <li><input type="checkbox"/> For all spills immediately notify Incident Commander (verbally).               <ul style="list-style-type: none"> <li><input type="checkbox"/> For Tier 1 spills send Initial Notification Form (<b>Appendix 4.0</b>, INF) within 1 hour.</li> <li><input type="checkbox"/> For Tier 2/3 spills send INF followed by <b>POLREP</b> as soon as practicable.</li> </ul> </li> <li><input type="checkbox"/> For Tier 2/3 spills liaise with Operations Chief on additional actions and/or resources required, and the practical deployment of resources.</li> </ul>

OFFSHORE ON-SCENE COMMANDER (OSC)	
Coordinates the tactical offshore oil spill response activities. OIM/ Vessel Master assumes OSC position for spills in water. Reports to: Operations Chief.	
Step	Actions
Initial Actions	<ul style="list-style-type: none"> <li><input type="checkbox"/> Identify tasks that must be performed to implement the initial strategy and identify task leaders for tactical response</li> <li><input type="checkbox"/> Agree a danger zone for the spill (i.e. a safe distance from the spill which the Damage Control Team must enforce).</li> <li><input type="checkbox"/> If necessary request a helicopter through the Operations Chief to provide aerial observation. Aerial surveillance will allow you to observe and record the size and location of the slick.</li> <li><input type="checkbox"/> The colour of the oil on water will indicate its thickness. Using the Bonn Agreement Oil Appearance Code (BAOAC, <b>Appendix 5.2 – Aerial Surveillance Form</b>) colour chart, calculate the volume of oil based on the area and colour of oil visible from the aerial observation.</li> <li><input type="checkbox"/> Once the scale and movement of the spill are known, and if required, request assistance from the field support vessels.</li> </ul> <div style="text-align: center; border: 1px solid black; padding: 10px; margin: 10px 0;"> </div> <p style="text-align: center;"><b>Figure 5.2: Predicting movement of oil on water</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Obtain information on tides &amp; direction/speed of current and wind.</li> <li><input type="checkbox"/> Using the information on current and wind, predict the trajectory and speed of movement of the spill as illustrated in <b>Figure 5.2</b> above.</li> <li><input type="checkbox"/> Draw the slick on a chart (map) with co-ordinates, showing position and predicted movement of the oil.</li> <li><input type="checkbox"/> Notify Operations Chief via Situation Report (SITREP, <b>Appendix 4.9</b>).</li> </ul>
Further Actions	<ul style="list-style-type: none"> <li><input type="checkbox"/> Request support/additional procurement of equipment, manpower and services via the Operations Chief.</li> <li><input type="checkbox"/> Maintain real time knowledge of the situation and continue to evaluate the spill.</li> <li><input type="checkbox"/> Keep the Operations Chief updated with the <b>SITREP</b> form.</li> <li><input type="checkbox"/> Prepare to meet and brief specialist response personnel if these have been mobilised.</li> </ul>

<b>OFFSHORE ON-SCENE COMMANDER (OSC)</b>	
<p><b>Coordinates the tactical offshore oil spill response activities.</b>  <b>OIM/ Vessel Master assumes OSC position for spills in water.</b>  <b>Reports to: Operations Chief.</b></p>	
<b>Step</b>	<b>Actions</b>
<b>Final Actions</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> When safe to restart, approve restart of normal site operations</li> <li><input type="checkbox"/> Hold debrief for onsite personnel who were involved in the response</li> <li><input type="checkbox"/> Collate all information received and personal logs of actions taken</li> <li><input type="checkbox"/> Send logs of the incident and other relevant records to the Planning Chief.</li> </ul>

## 5.3.3. Onshore On-Scene Commander (OSC)

<b>ONSHORE ON-SCENE COMMANDER (OSC)</b>	
<p><b>Coordinates the tactical onshore oil spill response activities.</b>  <b>Pipeline Site Manager assumes OSC position for spills onshore and inland.</b>  <b>Implementing and coordinating oil spill response activities on the shoreline in collaboration with local government authorities</b>  <b>Reports to: Operations Chief.</b></p>	
Step	Actions
<b>Initial Actions</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> <b>ENSURE SAFETY IS FIRST PRIORITY</b></li> <li><input type="checkbox"/> Pipeline Site Manager assumes role of <b>OSC</b> if spill occurs at onshore and/or inland, regardless of size.</li> <li><input type="checkbox"/> Make an initial assessment of the incident.               <ul style="list-style-type: none"> <li><input type="checkbox"/> Spill source and cause</li> <li><input type="checkbox"/> Type of hydrocarbon</li> <li><input type="checkbox"/> Size and location</li> <li><input type="checkbox"/> Injuries</li> <li><input type="checkbox"/> Hazards</li> </ul> </li> <li><input type="checkbox"/> If the volume of oil spilt is unknown, estimate the maximum volume which may have spilt and assume 'worst case scenario'</li> <li><input type="checkbox"/> Mobilise the Damage Control Team, brief the team of the situation.</li> <li><input type="checkbox"/> Start a Personal Log and record time and details of own actions and own decisions</li> <li><input type="checkbox"/> Arrange for onshore oil samples to be collected and sent for analysis</li> <li><input type="checkbox"/> Authenticate the reported emergency details by speaking with the original Observer and obtain full details of the incident</li> <li><input type="checkbox"/> If the spill leak is from an onshore operation, cordon off the area (i.e. POC)</li> <li><input type="checkbox"/> Decide on whether to discontinue or cease operations</li> <li><input type="checkbox"/> Decide if there is a need to evacuate an area</li> <li><input type="checkbox"/> For all spills, immediately notify Incident Commander (verbally).               <ul style="list-style-type: none"> <li><input type="checkbox"/> For Tier 1 spills send Initial Notification Form (<b>Appendix 4.0, INF</b>) within 1 hour.</li> <li><input type="checkbox"/> For Tier 2/3 spills send INF followed by <b>POLREP</b> as soon as practicable.</li> </ul> </li> <li><input type="checkbox"/> For Tier 2/3 spills liaise with Operations Chief on additional actions and/or resources required, and the practical deployment of resources.</li> <li><input type="checkbox"/> Identify tasks that must be performed to implement the initial strategy and identify task leaders for tactical response</li> </ul>

<b>ONSHORE ON-SCENE COMMANDER (OSC)</b>	
<p><b>Coordinates the tactical onshore oil spill response activities.</b>  <b>Pipeline Site Manager assumes OSC position for spills onshore and inland.</b>  <b>Implementing and coordinating oil spill response activities on the shoreline in collaboration with local government authorities</b>  <b>Reports to: Operations Chief.</b></p>	
<b>Step</b>	<b>Actions</b>
<b>Initial Actions</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Agree a danger zone for the spill (i.e. a safe distance from the spill which the Damage Control Team must enforce).</li> <li><input type="checkbox"/> If necessary request a helicopter through the Operations Chief to provide aerial observation. Aerial surveillance will allow you to observe and record the size and location of the spill.</li> <li><input type="checkbox"/> Notify Operations Chief via Situation Report (SITREP, <b>Appendix 4.9</b>).</li> </ul>
<b>Further Actions</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Request support/additional procurement of equipment, manpower and services via the Operations Chief.</li> <li><input type="checkbox"/> Maintain real time knowledge of the situation and continue to evaluate the spill.</li> <li><input type="checkbox"/> Keep the Operations Chief updated with the <b>SITREP</b> form.</li> <li><input type="checkbox"/> Prepare to meet and brief specialist response personnel if these have been mobilised.</li> </ul>
<b>Final Actions</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> When safe to restart, approve restart of normal site operations</li> <li><input type="checkbox"/> Hold debrief for onsite personnel who were involved in the response</li> <li><input type="checkbox"/> Collate all information received and personal logs of actions taken</li> <li><input type="checkbox"/> Send logs of the incident and other relevant records to the Planning Chief.</li> </ul>

## 5.3.4. Incident Commander

<b>INCIDENT COMMANDER</b>	
<p>Responsible for the overall management of the incident.            Establish response priorities (People, Environment, Asset &amp; Reputation).            Establish Incident Objectives, Strategy, and Tactical Direction.            Establish the Termination Criteria in consultation with relevant authorities.            Monitor scene safety.            Establish and monitor incident organization adequacy.            Conduct planning meetings and briefings, as required.            Approve and authorize the implementation of an Incident Action Plan.            Approve requests for additional resources or for the release of resources.            Authorise the release of Holding Statement and draft Press Release.            Reports to: Incident Commander (Kuala Lumpur)</p>	
Step	Actions
<b>Initial Actions</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> <b>ENSURE SAFETY IS FIRST PRIORITY</b></li> <li><input type="checkbox"/> Following notification from <b>OSC</b>, discuss incident details and make an assessment of incident severity and collate all information received.</li> <li><input type="checkbox"/> For Tier 2/3 spills liaise with Operations Chief over requirement for additional resources to ensure optimal response.</li> <li><input type="checkbox"/> For all spills &gt; 5bbls notify the Incident Commander in Kuala Lumpur verbally within 1 hour.</li> <li><input type="checkbox"/> Once a <b>POLREP</b> is received from the OSC and/ or sufficient information is available, ensure that appropriate Authorities are notified.</li> <li><input type="checkbox"/> Start a Personal Log and record time and details of own actions and decisions.</li> <li><input type="checkbox"/> Establish Incident Objectives, Strategy, and Tactical Direction.</li> <li><input type="checkbox"/> Establish the Termination Criteria in consultation with relevant authorities.</li> </ul>
<b>Further Actions</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Maintain close contact with the <b>OSC</b> via the Operations Chief and obtain regular updates regarding the situation at the spill site. Ensure adequate resources are available.</li> <li><input type="checkbox"/> In the event of Tier 2/ 3 spills, brief Head – MO for external communication with the relevant Authorities and receive regular briefings on same.</li> <li><input type="checkbox"/> Mobilise EMT and support groups as required (ensure roles adequately filled).</li> </ul>

<b>INCIDENT COMMANDER</b>	
<p>Responsible for the overall management of the incident.            Establish response priorities (People, Environment, Asset &amp; Reputation).            Establish Incident Objectives, Strategy, and Tactical Direction.            Establish the Termination Criteria in consultation with relevant authorities.            Monitor scene safety.            Establish and monitor incident organization adequacy.            Conduct planning meetings and briefings, as required.            Approve and authorize the implementation of an Incident Action Plan.            Approve requests for additional resources or for the release of resources.            Authorise the release of Holding Statement and draft Press Release.            Reports to: Incident Commander (Kuala Lumpur)</p>	
Step	Actions
<b>Further Actions</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Provide initial briefing giving details of actions taken.</li> <li><input type="checkbox"/> Receive regular briefings from Chiefs in EMT.</li> <li><input type="checkbox"/> Provide Incident Commander in Kuala Lumpur with regular updates verbally and using <b>SITREP</b> forms.</li> <li><input type="checkbox"/> Discuss feedback/ guidance received to brief Chiefs in the EMT.</li> <li><input type="checkbox"/> In the event that Tier 3 resources are required, authorize procurement of OSRL services (refer to <b>Appendix 4.6 and 4.7</b>).</li> <li><input type="checkbox"/> In the event of a well blow-out, ensure regular updates received on capping/ relief well progress.</li> </ul>
<b>Final Actions</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Obtain approval from relevant authorities on incident close-out/termination.</li> <li><input type="checkbox"/> Conduct debrief session for EMT members who were involved in the response.</li> <li><input type="checkbox"/> Complete and hand-in Log to Planning Chief.</li> <li><input type="checkbox"/> Authorise final close-out report.</li> </ul>

## 5.3.5. Operations Chief

<b>OPERATIONS CHIEF</b>	
<p><b>Focal point for communications with OSC.</b>  <b>Responsible for managing all tactical operations and resources of the oil spill incident, which include:</b></p> <ul style="list-style-type: none"> <li>• <b>Ground or surface-based tactical resources;</b></li> <li>• <b>Aviation (Air) resources (i.e. helicopters and fixed-wing aircraft);</b></li> <li>• <b>Staging Areas</b></li> </ul> <p><b>Reports to: Incident Commander</b></p>	
<b>Step</b>	<b>Actions</b>
<b>Initial Actions</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> <b>ENSURE SAFETY IS FIRST PRIORITY</b></li> <li><input type="checkbox"/> After being notified of the incident, establish direct contact with the OSC to establish details.</li> <li><input type="checkbox"/> Collate all information received from the OSC.</li> <li><input type="checkbox"/> Liaise with the Incident Commander over the requirement for additional resources.</li> <li><input type="checkbox"/> Attend initial briefing.</li> <li><input type="checkbox"/> For Tier 2/3 spills, notify Logistics Chief and ensure that requirements for Staging Areas are made ready.</li> <li><input type="checkbox"/> Start a Personal Log and record time and details of own actions and decisions.</li> <li><input type="checkbox"/> If Tier 2 resources are required, coordinate with OSC, HSE &amp; Liaison Officer and Logistics Chief to arrange mobilisation of own resources and request available external resources.</li> <li><input type="checkbox"/> In the event that Tier 3 resources may be required, coordinate with Logistics Chief to arrange resources from OSRL and for receiving the resources and transportation to the site.</li> </ul>
<b>Further Actions</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Maintain close contact with the OSC and obtain regular updates regarding the situation.</li> <li><input type="checkbox"/> Attend briefings and maintain regular contact with EMT (e.g. Planning and Logistics functions to ensure adequate provision of resources in line with Action Plan).</li> <li><input type="checkbox"/> Provide Incident Commander with regular updates (e.g. <b>SITREPs</b>).</li> <li><input type="checkbox"/> For Tier 2 incidents, continue to liaise with OSC, HSE &amp; Liaison Officer and Logistics Chief and ensure that additional resources have been mobilised for Tier 2 support.</li> </ul>

<b>OPERATIONS CHIEF</b>	
<p><b>Focal point for communications with OSC.</b>  <b>Responsible for managing all tactical operations and resources of the oil spill incident, which include:</b></p> <ul style="list-style-type: none"> <li>• <b>Ground or surface-based tactical resources;</b></li> <li>• <b>Aviation (Air) resources (i.e. helicopters and fixed-wing aircraft);</b></li> <li>• <b>Staging Areas</b></li> </ul> <p><b>Reports to: Incident Commander</b></p>	
Step	Actions
<b>Further Actions</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Liaise with OSRL in the event that Tier 3 resources are required.</li> <li><input type="checkbox"/> Act as operational focal point to ensure that that all response resources (internal and external) are coordinated to provide an effective and efficient response in line with operational action plans.</li> </ul>
<b>Final Actions</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Attend debrief for onsite personnel who were involved in the response.</li> <li><input type="checkbox"/> Complete and hand-in Log to Planning Chief.</li> <li><input type="checkbox"/> Be prepared to provide input to the after action report.</li> </ul>

## 5.3.6. Logistics Chief

<b>LOGISTICS CHIEF</b>	
<p><b>Responsible for obtaining personnel, equipment, materials and supplies needed to mount and sustain emergency response operations and for providing services necessary to ensure that emergency response operations are carried out in a safe and efficient manner.</b></p> <p><b>Reports to: Incident Commander</b></p>	
<b>Step</b>	<b>Actions</b>
<b>Initial Actions</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> <b>ENSURE SAFETY IS FIRST PRIORITY</b></li> <li><input type="checkbox"/> On notification of the incident, report to the ECC</li> <li><input type="checkbox"/> Obtain briefing by Incident Commander</li> <li><input type="checkbox"/> Check Status Boards for the latest information, log arrival on the White Board in the ECC</li> <li><input type="checkbox"/> Start a Personal Log and record time and details of own actions and decisions and all own incoming/ outgoing calls.</li> <li><input type="checkbox"/> Confirm the initial incident severity classification, with the Incident Commander and Operations Chief.</li> <li><input type="checkbox"/> Place aerial surveillance helicopters and support vessels on standby</li> <li><input type="checkbox"/> Advise on the response equipment available</li> <li><input type="checkbox"/> Ensure early availability of MSDS Sheets</li> <li><input type="checkbox"/> Advise and coordinate the EMT on all logistical requirements</li> <li><input type="checkbox"/> Liaise with the Finance &amp; HR Chief to coordinate actions and requirements for Oil Spill Responders i.e. accommodation and transportation, catering and medical services, and sanitation facilities.</li> </ul>
<b>Further Actions</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Establish a system for recording and tracking all equipment</li> <li><input type="checkbox"/> Establish a refuelling and maintenance schedule for equipment being used</li> <li><input type="checkbox"/> Establish necessary backup systems that can be used to support personnel affected by the incident and those in the response teams</li> <li><input type="checkbox"/> Coordinate Search and Rescue activities</li> <li><input type="checkbox"/> Request aircraft and observer for aerial surveillance activities or equipment transportation</li> <li><input type="checkbox"/> Assist the Planning Chief with the development of the site clean up and waste disposal plan</li> </ul>
<b>Further Actions</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Ensure all logistical support is provided, e.g. transport and support facilities for all response activities.</li> <li><input type="checkbox"/> Prepare for the potential arrival of Tier 3 equipment and personnel.</li> <li><input type="checkbox"/> Obtain data related with weather, wind, tide, current information, relay information to Planning Chief for oil spill modelling.</li> </ul>

**LOGISTICS CHIEF**

Responsible for obtaining personnel, equipment, materials and supplies needed to mount and sustain emergency response operations and for providing services necessary to ensure that emergency response operations are carried out in a safe and efficient manner.

Reports to: Incident Commander

<b>Step</b>	<b>Actions</b>
<b>Final Actions</b>	<ul style="list-style-type: none"><li><input type="checkbox"/> Attend debrief for onsite personnel who were involved in the response.</li><li><input type="checkbox"/> Complete and hand-in Log to Planning Chief.</li><li><input type="checkbox"/> Be prepared to provide input to the after action report</li></ul>

## 5.3.7. HSE &amp; Liaison Officer

<b>HSE &amp; LIAISON OFFICER</b>	
<p><b>Responsible to develop and recommend measures for ensuring that all activities in the response to the oil spill are carried out in a safe manner, minimising risk to personnel, the public and environment.</b></p> <p><b>Assess and/or anticipate hazardous and unsafe situations.</b></p> <p><b>Reports to: Incident Commander</b></p>	
<b>Step</b>	<b>Actions</b>
<b>Initial Actions</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> <b>ENSURE SAFETY IS FIRST PRIORITY</b></li> <li><input type="checkbox"/> Once notified by Incident Commander, report to ECC</li> <li><input type="checkbox"/> Obtain briefing by Incident Commander</li> <li><input type="checkbox"/> Check Status Boards for the latest information, log arrival on the White Board in the ECC</li> <li><input type="checkbox"/> Start a Personal Log and record time and details of own actions and decisions and all own incoming/outgoing calls.</li> <li><input type="checkbox"/> Obtain situation status information and response activities from Operations Chief, and collate all information received from the OSC.</li> </ul>
<b>Further Actions</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Attend Briefings and maintain contact with Chiefs in the EMT.</li> <li><input type="checkbox"/> Develop the site safety, first aid and medical evacuation plans.</li> <li><input type="checkbox"/> Coordinate medical support and provide advice on personnel safety and fire prevention.</li> <li><input type="checkbox"/> Coordinate regular site inspection of all operational sites for compliance with Health &amp; Safety requirements.</li> <li><input type="checkbox"/> Liaise with OSC, Logistics Chief and Operations Chief to ensure that all operations are undertaken safely and within the requirements of applicable legislation.</li> </ul>
<b>Final Actions</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Attend debrief for onsite personnel who were involved in the response.</li> <li><input type="checkbox"/> Complete and hand-in Log to Planning Chief.</li> <li><input type="checkbox"/> Be prepared to provide input to the after action report</li> </ul>

## 5.3.8. NOK &amp; Media Officer

NOK & MEDIA Officer	
<b>Responsible to develop and obtain approvals for releasing information to the media, to response teams and other appropriate agencies and organizations. Assess and/or anticipate hazardous and unsafe situations. Reports to: Incident Commander</b>	
Step	Actions
<b>Initial Actions</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> <b>ENSURE SAFETY IS FIRST PRIORITY</b></li> <li><input type="checkbox"/> Once notified by Incident Commander, report to ECC</li> <li><input type="checkbox"/> Obtain briefing by Incident Commander</li> <li><input type="checkbox"/> Check Status Boards for the latest information, log arrival on the White Board in the ECC</li> <li><input type="checkbox"/> Start a Personal Log and record time and details of own actions and decisions and all own incoming/outgoing calls.</li> <li><input type="checkbox"/> Obtain situation status information and response activities from Chiefs in the EMT, and collate all information received from the OSC.</li> <li><input type="checkbox"/> Monitor media coverage of the incident and develop press strategy accordingly with assistance from ECC HQ.</li> <li><input type="checkbox"/> Notify PCSB HQ Incident Commander upon approval by the IC.</li> <li><input type="checkbox"/> <b>THE POLREP MUST BE SENT WITHOUT DELAY EVEN IF INCOMPLETE</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Missing information can be transferred in a Situation Report Form at a later stage.</li> </ul> </li> </ul>
<b>Further Actions</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Maintain close dialogue with local communities and authorities to disseminate and gather information.</li> <li><input type="checkbox"/> Engage with local communities to seek their involvement and assistance in cleanup activities.</li> <li><input type="checkbox"/> Keep Incident Commander updated of developments and media reports.</li> <li><input type="checkbox"/> Prepares draft press statements for endorsement by IC and approval by HQ.</li> <li><input type="checkbox"/> Set up a Media Centre to respond to media enquiries.</li> <li><input type="checkbox"/> Maintain close contact with the PETRONAS Regional Office and provide updates in status on a regular basis.</li> <li><input type="checkbox"/> Attend briefings and maintain contact with Coordinators</li> </ul>
<b>Final Actions</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Attend debrief for onsite personnel who were involved in the response.</li> <li><input type="checkbox"/> Complete and hand-in Log to Planning Chief.</li> <li><input type="checkbox"/> Be prepared to provide input to the after action report</li> </ul>

## 5.3.9. Planning Chief

<b>PLANNING CHIEF</b>	
<p><b>Responsible for all matters related to technical and information support. Coordinates, supervise and organize technical specialist supports.</b></p> <p><b>Maintains an accurate timed log of events, instructions and communications.</b></p> <p><b>Reports to: Incident Commander</b></p>	
<b>Step</b>	<b>Actions</b>
<b>Initial Actions</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> <b>ENSURE SAFETY IS FIRST PRIORITY</b></li> <li><input type="checkbox"/> Attend initial briefing by Incident Commander.</li> <li><input type="checkbox"/> Ensure that the ECC is set up properly and that appropriate equipment and supplies are in place.</li> <li><input type="checkbox"/> Start to collect, analyse information and ensure that information regarding the emergency situation and location of critical resources is displayed at the event boards</li> <li><input type="checkbox"/> Start a Personal Log or equivalent and record time and details of own actions and decisions.</li> </ul>
<b>Further Actions</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Ensure proper and effective log keeping is maintained by members of the EMT</li> <li><input type="checkbox"/> Ensure that status boards are kept current, neat and legible.</li> <li><input type="checkbox"/> Support Incident Commander in delivery of regular incident briefings.</li> <li><input type="checkbox"/> Maintain contact with EMT Coordinators to ensure that all significant events and issues are recorded.</li> <li><input type="checkbox"/> Provide Incident Commander and members of the EMT regular updates</li> <li><input type="checkbox"/> Recommend (as required) the activation of support teams in anticipation of or immediately following an incident or emergency. (e.g. environmental team, medical team, shoreline assessment team, dispersant application team).</li> <li><input type="checkbox"/> Prepare and disseminate Oil Spill Response Strategy, Objectives and Action Plan</li> <li><input type="checkbox"/> Ensure that worksites activities are integrated into the overall planning process.</li> </ul>
<b>Final Actions</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Attend debrief and provide support for incident investigation</li> <li><input type="checkbox"/> Complete and hand-in Log to Computer Operator</li> <li><input type="checkbox"/> Be prepared to provide input to the after action report</li> </ul>

## 5.3.10. Finance and HR Chief

<b>FINANCE AND HR CHIEF</b>	
<p><b>Manages all financial aspects of an incident.</b></p> <p><b>Ensures accurate recording of daily personnel time.</b></p> <p><b>Managing all financial matters pertaining to vendor contracts, leases, and fiscal agreements.</b></p> <p><b>Establishes local sources for equipment and supplies, rental agreements, and document billing invoices.</b></p> <p><b>Maintains an accurate time log of events, instructions and communications.</b></p> <p><b>Administers all claims for compensation and injuries, including medical claims.</b></p> <p><b>Provides cost analysis and maintains accurate records of incident cost.</b></p> <p><b>Reports to: Incident Commander</b></p>	
<b>Step</b>	<b>Actions</b>
<b>Initial Actions</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> <b>ENSURE SAFETY IS FIRST PRIORITY</b></li> <li><input type="checkbox"/> Attend initial briefing by Incident Commander.</li> <li><input type="checkbox"/> Ensure that the ECC is set up properly and that appropriate equipment and supplies are in place.</li> <li><input type="checkbox"/> Start to collect, analyse information and ensure that information regarding the emergency situation and location of critical resources is displayed at the event boards</li> <li><input type="checkbox"/> Start a Personal Log or equivalent and record time and details of own actions and decisions.</li> </ul>
<b>Further Actions</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Ensure proper and effective log keeping is maintained by members of the EMT</li> <li><input type="checkbox"/> Ensure that status boards are kept current, neat and legible.</li> <li><input type="checkbox"/> Support Incident Commander in delivery of regular incident briefings.</li> <li><input type="checkbox"/> Maintain contact with EMT Chiefs to ensure that all significant events and issues are recorded.</li> <li><input type="checkbox"/> Provide Incident Commander and members of the EMT regular updates.</li> <li><input type="checkbox"/> Monitor and records all expenses of all resources deployed for the cleanup operations and prepares expense reports</li> <li><input type="checkbox"/> Monitor timeliness and accuracy of personnel documentation and financial records.</li> <li><input type="checkbox"/> Arrange adequate facilities for labor force (shelter, toilet, catering)</li> <li><input type="checkbox"/> Establish sources for equipment supplies and rentals and maintain agreements.</li> </ul>

<b>FINANCE AND HR CHIEF</b>	
<p><b>Manages all financial aspects of an incident.</b></p> <p><b>Ensures accurate recording of daily personnel time.</b></p> <p><b>Managing all financial matters pertaining to vendor contracts, leases, and fiscal agreements.</b></p> <p><b>Establishes local sources for equipment and supplies, rental agreements, and document billing invoices.</b></p> <p><b>Maintains an accurate time log of events, instructions and communications.</b></p> <p><b>Administers all claims for compensation and injuries, including medical claims.</b></p> <p><b>Provides cost analysis and maintains accurate records of incident cost.</b></p> <p><b>Reports to: Incident Commander</b></p>	
<b>Final Actions</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Attend debrief and provide support for incident investigation</li> <li><input type="checkbox"/> Complete and hand-in Log to Planning Chief.</li> <li><input type="checkbox"/> Be prepared to provide input to the after action report</li> </ul>

## 5.3.11. Computer Operator

<b>COMPUTER OPERATOR</b>	
<p><b>Responsible for maintaining an accurate written record of all the information and actions carried out by the EMT within the ECC. Planning Chief to assign this role from available resources.</b></p> <p><b>Reports to: Planning Chief</b></p>	
<b>Step</b>	<b>Actions</b>
<b>Initial Actions</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> On notification of the incident report to the ECC and log arrival</li> <li><input type="checkbox"/> Obtain briefing by Incident Commander</li> <li><input type="checkbox"/> Switch on computer and start Event Log Sheet Excel file.</li> <li><input type="checkbox"/> Update Event Log Sheet with the latest information (ensuring information is current, neat and legible)</li> <li><input type="checkbox"/> Maintain a dated and timed record of EMT information, actions and communications</li> </ul>
<b>Further Actions</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Liaise with Planning Chief and other Section Chiefs and update Status Boards</li> <li><input type="checkbox"/> Commence a time record for key information about the incident including: <ul style="list-style-type: none"> <li>• Record the EMT members present</li> <li>• Record the latest status on the Status Board</li> <li>• Record actions to be taken</li> </ul> </li> <li><input type="checkbox"/> Record Briefings and Time Outs</li> </ul>
<b>Final Actions</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Attend debrief and provide support for incident investigation</li> <li><input type="checkbox"/> Collate all personal logs ready for incident review and provide to Incident Commander.</li> </ul>

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## 6. Training, Exercises and Review

### 6.1. Training

PCML personnel will receive training relating to the current OSRP through a Plan Roll-Out Workshop. Specific operator training in the use of oil spill response equipment will be provided.

The International Maritime Organisation (IMO) and PIMMAG provide details of recommended training courses (**Appendix 6.1**).

PCML shall ensure that the key individuals identified in this OSRP are trained appropriately. An overview of the training required is summarised below in **Table 6.1**.

**Table 6.1: Level of Training Required for PCML personnel**

Emergency Response Role / Job Title	Course Standard		
	IMO Level 3	IMO Level 2	IMO Level 1
Senior Manager & All PCML EMT	✓		
HSE Staff	✓	✓	
Managers including OIMs, PSM and Drilling Supervisor		✓	✓
Damage Control Team (DCT)			✓

A database will be maintained containing a record, for all company personnel who have attended oil spill response training (or participated in oil spill response exercises) – refer to **Appendix 6.2**.

In addition, volunteers and contractors' workers shall be provided with appropriate briefing/training prior to undertaking designated activities as part of the overall spill response that they are suitably trained. For example, sufficient volunteers and contractors' workers should be trained in dispersant spraying, and the deployment of booms and skimmers from vessels.

## 6.2. Exercises

The purpose of exercises is to improve responder's skills and maintaining their awareness. Exercises will also provide management with an opportunity to assess equipment, familiarise personnel with their roles and responsibilities, measure performance, obtain feedback from participants and give a clear message about the company's commitment to oil spill preparedness and response. Any feedback or lessons learnt from oil spill exercises are compiled and analysed by the HSE Department for the response plan improvement.

**Table 6.2** provides an overview of the different types of exercises recommended.

A record of training and exercises undertaken will be maintained (**Appendix 6.2**). The training database will be updated with the most current information and relevant personnel will be notified of their training requirements. Any feedback or lessons learnt from oil spill exercises are compiled and analysed by the HSE Department for the response plan improvement.

Table 6.2: Overview of Exercises

Exercise	Description	Frequency
<b>Oil Spill Contingency Plan Workshop</b>	<ul style="list-style-type: none"> <li>Familiarisation of staff with roles, procedures and responsibilities;</li> <li>Review of each section of the plan by encouraging discussion to make useful and practical improvements to the plan.</li> </ul>	Yearly
<b>Notification</b>	<ul style="list-style-type: none"> <li>Practice of the procedures to alert and call out the emergency management teams;</li> <li>Conducted telephone or radio test, depending on the source of initial oil spill report;</li> <li>Test communications systems, availability of personnel, travel options and ability to transmit information quickly and accurately. Duration: 1-2 hours, held at any time of the day or night.</li> </ul>	Weekly  Weekly  Communications test once a month.
<b>Tabletop</b>	<ul style="list-style-type: none"> <li>Simulated oil spill incident to test teamwork, decision-making and procedures;</li> <li>Planning of a realistic scenario, clearly defined objectives for participants, exercise inputs, and a well briefed team in control of the running and debriefing of the exercise. Duration: 2-8 hours.</li> </ul>	Yearly
<b>Equipment Deployment Offshore and Shoreline Oil Recovery Equipment</b>	<ul style="list-style-type: none"> <li>Designed to give personnel a chance to become familiar with equipment, or part of a detailed and specific emergency response scenario, where maps, messages, real-time weather and other factors can be included;</li> <li>Test / evaluation of the capability of equipment, personnel or functional teams within the wider oil spill response;</li> <li>Verification of availability of oil spill response equipment and its working order;</li> <li>Level of difficulty can be varied by increasing the pace of the simulation or by increasing the complexity of the decision-making and co-ordination needs. Duration: 1 day.</li> </ul>	As and when required

### **6.3. Review**

A full review shall be conducted every three years. The recommendation arising from the review shall be submitted to PCML Management for approval.

In line with PCSB HSEMS, the review will cover wholly or any parts of the PCML Oil Spill Response Plan.

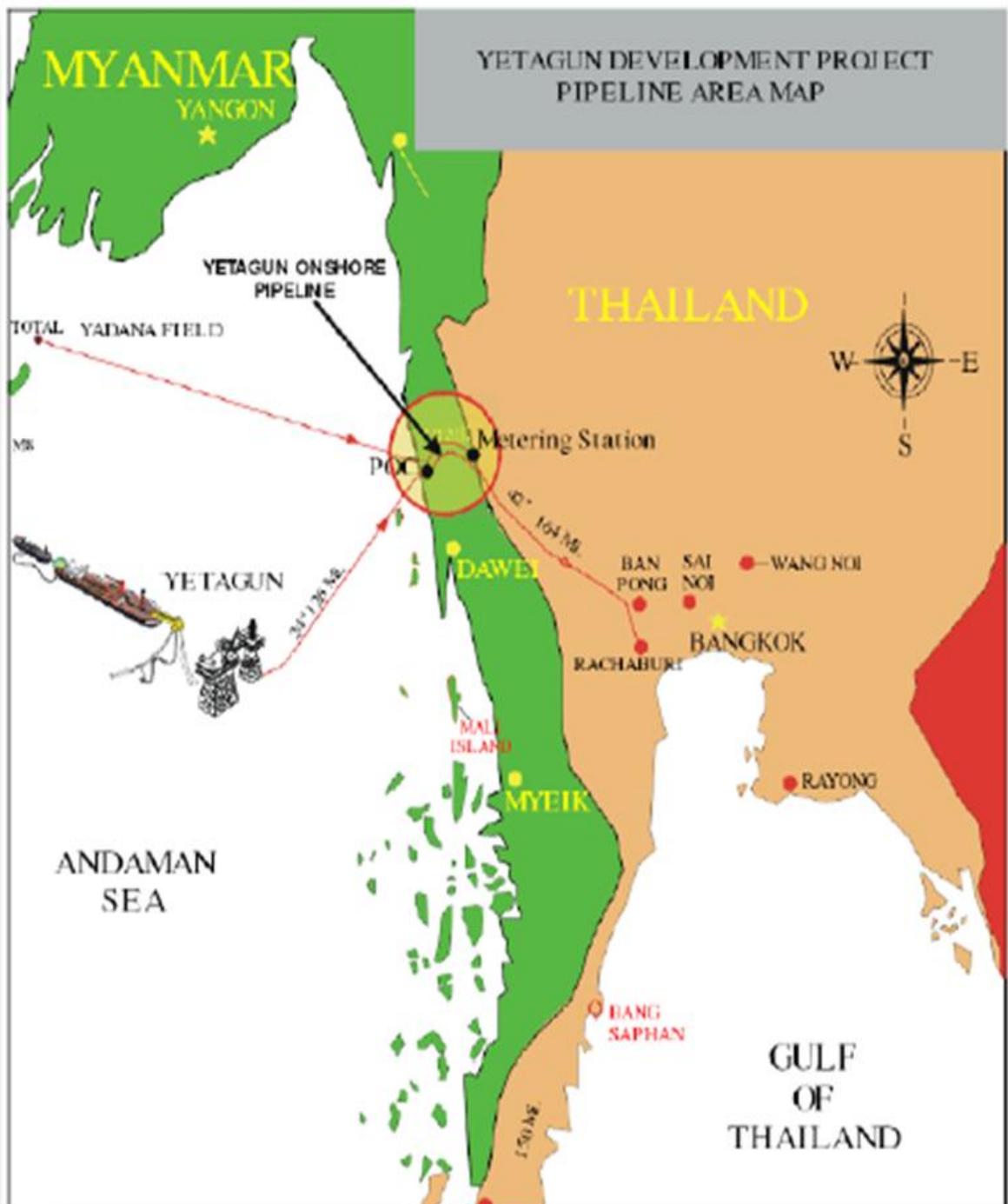
#### **6.3.1. Annual Preparedness Review (APR)**

The purpose of this review is to assess the level of preparedness in responding to oil spill incident. The review shall be carried out at least once every year.

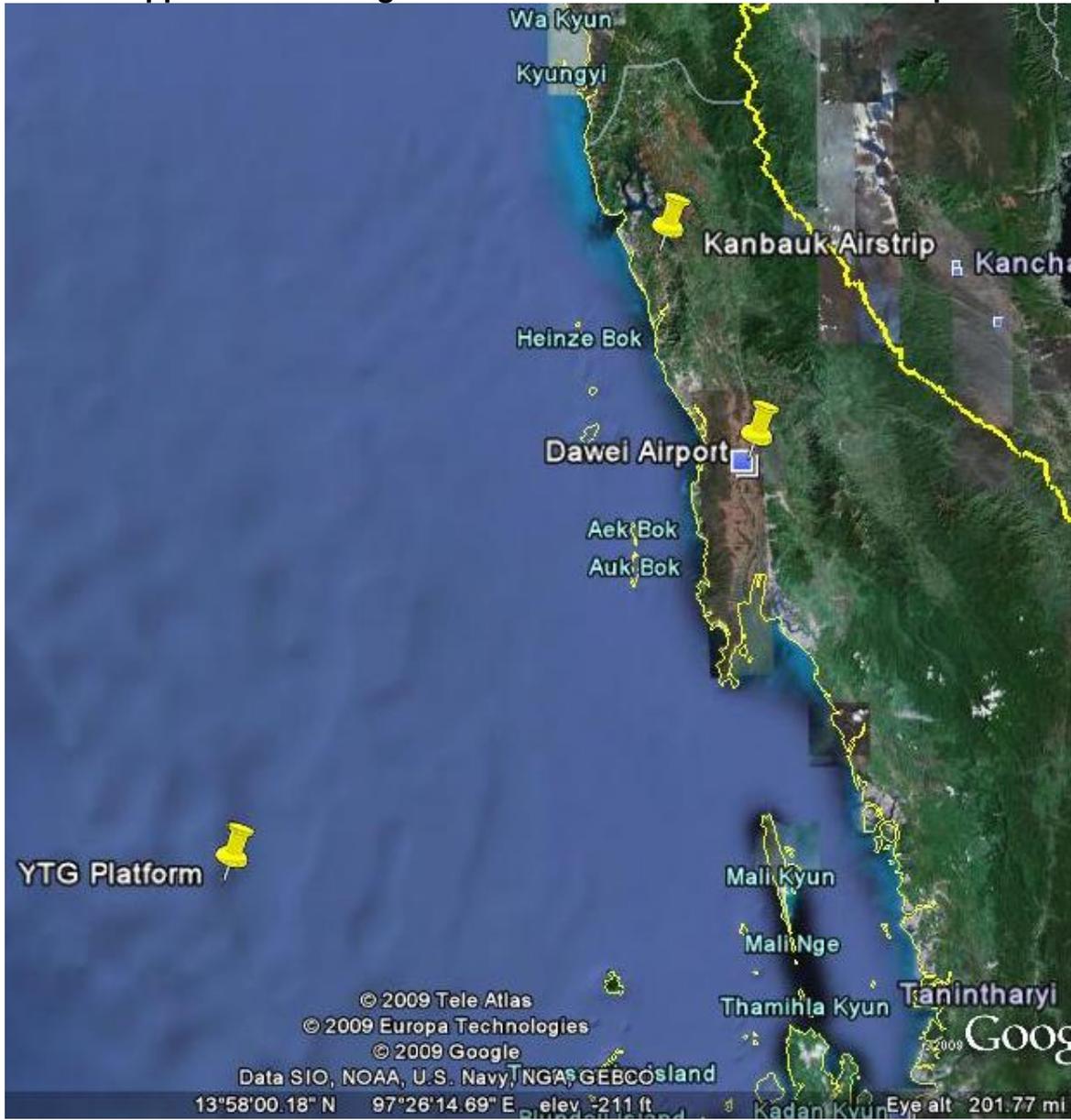
#### **6.3.2. Management Review**

The purpose of the review is to assess the overall effectiveness and adequacy of the PCML Oil Spill Response Plan. The management review shall be carried out yearly by the MO – HSE Committee (MOHSEC). Findings and recommendations shall be presented to the MO Management Committee (MOMC) for approval.

Appendix: 1.1 Fig 1 Fields Location and Sensitivities Map



Appendix: 1.1 Fig 2 Fields Location and Sensitivities Map



PCML Coordinate (Ref: Google Earth)		
Location	Latitude	Longitude
YGN Airport	16°54'03.67"N	96°08'01.90"E
Head Office	16°48'35.07"N	96°09'08.03"E
Thaketa Base	16°47'20.40"N	96°13'03.84"E
KBK Airstrip	14°37'02.34"N	97°58'54.22"E
POC	14°36'30.07"N	98°58'34.02"E
MS	14°40'48.97"N	98°21'32.08"E
YTG Platform	13°02'57.56"N	96°52'07.73"E
FSO	13°03'50.19"N	96°51'08.18"E
Dawei Airport	14°05'55.37"N	98°12'16.07"E
Base Station	14°04'19.09"N	98°12'22.75"E

## Appendix 2.1: List of JV Partners &amp; Embassies

JOINT VENTURE PARTNERS				
	Name	Designation	Office/Mobile	Fax
MOGE	OFFICER IN CHARGE	MD's Office	657667/657668 (Yangon)	95-1-657678
	Name	Designation	Yangon	Nay Pyi Taw
	U MYO MYINT OO	MD (MOGE)	09-830 4533	067- 411 056 (Off:) 067- 411 055 (Off:) 067- 411 125 (Fax) 067- 403 088 (Res:)
	U THAN TUN	DIRECTOR OFFSHORE (MOGE)	542728 (Residence) 09- 4300 8842	067- 411 009 (Off:) 067- 411 331 (Off) 067- 411 330 (Fax) 067- 420 701 (Res:)
NIPPON OIL	MR. KAZUNORI TANUMA	Manager, PC&BD Dept.II	+81-3-6275-5246	+81-3-3276-1359
NIPPON OIL	MR.MASAHIDE SHIMADA	Senior Geologist, PC&BD Dept. II	+81-3-6275-5246	+81-3-3276-1359
PTTEPI	KHUN KANOK INTHARAWIJITR	Senior Vice President, Myanmar Asset Division	667782 , 652700, 01, 02,03, 04	kanok@pttep.com
PTTEPI	MS NATRUDEEK KHOSITAPHAI	FOCAL (YETAUGUN PROJECT)	+662 5375784	+6625374909 (Fax) natrudeek@pttep.com

EMBASSIES		
MALAYSIAN EMBASSY	220248 / 220249 220230 / 220251	221840
BRITISH EMBASSY	370863 / 370864/370517 256918 / 256438 254657 / 254659/254865/254867	370866
US EMBASSY	536509 / 535756	511069
AUSTRALIAN EMBASSY	251810 / 251797/251798 246462/521809	246159
THAI EMBASSY	226 721 / 226 728/226 784	221713
SINGAPORE EMBASSY	559 001	559 002
INDONESIA EMBASSY	254465/ 254469/229750	254 468
PHILIPPINE EMBASSY	558149-52	558154
VIETNAM EMBASSY	511305	514897

HOTELS IN YANGON		
GOLDEN HILL TOWERS	558556, 558558	558557
SEDONA HOTEL	666900	666911, 666833
MICASA APARTMENT	650933	650950
SAKURA APARTMENT	525001	525002
MARINA APARTMENT	650651	650630
DUSIT INYA LAKE RESORT	662857/662866	665537
TRADERS HOTEL	242828	242800
CHATRIUM HOTEL	544500	544400
PARK ROYAL HOTEL	250388	252478

## Appendix 4.0 : INITIAL INCIDENT NOTIFICATION FORM

OPU to tick:	COMCEN to notify the following:	OPU to notify internally as follows:
<input type="checkbox"/> Tier 1	<input type="checkbox"/> <b>With IMPACT / HIGH POTENTIAL (HI-PO) - see list below*</b> <ul style="list-style-type: none"> <li>• PETRONAS Management Committee</li> <li>• VP Supply Chain and Risk Management</li> <li>• Head GHSED</li> <li>• GM CSD</li> <li>• GM HSE PMU (for Upstream Emergency only)</li> </ul> <input type="checkbox"/> <b>No IMPACT*</b> <ul style="list-style-type: none"> <li>• GM HSE PMU (for Upstream Emergency only)</li> </ul>	<ul style="list-style-type: none"> <li>• Notification list to be established by OPU / BU</li> </ul>
<input type="checkbox"/> Tier 2	<input type="checkbox"/> <b>With IMPACT / HI-PO - see list below*</b> <ul style="list-style-type: none"> <li>• PETRONAS Management Committee</li> <li>• VP Supply Chain and Risk Management</li> <li>• Head GHSED</li> <li>• GM CSD</li> <li>• GM HSE PMU (for Upstream Emergency only)</li> </ul> <input type="checkbox"/> <b>No IMPACT*</b> <ul style="list-style-type: none"> <li>• Head GHSED</li> <li>• GM CSD</li> <li>• GM HSE PMU (for Upstream Emergency only)</li> </ul>	<ul style="list-style-type: none"> <li>• Notification list to be established by OPU / BU</li> </ul>
<input type="checkbox"/> Tier 3	<ul style="list-style-type: none"> <li>• PETRONAS Management Committee</li> <li>• VP Supply Chain and Risk Management</li> <li>• Head GHSED</li> <li>• GM CSD</li> <li>• GM HSE PMU (for Upstream Emergency only)</li> </ul>	<ul style="list-style-type: none"> <li>• Notification list to be established by OPU / BU</li> </ul>
<b>* IMPACT / HI-PO (tick where relevant)</b>		
<b>Impact:</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Fatality</li> <li><input type="checkbox"/> Major injury (e.g. Permanent Partial Disability, Lost Workday Case more than 4 days)</li> <li><input type="checkbox"/> Significant environmental impact (e.g. groundwater contamination, vegetation damage, fish kill) or release above Tier 1 threshold quantity**</li> <li><input type="checkbox"/> Asset damage exceeding USD 25,000</li> <li><input type="checkbox"/> Local media / public concerns</li> <li><input type="checkbox"/> Security incident (e.g. arson, kidnapping, bomb threat, piracy, hijack)</li> </ul>		<b>Hi-Po:</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Incident with potential consequences leading to fatality or impact to organisational reputation</li> </ul>
<b>** Note</b> <ul style="list-style-type: none"> <li>i. Natural gas, Methane, Ethane, Propane, Butane, LPG, LNG = 500 kg</li> <li>ii. Petrol, Gasoline, Methanol, above 15 API Gravity Crude oil = 1000 kg or 7 bbl</li> <li>iii. Diesel, below 15 API Gravity Crude oil = 2000 kg or 14 bbl</li> <li>iv. For other material, please refer to API 754 Standard</li> </ul>		

	<b>NOTIFICATION FORM</b>		<b>BU / OPU:</b>		
			<b>Tel:</b>		
			<b>Fax:</b>		
<b>*** Mandatory to be filled up for initial notification</b>					
<b>Type of Notification ***</b>	<input type="checkbox"/> Initial <input type="checkbox"/> Update <input type="checkbox"/> Stand Down / All Clear				
<b>Response Tier ***</b>	<input type="checkbox"/> Tier 1 <input type="checkbox"/> Tier 2 <input type="checkbox"/> Tier 3				
<b>SECTION A: BASIC INFORMATION ***</b>					
<b>Department Responsible:</b>			Date Prepared:		
			Time Prepared:		
<b>Emergency Location:</b>	<input type="checkbox"/> Onshore:	Emergency Date:			
	<input type="checkbox"/> Offshore:	Emergency Time:			
<b>SECTION B: NATURE OF EMERGENCY / TYPE OF EMERGENCY ***</b>					
<b>HSE</b>	<input type="checkbox"/> Fatality	<input type="checkbox"/> Environment	<input type="checkbox"/> Fire / Explosion	<input type="checkbox"/> High Potential Incident (Hi-Po) (	
	<input type="checkbox"/> Loss of Containment / Gas Leak	Spillage / Release Volume:			
	Recovered Volume:				
<b>Security</b>	<input type="checkbox"/> Arson	<input type="checkbox"/> Kidnapping Hostage	<input type="checkbox"/> Bomb Threat	<input type="checkbox"/> Community Disturbance	
	<input type="checkbox"/> Others: Please specify				
<b>Transportation</b>	<input type="checkbox"/> Land	<input type="checkbox"/> Water	<input type="checkbox"/> Air	Please specify:	
<b>SECTION C: CASUALTY / FATALITY / MISSING ***</b>					
<b>Number of Injured Person</b>		<b>Number of Fatality</b>		<b>Number of Missing</b>	
<input type="checkbox"/> PETRONAS:		<input type="checkbox"/> PETRONAS:		<input type="checkbox"/> PETRONAS:	
<input type="checkbox"/> Contractor:		<input type="checkbox"/> Contractor:		<input type="checkbox"/> Contractor:	
<input type="checkbox"/> 3 <sup>rd</sup> Party:		<input type="checkbox"/> 3 <sup>rd</sup> Party:		<input type="checkbox"/> 3 <sup>rd</sup> Party:	
<b>SECTION D: EMERGENCY POTENTIAL ***</b>					
<input type="checkbox"/> Under control with available resources. No potential of escalation			<input type="checkbox"/> May require additional resources (e.g. authorities, contractors, mutual aid)		
<input type="checkbox"/> Authorities may take over command and control			<input type="checkbox"/> May trigger significant authorities / public / community / media interest		
<b>SECTION E: AUTHORITIES INFORMED</b>					
<b>Authorities / Date Informed:</b>	<input type="checkbox"/> Police ( )	<input type="checkbox"/> Fire Dept. ( )	<input type="checkbox"/> Medical ( )	<input type="checkbox"/> HSE Regulator ( )	<input type="checkbox"/> Others: e.g. Coast Guard, Marine Dept, Municipality, etc. ( )
<b>SECTION F: BRIEF DESCRIPTION OF EMERGENCY (Who, What, Where, When &amp; Consequence)</b>					

**SECTION G: RESPONSE ACTION TAKEN**

Empty space for recording response actions taken.

**SECTION H: COMMENT / ADDITIONAL INFORMATION**

Empty space for providing comments or additional information.

<b>SECTION I: STAND DOWN / ALL CLEAR</b>	<b>Date:</b>	<b>Time:</b>	
<b>Prepared / Reported by ***</b>	<b>Name:</b>		<b>Signature:</b>
	<b>Designation:</b>		
<b>Approved and Submitted by ***</b>	<b>Name:</b>		<b>Signature:</b>
	<b>Designation:</b>		

<b>Pollution Report Form (POLREP)</b>			
		<input type="checkbox"/> Urgent	<input type="checkbox"/> Critical
Date/Time of Report			
Date/Time of Incident			
Location of Incident			
Latitude:			Longitude:
Original Report Source			
Contact:	Phone/Mobile:	Fax/Email:	
Nature of incident and spill source (if source unknown give identity and position of adjacent vessels)			
Point of Discharge from Source:			
Cause of Discharge:			
Oil Type or Description:			
Has Discharge Stopped?			
Nature, Extent and Volume of Spill:			
Projected Trajectory of Spill:			
Samples Taken:	<input type="checkbox"/> Yes <input type="checkbox"/> No	Photographs Taken:	<input type="checkbox"/> Yes <input type="checkbox"/> No
Weather / Sea / Tide Conditions:			
Lead Response Agency:			
Primary Statutory Agency:			
Initial Response Action:			
Additional Information:			
Report Prepared By:	Phone/Mobile:	Fax/Email:	

## Appendix 4.2: List of Authorities to be Notified

MOGE				
MOGE	Name	Designation	Office/Mobile	Fax
	OFFICER IN CHARGE	MD's Office	657667/657668 (Yangon)	95-1-657678
	Name	Designation	Yangon	Nay Pyi Taw
	U MYO MYINT OO	MD (MOGE)	09-830 4533	067- 411 056 (Off.) 067- 411 055 (Off.) 067- 411 125 (Fax) 067- 403 088 (Res:)
U THAN TUN	DIRECTOR OFFSHORE (MOGE)	542728 (Residence) 09- 4300 8842	067- 411 009 (Off.) 067- 411 331 (Off) 067- 411 330 (Fax) 067- 420 701 (Res:)	

## Appendix 4.3: List of Authorized Signatories for Callout Requests

## LIST OF CONTACT NUMBERS

PARTIES	CONTACT NUMBERS	
	TELEPHONE	FAX
<b>PETRONAS HQ , KUALA LUMPUR</b>		
PETRONAS COMCEN	+603 21611703 / +603 2331 2141 / 2 / 3 / 4 +6012 3748702 / +6012 3168496	+6 03 2161 1696
<b>PCSB HQ, KUALA LUMPUR</b>		
DATUK ANUAR MOHD TAIB VP/CEO PETRONAS DEVELOPMENT & PRODUCTION	+6012 8772029(h/p) +6012 906566	
SHARBINI BIN SUHAILI HEAD PRODUCTION INTERNATIONAL	+6 03 2331 1965(off) +6 01 2807 6607(h/p)	+6 03 2331 5372
ZAMRI HARUN HR FOCAL PERSON	+6 03 2331 4039 (off) +6 01 7363 0489 (h/p)	+6 03 2331 6677
SYED NAHAR SYED ELLIAS HEAD, HSE OPERATIONS	+603 2331 5741(off)	+6 03 2331 5742
PCSB HQ DUTY MANAGER	+6 03 2331 8279 (ECC) +6 01 9213 7330 (h/p)	+603 2331 8280

<b>PETRONAS &amp; PCML, YANGON</b>		
AHMAD LUTPI BIN HARON HEAD (MYANMAR OPERATIONS)PCML	515011 ext:3002 (off) 09 518 9317(h/p)	515092
JAYANG UNDUM MANAGER PRODUCTION DEPT.	515011 ext: 3096 (off) 09 5035337 (h/p)	525698
ANNIE NILAR SEIN MANAGER HUMAN RESOURCE MANAGEMENT DEPT.	515011 ext: 3039 (off) 09 519 7056 (h/p)	525698
KHIN MOE KYU MANAGER FINANCE & ACCOUNTING DEPT.	515011 ext: 3048 (off) 09 510 1454 (h/p)	525698
EDWARD ZAN MANAGER CORPORATE AFFAIRS & ADMINISTRATION DEPT.	515011 ext:3004(off) 09 511 4216 (h/p)	525698
SUNNY@ LINN THURA HTUN MANAGER HEALTH,SAFETY & ENVIRONMENT DEPT.	515011 ext: 3038 (off) 09 516 5876 (h/p)	525698
YAN NAING WIN MANAGER RELIABILITY & INTEGRITY ENGINEERING DEPT.	515011 ext: 3086 (off) 09 519 4985 (h/p)	525698
SHAHRIL B KAMARUDIN MANAGER MAINTENANCE ENGINEERING DEPT.	515011 ext: 3207 (off) 09 515 1692 (h/p)	525698
JAFRI BIN ABD RAHIM MANAGER SUPPLY CHAIN MANAGEMENT DEPT.	515011 ext:3166(off) 09 519 8343 (h/p)	515094
MOHD AZLAN SHAH BIN MOHAMAD MANAGER PLANNING DEPT.	515011 ext:3167 (off) 09 512 4304 (h/p)	525698
JAZMIE OSMAN MANAGER PROJECT DEPT.	515011 ext: 3152 (off) 09 513 1805 (h/p)	525698
AZMAN B AHMAT KAMIS MANAGER PETROLEUM ENGINEERING DEPT.	515011 ext: 3149 (off) 09-504 2610 (h/p)	525698
AZLAN B M SABIRIM MANAGER EXPLORATION DEPT.	515011 ext: 3198 (off) 09 535 1123 (h/p)	525698
M SHAUFI B DAHLAN MANAGER DRILLING DEPARTMENT	515011 ext: 3145 (off) 09 5046977 (h/p)	525698

**PCML EMERGENCY COORDINATION TEAM**

PCML Yangon Office <b>#16 Shwetaung Kyar (Golden Valley Road)</b> Bahan Township Yangon	<b>Switchboard Tel:</b> Switchboard Tel: Fax: Inmarsat:	515011 526411 525698, 525684 +873 151 0230
<b>PCML Yetagun FSO/Yetagun Platform/Yetagun POC/Yetagun Metering Station</b> For telephone connection to the PCML Yetagun facilities from outside the PCML Yangon office, dial the PCML Yangon Switchboard (see above) and ask to be connected to the required facility.		
INCIDENT COMMANDER	Ext: 3170(EMT) DL: 662538 (EMT) 09 519 3367 (h/p) (As per weekly roster)	525698
OPERATIONS CHIEF	Ext: 3171 (EMT) OPS - 09 519 3872 FSO/SBM - 09 508 5070	525698
PLANNING CHIEF	Ext: 3172 (EMT) 09 519 4187 (h/p)	525698
LOGISTICS CHIEF	Ext: 3173 (EMT) 09 519 4253 (h/p)	525698
FINANCE & HR CHIEF	Ext: 3142 (EMT) 09 519 4513 (h/p)	525698
HSE & LIAISON OFFICER	Ext: 3143 (EMT) 09 519 4569 (h/p)	525698
NOK & Media Liaison Officer	Ext: 3140 (EMT) 09 519 4607 (h/p)	525698
HOST LIAISON COORDINATOR	515011 Ext:3138 09-862 3374	525698
AVIATION COORDINATOR	515011 ext: 3042 09 519 1018 (h/p)	525698
THAKETA WAREHOUSE COORDINATOR	515011 Ext: 3063 09 513 4361	525698
IT ENGINEER	09 519 4984 (h/p)	525698
TELECOMM ENGINEER	09 519 4670 (h/p)	525698
PCML DRIVER	515011 Ext: 3271,3270,3070	

ECC email: [ecc.myanmar@petronas.com.my](mailto:ecc.myanmar@petronas.com.my)  
[yangon\\_ic@petronas.com.my](mailto:yangon_ic@petronas.com.my)

ECC Fax: + 95(1) 525698

<b>YETAGUN FSO</b>		
SUPERINTENDENT / OIC	3391/3398 +870 330-808-510	3392 +870 330-808-512
<b>YETAGUN</b>		
OIM	00 870 772 520 445/00 870 772 520 444	00 870 782 441 513
<b>POC</b>		
PSM	00 870 772 520 443	
<b>YANGON</b>		
ECC ROOM	00 873 763 050 625	
<b>METERING STATION</b>		
PCML Metering Station	00 870 772 520 810	
<b>ROMIC TIDE</b>		
MASTER	001 713 357 6342	
<b>REYNALDO TIDE</b>		
MASTER	001 713 357 6350	

<b>OTHERS</b>		
SOS/AEA CLINIC	667877, 667871	667866
INTERNATIONAL SCHOOL (ISY)	512793 / 512794/512795	525020
FIRE EMERGENCY	191	
POLICE	199	

<b>DAWEI</b>		
DAWEI BASE STATION	(059) 21107/098613199	(059) 22363

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**Appendix 4.4: List of PCML Oil Spill Response Equipment and Materials****1 Onboard Yetagun Platform**

The following resources are available for immediate use to combat an oil spill in the field:

**1.1 Oil Spill Response Spill Kit #2 unit at Yetagun A**

- 25x General Purpose Sorbent Pad
- 2x General Purpose Sorbent Boom
- 1x General Purpose Folded Sorbent
- 1x Disposable Coveralls XL
- 1x 120L Wheely Bin
- 1x Pair of Solvent and Oil Resistant Gloves
- 1x Contaminated Waste Bag
- 1x Spill Response Procedures

**1.2 Oil Spill Response Spill Kit #3 unit at Yetagun B**

- 25x General Purpose Sorbent Pad
- 2x General Purpose Sorbent Boom
- 1x General Purpose Folded Sorbent
- 1x Disposable Coveralls XL
- 1x 120L Wheely Bin
- 1x Pair of Solvent and Oil Resistant Gloves
- 1x Contaminated Waste Bag
- 1x Spill Response Procedures

**1.3 Oil Spill Response Spill Kit #3 unit at Yetagun C**

- 25x General Purpose Sorbent Pad
- 2x General Purpose Sorbent Boom
- 1x General Purpose Folded Sorbent
- 1x Disposable Coveralls XL
- 1x 120L Wheely Bin
- 1x Pair of Solvent and Oil Resistant Gloves
- 1x Contaminated Waste Bag
- 1x Spill Response Procedures

**2 Onboard the Standby/Supply Vessels**

The following resources are available onboard the dedicated Standby/Supply Vessel Reynaldo Tide and Romic Tide:

**REYNALDO TIDE  
INVENTORY OF EMERGENCY OIL SPILL EQUIPMENTS**

No.	Description	Quantity
1	Oil Dispersant	40Liters
2	Degreaser	3 Cans
3	Absorbent Sand	4 Sacks
4	Saw Dust	6 Sacks
5	Plastic Shovel	2 Pcs
6	Hand Pump with Hose	1 Set
7	Mop Head with Handle	2 Pcs
8	Scoop (Dust Pan)	2 Pcs
9	Plastic Bags	3 Bdl
10	Plastic Bucket	2 Pcs
11	Goggles	4 Pairs
12	Rubber Gloves	3-Pairs
13	Absorbent Pad	580-Pcs
14	Disposable Coverall	5 Pcs
15	Heavy Duty Boom	8 Length
16	Absorbent Pillows	10 Pcs
17	Absorbent Sock	12 Length
18	Disposable Bags With Tie	10 Pcs
19	One Ton Polytex Heavy Duty Bag	1 Pc

**ROMIC TIDE  
INVENTORY OF EMERGENCY OIL SPILL EQUIPMENTS**

No.	Description	Quantity
1	Oil Dispersant	40Liters
2	Degreaser	3 Cans
3	Absorbent Sand	4 Sacks
4	Saw Dust	6 Sacks
5	Plastic Shovel	2 Pcs
6	Hand Pump with Hose	1 Set
7	Mop Head with Handle	2 Pcs
8	Scoop (Dust Pan)	2 Pcs
9	Plastic Bags	3 Bdl
10	Plastic Bucket	2 Pcs

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11	Goggles	4 Pairs
12	Rubber Gloves	3-Pairs
13	Absorbent Pad	580-Pcs
14	Disposable Coverall	5 Pcs
15	Heavy Duty Boom	8 Length
16	Absorbent Pillows	10 Pcs
17	Absorbent Sock	12 Length
18	Disposable Bags With Tie	10 Pcs
19	One Ton Polytex Heavy Duty Bag	1 Pc

### 3 Aerial Surveillance

Aerial surveillance is available from the dedicated Helicopter Contractor (Heli Union Helicopters).

### 4 On board FSO

Refer to FSO Shipboard Oil Pollution Emergency Plan (SOPEP)

### 5 Yangon Office

The following resources are available onshore to supplement Yetagun offshore infield responses to Tier 1 – 3 spills.

For Tier 1 equipment responses:

- Back-up packs – additional packs of for containing / absorbing oil spills.

For Tier 2 and 3 responses:

- Helicopter surveillance and trained observers.
- Specialist advice for dealing with the potential environmental impact.
- Government resources.

## Appendix 4.5: List of Other Agencies for Assistance

CONTRACTOR REPRESENTATIVE		
CONTRACTORS REPRESENTATIVE	Ext: 3141 (EMT) 370852/ 09 73212269 (CARIMIN) 09 508 5070(SBM) 556780/09 4500 44484 (TideWater) 09 862 4137 / 09 510 1453(TNS) 09 513 0398 / 647050 (IPSC) 09 515 0178 (AGS) 09 500 7439 (DARE) 539301/ 09 5001609 (M&A) 09 205 1415 (Heli Union) 571321/ 560378/094316312 (UE)	
TOTAL MYANMAR E&P		
YANGON HEAD OFFICE	650977/ 650989/ 660466	650478/ 650479
TEPM DUTY OFFICER	09 500 9241 09 99 28005	
HSE & SECURITY MANAGER	650989 (EXT: 3248)	

## Mobilisation Authorisation Form



**Oil Spill Response's** details:

**WARNING!** Ensure telephone contact has been established with the Duty Manager before using e-mail and fax communications.

To	Duty Manager		
Southampton Emergency Fax	+44 (0)23 8072 4314	Singapore Emergency Fax	+65 6266 2312
Southampton Telephone	+44 (0)23 8033 1551	Singapore Telephone	+65 6266 1566
Email	dutymanagers@oilspillresponse.com		

### Authoriser's Details

Subject	Mobilisation of <b>Oil Spill Response</b>
Date	
Name	
Company	
Position	
Contact Telephone Number	
Contact Mobile Number	
Contact Email Address	
Incident Name	
Invoice Address	

I, authorise the activation of **Oil Spill Response** and its resources in connection with the above incident under the terms of the Agreement in place between above stated Company and Oil Spill Response Limited.

Signature:

If **Oil Spill Response** personnel are to work under another party's direction please complete details below:

Additional Details	
Name	
Company	
Position	
Contact Telephone Number	
Contact Mobile Number	
Contact Email Address	

## Notification Form

**COMPLETE BOTH PAGES** (Page 1 of 2)

*Oil Spill Response's* details:

**WARNING!** Ensure telephone contact has been established with the Duty Manager before using email and fax communications.

To	Duty Manager		
Southampton Emergency Fax	+44 (0)23 8072 4314	Singapore Emergency Fax	+65 6266 2312
Southampton Telephone	+44 (0)23 8033 1551	Singapore Telephone	+65 6266 1566
Email	<a href="mailto:dutymanagers@oilspillresponse.com">dutymanagers@oilspillresponse.com</a>		

**Section 1** Obligatory Information Required – Please Complete All Details

Name of person in charge	
Position	
Company	
Contact telephone number	
Contact Mobile number	
Contact fax number	
E-mail address	

**Section 2** Spill Details

Location of spill	
Description of slick (size, direction, appearance)	
Latitude / longitude	
Situation (cross box)	<input type="checkbox"/> Land <input type="checkbox"/> River <input type="checkbox"/> Estuary <input type="checkbox"/> Coastal <input type="checkbox"/> Offshore <input type="checkbox"/> Port
Date & time of spill	<input type="checkbox"/> GMT <input type="checkbox"/> Local
Source of spill	
Quantity (if known)	<input type="checkbox"/> Cross box if estimate
Spill status (cross box)	<input type="checkbox"/> On-going <input type="checkbox"/> Controlled <input type="checkbox"/> Unknown
Action taken so far	
Product name	
Viscosity	
API / SG	
Pour point	
Asphaltene	

**Section 3** Weather

Wind speed & direction	
Sea state	
Sea temperature	
Tides	
Forecast	

**Notification Form**



**COMPLETE BOTH PAGES (Page 2 of 2)**

**Section 4 Additional Information Required  
Please Complete Details If Known**

Resources at risk	
Clean-up resources	
On-site / Ordered	
Nearest airport (if known)	
Runway length	
Handling facilities	
Customs	
Handling agent	

**Section 5 Vessel availability**

Equipment deployed	
Recovered oil storage	

**Section 6 Equipment logistics**

Transport	
Secure storage	
Port of embarkation	
Location of command centre	
Other designated contacts	

**Section 7 Special requirements of Country**

Security	
Visa	
Medical advice	
Vaccinations	
Others (specify)	

**Section 8 Climate Information**


**Section 9 Other Information**


<b>Situation Report Form (SITREP)</b>		
Report number:	Report date:	Time issued:
Incident name:		
Incident location:		
Latitude:	Longitude:	
Date of incident:	Time of incident:	
Type of incident:		
Brief account of incident:		
Assets affected:		
Nature, extent and volume of spill:		
Third parties involved:		
Incident objectives:		
Summary of events since last report:		
Expected developments:		
Planned course of action:		
Other pertinent information:		
Report Prepared By:	Position:	
Phone/Mobile:	Fax/Email:	

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## 1. Monitor and Evaluate, including Aerial Surveillance

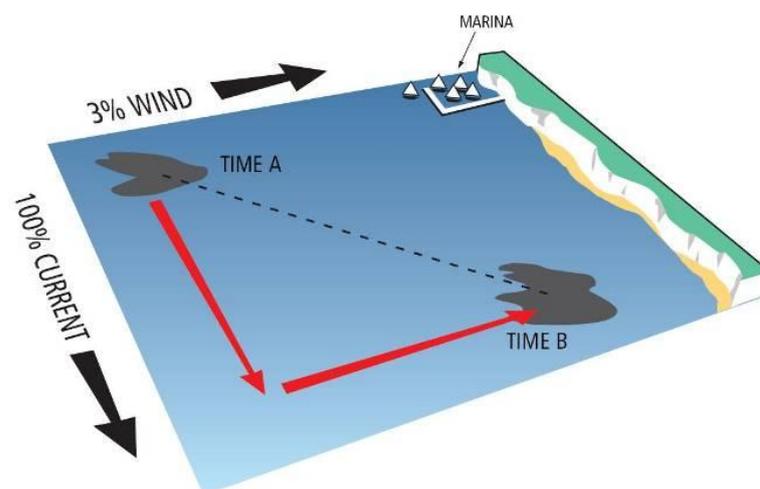
### 1.1. Resources Available

PCML will charter helicopters which can be utilised for aerial surveillance (usually engaged in crew transfer operations). Further surveillance platforms include the Drilling Rig's and standby / support vessels. *Oil Spill Response* can provide:

- Trained aerial surveillance personnel to a Tier 3 incident.
- Provide aerial surveillance training to local personnel as requested
- Oil spill computer modelling for assessing trajectory of oil based on real time conditions.
- Facilitate the mobilisation of aerial surveillance aircraft with remote sensing capabilities, including, Side Looking Airborne Radar (SLAR) and Infrared (IR) and Ultraviolet (UV) cameras.

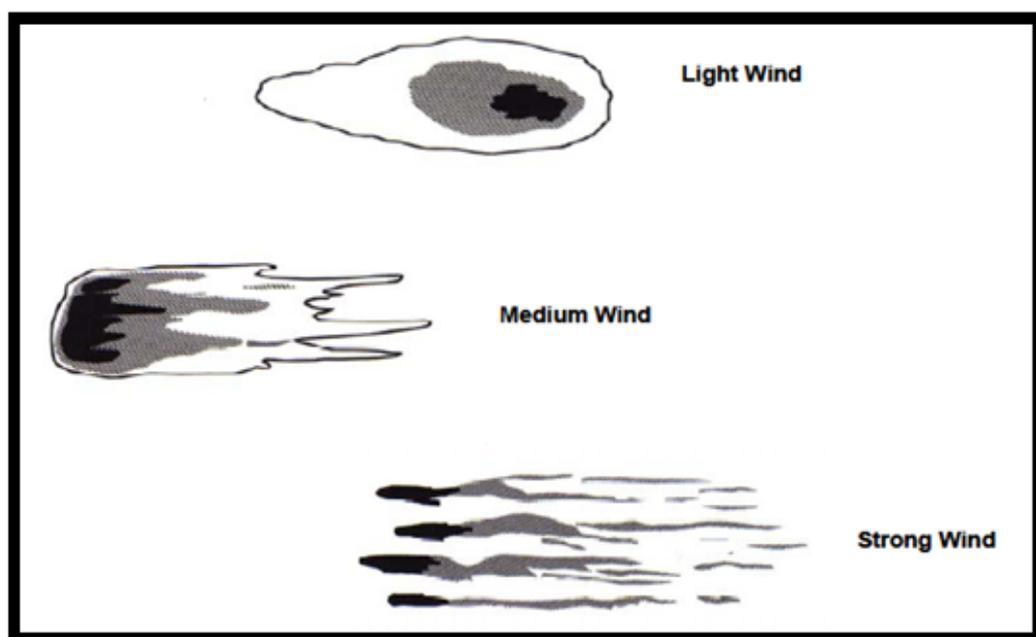
### 1.2. General Considerations

- Aerial surveillance provides the best option for monitoring a spill; however visual observation from sea level may be the only option initially, although this will not give a reliable overall picture especially for larger oil spill events.
- Aerial surveillance should be used to direct offshore dispersant application, and containment and recovery operations. It can also be used to assess and monitor the successfulness of these strategies.
- Prior to flying, obtain information on last known position of slick(s) and plot on a map. The use of oil spill modelling will provide an estimate of the slick position. For manual plotting, oil moves at approximately 100% of current speed and direction, and 3% of wind speed and direction as per below. For example, a current of 1 knot will move the slick 1nm in one hour. A wind speed of 10 knots will move the oil 0.3nm in one hour.



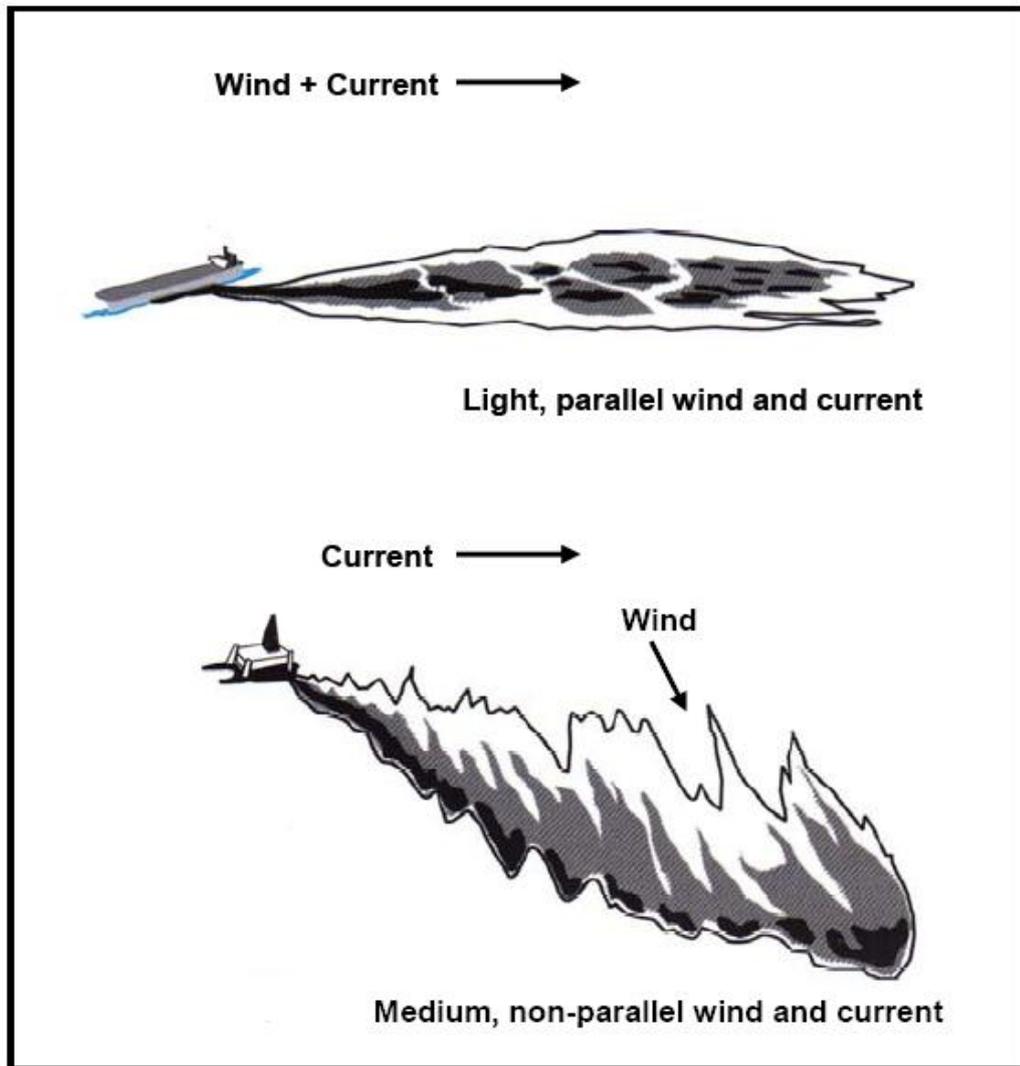
**Effect of Wind and Current on a Spill**

- Ensure the following are available for any surveillance flight: map/chart, polarising sunglasses, stopwatch, calculator, notebook, pencils, GPS with remote aerial and spare batteries (backup GPS track log and clear for new flight), digital camera and spare batteries, and a surveillance reporting form.
- For all surveillance flights: Obtain latest weather forecasts and current conditions; start observation at higher altitude (>1500ft) for a good overall picture; ensure there is a good viewing window, or consider flying with door open; ensure there are good communications with pilot; map out entire extent of oil slicks but concentrate on thicker parts.
- The shape and thickness distribution of fairly fresh oil spills depends on the oil properties, wind and currents. The wind spreads and elongates the spill, eventually cutting it into windrows and finally fragmenting, see below. The thickest patches move furthest downwind.



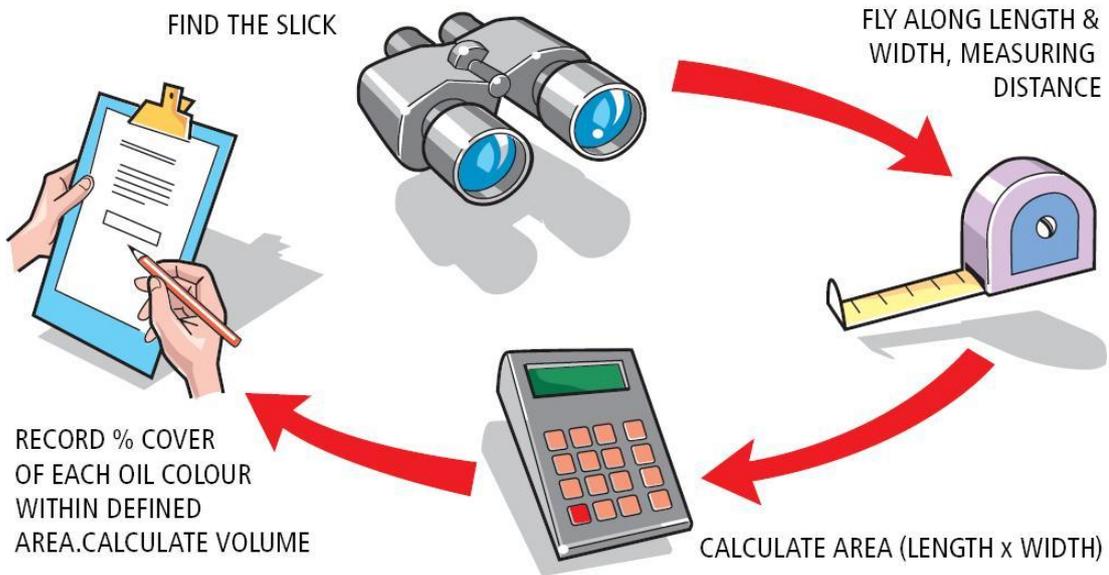
### Effect of Oil Spreading on the Sea Surface

- As time passes, the slicks will become 'weathered'; the sheen, rainbow and / or metallic films gradually disappear. Only very thick, highly emulsified patches remain, barely floating on the surface. In heavy weather, even large slicks / patches may not be visible and will be masked by waves.
- Breaking waves may fragment the patches so that they eventually become scattered lumps which become increasingly difficult to see. Continuous discharges will be shaped by the direction of the wind and current, see below.



Effects of Wind and Current Direction on Oil Spill Shape

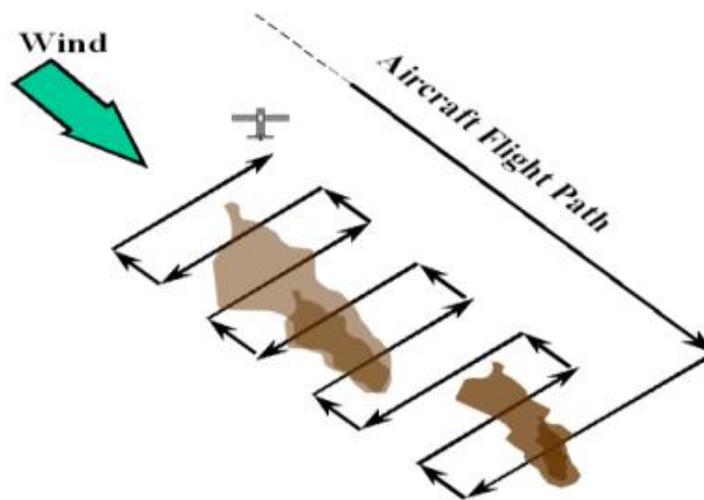
### 1.3. Key Steps in Aerial Surveillance



**Key Steps in Aerial Surveillance**

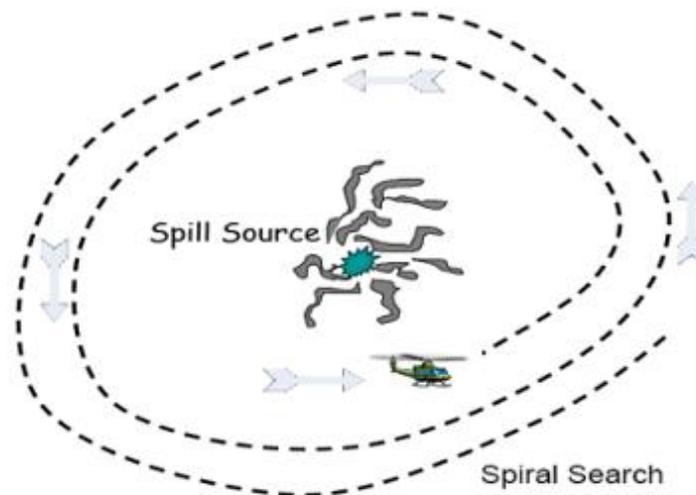
#### 1.3.1. Step 1: Find the Slick

- A ‘standard’ ladder search pattern is used when it is considered that the oil spill may be anywhere in the search area to an equal probability. It is known as the “Parallel Track Search/Ladder Search” as pictured below. It is the most economical method of surveying an area. The spacing between tracks should be 6 to 10 nm.



**Ladder Search Pattern**

- If there is an uncertainty as to the exact location/extent of the spill, a spiral pattern can be used to investigate the area of interest. It should be noted that spiral searches can be difficult operationally in a fixed wing aircraft.

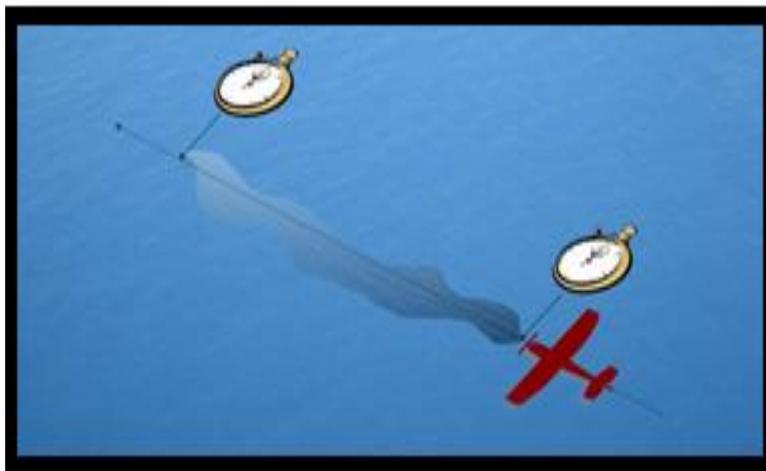


### Spiral Search Pattern

- The size of the search area should take into account possible errors in the initial release position, the navigational errors of the search units and the errors in the drift calculations. In general terms, 1 - 2 nm will account for any positional error. Drift error is expressed as a percentage of drift distance and 30% is normally used (drift distance x 0.3).
- It is recommended that, where practical, the long search legs be aligned at 90° to the direction of the prevailing wind to increase the chances of oil detection as floating oil has a tendency to become elongated and aligned in long, narrow, strips called 'windrows' typically 30 to 50 metres apart and lying parallel to the direction of the wind. However haze and dazzle reflected from the sea surface can often affect their visibility. Depending on the position of the sun it may be more beneficial to fly the search pattern with a different orientation.
- There is more chance of detecting targets at lower search speeds. Generally, the more difficult the target is to see because of size, colour, and light conditions etc., the lower the required search altitude. For lower altitudes, the track spacing will need to be closer and the search effectiveness will be reduced. An altitude of 1000 – 1500 feet is the usual range for daylight over water visual searches.

### 1.3.2. Step 2: Fly along the Spill and Measure

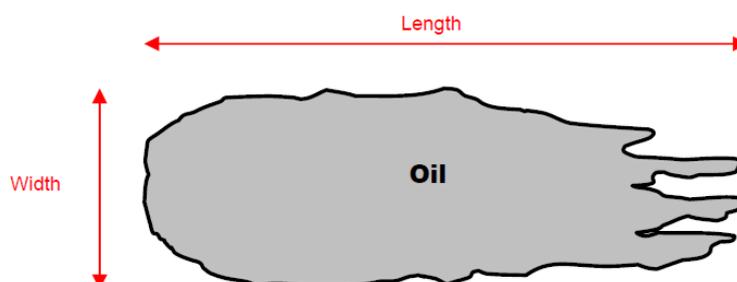
- Fly the length and width of the slick and record the time taken and the aircraft speed (note: 1 knot = 0.5m/second = 1.8 km/hour).
- Once the speed and times to fly the length and width are recorded, the area can then be calculated.



Timing the Flight along the Length of the Slick

### 1.3.3. Step 3: Spill Area Calculation

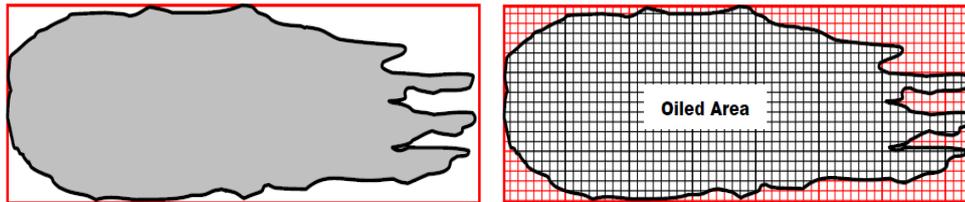
- Example – A helicopter flying at a ground speed of 120 knots (taken from the GPS or helicopter's flight instrument) takes 260 seconds to fly along the length of the slick and 70 second to measure the width.



- Length = (260 seconds x 120 knots) /3600 seconds in one hour = 8.67 nm = 16.05km
- Width = (70 seconds x 120 knots) /3600 seconds in one hour = 2.33nm = 4.32km
- Area = 16.04km (length) x 4.31km (width) = 69.13km<sup>2</sup>

#### 1.3.4. Step 4: Percentage Cover and Volume Calculation

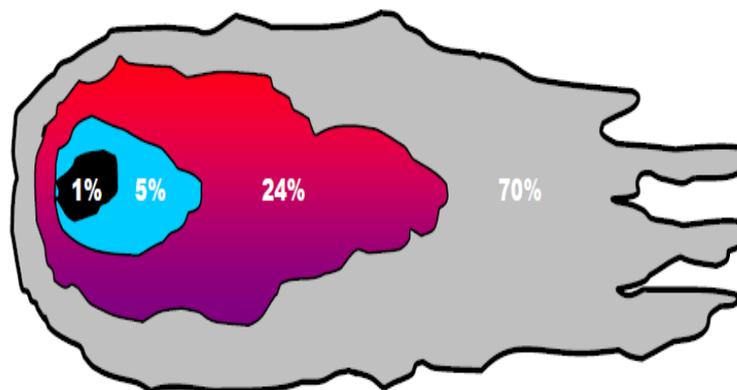
- The area covered with oil is calculated by placing a rectangle around a 'map' of the slick equal to the overall length and width, and calculating or estimating the percentage of the overall area covered by the oil.
- It can be difficult estimating the percentage of the overall area covered with oil in flight. All visual assessments should be carefully checked after landing. The use of grid overlays should be used to obtain accurate measurements of overall slick area from the recorded images or maps.



(a) Overall Area and Use of Grids to estimate Coverage – in this example, estimate of oil area is 80% and clear water 20%.

(b) Oiled Area =  $69.13 \text{ km}^2$  (overall area)  $\times$  80% (oiled area) =  $55.30 \text{ km}^2$

- The oiled area should be sub-divided into areas that relate to a specific oil appearance, see below, following the Bonn Agreement Oil Appearance Colour Code.
- Care should be taken in the allocation of coverage to appearance, particularly the appearances that relate to higher thicknesses (Discontinuous True Colour and Continuous True Colour).
- The assessment should be made in-flight and checked post flight using the grid overlay. Photographs, particularly those taken overhead using a digital camera and the visual assessment, should be used to verify data.
- It is generally considered that 90% of the oil volume will be contained within 10% of the oiled area (normally the leading edge up wind side of spill slick).



**Appearance of the Slick**

- In this example, 1% of the slick is continuous true colour, 5% metallic, 24% rainbow and 70% sheen.

- The Bonn Agreement Colour Code can be used to estimate minimum and maximum thickness for each identified colour, and then the overall minimum and maximum slick volume can be estimated (see **Table 1.1**). Full details are in the Bonn agreement Aerial Surveillance Handbook 2004 (<http://www.bonnagreement.org>).

**Table 1.1: Bonn Agreement Colour Code**

Colour Code / Appearance		Thickness (µm)	Volume (m <sup>3</sup> /km <sup>2</sup> )
<b>1. Sheen (silvery / grey)</b> Appearance is due to their thickness		0.04 to 0.30	0.04 – 0.3
<b>2. Rainbow</b> Rainbow oil appearance is independent of oil type		0.30 to 5.0	0.3 – 5
<b>3. Metallic</b> The appearance of the oil in this class is oil type dependent		5.0 to 50	5 – 50
<b>4. Discontinuous True Colour</b> The broken nature of the colour is due to thinner areas within the slick		50 to 200	50 – 200
<b>5. Continuous True Colour</b> Homogenous colour can be observed with no discontinuity as described in Colour Code 4		200 to > 200	> 200

- In the example used, the minimum and maximum oil volumes can then be calculated using the Bonn Agreement as per below:
  - Appearance 1 (Sheen) =  $55.3 \text{ km}^2 \times 70\% \times 0.04 \text{ µm} = 1.55 \text{ m}^3$
  - Appearance 2 (Rainbow) =  $55.3 \text{ km}^2 \times 24\% \times 0.3 \text{ µm} = 3.98 \text{ m}^3$
  - Appearance 3 (Metallic) =  $55.3 \text{ km}^2 \times 5\% \times 5 \text{ µm} = 13.83 \text{ m}^3$
  - Appearance 5 (Continuous True Colour) =  $55.3 \text{ km}^2 \times 1\% \times 200 \text{ µm} = 110.60 \text{ m}^3$
  - Total Minimum Volume =  $1.55 + 3.98 + 13.83 + 110.60 = 129.96 \text{ m}^3$

## 2. Allow to Evaporate

The fundamental principle of the plan must be that all spills that can be controlled will in fact be controlled.

### 2.1. Resources Available

By closely monitoring and evaluating any accidental release of product, the **OSC/PETRONAS** will be able to choose the most appropriate strategy to combat any pollutant risk. Given the high ambient air and sea temperature a suitable response strategy for such products as Light Oils (Diesel, Kerosene, Aviation fuel) might be one of allowing them to evaporate safely.

### 2.2. Considerations

- Immediately implement all fire, gas and explosive vapour safety precautions
- Emergency shut down if necessary
- Prevent further spillage (i.e. stop the spill or isolate the source)
- Quickly assess the size of spill and where it is moving. It is best seen from the air and usually appears as a silver or rainbow coloured sheen
- The best option is to monitor the spill and allow it to evaporate. Low viscosity oils spread very quickly on the open sea and form rainbow and silver sheen within a few hours. Evaporation will be rapid, and normally it will be difficult to see any remaining oil in the water 24 hours after the spill. If there is a high wind, evaporation will be faster
- Alert all nearby vessels and installations that there is a spill
- Use fire-fighting hoses to break up and to disperse the slick. Fire fighting vessels should approach the slick from upwind and at 90° to the direction of the current
- Establish exclusion and safety zones, and stop all vessels and aircraft from entering
- DO NOT deploy booms to redirect or divert the slick
- DO NOT try to recover the spill
- DO NOT use dispersants
- DO NOT burn
- Monitor spill movement
- When there is no further danger from the spill or gas, advise nearby ships and installations and lift the exclusion zone

### 3. Offshore Containment and Recovery

#### 3.1. Resources Available

Drilling Rig and standby vessel have onboard spill kits. PCML has offshore containment and recovery capability as per **Appendix 4.4**.

#### 3.2. Considerations

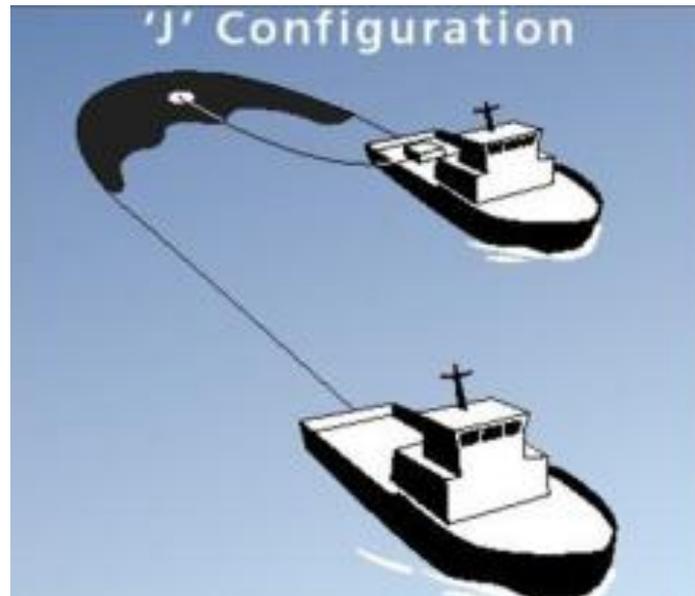
- Ensure safety is considered; stop any ignition sources and ensure gas monitoring is undertaken.
- Effective offshore recovery requires trained operators, suitable equipment, well-maintained equipment, vessel logistics, aerial support, temporary storage, transportation and waste disposal.
- Aerial surveillance should be used to direct vessels to areas of thickest oiling.
- Even in the most ideal conditions recovery rates will never be 100% and are actually more likely to be around 10 – 20%.
- The faster the response, the better the recovery rate as the spill will have had less time to spread and fragment.
- If ice is present on the waters surface it is likely that oil will become remobilised once there is a thaw.
- Operations are likely not possible, and are probably unsafe to attempt, in wave heights exceeding 2 m (failure of boom with oil being washed over) or in winds of more than 35 km/hr.
- Vessels suitable to deploy offshore boom must have sufficient deck space to house boom reels and power packs and sufficient vessel power rating (bollard pull) to tow the boom. Typically these vessels need to have a roller stern without a transom. In addition vessels need sufficient deck space to allow crew movement. To accommodate these arrangements minimum deck sizes are:
  - Deck space to stow 2 x 10ft containers safely and allow personnel movement
  - At least 2 m stern to deploy and inflate the boom.
  - Offshore boom towing vessel at least a 1.5 tonne bollard pull and 400 hp engine

### 3.3. Further Considerations

- Eddies behind the booms are an indication that they are being towed too fast.
- Oil lost under the boom will appear as globules or droplets rising 2-10m behind the boom.
- Sheens will often be present even when the boom is functioning well.
- In the event of a spill, the Tier 2/ 3 equipment will have to be loaded onto a suitable vessel for use offshore.
- Using an appropriate supply vessel, a number of booming and recovery configurations are available, as per below, with the advantages and disadvantages listed. The choice of configuration will rely on the number and type of vessels available for oil spill response.
- When towing a sectioned boom that has been joined in a 'U' configuration, an odd number of sections of boom either side of the join should be used to prevent having a join in the centre of the boom from which oil can more easily escape.
- To avoid sharp stress or snatching on a towed boom, lines between boom ends and the vessel should be of sufficient length. 50 m or more would be appropriate for towing a 400 m length of boom.
- Recovered oil could be pumped into the inflatable storage barge or the recovery oil tank of a standby vessel (a positive displacement pump such as a Desmi DOP 160 would be best suited for heavy oil or viscous emulsion).
- Very viscous oils or emulsions may need to be heated to pump.

### 3.4. Techniques

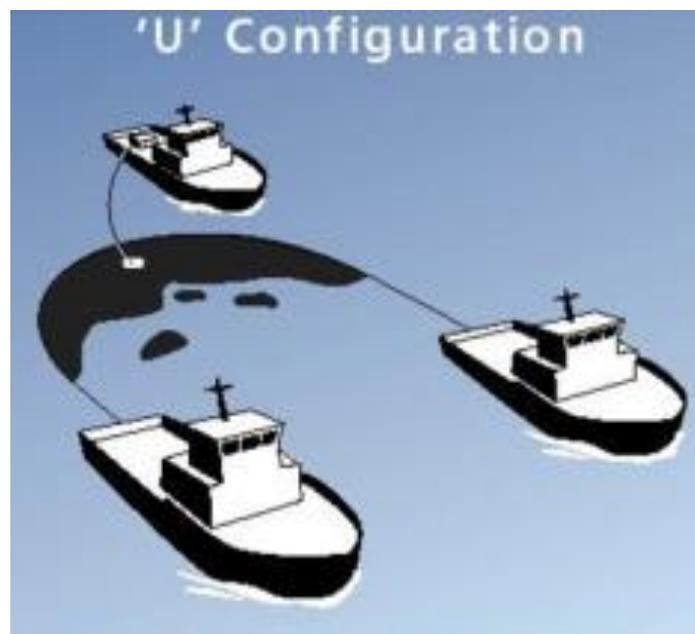
#### 3.4.1. J Configuration



**Advantage:** Only two vessels required,

**Disadvantage:** Smaller encounter than three vessel system

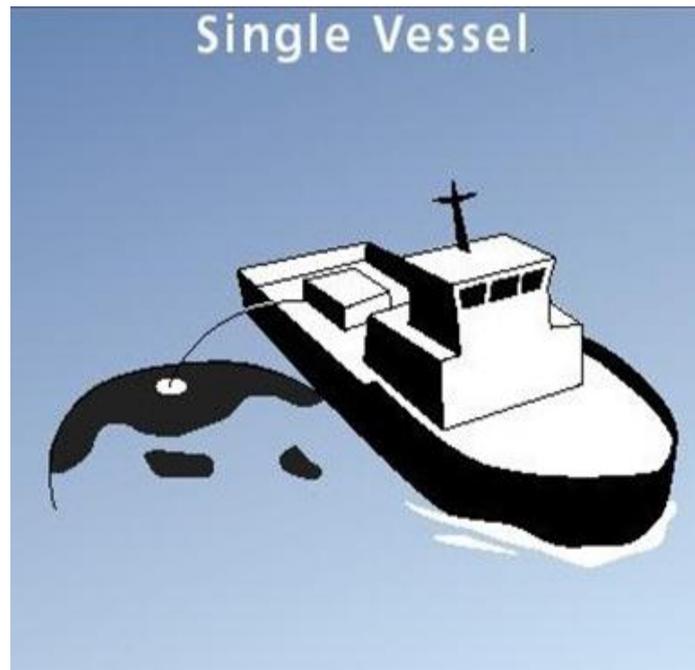
#### 3.4.2. U Configuration



**Advantage:** Wide encounter with oil,

**Disadvantage:** Logistics, Difficult to coordinate vessels, Wide boom apex.

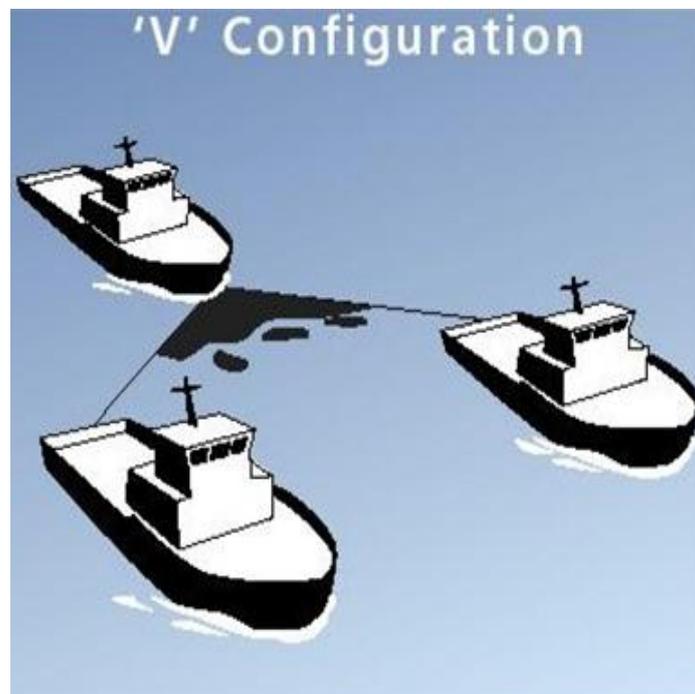
### 3.4.3. Single Vessel



**Advantage:** Logistics, Quick to deploy if available, Easy to maintain configuration when recovering

**Disadvantage:** Small encounter

### 3.4.4. V Configuration



**Advantage:** Wide encounter, Tight apex aids recovery

**Disadvantage:** Specialist equipment required, Skimmer vessel, Logistics.

## 4. Dispersant Application

### 4.1. Considerations

When dispersants are permitted the following limitations apply:

- The area of application shall be referred to the Environmental Impact Assessment Report where dispersants shall not be applied at areas classified as “Do not use dispersant on rising tide”;
- The water depth shall not be less than 10 meters (or 33 feet) in the area in which the dispersant will be applied
- Dispersant should only be applied to crude and not light oils such as diesel or heavy oils.
- The window of opportunity for dispersant spraying (especially with heavier oils) may be extremely limited – a decision to spray dispersants should be taken as soon as practicably possible.

### 4.2. Advantages

- Dispersants are an method of dealing with large volumes of oil in a short time;
- Dispersants aid in accelerating the natural degradation processes;
- Potential damage to marine fowl is reduced as oil is removed from the water surface;
- The dispersed oil droplets are not driven by the wind, thus reducing the speed of slick movement;
- Dispersed oil tends not to wet sediments, beach sand, etc.;
- Formation of tar balls and mousse is reduced as chemically dispersed oil tends not to coalesce;

The concentration of dispersed oil per unit volume of water will decrease rapidly;

### 4.3. Safety

- Adequate PPE (in particular goggles) for working in the vicinity of dispersant should be worn by personnel on vessels involved in or working near dispersant spraying operations
- Lifejackets should be worn when working on deck
- When lifting or operating equipment over the side of a vessel personnel should operate a buddy system

Gas monitoring should be conducted throughout operations within spill area

#### 4.4. Resources

##### 4.4.1. PCML's Resources

**PCML Oil Spill Response Equipment is listed as per Appendix 4.4**

#### 4.5. Steps to carry out dispersant application by vessel

##### 4.5.1. Step 1: Direct Vessels to Dispersant Application Site

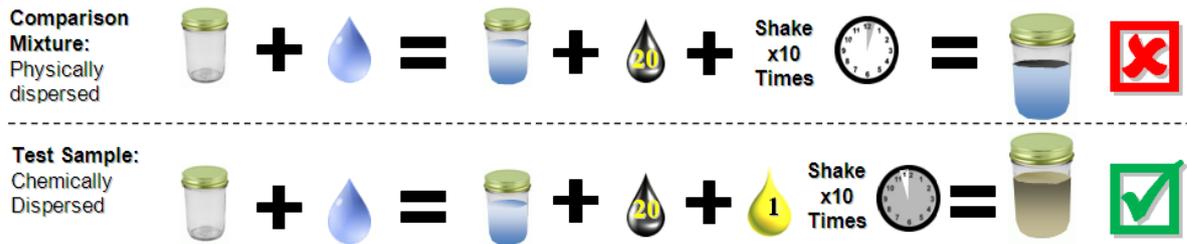
- Aerial surveillance should be utilised for all dispersant application operations to direct operations and monitor the effectiveness.
- The dispersant operation must be directed at the thickest portion of the slick (leading edge) and not the thinner iridescent silvery sheen areas.
- Dispersant application should be considered in offshore and near shore waters to prevent oil entering environmentally sensitive inshore areas.

##### 4.5.2. Prior to Application

- A simple field dispersant effectiveness test should be conducted on board the vessel to determine effectiveness, follow the procedure below
- Prior to wide scale application, a test spray should be conducted to ensure the dispersant will be effective in the marine environment.

OSC will arrange for dispersant effectiveness testing of oil when in a position to provide a suitable sample for laboratory analysis. If a spill occurs where the oil has not already undergone laboratory dispersant effectiveness tests, the OSC should instruct an Oil Spill Response Team Member to carry out the following test:

1. Take one glass jar and fill  $\frac{3}{4}$  with sea water;
2. Add 20 drops of oil to the water using the pipette, or if not available gently pour a small amount to cover the water surface to about 1 mm thickness;
3. Cap the jar and shake the oil and water mixture lightly about 10 times;
4. The oil and water should not mix very well and the droplets should rise to the surface quickly leaving the water fairly clear. This is your comparison mixture;
5. Take the second clean jar and repeat steps 1 – 3, but also add one drop of your dispersant to the mixture before shaking. This is your test sample;
6. The oil and water should now mix to form a cloudy mixture in the jar, with very small droplets that rise to the surface very slowly (> 1hr) if left undisturbed;
7. Compare your comparison mixture with the test sample. If the dispersant is effective you should see a marked increase in water cloudiness and less surface oiling. The greater the difference the more effective the dispersant, if the two jars show similar clarity dispersant has not been effective and alternative strategies should be explored.



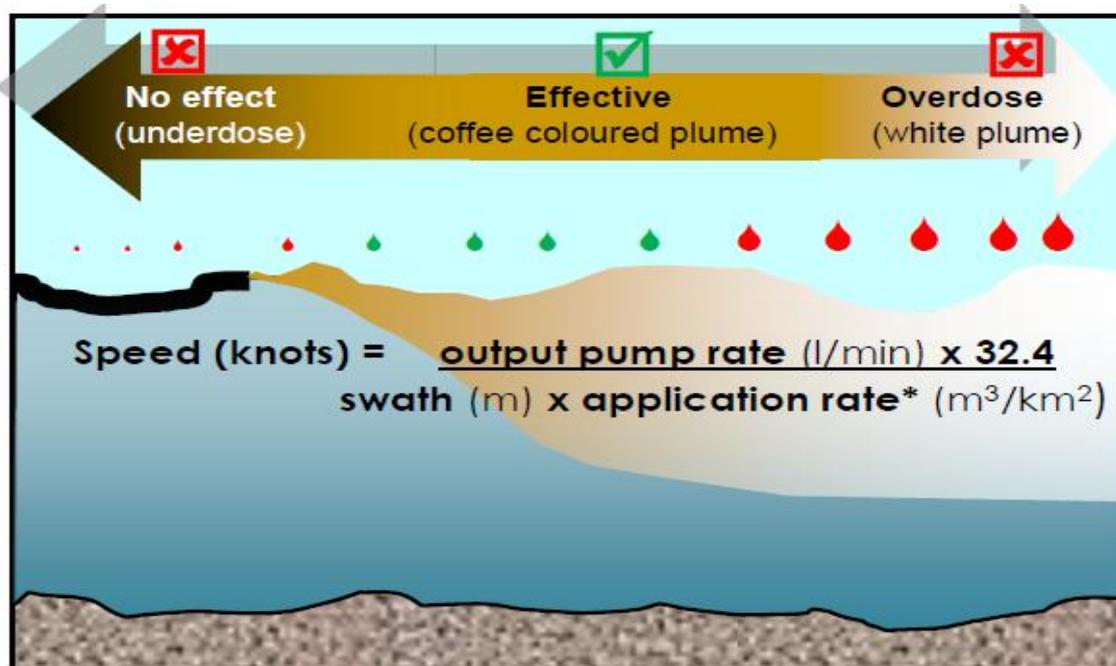
#### 4.5.3. Step 2A: Dispersant Application Technique

- Vessel speed should normally be between 5 and 10 knots.
- The spray arms or spray nozzle should be mounted at the bow to avoid the effect of the bow wave which can push the oil beyond the spray width. The bow wave will also provide the required mixing energy. Dispersant should be applied when steaming into the wind.
- Agitation will be required to produce the required mixing energy. In calm sea states the bow wave of the vessel should be sufficient. Applying dispersant in conditions above a Force 5 is not recommended as the turbulence will cover the oil and spray droplets will be blown away.

#### 4.5.4. Step 2B: Dispersant Application Rate

Typically the most efficient dispersant to oil ratio (DOR) is 1:20, but on fresh oils this can be a lot less (1:100).

The correct application is determined by pump rate and vessel speed (knots) as in the formula below:



DOR (Parts Dispersant : Parts Oil)	*Application Rate (m <sup>3</sup> / km <sup>2</sup> ) [assuming 0.1mm oil thickness]
1 : 20	5
1 : 40	2.5
1 : 60	1.67
1 : 100	1

#### Dispersant Dosage

*(Marine Operator's Dispersant Field Guide, Oil Spill Response 2009)*

#### 4.5.5. Step 3A: Monitor Effectiveness – Visual Monitoring

- A visual check of the spray area will indicate dispersant effectiveness. A grey / coffee colour plume indicates successful dispersion. Spraying too much dispersant will result in a cloudy white plume, too little and there will be no effect.



**Illustration of effective dispersant application (left) and ineffective dispersant application (right)**

*(Image from ITOPF Technical Information Sheet no. 4, 2005)*

#### 4.5.6. Step 3A: Monitor Effectiveness – Fluorometry Monitoring

- Ultra-violet fluorometry (UVF) can be used to provide an estimate of the concentration of dispersed oil in the water column during the application of dispersants. This technique can be provided by *Oil Spill Response*.
- Fluorometers emit light energy, different particle types re-emit energy at different wavelengths. The fluorometer is calibrated to record energy emitted by hydrocarbons.
- If deployed in an area with a high level of hydrocarbons distributed through the water column, the fluorometer will show a greater reading than in an area with no or only background levels of hydrocarbons.

Typically dispersant is considered effective if the fluorometer readings demonstrate 5 times or greater the levels of natural dispersion or background readings.

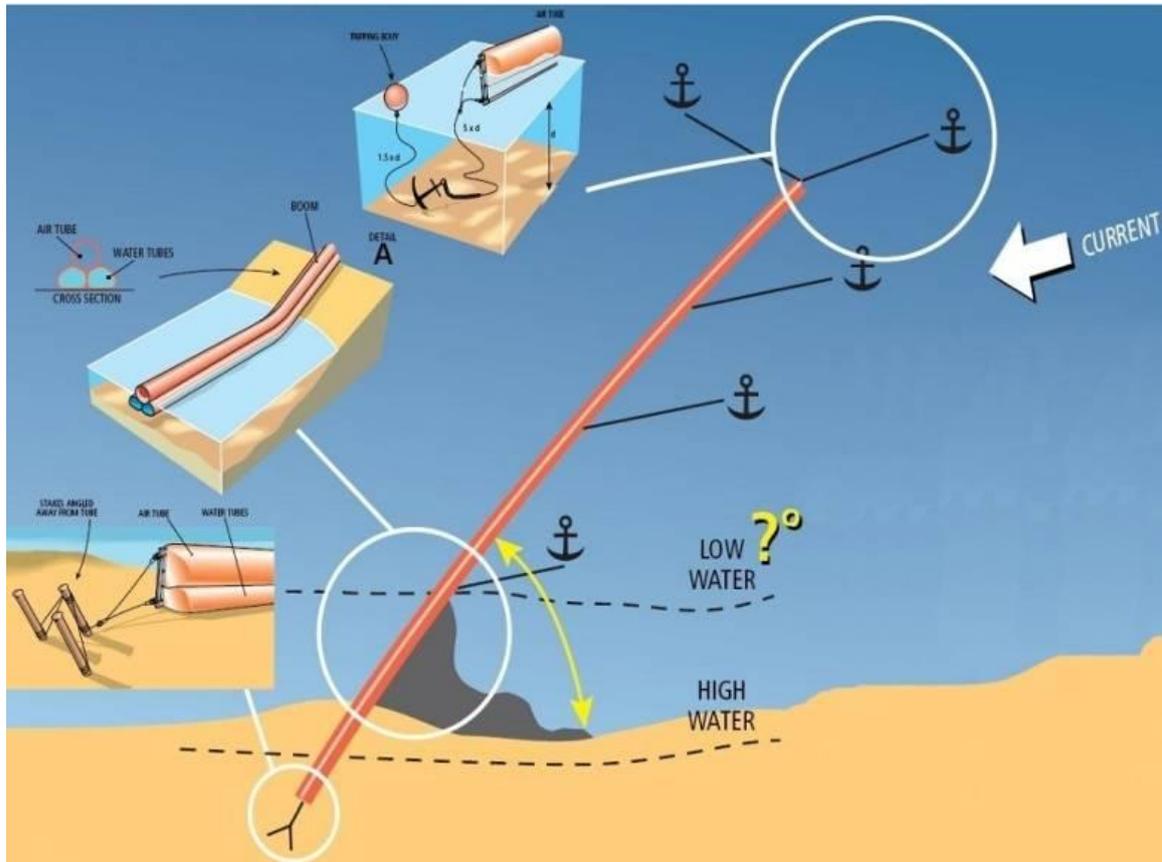
## 5. Shoreline Protection

### 5.1. Resources Available

Should any shoreline contamination occur, in order to mount an effective response operation, the following information should be used for awareness/guidance.

### 5.2. General Considerations

- In a Tier 2 incident (i.e. well blow-out) it is possible that oil may threaten the coastline and that of neighbouring countries (especially Brunei Darussalam on the northeast).
- The Authorities must be informed of the likely impact and strategic discussions must be initiated. The relevant local authorities according to the designated zones of the coastal zone should also be informed.
- Monitor and predict the trajectory of the spill to provide an indication of where the impact may occur. Suitable protection strategies can then be determined as appropriate
- Priority should be given to protecting coastal resources which are particularly sensitive to oil pollution and which can be boomed effectively if time allows (refer to the Environmental Sensitivity Index Map for Sarawak Coastline 2010).
- The principle of protection is to deflect oil away from those areas of most importance in order to minimise damage.
- It is often desirable to direct oil to an accessible, less sensitive part of the shoreline where it can be easily collected.
- The shoreline can be protected by deploying shore sealing booms to deflect or contain oil as appropriate.
- Boom is best deployed at an angle to the current to reduce the possibility of oil escaping beneath the boom.
- It is desirable that a good seal is made between the boom and the intertidal zone at low tide.
- Be prepared to allow oil to beach at areas that are of a lower sensitivity. It is better to use inshore booming techniques, as illustrated below, to redirect oil away from sensitive locations to less sensitive areas where oil can be easily recovered.



Inshore Booming

## 6. Shoreline Cleanup

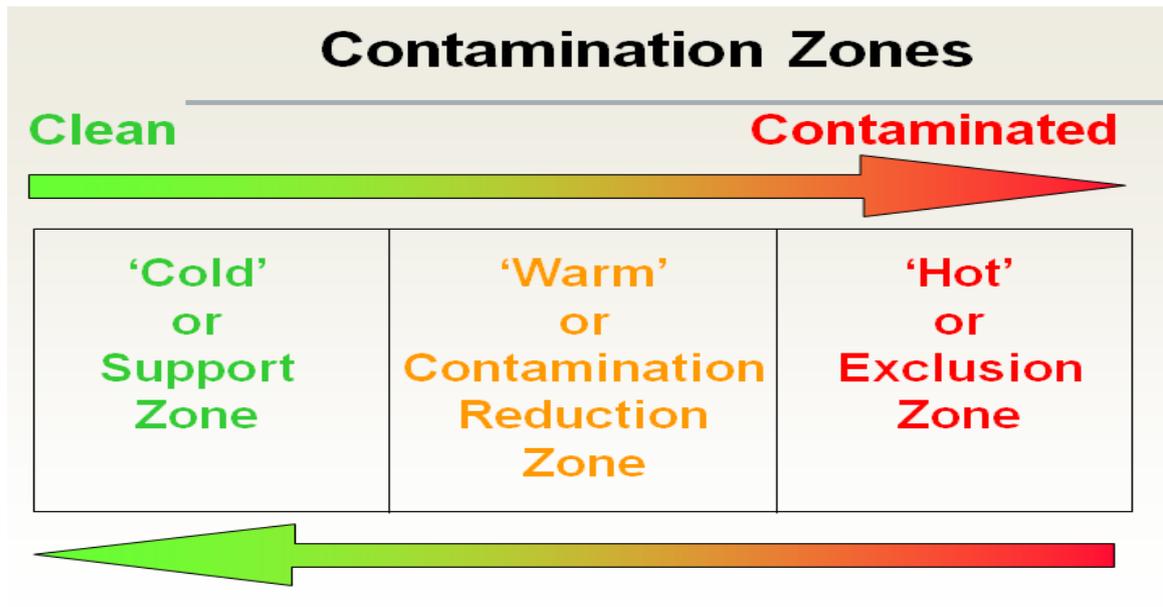
### 6.1. Resources Available

Should any shoreline contamination occur, in order to mount an effective response operation, the following information should be used for awareness/guidance.

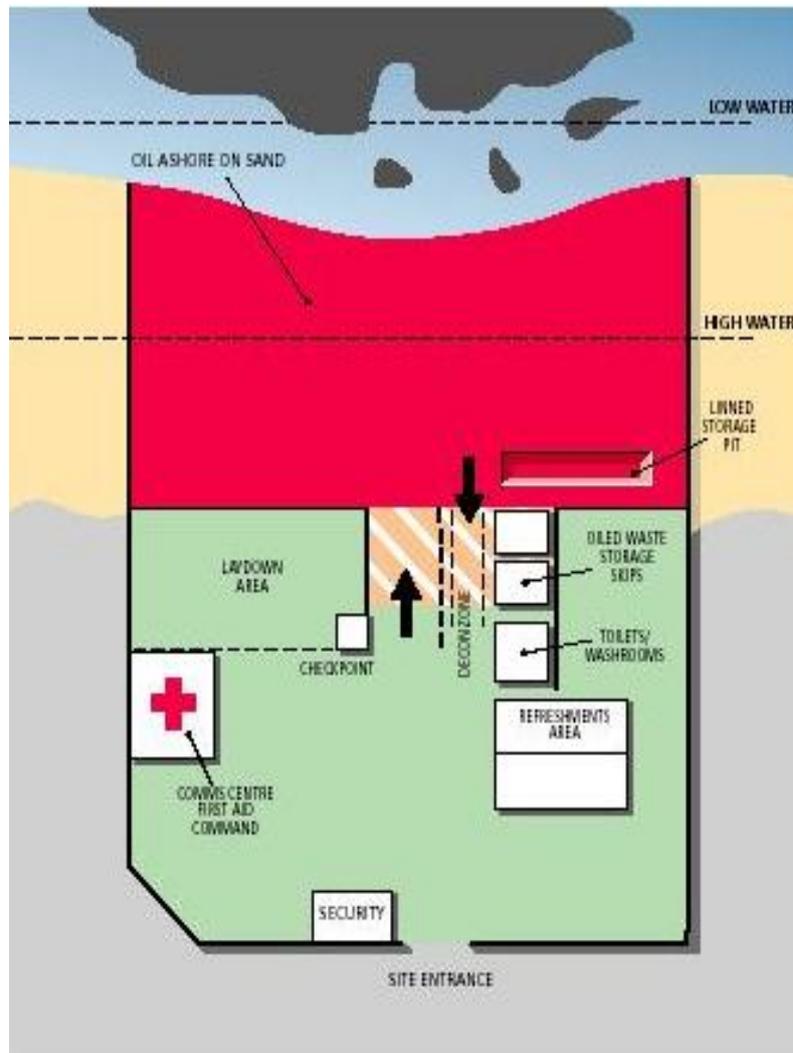
### 6.2. General Considerations

- Ensure safety is considered; stop any ignition sources and ensure gas monitoring is undertaken
- Depending on the degree of emulsification, amount of oiled debris and shoreline type, vast amounts of waste can be generated. In extreme cases, 30 times more waste can be generated than the volume of oil spilled
- Shoreline impact is often widely distributed as oil breaks up, spreads and fragments at sea under the influence of wind and currents. As a result, a range of different shores, of differing sensitivities, will inevitably be impacted by varying amounts of oil.
- Sensitive areas should be protected where possible prior to oiling, the spill being deflected to less sensitive areas
- Shoreline cleanup is generally extremely labour intensive and can in itself have a significant impact on the environment
- The purpose of shoreline cleanup should be to produce a net environmental benefit (NEBA). Regardless of specific strategy, where to focus shoreline cleanup needs to be prioritized using sensitivity data.
- In general, heavily contaminated areas should be cleaned first so that bulk oil is not re-mobilised impacting other areas:
  - Stage 1: Removal of heavy contamination and floating oil
  - Stage 2: Clean up of moderate contamination, stranded oil and oiled beached materials
  - Stage 3: Clean up of lightly contaminated shorelines and removal of oily stains
- In some circumstances oiled shorelines are best left to recover naturally, for example any areas exposed to high energy conditions

6.3. Site Setup



6.4. Schematic Site Layout



## 7. *In-Situ* Burning

### 7.1. What is *In-Situ* Burning?

*In-situ* burning (ISB) is the process of burning oil on water and has been researched and used since the 1960's. However, it has become more of a frontline response technique due to the manufacturing of fire resistant booms during the 1980's. Specialized fire resistant booms are used to contain the oil and increase its thickness and volume in order to allow a burn to occur.



Once the oil has been contained to a sufficient quantity and depth, it is ignited by the use of an incendiary device which may be deployed from a helicopter or vessel. The requirement for specialized boom is due to the heat generated from the burning oil. As with dispersant spraying, ISB has a potentially limited window of opportunity.

## 7.2. Limitations

- As a general precaution, *in-situ* burning should be avoided directly upwind of heavily populated areas and a recommended safe distance downwind of a burn site is in the range of 1 – 5 km, depending on meteorological conditions.
- The use of *in-situ* burning as a response tool may be approved when the burn will not be closer than 12 nautical miles from any adjacent shore

## 7.3. Resources Available

*Oil Spill Response Limited, Singapore* can provide assistance should *In-Situ* Burning be considered a viable response option. In order to allow for *Oil Spill Response Limited* to mount an effective response operation, the following information should be used for awareness/guidance and is taken from the *Oil Spill Response Limited's In-Situ* Burning Operations Field Guide.

## 7.4. Health & Safety

### 7.4.1. Risks Considerations



If the *in-situ* burn equipment is used correctly; following good operational procedures and using the correct personal protective equipment (PPE), offshore operations should pose minimum risk to health. However there are, as with other such activities, potential risks to responders and crew.

#### 7.4.2. Risks Minimization

The above risks can be minimized by:

- Identifying the risks through a comprehensive risk assessment process and implementing mitigations to reduce them where applicable
- Communicating the risks and mitigations in place through a safety brief prior to any operations being carried out.

#### 7.4.3. Minimum PPE Standards

- *Overalls*
- *Hard hat*
- *Personal Flotation Devices (PFD) or lifejacket*
- *Safety glasses*
- *Gloves (NB gloves can present an entrapment danger, wear if appropriate)*
- *Ear defenders whilst machinery is running*
- *Steel toe cap boots*

**Note:**

*Additionally responders handling burn residues need protective clothing e.g. Chemical Resistant overalls, oil Resistant Over-Boots, Chemical Resistant Gloves. Responders handling igniters should use flame-resistant overalls.*

#### 7.5. Contain the Oil in an Appropriate Site

- Follow guidance for ***Offshore Containment and Recovery***
- To withstand the heat during burning, a boom which is specifically designed for heat resistance must be used. These booms are typically more rigid and are therefore more difficult to operate than ordinary booms.

**See Limitations outlined above.**

## 7.6. Optimum Burn Conditions

In order for an ISB to be successful the burn must maintain a steady state to ensure the maximum volume of oil burns. For oil slicks to be ignited they must meet the following criteria:

<b>Oil state</b> Fresh and unweathered	<b>Oil thickness</b> >2-3mm (<1/10 inch) (>2mm thick for fresh oil, >5mm thick for a more weathered product)
<b>Wind</b> <20 knots ( km/hr)	<b>Waves</b> <1-1.5m (<3-5ft)
<b>Emulsification</b> <20—25% water content	<b>Exposure</b> <24-48 hours
<b>Current</b> <0.5m/s (<1 knot)	<b>Evaporation</b> <25-30%

### Note:

It has been documented that the window of opportunity for an ISB to be successful is roughly 72hours from the oils release. The use of ISB as a response technique is more beneficial when there is a continuous release of oil, from such things as a well blow-out. As time passes, the oil may become more difficult to burn due to loss of light ends and emulsification.

## 7.7. General Considerations

The Feasibility of in-situ burning depends on:

- Nature of release
- Oil Type
- Oil Weathering
- Status of Spill (terminated or ongoing).
- Status of other response efforts/availability of resources.
- Slick size, thickness
- Spill Location (including proximity to potential sensitive areas and shoreline)
- Current & predicted weather and sea conditions



#### 7.8. Conducting in-situ burn operations

Requirements for ISB Initial Response are:

- 2x Sets of Fire Boom (150m/500ft systems)
- PPE and Boom ancillaries
- Trained ISB Burn Response Personnel
- Trained Aerial Surveillance Operators
- Trained Data Capture Personnel
- Highlight location and number of aircraft available if required for a response (spotter aircraft)
- Ignition Systems – Heli-Torch or Hand Held Igniters (estimated materials to manufacture at least 20 igniters)
- Highlight Suitable Vessels of Opportunity to support response (2 vessels required to tow fire-resistant boom)
- Testing of oil produced from well, in order to see its suitability for an ISB Operation if possible.



### 7.9. End of Burn and Recovery of Residue

To extinguish an *in-situ* burn, slow down so that rate of oil encounter is reduced, or release one side of the burn boom.

- Unburned oil residue may be a thickness of several centimetres and adequately viscous enough to be recovered
- Residue is normally heavy, viscous and carries many of the attributes of heavily weathered oil.
- In some cases the fate of the oil may also have changed so the residue sinks rather than floats.
- Some viscous residue left behind after a burn can be very problematic.
- The decision whether to mechanically recover the residue left from the burn, or allow it to biologically break down, dependent upon the density of the residue, the total volume of the residue and its expected movements if not recovered.
- Manual recovery may be employed.
- Residue should be allowed to cool for at least an hour after extinguished before being recovered
- Specialist may want to take a sample of the burn residue and estimate the amount of residue left in the boom after the burn.



Aerial Surveillance Form								
Incident				Aerial Surveillance Report No.				
Date and time	Day	Month	Year	Takeoff time				
				Landing time				
Type of Aircraft				Aircraft Company				
PCML Observer				Short description of route		Weather		
PCML Asst. Observer						Wind Direction		
Photographer						Wind Speed		
Use of GPS	<input type="checkbox"/> Yes <input type="checkbox"/> No					Sea State		
Videographer						Weather	<input type="checkbox"/> Sunny <input type="checkbox"/> Cloudy <input type="checkbox"/> Rainy	
Observations								
Time	Position		Dimensions		Oil appearance / Coverage (%)		Volume	Slick Movement
Local	Latitude (N)	Longitude (E)	Length (m)	Width (m)	Appearance Rating	Coverage (%)	m <sup>3</sup> / km <sup>3</sup>	Direction
Comments / Remarks								

**Oil Spill Appearance Rating**

Rating	Appearance	Approximate Thickness (mm)	Quantity per km <sup>2</sup> = 1,000,000 m <sup>2</sup>	
			bbbl	metric ton
1	Barely visible under most favourable light	0.00005	0.3	0.04
2	Visible as silvery sheen on calm water	0.0001	0.6	0.09
3	First trace of colour observable	0.00015	0.9	0.13
4	Bright bands of colour - rainbow	0.0003	1.9	0.27
5	Dull colours on calm water	0.001	6.3	0.90
6	Yellowish brown slick, barely visible from aircraft	0.01	63	9
7	Light brown or black easily seen from aircraft	0.1	630	90
8	Thick dark brown, black or orange emulsions	1.0	6,300	900
9	Near the source of a large spill	10	63,000	9000

## OIL SPILL RESPONSE COURSE SYNOPSIS (LEVEL 1 – OPERATOR)

Course Type	PIMMAG Operator Course Syllabus 2007	IMO Level 1 First Responders Syllabus 2002
<b>Objectives</b>	To provide the participant with the practical skill and knowledge to effectively set-up and operate the OSR equipment	<p>The course is designed with the aim of improving the skills of Supervisory personnel responsible for undertaking on-site clean up operations and to provide them with an overview of the various techniques available for recovering oil spilled at sea and cleaning of polluted shorelines.</p> <p>The course focuses on and provides in-depth knowledge and skills in on-site first response to oil spills with emphasis on combat and clean-up technologies.</p>
<b>Who should Attend</b>	The first responder to an oil spill site, who is hands-on operating and maintaining the equipment.	This course is relevant for field supervisors e.g. Marine Officers, Shoreline Strike Team leaders and other personnel who will be involved in oil spill combating operations
<b>Course contents</b>	<ul style="list-style-type: none"> <li>• Introduction to PIMMAG</li> <li>• Introduction to oil spill response</li> <li>• Operator's roles &amp; responsibilities in OSR</li> <li>• Fate of oil and its impact</li> <li>• Types of oil spill response equipment, its use &amp; limitations</li> <li>• Shoreline and offshore response - operation of equipment, containment &amp; recovery techniques</li> <li>• Practical deployment exercise</li> <li>• Application of dispersant</li> <li>• Waste management</li> <li>• HSE in OSR operations</li> </ul>	<ul style="list-style-type: none"> <li>• Properties and Behaviour of Oil, Response Organization and Control Strategies.</li> <li>• Mechanical Containment, Recovery and Temporary storage &amp; Final Disposal.</li> <li>• Use of Dispersants and other Combating Techniques.</li> <li>• Shoreline Clean-up, Oil Sampling, Wildlife Casualties and Storage, Maintenance and Cleaning of Equipment.</li> <li>• Practical Exercises in Oil Combating.</li> <li>• Supplementary Lessons and Exercises e.g. Simulation of Sea/Shore Planning &amp; Activities by teams &amp; team leaders.</li> </ul>
Duration	2 days	5 days

## OIL SPILL RESPONSE COURSE SYNOPSIS (LEVEL 2 – SUPERVISORY)

Course Type	PIMMAG Supervisory Course Syllabus 2007	IMO Level 2 Supervisors & On-Scene Commanders Syllabus 2002
<b>Objectives</b>	To provide the participant with the practical skill and knowledge to effectively assess and supervise the oil spill clean-up at site.	To provide the basic knowledge and skills required of an On-Scene Commander and his Supervisors to carry out their roles and responsibilities, to coordinate and manage the response to an oil spill.
<b>Who should Attend</b>	The supervisor in-charge or on-scene commander of an oil spill response at site . The potential supervisor of an oil spill response site	Those persons, who already have some experience in oil spill response or have completed a course equivalent to the operational level course, and have supervision responsibilities and training and who are likely to be in charge of coordinating and managing a spill response.

Course Type	PIMMAG Supervisory Course Syllabus 2007	IMO Level 2 Supervisors & On-Scene Commanders Syllabus 2002
<b>Course contents</b>	<ul style="list-style-type: none"> <li>• Introduction to PIMMAG</li> <li>• Introduction to oil spill response</li> <li>• Supervisor's roles &amp; responsibilities</li> <li>• Fate of oil and its impact</li> <li>• Shoreline and offshore response - operation of equipment, containment &amp; recovery techniques</li> <li>• Application of dispersant</li> <li>• Waste management</li> <li>• HSE in oil spill response operations</li> <li>• OSR strategies &amp; issues</li> <li>• Conducting effective OSR exercise</li> <li>• Spill site assessment and planning (practical)</li> <li>• Use of ICT in oil spill response</li> <li>• Syndicate exercise</li> </ul>	<ul style="list-style-type: none"> <li>• Overview of Spill Response</li> <li>• Contingency Planning, Response Mgt &amp; Organization</li> <li>• Oil Spill Behaviour, Fate and Effects</li> <li>• Spill Assessment</li> <li>• Operations Planning</li> <li>• Containment, Protection and Recovery of Oil</li> <li>• In-Situ Burning</li> <li>• Dispersants</li> <li>• Site Safety</li> <li>• Shoreline Cleanup</li> <li>• Transfer, Storage and Disposal</li> <li>• Media Relations</li> <li>• Evidence Gathering and Documentation</li> <li>• Command, Control, Communications and Information</li> <li>• Liability and Compensation</li> <li>• Response Deactivation</li> <li>• Post Incident Debriefing</li> </ul>
Duration	2 days	5 days

## OIL SPILL RESPONSE COURSE SYNOPSIS (LEVEL 3 – MANAGEMENT)

Course Type	PIMMAG Management Course Syllabus 2007	IMO Level 3 Senior Managers & Administrators Syllabus 2002
<b>Objectives</b>	To provide the participant with the practical skill and knowledge to effectively plan and manage the overall oil spill response	Present main issues and challenges facing Senior Administrators & Managers in a big spill. Understand the roles and responsibilities of the On-Scene Commander and his Team & how they can effectively and successfully respond to a spill. A general overview of oil spill response, its strategies, limitations & issues arising out of the use of each strategy is taught
<b>Who should Attend</b>	The Manager who is responsible for the overall oil spill response at the Company's emergency command center. Emergency response team and crisis management team members at the command center.	For those who have little experience in oil spill response but do have a responsibility for ensuring such capability exists in their company, department or country.

Course Type	PIMMAG Management Course Syllabus 2007	IMO Level 3 Senior Managers & Administrators Syllabus 2002
<b>Course contents</b>	<ul style="list-style-type: none"> <li>• Introduction to PIMMAG</li> <li>• Management's roles &amp; responsibilities in OSR</li> <li>• Liability, compensation &amp; cost recovery</li> <li>• Fate of oil and its impact</li> <li>• Post spill monitoring Env Damage Assessment</li> <li>• Containment &amp; recovery</li> <li>• Application of dispersant</li> <li>• Shoreline and offshore response</li> <li>• OSR planning &amp; operation, strategies &amp; issues</li> <li>• International OSR activation</li> <li>• Media management &amp; public relations</li> <li>• National Oil Spill Contingency Plan</li> <li>• Table-top exercise</li> <li>• Crisis management</li> <li>• Use of Environmental Sensitivity Index</li> <li>• Case studies</li> </ul>	<ul style="list-style-type: none"> <li>• Causes, Fate and Effects of Spilled Oil</li> <li>• Contingency Planning</li> <li>• OSR Strategies, their Limitations and Issues</li> <li>• International Co-operation - The Legal Framework</li> <li>• Liability, Compensation and Cost Recovery</li> <li>• Spill Management, Roles and Responsibilities</li> <li>• Communication and Media Issues</li> <li>• Termination of Response</li> <li>• Post Spill Monitoring</li> <li>• Oil Spill Modeling</li> <li>• Case Histories</li> <li>• Table-top Exercise</li> </ul>
Duration	2 days	3 days

## OIL SPILL RESPONSE COURSE SYNOPSIS (INLAND OIL SPILL)

Course Type	PIMMAG Inland Spill Course Syllabus 2007	Global Alliance Inland Oil Spill Syllabus 2003
<b>Objectives</b>	To provide the participant with the practical skill and knowledge to effectively plan and manage the overall oil spill response	Present main issues and challenges facing Senior Administrators & Managers in a big spill. Understand the roles and responsibilities of the On-Scene Commander and his Team & how they can effectively and successfully respond to a spill. A general overview of oil spill response, its strategies, limitations & issues arising out of the use of each strategy is taught
<b>Who should Attend</b>	Those who have exposure to inland oil spill or have to respond to such spills	Inland responders, refinery staff, local authorities, environmental & wildlife organizations, those involved in transportation and storage of oil inland.
<b>Course contents</b>	<ul style="list-style-type: none"> <li>• Introduction to PIMMAG</li> <li>• Introduction to inland spills, causes, fate &amp; strategies</li> <li>• Inland spill containment &amp; recovery</li> <li>• Inland spill case studies 1 &amp; 2</li> <li>• Planning &amp; management of inland spills</li> <li>• Waste management &amp; disposal</li> <li>• HSE in oil spill response operations</li> <li>• Practical inland deployment exercise</li> </ul>	<ul style="list-style-type: none"> <li>• Causes of inland spills</li> <li>• Spill movement &amp; soil permeability</li> <li>• River booming &amp; damming techniques, specialized equipment</li> <li>• Case histories &amp; inland spill scenario</li> <li>• Environmental considerations</li> <li>• Health &amp; safety</li> <li>• Practical management of waste disposal</li> <li>• Tanker rollover, pipeline awareness</li> </ul>
<b>Duration</b>	2 days	3 days



Risk level: Yellow	<b>DSHA</b>	
<b>Title: Emergency Scenario - Spill Response</b>		
		<b>Version: 1.01</b>

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**1 Requirements**

Spill incidents are classified into those events that can be contained onboard the Tender and Drilling package and those that can't. In the majority of situations, overboard spill response is managed by the client and this is normally reflected in the bridging document.

This procedure deals with those incidents that can be managed from onboard the Tender or Drilling Package.

The range of onboard events can include liquid and bulk solid loss of containment. Additionally, generation of gas through chemical interaction is another consideration. However, for the purposes of this procedure, *Environmental Incident* shall refer to events relative to solid or liquid material only.

This procedure should be read in conjunction with the site specific SOPEP Manual.

**1.1 GENERAL DUTIES**

**OIM**

- Upon being notified of a spill, liaise with the Marine Section Leader and Department Supervisor (if affected) regarding situation.
- Brief Client Representative of circumstances
- Attend spill location and assess the hazard to personnel on the rig package and tender.
- Oversight Spill Response Team actions (led by Marine Section Leader on Tender / Tourpusher on Drilling Package).
- Coordinate with the Client Representative, any external response / assistance for any overboard spill outside the scope of the Tender
- Make report to authorities in accordance with regulatory requirements

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***Marine Section Leader***

On notification of spill, assemble Spill Response Team (On-Duty Roustabouts) and attend scene. Actions shall follow the guidelines provided in this procedure, summarized as;

- Identification of Chemical (obtain MSDS)
- Contain spill
- Treat spill
- Absorb spilt material
- Clean-up site and dispose of used spill kit absorbent gear

***On Duty Tourpusher***

Notify OIM and OSR upon any spill from the drilling operation on the Platform. Actions shall follow the guidelines provided in this procedure, summarized as;

- Identification of Chemical (obtain MSDS)
- Contain spill
- Treat spill
- Absorb spilt material
- Clean-up site and dispose of used spill kit absorbent gear

***Rig Administrator (Radio Operator)***

- Notify Medic of situation and advise to stand-by in hospital
- On direction of OIM / OSR, contact the standby boat and inform them of overboard spill situation, location of spill and request for preparation if spill dispersal assistance is required.

**1.2 RESPONSE GUIDELINES**

**All principal spill response responsibilities, consistent with the Rig’s Emergency Response Organization hierarchy, are shown in the attached Spill Response Chart (refer Section 3.4: Exhibit 1).**

As with any emergency response, each individual event needs to be assessed on its own individual circumstances. Once a spill has been identified, the relevant MSDS shall to be referred to so that the risks can be assessed accurately and precise information is identified. The particular risks (foreseen and unforeseen) arising could include toxic gas vapour, not to disperse with water etc. The Chemwatch program can also be referenced for response guidelines and the provision of bilingual resources for response team briefings.

**1.3 IDENTIFICATION OF SPILL**

Once a spill has been detected, move away from the immediate area and alert the Radio Room.

Items to include in the initial report should include

- Location of spill: The immediate area to where the spill is
- Source of spill: Where the spill is emanating from

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- Nature of spill: What type of chemical
- Amount of spill: An estimate of quantity (i.e. 2cm deep – 2m x 2m)
- Characteristics: Type of smell / colour / physical appearance

These details will assist in determining an appropriate response. Once the radio room has been contacted, if practicable, contact the Area Authority and advise him of the same details.

#### **1.4 PERSONAL PROTECTIVE EQUIPMENT**

When responding to a spill, refer to the MSDS for the minimum level of response attire and any precautions that need to be considered when responding.

For detailed description of PPE and required standards, please refer to TMS Procedure PRO-04-1051 'Personal Protective Equipment'.

#### **1.5 RESPONSE EQUIPMENT**

Response kits need to be readily available to respond to any potential incident.

These Response Kits shall at a minimum be positioned on the Pipe Rack deck and in the Sack Store Room.

Additional spill kits shall be located at rig discretion.

#### **1.6 SPILL CONTAINMENT**

The first step in spill containment is to isolate the spill which is achieved by shutting down the equipment feeding the spill and then deploying appropriate containment measures.

The spill response kits on board are designed to contain spills of a minor nature. If a spill is in excess of the capabilities of the response kits, every effort is to be made to prevent the travel of the chemical overboard. This can be achieved through the utilization of plugs in overboard drains and the use of pumps to transfer a spill into a temporary storage container such as a tote tank or appropriate storage medium.

Where a spill has occurred below deck it needs to be identified where bilge drains are routed.

#### **1.7 TREATING THE SPILL**

If the spill is highly reactive such as caustic or acid, measures need to be taken to neutralize it so that worker safety isn't compromised. As part of the process when chemicals are introduced into operations neutralizing agents should be identified and be available on board.

#### **1.8 ABSORBING THE SPILL**

Once a spill has been treated, (if needed) it can be absorbed or retained in an appropriate vessel for future disposal.

#### **1.9 CLEAN-UP OF THE SPILL**

Cleanup requires that no residual contaminant is left that may cause personnel injury or pollute the environment at a later stage. Cleanup requires that the area is thoroughly cleaned and that any absorbent material is marked as contaminated and disposed of appropriately (note: the clean-up kit drums can be used as a secure containment and disposal container for contaminated material).

<b>Risk level:</b> <b>Yellow</b>	<b>DSHA</b>	
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As with any incident the first priority is the safety of personnel and then protection of equipment and the environment.

Upon the detection of any spill, the person who identified the spill is to immediately notify the Rig Administrator (Radio Op) who will notify the OIM. If the reporting person is aware of the source of the spill, this information should also be reported.

### **1.10 SITE SPECIFIC RESPONSE PROCEDURES**

In addition to the general response guidelines the following **DSHAs** are subject to additional detail.

#### Engine Room

Shutdown engines if there is a possibility of igniting any spill which could include a ruptured day tank.

Shutdown bilge system to prevent any spill been pumped overboard

#### Sack Room

Determine from chemical inventory if there are any incompatible chemicals in close proximity to the spill.

Shutdown bilge system to prevent any spill going overboard.

#### Warehouse

Determine from chemical inventory if there are any incompatible chemicals in close proximity to the spill

Shutdown bilge system to prevent any spill going overboard.

#### Pipe deck

Identify spill source

If required insert drain plugs

#### Cranes / Hydraulic items at Height such as TDS

Reduce leakage to air as the dispersal footprint will be amplified due to height above deck

#### Spill Overboard

Immediately shutdown the source of the spill

Advise standby vessels who can apply an appropriate medium to minimize the environmental impact

### **1.11 SPECIAL PRECAUTIONS**

Any spill of a flammable material requires that all hot work is shutdown.

Ventilation should be shutdown to prevent transfer of flammable vapour to non intrinsic areas such as the accommodation.

<b>Risk level:</b> <b>Yellow</b>	<b>DSHA</b>	
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## **1.12 CONTACTS FOR REPORTING SPILLS**

The IMO Maritime Safety Circular MSC-MEPC.6/Circ.5 current edition provides a list of local contacts who shall be advised of any spills to sea. This circular is located in the Site Specific SOPEP Manual.

Additionally all spills shall be reported to the company Area Office in accordance with incident reporting requirements. The On Scene Representative will notify the Duty Manager at the operator's area office (and the Field Offshore Installation Manager).

## **2 Guidelines**

### **2.1 Definitions**

#### **Primary Containment**

An area where liquids or solids are normally stored e.g. fuel tanks, tote tanks and drums

#### **Loss of Containment**

Any situation where a solid or liquid has escaped from it's primary area of containment.

#### **Bunding**

A raised area or lip around an item that is used to prevent a spill from spreading outside of that immediate area.

#### **Secondary Containment**

The system in place to contain a spill once the primary containment has been defeated.

#### **MSDS**

Material Safety Data Sheet

#### **SOPEP**

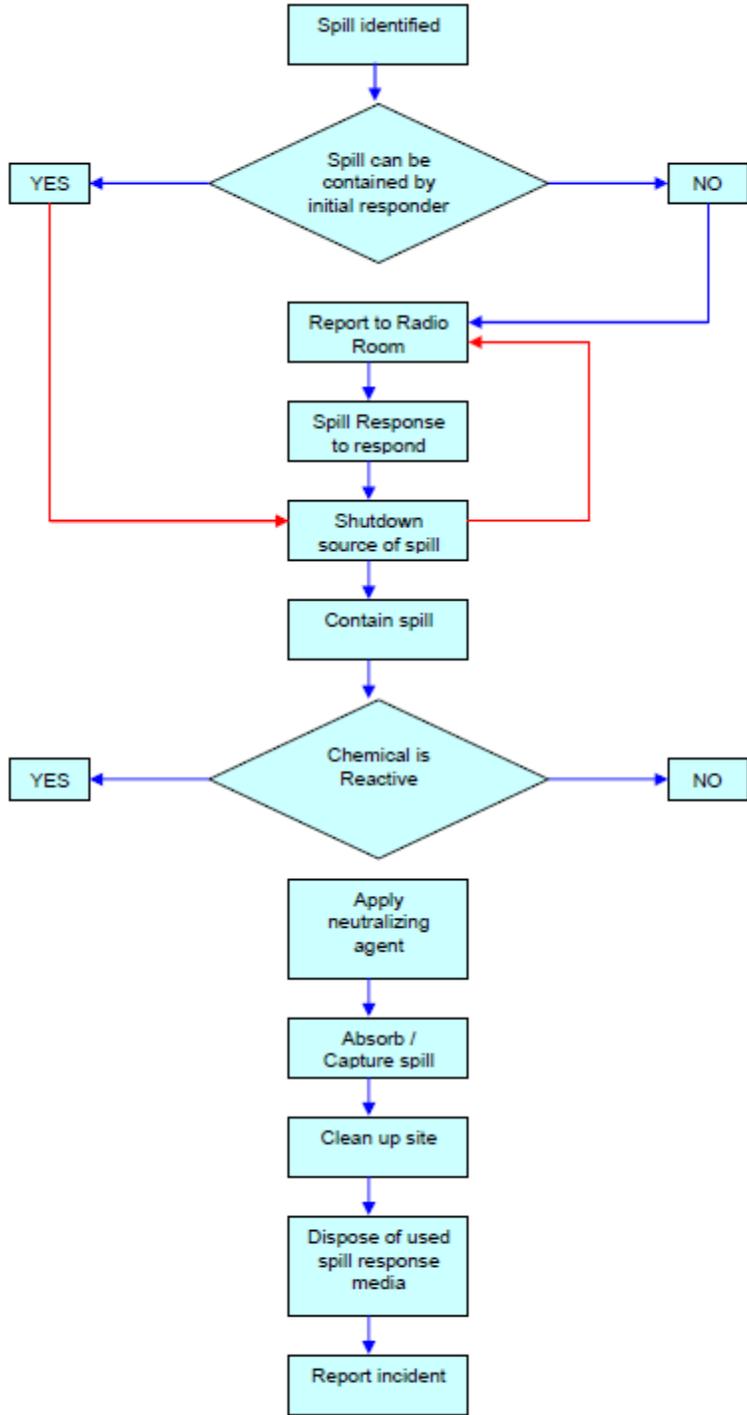
Shipboard Oil Pollution Emergency Plan

#### **Spill**

Loss of Containment

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**2.2 Exhibit 1 - Spill Response Chart**



<b>Risk level: Yellow</b>	<b>DSHA</b>	
<b>Title: Emergency Scenario - Spill Response</b>		
		<b>Version: 1.01</b>

### **3 Document Control and References**

- Site Specific SOPEP Manual
- Applicable MSDS
- Chemwatch Program
- IMO Maritime Safety Circular MSC-MEPC.6/Circ.5

# Appendix N - Public Consultation Results

## Meeting of Minutes: Yetagun Infill Drilling Project - Scoping Consultation in Dawei Tsp

Detail			
<b>Project</b>	Stakeholder Meeting for Environmental Impact Assessment for Yetagun Natural Gas (Scoping)		
<b>Venue</b>	Zayar Htet San Hotel (Dawei)	<b>Region</b>	Tanintharyi
<b>District</b>	Dawei	<b>Township</b>	Dawei
<b>Objective</b>	Yetagun Infill Drilling Project - Scoping Consultation		
<b>Date</b>	Date- 2/04/2018(Monday)		
<b>Time</b>	02:00 – 04:00 pm		

Presentation
<p><b>Daw Myat Mon Swe (Senior Consultant, Environmental Resources Management [ERM])</b> started the consultation process with the introduction to the meeting agenda, explaining the objectives of the meeting</p> <p><b>U Kyaw Zeya (Deputy Director - MOGE)</b> explained the purpose of the meeting and role of MOGE.</p> <p><b>U Kyaw Thiha Hla Myint (Executive, Environment)</b> and <b>U Zaw Zaw Aung (Executive, Field Coordinator)</b> (PC Myanmar Limited) explained about the Project.</p> <p><b>Daw Thi Thi Thein ((Senior Consultant, Environmental Resources Management [ERM])</b> giving an overview of the EIA process as per the Myanmar EIA Procedure.</p>

Question and Answer Session
<p><b>Question 1 - U Khaing Tun (A/D, ECD, Thanintharyi Region)</b> I would like to know whether 104 m is the distance from well to shore or the depth.</p> <p><b>Answer 1- U Zaw Zaw Aung (PC Myanmar)</b> 104 m is the water depth. The drilling depth will be about 17,000 feet from the sea surface to the reservoir.</p> <p><b>Question 2 - U Khaing Tun (A/D, ECD, Thanintharyi Region)</b> I understand that this drilling is required due to decreasing producing rate.</p> <p><b>Answer 2- U Zaw Zaw Aung (PC Myanmar)</b> Yes. The reservoir and infrastructure already exist. We plan to drill up to 20 slots; currently we have 7-8 slots there.</p> <p><b>Question 3 - U Khaing Tun(A/D, ECD, Thanintharyi Region)</b> I think you should disclose project information clearly in the project description. I understand that you are upgrading the existing well only after listening carefully.</p> <p><b>Answer 3A- U Zaw Zaw Aung (PC Myanmar)</b> It is not strictly speaking an old well. A new well will be drilled from the existing infrastructure.</p> <p><b>Answer 3B- Daw Myat Mon Swe (ERM)</b> The drilling will last around 25 days for each of the three proposed wells. Although water depth is around 100m, the drilling we be conducted down to between 4000 and 4500 m. The wells will be drilled into the existing reservoir. As new drilling is being conducted, an EIA is required.</p>

## Question and Answer Session

### **Question 4 - U Khaing Tun(A/D, ECD, Thanintharyi Region)**

Can I confirm that current scoping report is not finalized and you are here to conduct public consultation meetings for this scoping report?

### **Answer 4- Daw Myat Mon Swe (ERM)**

Yes, that is correct.

### **Question 5 - U Khaing Tun (A/D, ECD, Thanintharyi Region)**

If an oil spill occurs during operation, what is the separation rate of oil spill and current flow? I would like you to disclose this information. There are many attendees from governmental department.

### **Answer 5 - Daw Myat Mon Swe (ERM)**

We invited to government departments for meeting. We have also invited other stakeholders, including fishermen. I think they are late due to the rain. We started the meeting because some guests such as yourselves are already here. When the other stakeholders come, we will explain again to them.

### **Question 6 - U Khaing Tun (A/D, ECD, Thanintharyi Region)**

When you do this meeting in Myeik please invite us and the Marine Science Department..

### **Answer 6 - Daw Myat Mon Swe (ERM)**

Yes, we have already invited this department. We also invited three Universities in Myeik, Pathein, Mawlamyaing that are cooperating with FFI & WCS.

I would like to explain about dispersion modelling. From infill drilling, there will be drilling mud and drill cuttings that contain water based and synthetic based fluids. The treatment of the synthetic drilling mud and cuttings will take place onboard the vessel and will be discharged back to sea.

Local people are concerned about the impact of chemicals from the drilling fluids to the fishing ground and coral reefs. We conduct the dispersion model, taking into account of data such as, wind speed, water flow, water depth, etc., to calculate if the drilling mud/fluids will impact these sensitive areas. Although I am not an expert on this, based on my experience working with Woodside, the cuttings are fully dissolved into the water a little further than one mile from the drilling location.

Another assessment is the oil spill dispersion model. By developing this model, we select a relevant quantity of the oil spill, we also apply data such as wind direction, wave direction, wave height, weather conditions etc., and we put these data in the model and analyze it. Based on this analysis, we can understand the potential impact and dispersion of oil during a spill event. In the drilling process, oil spills are very rare. In case of an actual oil spill, the Emergency Response Plan is already in place for this development. The purpose of conducting these models is to understand the potential dispersion, and further reduce the concerns of stakeholders.

### **Question 7 - U Tin Oo (National Unity Party)**

I would like to ask one thing that I am not clear. We are not technicians, we are just local people. We are concerned about wastes and pollution from drilling. How do you undertake waste management? I would like to know clearly about waste disposal, and storage. We understand that Yetagun will upgrade the previous well; is this correct? We also appreciate and thank you for coming and presenting project information.

## Question and Answer Session

### **Answer 7 - Daw Myat Mon Swe (ERM)**

Petronas Company is the project proponent and ERM is third party environmental consultant. We were hired by Petronas to conduct an independent EIA. We have to submit all of our reports to the government. We will also prepare the Environmental Management Plan. If the project proponent does not comply with the commitments in EMP, according to Environmental Conservation Law (2012), they cannot continue their project activities.

### **Question 8 - U Tin Oo (National Unity Party)**

Thank you so much for your explanation. I asked because I really worry about this and the control methods.

### **Answer 8A- Daw Myat Mon Swe (ERM)**

The EMP report has to be submitted to MOGE and ECD every six months. When we submit, they may come and do an inspection. Thank you for your question about waste management. It is very important for our country. Currently, waste management cannot be followed even by the public. However, a waste management plan for the Project will be included in the EMP.

### **Answer 8B - U Kyaw Thiha Hla Myint (PC Myanmar)**

Firstly, we have to separate wastes into hazardous and non-hazardous waste. For non-hazardous waste, using support vessels, we transport the waste from the platform to MOGE's Thakayta jetty. It is then, transferred to YCDC for disposal. For hazardous waste, it is first transferred to MOGE's Thakayta jetty, then it is transferred to DOWA (Golden DOWA Eco-system Myanmar), waste management facility in Thilawa. The facility has special treatment facilities and makes sure that the discharge does not damage the environment (e.g. ground water, etc.).

### **Answer 8C- Daw Myat Mon Swe (ERM)**

DOWA is a Japanese Company. They operate and manage wastes from the Thilawa Special Economic Zone in compliance with JICA international guidelines. This is the only facility in Myanmar where we can dispose of hazardous wastes. There is a plan to establish a similar facility in Mandalay that could be used for future disposal of wastes from offshore projects.

### **Question 9-U Nyi Nyi (Deputy Staff Officer,GAD Yebyu Township)**

I would like to make a suggestion. I want to know if the handouts, presentation information (hard copy) can be shared? If we can have hard copies of presentation, we could make more suggestions. I would like to suggest for you to prepare enough hard copies for the next meetings.

### **Answer 9A- Daw Myat Mon Swe (ERM)**

We apologize that we didn't bring enough hard copies.

### **Answer 9B- Daw Thi Thi Thein (ERM)**

If you want soft copy, we will send file via email.

### **Question 10- U Nyi Nyi (Deputy Township officer, Yebyu)**

I would like to suggest to prepare enough hard copy for the meeting because you are from international organization. Technical terms are used in English language and we don't understand what they mean (eg. MARPOL). I think that if you use Myanmar Language, it is more convenient for us.

## Question and Answer Session

### **Answer 10- Daw Myat Mon Swe (ERM)**

I prepared for this, but I apologize for not distributing ahead. I will send this presentation soft copy via email.

### **Question 11- U Tint Lwin (Hintha Media)**

When projects conduct oil and gas extraction in our area, they undertake CSR programs for local people. In some cases, they defined donation activities as CSR program and donation activities are included in CSR program. I would like to suggest to disclose what percentage of the profit will be used for the CSR program. Also, I would like to know if local communities will have the opportunity to take part in managing the CSR programs. If you are not ready to explain about this information, please let me know in next meeting what is your plan for CSR.

### **Answer 11- U Zaw Zaw Aung (PC Myanmar)**

Thank you for your question. I will answer as much as I can. I will also inform our office of your suggestion to include local communities in the management of CSR programs. Normally, when we plan to commence CSR programs, we inform the local communities. In Yebyu township, where we have our base, communities from Kanbaw Ohnbinkwin, etc. are aware of our CSR programs. Normally, it is rare for the Company to give donation (money) and mostly, there is not donation budget under CSR budget. CSR programs are conducted in the Project area. Recently Yetagun held the Yetagun youth program in schools all over the country. I have worked for 17 years in Yetagun and I have seen the gradual progress. It is up to local people to make programs sustainable and keep it going. We cannot do CSR without local people's participation. We will not make CSR program in area where is not Project related. We will do CSR program in Dawei, or near M12, M13 and M14 project area. For example, providing solar power panels to schools, and building schools. We also support Yangon and Mandalay Technological University but this is not common.

### **Question 12- U Tint Lwin (Hintha Media)**

What I mean is for local communities to have the opportunity to be involved in managing/ decision making of the CSR programs. Now, Total, Yetagun CSR projects, inform local communities of the amount spent at year end. I would suggest that at the beginning of the year, the company, local communities, and government should decide together how the budget for CSR will be used. This will strengthen the management process and also reduce complaints on the Company.

### **Answer 12- Daw Myat Mon Swe (ERM)**

You mean CSR program that involves local communities in the decision making process and one that is sustainable. This includes assigning local volunteers to work in CSR. They are called volunteers in CSR programs where local people are assigned as CSR volunteers and work with the CSR team.

### **Question 13- U Tint Lwin (Hintha Media)**

There is a big difference in giving donation and implementing development projects. We have experienced in the past, where companies give donations under CSR program.

### **Answer 13- Daw Myat Mon Swe (ERM)**

According to the MIC permit, for example, 2 to 3 % of the profit has to be used for CSR program. I would like to explain why we do this CSR program. There is no project that does not impact on the physical, biological, and social environments. The aim of CSR program is to recover environmental impacts and

## Question and Answer Session

develop the area. It is not a donation. It targets sustainable development. But sometimes local public think it is a donation and this creates a contradiction. The purpose of CSR programs is to recover / replace from the impacts due to the Project while collaboration of the local communities for ongoing sustainable development. Not only companies but local communities need to be involved in order to make the right decisions. As a third party, what I hear is that PCML consults with local communities before implementing CSR projects. Sometimes, different companies have different systems. Some companies, assign volunteers at village level, these volunteers collect needs data from the villages and submit the data to the company. Then the company needs to disclose to the communities what can be done as part of the CSR project.

There is also what is called grievance mechanism to mitigate impacts and grievance. This needs to be developed between the company, CSOs, and communities. This mechanism already exists at PCML. Our apologies for not including this in our presentation.

### **Question 14- U Soe Myaing (A/D, Fishing Department, Thanintharyi Region)**

The area around Bote island (Moscos Island) is a popular fishing ground. The waters nearby Lampi island are also a rich fishing ground. Fishing is now prohibited for three months but fishing season will resume around Oct-Dec, so the drilling schedule will coincide with the fishing season. There can be interactions with fishing boats. I would like to know more about the potential impacts on fishing boats. Furthermore, natural resources are not just fishes, there are also corals under water. I would also like to know how the project might impact on the surround natural resources. 108 nautical miles is not too far and within the fishing ground. Therefore, I would like you suggest you to invite fishing businessman in Myeik Region. There may object to the Project if it is within their fishing grounds.

### **Answer 14A- Daw Myat Mon Swe (ERM)**

Thank you for your question. When we do consultation meeting with Woodside, we consider these issues. As these issues arise, we study about the seagrass, corals, fishing grounds in project area. This is conducted based on secondary data by cooperation with FFI, WCS and Myeik University. As you have said, if the project is near to fishing grounds, we will assess the impact in the EIA Report, and submit to the government for their decision. We will disclose more information in the next meeting.

### **Answer 14B- U Zaw Zaw Aung (PC Myanmar)**

108 is nautical miles is far offshore. It will take about 1 hour by helicopter and 12 hours by boat from Kanbauk and the water is deep. When you see in maps, you may think it is close. According to my experience of 17 years, I have not found any fishing boats near this area, except sometimes Bengali boats. There are high waves this far offshore so it can be dangerous for some fishing boats.

### **Question 15- U Soe Myaing (A/D, Fishing Department, Thanintharyi Region)**

Some ships from Thabautseik (Moscos Island) will go as far as 200 miles off shore from their villages, in search of tuna fish. They also go along the coast as far as Rakhine State.

### **Answer 15- Daw Myat Mon Swe (ERM)**

Thank you for sharing this information.

### **Question 16- Nay Min Yarzar (Writer)**

We welcome this project. Your presentation about the area is excellent. I heard about oil spills in your presentation. You presented about natural disaster and impacts on aquatic lives, coral and people. It is

## Question and Answer Session

also good. We agree you need to manage waste disposal. In Dawei, Thanintharyi Region, there are 50 bays. Currently, Boe Boe Kyauk beach, Nyawbyin and Maungmakan beaches are the second best beaches in the world. Lampi Island is an ASEAN heritage park. If you do as you presented, we welcome the project. I would like to recommend, for oil spill monitoring, and waste disposal, can you establish a group which includes local people?

### **Answer 16 - Daw Myat Mon Swe (ERM)**

Thank you for welcoming the Project. Regarding the monitoring group, the purpose of conducting the EIA is to develop an Environmental Management Plan (EMP). This includes plans such as how to prevent air pollution, water pollution and how do we manage it. In these plans, frequency of monitoring (eg. every two months, every three months), who will take responsibility, and what is the budget are all included. This EMP is monitored by ECD (Environmental Conservation Department) and MOGE (Myanmar Oil and Gas Enterprise). The Project needs to submit the EMP to these two departments every six months. As for EIA, when we submit, we need to send to ECD review panel which is comprised of 15 different Government departments. Then we need to undergo a review team meeting, then revise, submit, revise again and submit again etc... Up to three times we submit before the EIA/EMP is approved.

At the end section of the report, there is the waste management plan. As explained earlier, waste will be managed including hazardous wastes. For oil spills, emergency response is also included in the Emergency Response Plan. This also includes how to respond during cyclones, and if there is any spills of hazardous wastes.

In addition, there is the grievance mechanism. This mechanism is very important in such cases and the mechanism needs to be applied by Company for the entire lifecycle of the Project. This plan should include local communities as well as government departments such as the administrative department.

As for biodiversity management plan, since the project is 108 miles offshore and there is limited biodiversity management plan is not required.

### **Question 17- U Tin Oo (National Unity Party)**

I would like to suggest the Project to do effective management for oil spill. There were previously 120 fish species recorded around Heinze River in Kan Bauk in 1986 and currently 10 species are now extinct.

### **Answer 17 - Daw Myat Mon Swe (ERM)**

We are doing workshop with relevant department relating with this issues. Our government is trying to pronounce regulations.

### **Comment 18- U Khaing Tun (A/D, ECD, Thanintharyi Region) to MOGE**

I would like to know is there are anyone from MOGE assigned for close inspection. ECD does not have a person assigned for close inspection. So, MOGE assigned person can inform us, and ECD will come and check. ECD must also follow instructions in the EIA report for monitoring procedures. If we are instructed to inspect every six months, we must inspect every six months. In every block, there is a person from a relevant government department in charge and I just want it to be clear for the participants which department is assigned; it is from MOGE.

### **Comment 19 : Name not noted**

### **Question and Answer Session**

According to my own experience, for monitoring process, in reality, the Government department is mainly responsible but there is the need for skills to be monitored. Therefore, the public should be involved in the monitoring process.

**Photos:**



**Attendant List:**

Stakeholder Consultation for Yetagun Infill Drilling Project

Date - 2/04/2018

02:00 PM to 4:00 PM

Zayar Htet San Hotel, Dawei

No.	Name	Department / Organization	Address
1	U Kyaw Latt	Information and Public Relation Department (IPRD)	Dawei
2	U Kyaw Moe	Inland Transportation Department	Dawei
3	U Aung Maw Oo	Department of Forestry	Dawei
4	U Tint Lwin	Hinthar Media	Dawei
5	U Win Tint Aung	Department of Fishery	Thayet Chaung
	U Tin Oo	National Unity Party	Dawei
6	U Chit Wai	Department of Planning	Dawei
7	U Nyan Shwe	National Unity Party	Dawei
8	Daw Hinn Kyae	National Unity Party	Dawei
9	U Mg MgSoe	National Unity Party	Dawei
10	Daw Hal Lin	National Unity Party	Dawei
11	U Ko Zaw		Dawei
12	U Nyi Nyi	Deputy Township officer	Yebyu
13	U Tin Soe Wai	Dawei Nationality Party	Dawei
14	Nay Min YarZar	National Democratic Force Party	
15	U Than Shwe	Union Solidarity and Development Party	Thae Kyun
16	U sein Win	MWD Media	Dawei
17	U Thu Rain Tun	Deputy Township officer	Launglon
18	U Khine Tun	Environmental Conservation Department (ECD)	Dawei
19	U BO BO Naing	Observer	Dawei
20	U SoeMyaing	Department of Fishery	Dawei
21	U Aung KoMyat	Department of Fishery	Launglon
22	U Kyaw Thu	Dawei Watch Media	Launglon
23	U HlaMyo Aung	Department of Fisheries	Thayatt Taw

## Meeting of Minutes - Yetagun Infill Drilling Project - Scoping Consultation in Myeik Tsp

Detail			
<b>Project</b>	Stakeholder Meeting for Environmental Impact Assessment for Yetagun Natural Gas (Scoping)		
<b>Venue</b>	Grand Jade Hotel (Myeik)	<b>Region/State</b>	Tanintharyi
<b>District</b>	Myeik	<b>Township</b>	Myeik
<b>Objective</b>	Yetagun Infill Drilling Project - Scoping Consultation		
<b>Date</b>	3/04/2018(Tuesday)		
<b>Time</b>	02:00 - 04:00 pm		

Presentation
<p><b>Daw Thi Thi Thein (Senior Consultant, Environmental Resources Management [ERM])</b> started the consultation process with the introduction to the meeting agenda, explaining the objectives of the meeting, and giving an overview of the EIA process as per the Myanmar EIA Procedure.</p> <p><b>U Kyaw Zeya</b> (Deputy Director - MOGE) explained the purpose of the event and role of MOGE.</p> <p><b>U Kyaw Thiha Hla Myint</b> (Executive, Environment) and <b>U Zaw Zaw Aung</b> (Executive, Field Coordinator) (PC Myanmar Limited) explained about the Project.</p>

Question and Answer Session
<p><b>Question 1</b> - U Myat Zaw Moe (FFI) I would like you suggest you disclose contact address and phone number. Laynyar National park is currently at proposed stage. It is not yet a National Park status.</p> <p><b>Answer 1A-</b> Daw Myat Mon Swe (ERM) Although it is in propose stage, we will consider in preparing EIA report. For example, we have responsibility to conserve Pagodas although it is not international or national heritage. We will consider pagodas as cultural heritage in processing the project.</p> <p><b>Answer 1B-</b> Daw Thi Thi Thein (ERM) You can contact PC Myanmar for project related information. For EIA related questions, you can contact ERM. The contacts are shared on the powerpoint.</p> <p><b>Answer 1C-</b> U Zaw Zaw Aung (PC Myanmar) I will also leave my name card.</p> <p><b>Question 2</b> - U Saw Kaung Myat (FFI) How will you do the assessment before the project implementation? Please explain with examples.</p> <p><b>Answer 2</b> - Daw Myat Mon Swe (ERM) I will explain. Thank you for your question. The proposed infill drilling location is 180 nautical miles away from the coast. There may be air emission from the project. As the location is quite far from the coastal area, the assessment on air quality will not be considered in the EIA process. However, we will consider impact on water quality. During consultation meetings, local people have expressed concerns on impacts on seagrass, seabed and corals underwater. As fishes depend on these areas, local people near this area are worried about impacts on fisheries. Therefore water quality has to be tested before starting the project. Similarly, sediment samples are collected by the equipment called grab sampler which collect sediment samples from the seabed. We also survey whether or not toxic substances exist and also study living organisms, species in the sediment. Near shore fishing is limited to 10 miles from shore and offshore is 30 miles. We will collect secondary data on coral reefs by cooperation with FFI, WCS and Myeik University.</p>

## Question and Answer Session

For Projects near shore area, we will put an underwater video camera to study existence of coral and analyze it. Then, we will collect aquatic species samples and verify the percentage of coral in the area. Local people are also concerned with the impact of drilling fluid on fishing ground. The project will use synthetic fluid which are environmental friendly, bio-based drilling fluids. We will conduct a dispersion model. Synthetic drill cutting will not be disposed directly into the water. Instead, it will be treated onboard the vessel in accordance with international standards to reduce the percentage before being disposed.

Dispersion modelling is conducted using computer software. The Model is built based on water flow, wavelength, wind speed and water depth. It is to confirm that there will be no spreading of cutting to sensitive area. An oil spill model is also developed. This Project is to extract gas, not oil. However, there will be three supporting vessels to assist during the infill drilling process. There will be refueling of these vessels which could cause a spill into the sea. This is why the oil spill model is also developed. The model will calculate at what depth and how wide a spill might spread. I would like to explain why the EIA has to be conducted.

Combining the findings of potential impacts from the investigations, findings from public consultations, we must analyze and assess for mitigation measures, and then prepare the Environmental Management Plan (EMP). The EMP will lay down procedures and responsibilities in detail. According the EMP, the Project proponent will be responsible for all commitments made to mitigate impacts. For example, monitoring water quality once every two months, six month and monitoring soil quality once in six months. These monitoring reports will be monitored by Myanmar Oil and Gas Enterprise (MOGE) and Environmental Conservation Department (ECD). MOGE will monitor and ECD will analyze the data. If the project developer does not comply according to EMP, the project cannot continue. This fact is included in Environmental Conservation Law, 2012. One aim of the EMP is to perform monitoring. The purpose of public consultation is for the participation of local people in explaining about impacts and monitoring process.

According to MIC permission, a percentage of profits have to be used in the CSR program. Government defines to do CSR program for sustainable development to recovery from the impacts and to protect social environment. At the same time, to protect natural, biological environment the management plans includes emergency response plans, oil spill management plans. It is included as a commitment in the EIA and is legally binding, and has to disclose how the plans will be carried out. I would like the public to understand this process and that is why I would like to explain this.

### **Question 3 - U Saw Kaung Myat (FFI)**

I would like to suggest that EIA consultation company, such as yourselves (ERM) to participate during monitoring.

### **Answer 3 - Daw Myat Mon Swe (ERM)**

ERM, as a third party, will conduct EIA to assess and submit finding report to the two ministries (Ministry of Electricity and Energy (MOEE) and Ministry of Natural Resources and Environmental Conservation (MONREC). The ministries will examine the report findings and its validity. The monitoring process is a continuation of the EIA. However, at this stage, ERM will not be involved as a third party as we are only involved at assessment stage.

### **Question 4 - U Thaw Tun Nyi Nyi (ECD, SO)**

I would like to know about the oil spill response plan and the number of endangered marine species in the project area. How about drilling cuttings pile? How much drill cutting will be discharged per day?

### **Answer 4A - Daw Myat Mon Swe (ERM)**

All oil companies must comply with international regulations regarding oil spill prevention. Because if oil spill occurred, it will impact on the company's ethic and the environment. Preventing oil spills is extremely important for the companies. Therefore, oil spill response plan is already included in the

## Question and Answer Session

Company's emergency response plan. However in the EIA, as preventive measure, we must include detail procedures on how to protect oil spills due to Project, such as proper refilling process, regular inspection on equipment. Public is concerned about oil spillage and discussion about oil spill is also discussed at the EIA reviewing meeting. Our country does not have regulation and guideline for oil spill. Government is currently trying to set up regulations and guidelines for this. As for ERM, oil spill management plan will be included in the EIA's EMP.

### **Answer 4B - U Zaw Zaw Aung - (PC Myanmar)**

As Daw Myat Mon Swe has explained, Myanmar does not have specific laws and regulations on oil spill. Oil companies must abide by Myanmar laws and international guidelines such as IFC guidelines and for safety, HSE guidelines. If local laws are not complete, we must apply international regulations and guidelines. PC Myanmar has oil spill guideline and management procedures to prevent oil spill. Also, we will are not an oil rig, and will be extracting gas only, not oil. There will not be heavy oil spillage. There will be small amount of diesel use by support vessels. Gas is being extracted.

For preventing spills during bunkering, there is maintenance procedure for the pipes for every month, six, yearly, five years etc... For this we used the Computerized Lube Management System (CLMS), which is also regularly documented. This is a preventive measure. Beyond prevention, if incidents should occur, there are various barriers to prevent it from oil spilling and usually, it can be managed during this stage. Even then if there should be oil spillage, for recovery measure, the boats have oil spill response kits, to contain the spillage. These kits are readily available on our platforms.

### **Answer 4C - U Kyaw Thiha Hla Myint (PC Myanmar)**

It is difficult to say how much drilling cutting will be produce daily. It can be said after defining drilling technology. Also, they will first have to be treated before being disposed. Only then, we can estimate the quantity.

### **Answer 4D - U Zaw Zaw Aung - (PC Myanmar)**

Question also includes where the cuttings will be disposed. Cuttings are not toxic. It is like digging an artesian well. The cutting coming out of it the well is earth. However, there will be drilling fluid which is mixed in the cutting and will need to be separated. Based on the cutting content, we also need to analyze the content and depth as part of drilling process. The drill cutting is treated in accordance with international standards and only afterwards, it is disposed to sea. During the process, there is a laboratory near the drilling location for quality control (QC).

Regarding dispersion model, Yetagun is far from the shore, which takes around one hour to fly there. There is a 5 nautical miles radius, which is the operation area. Commercial and fishing boats and fishing is prohibited in this area.

### **Answer 4E - Daw Myat Mon Swe (ERM)**

We have not studied for biodiversity yet. According to this we will announce via website when scoping report is ready. The purpose of public consultation is to know the public concern. We cannot say definitely as the biodiversity survey team has not done surveying yet. When we reach EIA stage, detail information will be disclosed to you. The Scoping report will be submitted to the company's website. Hardcopies of report will be delivered to administration offices in your area. We apologize that we cannot answer exactly about biodiversity at this time. We have FFI and WCS reports. We also have secondary data about protected species according to Myeik University. We will disclose about biodiversity in EIA report after surveying.

### **Answer 4F - U Zaw Zaw Aung (PC Myanmar)**

According to my experience, the project location is too far from the shore. Water depth 104 m is very deep and water is very clear. Sometime, we can see only a few times some turtles, anchovy fishes, and whales. The biodiversity team could have some difficulties because project location is too far from the shore. Only with specific research vessels like in China, Australia, with well equipped vessels and technology, can the assessments be carried out well.

## Question and Answer Session

### **Answer 4G - Daw Myat Mon Swe (ERM)**

Secondary data will always be referred for biodiversity. Moreover, as per procedure, we must also study onshore biodiversity in case there can be some form of impact. At the Project area, we will focus more on observation on site and we will collect number and frequency marine species sighted and findings will also be disclosed. This is also because there is a time limit for EIA procedure.

### **Question 5 - U Myo Thura (ECD)**

How do you transport drilling cutting to Thilawa, GOLDEN DOWA ECO-SYSTEM MYANMAR (DOWA) and Thar Kay Ta (MOGE)? Have you already discussed with MOGE and DOWA for this?

### **Answer 5A- U Kyaw Thiha Hla Myaint (PC Myanmar)**

Firstly, we have to separate wastes into hazardous and non-hazardous waste. We will transport to Thilawa and DOWA. Non-hazardous waste will be disposed to MOGE's Thar Kay Ta supply base. It will then be transferred to Yangon City Development Committee (YCDC) and it will be transferred to relevant landfill site. For hazardous waste will be disposed at DOWA.

### **Question 6 - U Myo Thura (ECD, SO)**

I think that greenhouse gas will also emitted and there can be impact on the seabed. I would like to suggest this information and mitigation measures to be disclosed in the presentation.

### **Answer 6 - Daw Myat Mon Swe (ERM)**

These detail information will be included in EIA report.

### **Question 7 - U Myo Thura (ECD,SO)**

Do you have specific CSR program related to this infill drilling project on the three blocks. In the EIA, I would like to suggest that it specifically mentions what CSR programs will be implemented as part of this infill drilling project.

### **Answer 7A - U Zaw Zaw Aung (PC Myanmar)**

The M12/13/14 blocks are not new blocks. We already have existing platform. For the infill drilling project we have to perform EIA again due to EIA procedure. Additional CSR program will be included later.

### **Answer 7B - Daw Myat Mon Swe (ERM)**

CSR program will be presented in Chapter 9 in EIA report including budget.

### **Question 8 - U Myo Thura (ECD,SO)**

Regarding CSR, instead of stating 2 or 5 % of the profit will be used for CSR, it would be better use state the amount, for example, MMK 10 million will be used for CSR and how much will be used for which development sector. This has been suggested in the EIA review team meetings by ECD.

### **Answer 8A- Daw Myat Mon Swe (ERM)**

We cannot definitely say a fixed cost for CSR program because we cannot know how much we can get profit from the project. So, it is a little difficult for companies to mention a fixed amount. The purpose of CSR program is for sustainable development as a recovery. Therefore, some percentage of profit will be used for CSR program. This is now accepted. CSR is not a donation. As mentioned earlier, there is no project with zero discharge. Impact can only be mitigated and reduced. Therefore, CSR is used to recover environmental and social impacts due to project, in a sustainable way. There are of course some companies that have not made profits yet but have started CSR activities for example in health and education. The purpose is for sustainable development.

### **Answer 8B - U Zaw Zaw Aung (PC Myanmar)**

## Question and Answer Session

CSR programs are initiated by the company, such as providing training courses but local people have responsibility to continue this program and to keep it sustainable and on-going. For example, for education, full scholarships are granted to outstanding students who attend at Petronas Technology University for four years. Sometime, there is a bond related to the scholarship.

### **Answer 8C - Daw Ei Mon Swe (PC Myanmar)**

We collected survey from village level, then township, regional level. This is to collect community data on what projects the communities would like in the communities. Then, annually, we make plans, inform our Joint-venture Partners and also inform MOGE of the budget we will use for CSR. Based on the approved budget, we implement the projects.

### **Answer 8D- Daw Myat Mon Swe (ERM)**

Just to clarify. Supposing if CSR budget had initially agreed to MMK 10 million for education at the initial project stage, but at production stage, when company starts to make profit, education is no longer a priority instead it is health. So, in that case, budget will have to be used for health. Rather than committing to an amount, companies prefer to fix on percentage of the profit to be used for CSR programs. This is now accepted.

### **Question 9- U Myat Zaw Moe (FFI)**

Are there any successful CSR project by Yetagun in education, health and environmental conservation? How many percent did you get success? Do you have plan for supporting livelihood such as in livestock?

### **Answer 9A- U Kyaw Thiha Hla Myint (PC Myanmar)**

According to environmental conservation, we have typical project, Tanintharyi Nature Reserve Project (TNRP) cooperation with WCS. It is seen as one of the model projects in Southeast Asia.

### **Answer 9B - U Zaw Zaw Aung (PC Myanmar)**

Is specific to Tanintharyi Nature Reserve Project (TNRP), I don't have the exact numbers but there are surveys on biodiversity that has been collected by the Forest Department. PC Myanmar mainly supports funding to the Forest Department which is the department mainly running the project. Currently, it is seen as a successful project and nearby villages that have received awareness training no longer practice logging. However, I do not have exact figures to measure the progress of the project. As for your question how to proceed in the future for success, I believe it cannot be done alone and also needs collaboration with local communities. As part of the CSR project, we provide awareness trainings and as a result we believe the project will be more successful.

### **Answer 9C- Daw Myat Mon Swe (ERM)**

As PC Myanmar only supports funding to Forest Department, if you would like to get facts and figures, please contact the Forest Department, they should have the data as they the department handles the implementation, monitoring process. Research is also conducted by TNRP. PC Myanmar only provides funding.

### **Answer 9D- U Zaw Zaw Aung (PC Myanmar)**

Regarding education, there are early child care development programs (ECCD) and health, education support programs include full scholarship and stipends, and for Technology universities, there is internship programs for outstanding students. Scholarship program is still ongoing. For Yetagun Youth Program, last year, there was a competition between youth from Mandalay, Yangon, Tanintharyi regions. Those who won received cash reward as well as excursion trip to the PC Myanmar site. Since I was not involved in this activity, I do not have exact data.

### **Question 10 - Name not recorded**

Will there be livestock breeding training for local communities as part of your CSR program?

### **Answer 10- U Zaw Zaw Aung (PC Myanmar)**

## Question and Answer Session

We provide vocational training such as sewing, electrician, carpentry trainings mainly in Kanbauk Area.

**Question 11** - Name not recorded  
How are they selected?

**Answer 11** - Daw Ei Mon Swe (PC Myanmar)  
It is based on the needs of the local communities through discussion with them.

**Question 12** - U Myo Thura (ECD,SO)  
For scoping report, will there be air, water, soil primary data collection?

**Answer 12A** - Daw Myat Mon Swe (ERM)  
We have not conducted yet, so we cannot disclose the results now. Sediment, water quality and plankton sampling will be conducted. There will be 12 water sampling areas for the project and from each location, we will collect one sample.

**Answer 12B** - U Zaw Zaw Aung (PC Myanmar)  
Water sampling will be conducted in April, 2018 around water festival. It will take around 2-3 days. You are welcome to join.

Photos:



**Attendant List:**

Stakeholder Consultation for Yetagun Infill Drilling Project

Date - 3/04/2018

02:00 PM to 4:00 PM

Grand Jade Hotel, Myeik

No.	Name	Department / Organization	Address
1	Daw Yin Yin Aye	Officer	Myeik (District)
2	Daw Mone Mone Naing	Assistant Director	Myeik
3	U Myint Oo		Myeik
4	KO Zaw Zaw		Myeik
5	U Zaw Zaw Aung	Petronas Carigali Myanmar (Hong Kong) Limited	Yangon
	U Saw Kaung Myat	Fauna & Flora International	Yangon
6	Zaw Moe Aung	Eleven Media	Myeik
7	U Lin Htine	International Committee of the Red Cross (Vice Chairman)	Myeik
8	U Nay Win	Human Right (Member)	Myeik
9	U Tun Tun Wai		Myike
10	U Zaw Myo Naing	Information and Public Relation Department	Myeik
11	U Myo Thura	Staff Officer (Environment Conservation Department)	Myeik
12	U Nay Thaw Tun Nyi Nyi	Deputy Staff Officer (Environment Conservation Department)	Myeik
13	Daw Aye ThandarSoe	Staff Officer (Department of Agriculture)	Myeik
14	Myat Zaw Moe	Fauna & Flora International (Junior Biologist)	Myeik
15	U Aye Naing	Myanmar Port Authority (MPA)	Myeik
16	Ko Than Soe	Lawka Alin	Myeik
17	Ko Kyaw shaing Oo	MWD Media	Myeik
18	U Kyaw Kyaw Naing	88 Generation	Myeik
19	U Myo Myint Oo	Dawei Watch	Myeik

**Meeting of Minutes: Environmental and Social Impact Assessment (ESIA) for PC Myanmar (Hong Kong) Limited (PCML) Yetagun Infill Drilling and 3D Seismic Project**

Detail			
<b>Project</b>	ESIA for Offshore Block M12, M13 and M14 Project		
<b>Venue</b>	Zayyar Htet San Hotel	<b>Region/State</b>	Tanintharyi
<b>District</b>	Dawei	<b>Township</b>	Dawei
<b>Objective</b>	Stakeholder Consultation Meeting		
<b>Date</b>	24 <sup>th</sup> August 2018		
<b>Time</b>	15:00-18:00 PM		

*Comment from U Nay Min Yar Zar, National Democratic Force*

- Thanks for the Kaleinaung to Daminseik road construction. I would like to request you to construct a road between Zardi and Htwat Wa. We should consider not only physical impacts but also psychological consequences. The company should listen to local people’s feelings and concerns. It is good that the impact of air and water will be assessed, please also include a soil assessment.
- Can oil and gas production cause earthquakes?

*Response from Daw Tin Nwe Nwe Nyo, PCML*

- We will consider road construction as a part of our corporate social responsibility (CSR) program.

*Response from U Phyo Paing Soe, PCML*

- In gas production, the gap in the soil is filled with oil and water. This does not cause earthquakes. In Myanmar, large earthquakes occurs around once in every 100 years. These earthquakes are not due to the production of oil and gas but rather due to movement of the tectonic plates (the Indian plate and Burma plate).

*Comment from U Tin Soe, Maung Mal Shaung Village*

- Can production of gas have impact fish?
- If the project is successful (commercial in the future), will Dawei Township have access to electricity? Does the project have any other impacts on the local community?

*Response from U Phoe Kyaw, PCML*

- The waste from the Project will be discharged in compliance with National Environmental Quality (Emissions) Guidelines (NEQG). If the waste cannot be discharged over board, it will be carried to the shore to disposal. General wastes such as kitchen waste will be discharged as per MARPOL (international) standards. We believe that there won’t be much impact from the project as the project try to reduce waste impacts as much as possible.

*Response from Dr. Soe Moe Aung, Myanmar Oil and Gas Enterprise (MOGE)*

- Ministry of Energy and Electricity (MOEE) proposes to construct a transmission line (Mawlamyine-Ye-Dawei transmission line) to get access to electricity.
- We sell the gas for domestic consumption with a reasonable price. If the region connects with the national grid, the cost of electricity may be lower than the current price.

### *Comment from U Htein Win*

- Is the Yetagun Platform still operating?
- The project is 90 miles far from Loung Lon, 96 miles from Dawei, 105 miles from Myeik and 85 miles from the nearest island.
- What are the benefits and drawbacks of the project on marine tourism and fishing blocks?
- Could the protected area near Laung Lon be affected by the project?

### *Response from U Phoe Kyaw, PCML*

- The two drilling activities that will be undertaken are exploration and infill drilling. We already have gas pipelines for the existing drilling and production.
- If we discover the new reserves of gas, there will be only one additional small production rig.

### *Response from U Zaw Zaw Aung, PCML*

- Water depth in the Project Area is about 300 feet and there are no tourism activities in that area. The Project will not affect the tourism industry given the distance offshore.

### *Comment from U Soe Thant, Regional Department of Fishery*

- The blocks operated by this project (M12, M13, and M14) are offshore as well as very important fishing areas. Drilling operations would take about 25 days per well and exclusion zone is 500 m.
- We have previous experience that drilling took more than 75 days and the exclusion zone was over 500 m. The exact information about drilling duration and exclusion area should be disclosed.
- As fishing at sea can last for about 20 days per month, fishermen would have many concerns on their livelihood if they could not fish in those days. What is the exclusion zone of drilling rig?
- This presentation included information about leatherback turtle. I started to establish regional marine conservation and according to my knowledge, there is no observation of leatherback turtle in Thanintharyi region. How did the third party organisation collect data about it or from which reference? Where and when did the company undertake seabed micro-organism survey?

### *Response from U Phoe Kyaw, PCML*

- Prior to the Project commencement a, "Notice to Mariners" will be announced in newspapers. This Notice will include the boundaries/edges of the Project Area. If fishing boats are in the path of the Project vessels, PCML will negotiate with them using Marine Channel-16.
- If a gas reservoir is found, a drilling rig would be mobilized and safety zone will be 500 m around it.
- The safety protection area is five nautical miles radius from safety zone. The project doesn't allow vessels to enter and operate in this area. This is a small area compared to the large area of the fishing grounds.

### *Response from Daw Khin Su Su Naing, Environmental Resources Management (ERM)*

- Seawater, sediment, plankton, and benthos sampling was conducted in April 2018. If you want detailed sampling locations and information, I can provide this.

- When we collected environmental data from fishermen in LongLon, we found out that the most common turtle species observed was the Olive Ridley. However, as a precaution, we also include any turtle species that may occur in the Region. The data sources will all be listed in the EIA.

#### Attendance List

No	Name	Position	Department/ Organization/ Address
1.	U Kyi Htay	Administrator	Ta Lai Htein quarter
2.	Daw Thida Moe	Assistant	
3.	U Sein Win	Reporter	Myawaddy Newspaper
4.	U Tin Soe Wai	District Chief Executive Officer(EO)	Myanmar Witter Association
5.	U Zaw	Reporter	Dawei Watch
6.	U Aung Thein	Village Administrator	
7.	U Tin Soe	Secretary	Maung Mal Shaung Village
8.	U Soe Soe	Secretary	
9.	U Min Maung	Township Reporter	Myanmar Radio and Television (MRTV), Myawaddy(MWD)
10.	U Than Win	Member	Human Rights Watch Dawei
11.	U Kyaw Soe		Village Elder
12.	U Aung Thwin		Village Administrator
13.	Daw Htet Taryar		Project Planner
14.	Daw Thae Zun Mo		Project Planner
15.	U Than Zaw	Deputy Assistant Staff Officer	Ye Phyu Department of Fishery
16.	U Tin Maung Win	Assistant Staff Officer	Laung Lon Department of Fishery
17.	U Soe Myaing	Township Staff Officer	Fishery
18.	U Aung Paing Oo		
19.	U Kyaw Sein		Information and Public Relations Department
20.	U Kyaw Kyaw Latt		Information and Public Relations Department
21.	U Kyaw Moe	Deputy Staff Officer	Department of Marine Administration
22.	U Aung Htay	Village Administrator	
23.	U Htein Win	Executive Committee (EC)	Public Light Network
24.	U Kyaw Ye Thu	Executive Committee (EC)	Civil Society Organization (CSO)
25.	U Khaing Tun	Assistant Director	Environmental Conservation Department
26.	U Soe Thant	Staff Officer	District Department of Fishery
27.	U Si Thu Aung	Deputy Inspector	Bureau of Special Investigation
28.	Daw Marlar	General Service (G.S)	Women's Union
29.	U Khin Aung		
30.	U Kyi Htwe	Special Branch (SB)	
31.	U Aung Zin Htay		Dawei Police Station
32.	Dr. Zaw Win Hlaing	Staff Officer	Township Medical Office
33.	U Nyan Htun		District Public Health Department
34.	U Zaw Htun	Chairman	Future Light
35.	U Hla Gyi	Village Elder	

No	Name	Position	Department/ Organization/ Address
36.	U Aung Moe Naing	Village Administrator	
37.	U Nay Min Yar Zar	Deputy Chairman	National Democratic Force
38.	U Khin Kyaw	Village Administrator	
39.	U Tint Lwin	Reporter	Hinthar Media
40.	U Htay Naing	Deputy Director	Project Planning
41.	U Ba Sein	Deputy Chairman	National League for Democracy
42.	U Myint Kywe		
43.	U Phay Lwin	Officer	District Department of Fishery
44.	U Phyo Zin	Reporter	Eleven Media

Photo





**Meeting of Minutes: Environmental and Social Impact Assessment (ESIA) for PC Myanmar (Hong Kong) Limited (PCML) Yetagun Infill Drilling and 3D Seismic Project**

<i>Detail</i>			
<b>Project</b>	ESIA for Offshore Block M12, M13 and M14 Project		
<b>Venue</b>	General Administrative Department's Office	<b>Region/State</b>	Tanintharyi
<b>District</b>	Dawei	<b>Township</b>	Launglon
<b>Objective</b>	Stakeholder Consultation Meeting		
<b>Date</b>	24 <sup>th</sup> July 2018		
<b>Time</b>	09:00-12:00 PM		

*Comment from U Aung Thu, Individual Civil Society Organization*

- What is the Contract sharing between Myanmar Oil and Gas Enterprise (MOGE) and PCML? From this contract, how much will be used in this region?
- How do you mitigate the impacts on fishermen?
- How will the company protect coral reefs?
- We are concerned about waste disposal even though the company will be conducting a waste management plan. If there is leakage of mercury, it can affect fish and other marine animals. I want to know how PCML will manage mercury as I didn't see any mercury management in this presentation. Who will PCML collaborate with to conduct laboratory analysis?
- If we enter the exclusion zone during the night, there is a risk for both sides. I want to know the safety measures for fishermen.
- I found that the Environmental Impact Assessment (EIA) study has conducted only for the drilling areas, not for the immediate areas around the blocks. The EIA study should cover the three blocks and the other blocks around the project site. These drilling areas are located around our main fishing zone so PCML should conduct the Project carefully during the drilling activities.
- The third party should directly disclose the EIA reports to the local community, rather than doing it after getting permission from PCML. The Cooperate Social Responsibility (CSR) activities should be implemented in the undeveloped villages in Dawei and Laung Lon, which are difficult to access.

*Response from Dr. Soe Moe Aung, MOGE*

- There is a Production Sharing Contract (PSC) between PCML and MOGE. The Union Government manages all the profits although the contract was signed by MOGE. The regional government manage resources within 25 nautical miles of the coast.
- The current drilling project is outside of 25 nautical miles of the coast, the profits from this project are under the management of the Union Government. The Union Government will share the profits equally to the development programs of States and Regions. MOGE's role is to take responsibilities in technology for exploration, drilling and production as the governmental department.

*Response from Daw Khin Su Su Naing, ERM*

- I would like to explain about the EIA. We collected different marine species including phytoplankton and zooplankton that can only be seen by microscope. We also assess the location of mangroves, seagrass and coral reefs where marine species can breed and are very important for marine ecology.

- PCML will disclose the report on their website when it is finished. This is a legal requirement for the Proponent under the EIA Procedure.
- The report also assesses the cumulative impacts of surrounding areas around the project site. Monitoring programs along with the proposed mitigation measures and will be submitted to the Environmental Conservation Department (ECD). If you want to know the progress of monitoring plans, you can ask the project proponent. This stage is only the assessment stage, we will include your comments, suggestions and recommendations in the EIA report.

*Response from U Phoe Kyaw, PCML*

- We have to submit an Environmental Monitoring Plan to ECD as per requirements of EIA. We will use modeling to know where the drill cuttings will disperse and the amount of cuttings deposited. The drill cuttings will be discharged in accordance with the National Environmental Quality (Emission) Guidelines. We will discharge drill cuttings only after treatment which achieve the acceptable levels. An acceptable level for mercury is 1 mg/kg and for oil and gas is 6.9 ppm according to the guideline.

*Comment from U Maung Maung Aye, Villager, Auk Yae Phyu*

- Tanintharyi Region is a major oil and gas production area, but we are still purchasing diesel, gas, and electricity at a high price. What are the benefits from the future blocks?

*Response from Dr. Soe Moe Aung, MOGE*

- We are trying to produce gas from the project as the amount of gas produced in Myanmar has decreased. Power generation is required in order to generate electricity and transmission lines are also required to distribute electricity to other areas. There are no transmission lines from the national grid in Tanintharyi Region at present. Therefore we can only distribute to areas where there are transmission lines. In the drilling stage, we are not sure if the reservoir exists or not. If a reservoir is found, the project move onto the development stage.

*Comment from U Kyaw Lwin Soe, Villager, Pan Tae Inn*

- What are the management plans for mercury leakage and how will you mitigate that kind of leakage?
- The EIA report should be translated into Burmese and disclosed into local community.
- The community want to accept this project as it is the country's development project but this project doesn't give any benefit for local.

*Comment from U Aung Soe, Fisherman, Pa Nyit Village*

- Most fishermen are facing many difficulties due to drilling of gas.

*Response from U Phyo Paing Soe, PCML*

- We have Notice to Mariner which will be notices for the drilling of oil and gas. Ships are rotating within 500 m exclusion zone in order to be safe for fishing boats and fishermen.

### *Comment from U Aung Soe, Fisherman, Pa Nyit Village*

- Fishermen need to be informed about project operations using brochures that should be sent to every fishing household.
- If the marine environment and animals within the blocks are affected and fishing is prohibited, our livelihood would be impacted. How will the company handle this issue?

### *Response from U Phoe Kyaw, PCML*

- These blocks are far from the shore. Some fishing boats may go around the blocks. Fishermen will be informed in advance where the Project vessels are going to operate and there will be support vessels offshore to liaise with fishermen.
- Local communities need to be aware that seismic vessels would go back and forth over the Block during seismic operations. PCML will make sure the seismic survey contractor is aware of the presence of fishing boats.
- Total duration of seismic survey and exploration drilling is about 7 months and these operations are temporary. If a gas reservoir is found economically, gas pipelines will be connected from this place to the bottom of the station built in the first phase. Seismic survey takes about 50 or 70 days as maximum and it will take about 75 days to drill one exploration well. The actual duration could be shorter.

### *Comment from U Aung Soe, Fisherman, Pa Nyit Village*

- How will the company address socio-economic impacts?
- Will the community have any negative impacts from eating fish that eat wastes generated from drilling operations?

### *Response from Daw Khin Su Su Naing, ERM*

- There are two approaches. Firstly, an assessment of the impacts to fisheries is undertaken and mitigation is recommended. Secondly, 'Notice to Mariner' will be communicated. The Project Area is located about 100 miles from the shore.
- Data collection would be undertaken not only with fishermen in this meeting but also with relevant organizations including the Regional Fishery Federation and Department of Fishery. The Notice to Mariner will be communicated one month in advance of the activity to the fishery community and will include information on the operation area.
- Waste generated from Project activities will be categorized. Some wastes will be sent to the shore where it can be disposed. Food waste will be disposed into the sea (after being ground into very small pieces). No solid or hazardous waste will be disposed of at sea. Waste management will be undertaken in compliance with national and international standards; such as MARPOL.

### *Discussion from U Tun Kyi, Villager, Maung Makan*

- Is it possible for the project to go ahead?
- MOGE representative said that the Union government is responsible for this project as it is located over 45 nautical miles from the shore. In terms of fishing, inshore fishing is within 12 miles from the shore and offshore is over 12 nautical miles from the shore.

### *Comment from Daw Yee Yee Htwe, Fishermen Union*

- The community have experienced with Cooperate Social Responsibility (CSR) programs conducted by the Yetagun project where there were conflicts among local communities as the project did not provide enough money. For example, the project provided budget for building preschool in one village. Land ownership issues are complex in rural area as there is no official documentation of ownership. There have been arguments between villagers and land owners. That preschool was built on the land with ownership issues and the Project did not take responsibility. They only asked how much the villagers and owner needed as compensation and didn't pay the current market price. It is necessary that all village administrators are aware of the Yetagun CSR programs and that we don't get anything free from Yetagun. However, most of the administrators have accepted Yetagun's support. Yetagun is undertaking these tasks, in coordination with the union government and locals do not have the right to discuss about these matters. So I request to stop this project.

### *Response from Dr. Soe Moe Aung, MOGE*

- The project is not a new one and it is continuation of the Yetagun. The contract includes the duration in which the specified amount of gas will be produced but it cannot currently be achieved due to the current decrease in production. The government is in the situation of compensating the loss.
- Infilling and exploration wells have to be drilled in order to overcome this situation. The probability of successful production for an infilling well is 80% to 90%, whereas that of exploration well is from 10% to 15%. The compensation of government for the loss disadvantages the citizens.
- Gas reservoirs will be explored in Blocks M-12, M-13 and M-14 only. The production process will be carried out in the area of gas reservoirs where environmental impact assessments have been conducted.

### *Comment from U Tun Kyi, Villager, Maung Makan*

- The locals have to pay from 200 to 600 kyats per unit for electricity while the nationwide price is 35 kyats per unit. Please inform the government that they are only concerned about their contract and not about the concerns of the community. We heard that we are entitled to access 25% of the produced gas. Where does this 25% go? The government should equally treat both developer and community, if not, we will protest.

### *Response from Dr. Soe Moe Aung, MOGE*

- Concerning the profit sharing, 20.5 % of the profit will be received to the whole nation (Union Level). Regarding access to electricity, MOGE has supported domestic use by installing domestic gas pipelines. Just like other regions/states, natural gas has been sold to Taninthari region at 7.5 USD per 1MMbtu (British thermal units).
- A power plant which will use natural gas will also be built in Tanintharyi and transmission lines need to be constructed to get access to electricity.

### *Discussion from U Kyaw Lwin Soe, Villager, Pan Tae Inn*

- It is said that the drilling activity has no impacts on the environment, but it will affect the marine environment. Dead fish and animals are found near the Project Area and we believe that it is related to the waste generated from the drilling rigs.

### *Comment from U Tin Htwe, Administrator, Pa Nyit Village*

- The Project Area is about 30 miles (*NOTE: this is not correct and wasn't mentioned by ERM or PCML*) from LaungLon and it is closer to our coastal region. Yetagun have conducted many CSR programs in the towns/villages which have accessible roads. There are 18 villages in LaungLon Township and Yetagun CSR programs have reached only 2 or 3 villages. CSR programs should be reviewed. The meeting was organized by MOGE, the project proponent, and the EIA company. We want to have an open conversation with the EIA Company but we need to aware the government representative.

### *Response from Daw Khin Su Su Naing, ERM*

- We normally conduct the meetings together with government representative and project proponent as we intend to explain all information related to the project at the same time. If the meetings are conducted separately, the community may not be comfortable to attend all these. However, we are able to listen to you privately if you would like. We do focus group discussions individually with the community after the presentation. Please feel free to talk to us and your concerns will be considered and accessed in the EIA.

### **Attendance List**

No	Name	Position	Department/ Organization/ Address
1.	Daw Aye Aye Mar	Officer	Meteorology Department
2.	Daw Pyae Pyae Moe	Engineer -2	Rural Development Department
3.	U Sein Win	Wai Di	Administrator
4.	U Zaw Win	Wai Di	Community Based Organization
5.	U Aung Than	Wai Di	Community Based Organization
6.	Daw Phyu Phyu Aung	Industry - 5	Communication
7.	Daw Tar Lwin	Staff Officer	Planning
8.	Dr. Thein Zaw	Staff Officer	
9.	U Myo Thein	Villager	San Hlan
10.	U Naing	Villager	San Hlan
11.	U Thin Kyaing	Villager	San Hlan
12.	U Thit San	Villager	San Hlan
13.	U Soe Thu	Hundred Household Head	
14.	Daw Tin Zar Aung	Staff Officer	Commission
15.	U Maung Than	Ta Sa Nya Party	Tha Byar
16.	U Aung Soe	Fisherman	Pa Nyit

No	Name	Position	Department/ Organization/ Address
17.	U San Htet	Fisherman	Pa Nyit
18.	U Than Naing	Administrator	Maung Makan
19.	U Tint San	Villager	Maung Makan
20.	U Maung Maung Aye	Clerk	Auk Yae Phyu
21.	Daw Swe Swe Mwe	Clerk	Pa Nyit
22.	Daw Saw Phyu	Clerk	Wai Di
23.	Daw Yee Yee Lwin	Post Officer	Myanma Post
24.	Daw Khin Mar Win	Township Manager	Fire Service Department
25.	U Pyae Phyo Aung	Assistant Officer	Fire Service Department
26.	U Zaw Moe Naing	Deputy Staff Officer (Civil)	
27.	U Min Lwin		Myanmar Police Force
28.	U Than Win	Hundred Household Head	Kyauk Matat
29.	U Myint Aung	Village Administrator	Kyauk Matat
30.	U Tin Maung Win	Assistant Director	Department of Fisheries
31.	U Than Htike	Farmer	Ba Kyet Taw
32.	U Aung Naing Soe	Fisherman	Kyauk Sin
33.	U Nyi Nyi Htwe	Villager	Kyauk Sin
34.	U San Lwin	Villager	Kyauk Sin
35.	U Than Zaw Oo	Villager	Kyauk Sin
36.	U Kyaw Lwin Soe	Villager	Pan Tae Inn
37.	U Htun Kyin	Villager	Maung Makann
38.	U Kyaw Swar Lin	Administrator	Kyauk Wut Pyin
39.	U Thura Shein	Clerk	Kyauk Wut Pyin
40.	U Myo Thein	Villager	Kyauk Ni Maw
41.	U Kyaw Htay	City Development Committee	Laung Lon
42.	U Zaw Naing Oo	Township Manager	Development Bank
43.	U Aung Tin Saw	Township Staff Officer	Department of Fishery

No	Name	Position	Department/ Organization/ Address
44.	U Thet		Department of Traditional Medicine
45.	Daw Thandar Soe	Staff Officer	Audit Department
46.	U Naing Naing	Villager	San Hlan
47.	U Myo Zaw Lin	Clerk	Myin Gyi Kyun
48.	U Thet Htwe	Clerk	Tha Kyet Taw
49.	U Zaw Zaw Win	Clerk	San Hlan
50.	U Naing Min Htun	Clerk	General Administrative Department
51.	U Aung Ko Phyo	Clerk	General Administrative Department
52.	U Zaw Zaw Soe		Department of Education
53.	U Soe Myint	Elder	Tizit
54.	U Thein Aung	Staff Officer	Revenue Department
55.	U Min Thu Lat	Clerk	General Administrative Department
56.	U Aung Kyaw Moe	Elder Person	(Kha) Yard
57.	U Hla Win	Village Administrator	
58.	U Myo Aung	Hundred Household Head	
59.	U Zaw Naing Lin	Staff Officer	Forest Department
60.	U Aung Naing	Deputy Staff Officer	Department of Immigration
61.	U Win Htoo	Staff Officer	Laung Lon
62.	U Kyaw Min Htun	Lawyer	Law Offices
63.	Daw Moe War	Staff Officer	Department of Information and Public Relations
64.	U Aung Khant	Township Court	Laung Lon
65.	U Zay Yar Htay	Sport Coach	Laung Lon
66.	U Aung Thein	Villager	Nyin Maw
67.	Dr. Maung Maung Kyaw	Administrator	Kyauk Sin
68.	U Phoe Shein	Administrator	

No	Name	Position	Department/ Organization/ Address
69.	U Aung Min Htun	Senior Assistant Engineer	Road Department
70.	Dr. Lin Zar Ni Myo	Assistant Surgeon	Laung Lon Hospital
71.	Daw Thet Thet Soe	Village Administrator	Kyauk Ni Maw
72.	U Khin Naing Win	Fisherman	Kyauk Ni Maw
73.	U Maung Naing	Clerk	Kyauk Ni Maw
74.	U San Shwe	Elder	Kyauk Ni Maw
75.	U Win Min Soe	Village Administrator	Tizit
76.	U Aung Thu	Individual Civil Society Organization	Laung Lon
77.	U Maung Myint	Villager	Tizit
78.	Daw Cho Cho San	Maternal and Welfare Association	Nyin Maw
79.	U Soe Paing Thu	Villager	Nyin Maw
80.	U Aung Thu Oo	Village Administrator	Zalut
81.	U Kyaw Phay	Hundred Household Head	Zalut
82.	U Myo Aung	Staff Officer	Department of Agriculture
83.	U Aye Lwin	Villager	Kanni
84.	U Thet Lwin	Villager	Laung Lon
85.	U Than Win	Villager	Kyauk Twin
86.	U Toe Htet	Villager	Kyauk Twin
87.	U Myo Win	Fisherman	Thabawt Seik
88.	U Chit Wai	Villager	Kanyut
89.	U Zaw Oo	Villager	Maung Makan
90.	U Tin Htwe	Village Administrator	Pa Nyit
91.	U Hla Htwe	Fisherman	Ma Nyit
92.	U Win Aung	Village Administrator	Auk Kyauk Wut
93.	U Tun Kyi	Villager	Maung Makan
94.	Daw Yee Yee Htwe	Fishermen Union	
95.	Daw Su Zin Mar	Fishermen Union	

Photo





**Meeting of Minutes: Environmental and Social Impact Assessment (ESIA) for PC Myanmar (Hong Kong) Limited (PCML) Yetagun Infill Drilling and 3D Seismic Project**

Detail			
<b>Project</b>	ESIA for Offshore Block M-12, M-13 and M-14 Project		
<b>Venue</b>	Grand Jade Hotel	<b>Region/State</b>	Tanintharyi
<b>District</b>	Myeik	<b>Township</b>	Myeik
<b>Objective</b>	Stakeholder Consultation Meeting		
<b>Date</b>	26 <sup>th</sup> July 2018		
<b>Time</b>	09:00-12:00 PM		

***Comment form U Win Naing, Fishery Businessman***

- I am interested in environmental and socio-economic impact assessment. I am sure that there will be impacts. Is there any plan to compensate the short-term impact on fishery due to the activity?
- There must be long term impact as Yetagun and Yadana have been operating here for 20 years and those are unrenewable energy resources.
- People are annoyed they cannot use the resources. Electricity is very expensive in this area. Do you have any plan to sell the gas produced from the project in the future and will people have access to electricity.
- The Pinlong Peace Conference mentioned that resources have to be shared. I would like to know how things would change if the regional government had authority to manage the resources.

***Response from Dr. Soe Moe Aung, Myanmar Oil & Gas Enterprise (MOGE)***

- The project contract is not a new one. The production rate of the existing well is decreasing therefore, infill drilling and exploration drilling is required in order to meet the expected production. The project activities include exploration and infilling drilling which will be undertaken near the area of existing Yetagun platform. The project is to extract gas which will be sold at the fixed prices by connecting with national gas pipe lines.
- There are three steps to get access to electricity; generation, transmission lines and distribution. Although gas will be sold with the fixed price for generation, a transmission line is still required. If this Region can connect lines to the national grid, the electric cost per unit will be reduced.

***Response from U Zaw Zaw Aung, PCML***

- PCML has a grievance mechanism. We have to comply with the local laws and regulations. If there are laws and regulation to give compensation for the project located in the sea, we will comply with the governments instruction.

***Comment from U San Maung, Myeik Fishery Federation***

- We usually participate in different public consultation meetings related to oil and gas projects but I feel that our opinions and comments given in the meetings were not submitted to the higher level as there have been no actions. Even though our region is rich in natural resources, we have to pay 400 kyats per unit for electricity.
- There are CSR programs in Tanintharyi (Dawei) but there is no CSR activity in Myeik Township, this area should be considered for the support.
- Fishing is the main business in Myeik. As blocks M-12, M-13 and M-14 are located within our fishing ground, 20 fishing plots out of 52 plots cannot be used for fishing. Previous projects, such as TOTAL

and Shell, operated their project activities at the place where the water depth is about 500- 1000 m. However, this project is near to the shore, it is also close to the shark protection area. One of scholar who did a study said that there are so many fishing boats and overfishing is currently taking place in the area. When oil and gas activity takes place, fishing boats have to move and might reach to restricted areas.

- We understand that these projects are important for national development. When will the contract end? Will the infill drilling fulfil the amount required in the contract? Will the project take be extended if oil and gas extraction can continue?
- What will be the positive impacts from this project to our region? There is Form 7 for land ownership; what is the ownership in the water? We have fishing license in the sea and we also have to pay taxes according to the government regulations. The mitigation measures only apply for the company and not for the fishermen. Notice to Mariners explains where the activity will take place but it does not mention the loss of the fishermen. We are fishing seasonally and if the restriction is in the season, we cannot do our business. It is only the restriction for the fishermen not to fish in the project area. We have mentioned several times and there is no actions coming out of this message. If oil and gas companies come to inform us about the project but not to consider the impact from the fishing business, we don't want to participate in the consultation meeting anymore.
- The presentation explained that seismic activity will be undertaken with a soft start to alert marine animals. What about crabs living in the ground and sea turtles? The presentation mentioned about whales and sharks. We aren't interested in them as we don't catch them. We are aware that the red crab catch is decreasing which impacts our business. What is the impact of seismic surveys on fishes and crabs.
- We also want to understand how much gas has to be produced to fulfil the contract? How much gas can be produced from the potential wells? I want you to disclose the amount because seismic survey had already been done. Then we can understand whether the gas can be left for the people when the contract expire.

#### *Comment from U San Hmwe, Kyun Su Department of Fishery*

- There is Form 7 for land ownership, likewise there are 52 fishing blocks for Tanintharyi region and there can be a kind of ownership for the fishermen in the sea.

#### *Response from Daw Khin Su Su Naing, Environmental Resource Management (ERM)*

- Third party organization has to prepare the report and submit to the Environmental Conservation Department (ECD) to be reviewed and give approval. The report is reviewed by different relevant departments such as Ministry of Labor, Immigration and Population, Ministry of Health and Sports, Forest Department, Department of Meteorology and Hydrology, Department of Marine Administration, Port Authority, and professors from relevant universities. The department officers give comments and suggestions for the report to be amended. The comments and suggestions of the local people in the meetings are included and considered in the report.
- There is no evidence of significant impact to fish species or animals on the seabed from 3D seismic surveys.

### *Response from Dr. Soe Moe Aung, Myanmar Oil & Gas Enterprise*

- Oil and gas projects, like Yadana, Yetagun, and Zaw Ti Ka, are doing CSR programs. They have to negotiate with the Regional Government before starting the CSR activities. The regional government makes sure the projects not to overlap with their planned projects.
- The current production rate of oil and gas become decreasing. We assume that the proposed wells will have some chance of success. According to technology, drilling on the existing well has only 30% for success. Infrastructure is required to be built if the gas volumes found are commercially viable

### *Comment from U Tin Than, Myeik Fishery Federation*

- Offshore fishing can be undertaken to around 160 miles from the shore. The Project Area is 60 square miles (*NOTE: this is incorrect information and was not mentioned by PCML or ERM*). There are around 2,000 members in fishery association. We cannot catch fishes in these 60 square miles and we have to fight for the fishing ground in the remaining areas.

### *Comment from U Win Naing, Fishery Businessmen*

- The community wants transparency of the project and responsibility of the company. It should not be mentioned that the grievance mechanism will be undertaken only if the government gives instruction.
- The information presented that fishermen mostly catch fish within 10 miles from the shore was wrong as fishermen usually go 20-100 miles for fishing.

### *Comment (unknown)*

- It is mentioned that the company spent 750,000 USD on their CSR program. It should be disclosed in the presentation how much percentage of the profit will be used for the CSR program.

### *Response from Daw Tin Nwe Nyo, PCML*

- We pay taxes to the government according to the contract. We have to share profit by proportion with government and MOGE as per this contract. The CSR program is not included in the contract.
- Yetagun performs CSR program for the local development.

### *Comment from U Myat Zaw Moe, Myeik University*

- What does the term “profit sharing with proportion” mean? The contact numbers mentioned in the presentation is not important for the locals. We only want the number that we can complain effectively for the project negative impacts. What is the plan for fishermen having to relocation to another area as it is very important and costly.

### *Response from Dr. Soe Moe Aung, MOGE*

- Sharing profit with proportion means that all proponents have to invest a certain amount for hiring ships, drilling cost, and constructing platform (if necessary) when exploration drilling starts. The amount of profit depends on the investment amount and therefore it is termed “sharing profit with proportion”.

### *Comment from U Aung Than*

- Does the third party stand for PCML or local community?

### *Comment from U Yan Kin, Department of Fishery*

- When drilling activities start, there may have noise and vibration. Will you consider impacts to fisheries? We are trying to conserve marine resources by reducing 10% of catching fishes and restricting for breeding season three (3) months.

### *Response from Daw Khin Su Su Naing, ERM*

- The Third party is an independent organisation which assesses the potential environmental and social impacts by the project. The information “fishing within 10 miles” was received from a previous visit but now we know that offshore fishing boats go over 100 miles from the shore. In the EIA report, we will include all the comments, suggestions and conduct fishery assessments. We will also include the mitigation measures for any impacts.

### *Comment from U Kyaw Kyaw Naing*

- 20 years ago, there were only 230 KV transmission lines, but now 500 KV is available, in Myanmar. In Kanbawk Township, there is a Liquefied natural gas (LNG) power plant and the electricity will be sent to Bago, however, Tanintharyi Region is not included. Although projects are located in our region, why don't we have any benefits?

### *Response from Dr. Soe Moe Aung, MOGE*

- The LNG power plant is currently under construction in Kanbawk Township. The Department of Electricity (DOE) and MOGE is not the same. Oil and gas processes are operated under MOGE and electricity generation and distribution is run by the Department of Electricity. According to the DOE plan, the implementation timeline is that a Dawei-Myeik transmission line will be constructed in 2021-2022, a Myeik- Bokepyin line in 2021- 2022, and a Bokepyin- Kawthaung line in 2022- 2023.

### *Comment from U Chit Htwe, Youth Network*

- The project cannot get license to operate without local people agreement. There is no fisherman in the Union Government and they don't know about the local fishery. The Regional government has no authority on this project and local people have no power as well. I want to suggest you to extend the project schedule for more discussion and comments.

### *Comment from U Htay Hlaing*

- Blocks M-12, M-13 and M-14 have been contracted with the previous government and processed to continue by the current government. These blocks are located near the fishing grounds.
- When will the project end and can these blocks be managed by local when the contract ends?
- As a local, I would like you suggest to stop this project because these three (3) blocks are the most dangerous and nearest to the shore.

### *Response from Dr. Soe Moe Aung, MOGE*

- The project had already been contracted. The production rate of the existing well is decreasing and therefore infilling need to be done to fulfill the expected production. If the production amount is less than the amount in the contract, the government has to compensate according to the contract. The project activities such as exploration and infill drilling will be done near the existing platform.
- The Yetagun project as a whole has a 30 year contract and it started in 2000. The time remaining for the project is 12 years from now.

### *Comment*

- Do you make a record of the comments and suggestion of local people in this meeting? The agenda of the meeting should be provided and group discussions conducted to get more comments and suggestion.

### *Comment from U San Maung, Myeik Fishery Association*

- Can you please confirm that “the restricted area is 5 miles radius from the drilling rig”?
- When the fishing boat is 6 miles away from drilling rig, and if the fishing boat is caught by the Navy guards, how would you solve for this issue?
- The fishery federation have previous experience that fishing boats could not enter within 10 miles. The navy guards usually stay 10 miles away from the restricted area. Therefore, the restricted area is 20 miles distance from the drilling rig.
- We would like to suggest that to disclose the information of restricted area in newspapers and magazines.

### *Response from U Zaw Zaw Aung, PCML*

- The restricted area is five miles radius from the drilling rig and will be marked on nautical maps and disclosed. We have not seen any fishing boats entering the restricted area.

### *Comment from U San Maung, Myeik Fishery Association*

- We know that it is disclosed in the nautical map. We want you to disclose this information in newspaper and magazines because we want to have an evidence when there will be a problem relating to the restricted area.
- How can we assess the results of this public consultation meeting? How would ERM analyse the results of this meeting according to recent comments and suggestion of ship owners, local people and associations?

### *Comment from U Chit Htwe*

- How do the company submit the report to the Environmental Conservation Department? We don't believe that our comments and suggestion will be included in that report.

### *Response from Daw Khin Su Su Naing, ERM*

- When the EIA process is conducted, the report has to be disclosed to the public. This report has also to be sent to Department of Fishery and relevant administrative offices in the Region. It will be also

disclosed on the project proponent's website. If you have questions and comments, you can contact to the address described in the presentation. The purpose of this meeting is to explain about the project information and to collect comments and suggestion from local people. We will include this meeting minutes in the report and undertake the assessment based on your information.

*Comment from U Too Hlaing Myint*

- If the local people disagree with the project, would you stop the activities? If the project will be processed to continue, although local people disagree with the project? If so, the public consultation meetings are nonsense.

*Comment from U Aung Than*

- If the company continue project activities without local people's agreement, conducting public consultation meetings are time consuming.
- Is the activity under a new contract?

*Response from U Phoe Kyaw, PCML*

- The contract is the old one.

**Attendance List**

<b>No</b>	<b>Name</b>	<b>Position</b>	<b>Department/ Organization/ Address</b>
1.	U Aung Min Naing	Accountant	Kyaw Chan Thar Company
2.	U Kyaw Htay Win	Squid Business Association	Myeik
3.	U Tin Shein	Chairman	Regional Fishery Department
4.	U Aung Lwin	Squid Business Association	Myeik
5.	U Win Myint	Community Person	Myeik
6.	U Tin Than	Fishery	Myeik
7.	U Chan Thar Oo	Government Staff	Bureau of Special Investigation
8.	U Than Soe	Project Officer	Law Ka Alin
9.	U Myo Thura Kyaw	Fishery	Myeik
10.	U Soe Thu Aung	Observer	
11.	U Kyaw Naing Soe	Reporter	Myawaddy New
12.	U Aung Oo	Squid Business Association	Myeik
13.	U Aung Kyaw	Reporter	Democratic Voice of Burma
14.	U Kyaw Shein	Accountant	Regional Fishery Department
15.	U Soe Htike Aung	Member	Fish Vessel Association
16.	U Hlaing Thura	Finance Officer	Regional Fishery Department
17.	U Htay Hlaing	Assistant Finance Officer	Squid Business Association
18.	U Thaung Aye	Administrator	Seiklu
19.	U Tin Soe	Community Person	Myeik
20.	U Myint Oo	Reporter	Myanma Alin/ Mirror
21.	U Khaing Htoo	Staff	Information Department
22.	U Aung Thaw Oo	Community Person	Myeik
23.	U Nyi Nyi Aung	Community Person	Myeik
24.	U Min Kyaw	Community Person	Myeik
25.	U Naing Win Tun	Community Person	Myeik
26.	U Maung Gyi	Fishermen	Myeik
27.	U San	Reporter	Thanintharyi Journal
28.	U Kyaw Oo	Community Person	Yay Pone
29.	U Zaw Moe Oo	Senior Reporter	Eleven Media

No	Name	Position	Department/ Organization/ Address
30.	Ma Zin Mar Win	Student	Myeik University
31.	U Yan Kin	Township Staff Officer	Department of Fishery
32.	Daw Mon Mon Naing	Deputy Director	Planning Department
33.	U Thaung Myint	Secretary	Myeik Fishery Association
34.	U Thet Soe	Secretary	Regional Fishery Association
35.	U San Hmwe	Township Staff Officer	Kyun Su, Department of Fishery
36.	U Nay Thawtar Nyi Nyi	Deputy Staff Officer	Environmental Conservation Department
37.	U Too Hlaing Myint	Member	Squid Business Association
38.	U Win Myint	Member	Squid Business Association
39.	U Thet Tun San	Assistant Director	City Development Committee
40.	U Thein Saw	Community Person	Myeik
41.	U Kyaw Moe Lwin	Range Officer	Forest Department
42.	U Wai Linn	Staff	Lin Aung Phyco Co., Ltd
43.	U Win Naing	Fisherman	Myeik
44.	U Maung Yu	Fisherman	Myeik
45.	U Htay Lwin	Fisherman	Myeik
46.	U Min Min Hlaing	Administrator	Talai Su, Myeik
47.	U Sein Thaung	Community Person	Myeik
48.	Daw Su Yee Htay	Reporter	Myawaddy New
49.	Dr. Mya Mya Tun	Professor	Zoology Department, Myeik University
50.	U San Maung	Chairman	District Fishery Association
51.	U Myat Zaw Moe	Junior Biologist	Fauna & Flora International
52.	U Tin Sein	Accountant	Fishery Association
53.	U San Htoo	Reporter	Newspaper
54.	U Chit Htwe	Incharge Person	Youth Network
55.	U Kyaw Ye Tun	Community Person	Myeik
56.	U Aung Than	Member	Our Future Initiative- Network
57.	U Aung Yan Htet	Deputy Staff Officer	Environmental Conservation Department
58.	U Tun Aung Kyaw	Deputy Chairman	District Fishery Association
59.	U Zaw Zaw	Media	Myeik

No	Name	Position	Department/ Organization/ Address
60.	U Maung Win	Manager	Taw Win Saung Co., Ltd
61.	U Than Tun Oo	Secretary	Squid Business Association
62.	U Myint Lwin	Member	Squid Business Association
63.	U Khin Maung Win	Community person	Myeik
64.	U Tin Myint	Associate Secretary	Fishery Association
65.	U Tun Tun Win	Community Person	Myeik
66.	U Ni Toe	Agent	Kyaw Khaing Min Group
67.	U Aung Min Lwin	Incharge Person	Vantage Co., Ltd
68.	U Than Ko	Administrator	Nan Taw Yar
69.	U Tin Soe	Community Person	Yay Pone Yat
70.	U Aung Kyaw Htay	Community Person	Myo Thit

Photos





**Meeting of Minutes: Environmental and Social Impact Assessment (ESIA) for PC Myanmar (Hong Kong) Limited (PCML) Yetagun Infill Drilling and 3D Seismic Project**

<i>Detail</i>			
<b>Project</b>	ESIA for Offshore Block M12, M13 and M14 Project		
<b>Venue</b>	General Administrative Department's Office	<b>Region/State</b>	Tanintharyi
<b>District</b>	Dawei	<b>Township</b>	ThaYetChaung
<b>Objective</b>	Stakeholder Consultation Meeting		
<b>Date</b>	23 <sup>rd</sup> July 2018		
<b>Time</b>	15:00-18:00 PM		

*Comment form U Kyaw Kyaw Thet, Dawei District Fishery Federation*

- Do Myanma Oil and Gas Enterprise and PETRONAS Carligali Myanmar (Hong Kong) Limited (PCML) have a new contract for these wells?
- Is there any electricity allocation for Tanintharyi region?
- Tanintharyi has an issue of overfishing. The fishery resources are declining up to 60% due to overfishing. Although the law had determined to fish 10 miles from the shore for onshore fishermen, they are extending further than this.

*Response from Dr. Soe Moe Aung, MOGE*

- This current project is not a new agreement and it continues as per the existing agreement. The project is the long-term agreement. When the production starts to decreased, there will be infill drilling to increase production and meet the contract requirements.
- The government has been distributing electricity for domestic uses from Yadanar and Zawtika gas fields.
- The agreement was contracted not only between PCML and MOGE but also with the Union Government. The economic benefit from the oil and gas industry goes directly to the union government and cannot be used as the department. The main contract is with the Union Government, MOGE is the department which participates and provides technical support.

*Comment from U Kyaw Kyaw Thet, Dawei District Fishery Federation*

- The cost of electricity is expensive and we have to purchase gas.

*Response from Dr. Soe Moe Aung, MOGE*

- There are currently two responsible departments, Department of Electricity (DOE) who is responsible for electricity transmission and distribution and MOGE who is focusing on exploration and drilling.
- According to the DOE, there is a liquefied natural gas project in Tanintharyi (Kanbauk) that will hopefully distribute electricity to the Region and a plan for transmission lines in the Region to connect to the national grid. The main reason for high electricity cost is that there is no connection with national grid.

*Comment from Dr. Soe Thein, Myo Ma Ward*

- The company continues the operation due to the existing contract. The exploration wells are in Tanintharyi offshore. If they find the gas source, will they need to make a new contract?

*Response from Dr. Soe Moe Aung, MOGE*

- The international and Myanmar law of resources states that if the zone is located in 25 miles from shore, it will be regional management. This block is located over 60 miles from shore, so it will be under the management of Union Government. According to the contract, the current agreement will end in 2025.

*Comment from U Kyaw Kyaw Thet, Dawei District Fishery Federation*

- Will the agreement for new block cover the current contract?

*Response from Dr. Soe Moe Aung, MOGE*

- This exploration wells are not in new block and they are part of the existing contract. Annual selling amounts were also included in the first contract. We have been drilling for 20 years in these three blocks since the first contract was signed.
- The production has decreased so we need to drill new wells to cover the production rate requirements in the contract. The new wells have only 50 percent possibility to success due to technical and natural resources limitations. We also invested in exploration drilling which has 20 percent probability to success. If the drilling can produce gas, we need to ensure it is commercially viable. If gas is not discovered, the exploration company and also the shareholder company have to compensate because these projects have long term contract with government.

*Comment form U Shu Tun, Elder Person*

- Although Tanintharyi Region can produce natural gas, the locals are still purchasing it. We need appropriate privilege for our Region.

*Response from Dr. Soe Moe Aung, MOGE*

- The contract has been running for 10 to 15 years but recently the natural gas resources are declining. Exploration drilling is required to meet the amounts in the contract. If the natural gas production increases, the government will supply for all Regions that need electricity.

## Attendance List

No	Name	Position	Department/ Organization/ Address
1.	Dr. Soe Thein	Elder Person	Myo Ma Ward
2.	Dr. Zaw Zaw Htun	Assistant Director	Livestock Breeding and Veterinary Department
3.	U Tin Yu	Deputy Administrator	General Administration Department
4.	U Saw Kyaw Soe	Assistant Director	Planning Department
5.	U Tin Htay Oo	Staff Officer	Forest Department
6.	Daw Ei Ei Maw	Member	Myanmar Maternal and Child Welfare Association
7.	Daw Khine Thinzar Lwin	Member	Myanmar Maternal and Child Welfare Association
8.	U Soe Htwe	District Hluttaw (Retired)	Myo Ma Ward
9.	U Aung Myo Lin	Administrator	Myo Ma Ward
10.	U Than Win	Administrator	
11.	Daw Myint Myint Khine	Women Affair	Myo Ma Ward
12.	Daw Thi Thi Win	Women Affair	Myo Ma Ward
13.	Daw Than Htay	Women Affair	Myo Ma Ward
14.	Daw Su Su Hlaing	Member	Myanmar Maternal and Child Welfare Association
15.	Daw Than Than Myint	Township Staff Officer	Fishery Department
16.	U Htay Min	Deputy Supervisor	Electricity Department
17.	U Myo Chit Oo	Camera - 2	Information and Public Relation Department
18.	Daw Soe Soe Thi	Staff Officer	Department of Rural Development
19.	U Tin Swan	Executive	City Development Committee
20.	U Twal Tar Aung	Village leader	Pan Taw
21.	U Kyaw Kyaw Naing	SYF Media	Thayet Chaung
22.	U Myint Ko Ko	Staff Officer	Land Record Department
23.	U Saw Naing		
24.	U Mya Lwin	Administrator	Kyauk Myaung
25.	U Nay Win	Administrator	Maw Shae Tone

No	Name	Position	Department/ Organization/ Address
26.	U Nyan Win	Reporter	Myanma Alin
27.	U Aye Win	Elder Person	Myo Ma Ward
28.	U Aung Thin	Village Administrator	Pein Taw
29.	U San Lwin	Village Administrator	Pan Che Shaung
30.	U Shu Tun	Elder Person	Thayet Chaung
31.	U Naing Win	Staff Officer	Information and Public Relation Department
32.	U Kyaw Kyaw Thet	Chairman	Dawei District Fishery Federation
33.	U Hein Zaw	Staff Officer	
34.	U Aung Tin Win	Staff Officer	Irrigation and Water Utilization Management Department
35.	Kyaw Lin Naing	Reporter	
36.	Daw Tin Mar Aye	Staff Officer	Thayet Chaung
37.	U Win Latt	Community Person	Thayet Chaung

Photo









### EIA လုပ်ငန်းစဉ်

လုပ်ငန်းစဉ်	ဆောင်ရွက်ချက်
၁.	စီမံကိန်းအစဉ်ပြုလွှာ
၂.	ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းကွမ်းကျင်းသူ မှားအားမှတ်ပုံတင်သွင်းခြင်း
၃.	လူထုတို့ ဆွဲ၍ အစဉ်အဆင့်အများကို ခြုံလုပ်တာဝန်ယူဆောင်ရွက်ခြင်း
၄.	နယ်ပယ်တိုင်းတာသတ်မှတ်ခြင်းအစီရင်ခံစာနှင့် ဆောင်ရွက်ရမည့်နည်းလမ်းများ
၅.	ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းအစီရင်ခံစာ
၆.	ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ဦးစီးဌာနမှလက်ခံခြင်း

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### တိုးတက်ဖွံ့ဖြိုးထုတ်လုပ်ရေးတွင်း တူးဖော်ခြင်း

Video

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သုံးဘက်မြင် ဆိုက်စမစ် တိုင်းတာခြင်း၏ ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း ဆိုင်ရာလေ့လာချက်

### အက္ခရာဇာတ် ဆိုက်စမစ်တိုင်းတာလေ့လာခြင်း

Video

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### IEE လုပ်ငန်းစဉ်

လုပ်ငန်းစဉ်	ဆောင်ရွက်ချက်
၁.	သဘာဝပတ်ဝန်းကျင်နှင့်လူမှုပတ်ဝန်းကျင်ရှိ ရုတ်တရက်အန္တရာယ်ရှိအချက်များကို စီစဉ်လေ့လာခြင်း
၂.	ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်းကွမ်းကျင်းသူ မှားအားမှတ်ပုံတင်သွင်းခြင်း
၃.	လူထုတို့ ဆွဲ၍ အစဉ်အဆင့်အများကို ခြုံလုပ်တာဝန်ယူဆောင်ရွက်ခြင်း
၄.	ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း အစီရင်ခံစာ
၅.	ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ဦးစီးဌာနမှလက်ခံခြင်း

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ပတ်ဝန်းကျင်အခြေအနေ

**ရုပ်ပိုင်းဆိုင်ရာ ပတ်ဝန်းကျင်အခြေအနေ**

- လှိုင်ကောက်ဆူပတ် M-12, 13, 14 တို့သည် ပင်လယ်ရေအောက်ကြွယ်မြိုင် အနက် ၃၅၀ မေ မှ ၃၃၀၀ မေ အထက် (၁၀၀ မီတာ မှ ၁၀၀၀ မီတာအထက်) တွင်တည်ရှိပါသည်။
- ခန့်မှန်းအားဖြင့် ပင်လယ်ရေအောက်ကြွယ်မြိုင်သည် ၅.၀၈ မြစ်သား ဖြန့်ဖြူး ကမ်းစပ်ရေစရိတ်သည် သို့မဟုတ် ပြင်ပကြွယ်မြိုင်ပါသည်။



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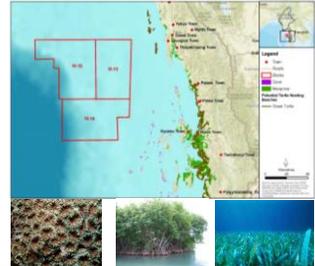
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**ဖိပ်ပျိုးစိတ် ပတ်ဝန်းကျင်အခြေအနေ**

**ထောင့်ကျောက်တန်း**  
 • ဖြတ်ကျွန်းမှစတင်အစွန်အဖျားတစ်သား ကျွန်းများတွင်သာအများဆုံးတွေ့ရပါသည်။

- လှေထောင့်များ**
- ကျွန်းကျွန်းအားလုံးတွင် ကာရိုလျက်ရှိသည်။
  - ဖြန့်ထုမှုတွင်ရှိပါသည်။
  - ဖြန့်ထုမှုအောက်အကျဉ်းစသော ခရီးယာများတွင် တွေ့ရပါသည်။

**ပင်လယ်မြက်များ**  
 • ခရိုင်ပိုင်ရှိ ရေအောက် မြေပေ အထက် အစိတ်အပိုင်းအပေါင်းစသော ခရီးယာတွင်တွေ့ရပါသည်။



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**ဖိပ်ပတ်ဝန်းကျင်အခြေအနေ**

- ဆေးကုသမှုပင်များ**
- ဆေးကုသမှုပင် (Balenoptera musculus) (EN)
  - ဆေးကုသမှုပင် (Balenoptera physalus) (EN)
  - သိပ္ပံနာမည်ပင် (Physeter macrocephalus) (VU)
- ပင်လယ်ရေညှိကောင်**
- ဖြတ်ကျွန်းများတွင်တွေ့ရသည် (ရုက္ခာရုံစုံ လက်ကျန် ဘိုးလွတ်ရုံစုံနှင့် သဲကျွန်း)
- ဆေးကုသမှုပင်များ**
- ဝါးကြိုးကောင် Hawkbill (*Eretmochelys imbricata*)
  - ခြင်္သေ့စိမ်း Green (*Chelonia mydas*)
  - ဝါးမာ့ Loggerhead (*Caretta caretta*)
  - ဝါးမာ့စိမ်း Olive Ridley (*Lepidochelys olivacea*)
  - ဝါးမာ့စိမ်း Leatherback (*Dermochelys coriacea*)
- ပင်လယ်ရေညှိကောင်**
- ပင်လယ်ရေညှိကောင်ပင်လယ်ရေ (*Sterna albifrons*) နှင့် ခရိုင်ကောက် Brown Booby (*Sula leucogaster*) တို့ကို ဖြတ်ကျွန်းများတွင် တွေ့ရပါသည်။

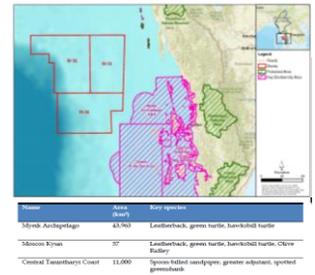


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**ဖိပ်ပတ်ဝန်းကျင်အခြေအနေ**

- ထောင့်ကျောက်တန်း အတွက်အခြေအနေ**
- ဖြတ်ကျွန်းမှ - ၄၄ မိုင်
  - မော်စကိုကျွန်းမှ (မော်စကိုကျွန်း) = ၆၅ မိုင်
  - ဖြတ်ကျွန်းမှစတင်အစွန်အဖျားအထိ = ၁၁၀ မိုင် စတုရန်းကီလိုမီတာ (၄၂၆ မိုင်)



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**အခြေခံစစ်တမ်းကောက်ယူမှုများ**

မှတ်တမ်းတင်သူ	ထည့်သွင်းရန် နမူနာအားလုံးတွင် အရေအတွက်			
	အရေအတွက်	ပတ်ဝန်းကျင် ဖြည့်စွက်မှု အခြေအနေ	ပင်လယ်ရေ ဖြည့်စွက်မှု	ပင်လယ်ရေ ဖြည့်စွက်မှု
၂၀၁၇ ခု ဇူလိုင်လ ၁၀ ရက်နေ့တွင် မြောက်ပိုင်း မြောက်ပိုင်း မြောက်ပိုင်း မြောက်ပိုင်း မြောက်ပိုင်း	၀	၀	၃	၀
၂၀၁၇ ခု ဇူလိုင်လ ၁၀ ရက်နေ့တွင် မြောက်ပိုင်း မြောက်ပိုင်း မြောက်ပိုင်း မြောက်ပိုင်း မြောက်ပိုင်း	၀	၀	၃	၀
၂၀၁၇ ခု ဇူလိုင်လ ၁၀ ရက်နေ့တွင် မြောက်ပိုင်း မြောက်ပိုင်း မြောက်ပိုင်း မြောက်ပိုင်း မြောက်ပိုင်း	၀	၀	၃	၀
၂၀၁၇ ခု ဇူလိုင်လ ၁၀ ရက်နေ့တွင် မြောက်ပိုင်း မြောက်ပိုင်း မြောက်ပိုင်း မြောက်ပိုင်း မြောက်ပိုင်း	၀	၀	၃	၀
<b>စုစုပေါင်း</b>	<b>၀</b>	<b>၀</b>	<b>၁၂</b>	<b>၀</b>



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**ကွင်းဆင်းရေလွှာအဖွဲ့အစည်းများ**

- ပင်လယ်ရေ အရေအတွက်**
- ကြွယ်မြိုင်မှ အပူချိန်၊ ဆားပါဝင်မှု၊ အောက်စီဂျင်ပမာဏ၊ အနက်အနက်ပါဝင်မှု၊ အပူချိန်၊ ဆားပါဝင်မှု၊ အောက်စီဂျင်ပမာဏ၊ အနက်အနက်ပါဝင်မှု၊ အပူချိန်၊ ဆားပါဝင်မှု၊ အောက်စီဂျင်ပမာဏ၊ အနက်အနက်ပါဝင်မှု
- အရေအတွက်အရေအတွက်**
- အပူချိန်၊ ဆားပါဝင်မှု၊ အောက်စီဂျင်ပမာဏ၊ အနက်အနက်ပါဝင်မှု၊ အပူချိန်၊ ဆားပါဝင်မှု၊ အောက်စီဂျင်ပမာဏ၊ အနက်အနက်ပါဝင်မှု
- ပင်လယ်ရေအောက်ကြွယ်မြိုင်ရှိ ဖိပ်ပတ်ဝန်းကျင်အခြေအနေ**
- အပြောက်အများရှိမှု၊ အပူချိန်အများရှိမှု
  - Plankton (ပိုက်စလိုဂျင်မြိုင်ရေအောက် အပင်များနှင့် သတ္တဝါများ)
  - အပြောက်အများရှိမှု၊ အပူချိန်အများရှိမှု



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**ထိခိုက်မှုများနှင့် ထိခိုက်သက်ရောက်မှုများအား ဂျော့ရှုရေး အစီအစဉ်များ**

**သက်ရောက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ နည်းလမ်းများ**

- ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း၏ ရည်ရွယ်ချက်မှာ စိတ်နှစ်ဖြင့် ဖြစ်နိုင်စေရုံသာ သက်ရောက်မှုများ အားသေရာရွာသိရှိပြီး သက်ရောက်မှုများအား ဂျော့ရှုရေးပြုလုပ်ခြင်း ဖြစ်ပါသည်။
- ERMသည် စီမံကိန်းဖြင့် သက်ရောက်နိုင်ခြေရှိသူ အားလုံးကို စိစစ်လေ့လာပါသည်။ (ဥပမာ- အသစ်များ ရေပူရည်အသွေး အစရှိသော သက်ရောက်မှုမရှိသော အရာများအားလုံး)
- ထိုအောက်သက်ရောက်မှုအတိုင်းအတာကို ဆန်းစစ်ပါ သည်။ (ဥပမာ- စီမံကိန်း အရွယ်အစားသက်ရောက်နိုင်မှု)

	Sensitivity/Vulnerability/Importance of Resource/Receptor		
	Low	Medium	High
Magnitude of Impact	Negligible	Negligible	Negligible
	Small	Negligible	Minor
	Medium	Minor	Moderate
Large	Moderate	Major	Major

**ထိခိုက်သက်ရောက်နိုင်မှုများကို ဂျော့ရှုနိုင်မည့်နည်းလမ်းများ (ရေန်တိုးတက်ဖွံ့ဖြိုးထုတ်လုပ်ရေးတွင်)**

ထက်ရောက်မှု	ဂျော့ရှုရေးနည်းလမ်းများ	ဖြည့်ဆည်းပေး ထောက်ပံ့မှု အခြေအနေ
• တွင်းဖွဲ့မှု၊ ဖမ်းဆည်းမှု၊ ဝှံ့လွှာ သဘာဝပတ်ဝန်းကျင် ချိတ်ဆက်ခြင်းနှင့် စားကြီးစားကားများ	• ရှိပြီးသားစီမံကိန်းများ အစီအစဉ်- ဂျော့ရှုခြင်း ဖြစ်လည်ပုံရိပ်ခြင်း ဖြစ်လည်ပုံရိပ်မရှိခြင်း	• အရည်ထည်
• မြက်စုများနှင့် တွင်းပူရည်ဖွဲ့စည်း ထုတ်ဖွဲ့	• မြက်စုများနှင့် တွင်းပူရည်ဖွဲ့စည်း ထုတ်ဖွဲ့ခြင်း စတင်ချိန်မှစ၍ စီမံခန့်ခွဲခြင်း	• အရည်ထည်
• အခြားစီးပွားဖြစ်ရောင်းချမှုနှင့်ပတ်သက်သည့် ဆက်သွယ်ခြင်း	• တွင်းပူရည်ဖွဲ့စည်းထုတ်ဖွဲ့ခြင်း	• အရည်ထည်
• ရေန်တိုး တွင်းပူရည် (ပိုမိုတက်) ရောင်းချမှုများ ရေစိတ်ကူးစက်သော ရှိနိုင်မှုများ	• ရေန်တိုးတက်ထိခိုက်မှုများကို ဖြည့်ဆည်းပေးသော အစီအစဉ်များ	• အရည်ထည် (အပိုအားပေးရမည်)

**ထိခိုက်သက်ရောက်နိုင်မှုများကို ဂျော့ရှုနိုင်မည့်နည်းလမ်းများ (ရက်စဝေတိုင်ပင်တာရင်း)**

ထက်ရောက်မှု	ဂျော့ရှုရေး နည်းလမ်းများ	ဖြည့်ဆည်းပေး ထောက်ပံ့မှု အခြေအနေ
• ပတ်ဝန်းကျင်ထိခိုက်မှုများ ဖြစ်ပေါ်လာခြင်း၊ ပတ်ဝန်းကျင်ထိခိုက်မှုများ ဖြစ်ပေါ်လာခြင်း၊ ပတ်ဝန်းကျင်ထိခိုက်မှုများ ဖြစ်ပေါ်လာခြင်း	• ပတ်ဝန်းကျင်ထိခိုက်မှုများ ဖြစ်ပေါ်လာခြင်း၊ ပတ်ဝန်းကျင်ထိခိုက်မှုများ ဖြစ်ပေါ်လာခြင်း	• အရည်ထည်
• ရေပူရည်အသွေး ဖြစ်ပေါ်လာခြင်း၊ ရေပူရည်အသွေး ဖြစ်ပေါ်လာခြင်း	• ရေပူရည်အသွေး ဖြစ်ပေါ်လာခြင်း၊ ရေပူရည်အသွေး ဖြစ်ပေါ်လာခြင်း	• အရည်ထည်
• မတော်တရားထိခိုက်မှုများ ဖြစ်ပေါ်လာခြင်း၊ မတော်တရားထိခိုက်မှုများ ဖြစ်ပေါ်လာခြင်း	• မတော်တရားထိခိုက်မှုများ ဖြစ်ပေါ်လာခြင်း၊ မတော်တရားထိခိုက်မှုများ ဖြစ်ပေါ်လာခြင်း	• အရည်ထည်
• မတော်တရားထိခိုက်မှုများ ဖြစ်ပေါ်လာခြင်း၊ မတော်တရားထိခိုက်မှုများ ဖြစ်ပေါ်လာခြင်း	• မတော်တရားထိခိုက်မှုများ ဖြစ်ပေါ်လာခြင်း၊ မတော်တရားထိခိုက်မှုများ ဖြစ်ပေါ်လာခြင်း	• အရည်ထည်



**ထပ်ပံ့ဆောင်ရွက်မည့်အစီအစဉ်**

**ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းနှင့် ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း အကျဉ်းချုပ်**

- EIA, EIA အကျဉ်းချုပ်
- ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းစာရွက်စာတမ်းသည် ပတ်ဝန်းကျင်နှင့်ပတ်သက်၍ ထိခိုက်သက်ရောက်မှုဆိုင်ရာ ရည်ရွယ်ချက်ဆိုင်ရာ ဖြစ်ပါသည်။
- ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်းစာရွက်စာတမ်းသည် ပတ်ဝန်းကျင်နှင့်ပတ်သက်၍ ထိခိုက်သက်ရောက်မှုဆိုင်ရာ ရည်ရွယ်ချက်ဆိုင်ရာ ဖြစ်ပါသည်။
- ထိခိုက်မှုပုံစံများအရ ဖြစ်နိုင်စေရုံသာ သက်ရောက်မှုများကို ကာကွယ်ရန်အတွက် ဂျော့ရှုရေးပြုလုပ်ခြင်း ဖြစ်ပါသည်။
- စီမံကိန်းအစီအစဉ်သည် ရှိပြီးသားစီမံကိန်းများကို မြှောက်ထူနေသည့် စီမံကိန်းများကို ဂျော့ရှုရေးပြုလုပ်ခြင်း ဖြစ်ပါသည်။
- စီမံကိန်းအစီအစဉ်သည် စီမံကိန်းဖြင့် ဖြစ်နိုင်စေရုံသာ ပတ်ဝန်းကျင်ထိခိုက်မှုဆိုင်ရာ ထိခိုက်မှုများကို တားဆီးပေးဆောင်ရွက်ရမည်။
- စီမံကိန်းအစီအစဉ်သည် ဖြစ်နိုင်စေရုံသာ ပတ်ဝန်းကျင်ထိခိုက်မှုဆိုင်ရာ ထိခိုက်မှုများကို တားဆီးပေးဆောင်ရွက်ရမည်။
- စီမံကိန်းအစီအစဉ်သည် ဖြစ်နိုင်စေရုံသာ ပတ်ဝန်းကျင်ထိခိုက်မှုဆိုင်ရာ ထိခိုက်မှုများကို တားဆီးပေးဆောင်ရွက်ရမည်။



# ဆက်သွယ်ရန်



# ကျေးဇူးတင်ပါသည်

The business of sustainability

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**Environmental and Social Impact Assessment (ESIA) for the Infill Drilling Campaign Project and Initial Environmental Examination of 3D Seismic Survey of Yetagun Gas Field (Block M12, 13 and 14)**

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Presented by: ERM and PETRONAS  
July 2018

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**Agenda**

Topic
1. Introductions
2. Project Description
3. EIA Study of Infill Drilling Project
4. IEE Study of 3D Seismic Survey Project
5. Environmental Setting
6. Social Setting and Stakeholder Engagement
7. Impact and Mitigation Measures (EIA for Infill Drilling Campaign)
8. Impact and Mitigation Measures (IEE for 3D Seismic Survey)
9. How to Contact

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**Project Description ( Infill Drilling Campaign & 3D Seismic Survey)**

**Project Developer**

**PETRONAS in Myanmar**  
Operator of 5 blocks and JV Partner of 1 Block.



Along the journey, PETRONAS has signed 13 Production Sharing Contracts (PSCs) for blocks M12/13/14, M15/16/17/18, MD 4/5/6, RSF2/3, IORS, and 1 Improved Petroleum Recovery Contract (IPR) for block IOR7 and farmed into 4 blocks (Block D, AD9, AD11, EP1).

Today, PETRONAS' portfolio in Myanmar includes a total of 6 blocks.

- We are the operator of three offshore blocks (M12, M13 and M14: Yetagun Gas Project in Tanintharyi Region) and two onshore blocks (IORS and IOR7 in Ayeyarwaddy Region).
- We are the partner with other oil and gas operators in one onshore block (EP1 in Magway Region).

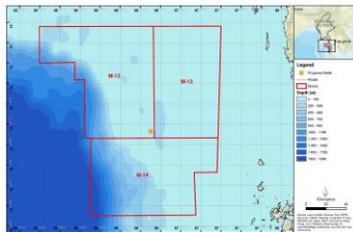
As a reputable company, our partners include local and international companies namely Myanma Oil and Gas Enterprise (MOGE), PTTEP International Limited, XN Nippon Oil & Gas Exploration, UNOG Pe Ltd and PB Myanmar.

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**Project Location (infill drilling)**

- Yetagun Field located in Block M12, M13, M14
- 112 miles (180 km) west of Dawei in Andaman Sea
- 65 miles (105 km) from nearest KBA (Mossos Island)
- 63 miles (101 km) from Myeik Archipelago
- 90 miles (144 km) from the mainland coast (Laungton Township)



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**Project Description (Infill Drilling Campaign)**

- 3 infill development wells
- Water depths at the well sites approximately 360 ft (110 m)
- Construction = Commencing in Quarter 4 2018
- Drilling period = 25 days per each well
- Depth of well below seabed = 65,000 ft to 98,000 ft ( 2,000 m to 3,000 m)
- Using mobile offshore drilling unit (MODU)
- 3 Support vessels
- Exclusion area around the MODU = 500 m radius

No	Name	Coordinates
1	YA-01	Lat: 12° 41' 08.76" Long: 95° 52' 51.31"
2	YA-05	Lat: 12° 41' 08.76" Long: 95° 52' 51.31"
3	YA-1251	Lat: 12° 41' 08.76" Long: 95° 52' 51.31"



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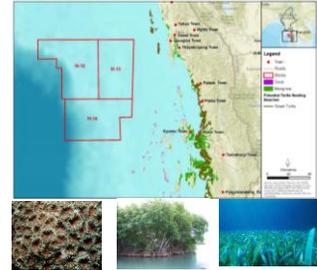
### Physical Environment

- Block M-12, M-13 and M-14 are located at seabed depth of 350->3,300 ft. (100 m - >1000 m)
- Seabed near well sites is "clay" and higher sand content in nearshore waters



### Biological Environment

- Coral:**
  - Common on outlying island in Myeik Archipelago
- Mangroves:**
  - Along the sheltered side of island
  - River mouths
  - Fringing tidal river area
- Seagrass:**
  - Found in shallow waters in >65 ft. water depth in sheltered areas



### Biological Environment

- Whale and Dolphins:**
  - Blue whale (*Balaenoptera musculus*) (Endangered)
  - Fin whale (*Balaenoptera physalus*) (Endangered)
  - Sperm whale (*Physeter macrocephalus*) (Vulnerable)
- Dugongs:**
  - Found in Myeik Archipelago (Sular Island, La Ngan Island, Bo Lut Island and War Kyunn Island)
- Marine Turtles:**
  - Hawksbill (*Eretmochelys imbricata*)
  - Green (*Chelonia mydas*)
  - Loggerhead (*Caretta caretta*),
  - Olive Ridley (*Lepidochelys olivacea*)
  - Leatherback (*Dermochelys coriacea*)
- Seabirds:**
  - Little Tern (*Sterna albifrons*) and the Brown Booby (*Sula leucogaster*) in Myeik Archipelago



### KBA

- Distance from Well Sites**
- Myeik Archipelago: 44 miles
- Moscov Island group (Moscovs Kyun) : 65 miles
- Shark protection area in waters of the Myeik Archipelago: 11,836 km<sup>2</sup> / 42 miles

Area	Distance	Area
Myeik Archipelago	72.52	11,836 km <sup>2</sup> / 42 miles
Moscov Island	97	11,836 km <sup>2</sup> / 42 miles
Central Myanmar Coast	11,800	11,836 km <sup>2</sup> / 42 miles



### Baseline Surveys

Sample Location	Number of Samples to be collected at each Location			
	Sediment	Benthic	Seawater	Plankton
North of "Yangon-A" well drilling site	1	1	3	1
East of "Yangon-A" well drilling site	1	1	3	1
South of "Yangon-A" well drilling site	1	1	3	1
West of "Yangon-A" well site	1	1	3	1
	4	4	12	



### Survey Parameters

- Seawater quality**
  - Transparency, temperature, salinity, dissolved oxygen, suspended sediments, nutrients, oil and grease, metals, petroleum hydrocarbons
- Sediment quality**
  - Particle size, carbon, metals, oil and grease, petroleum hydrocarbons,
- Animals living in the seabed (sediment)**
  - Abundance and diversity
- Plankton (microscopic plants and animals)**
  - Abundance and diversity



### Survey Findings

**Seawater quality**

- No evidence of pollution.

**Sediment Quality**

- No evidence of pollution.

**Animals living in the seabed (sediment)**

- Species comprise typical deep water animals with low numbers.
- Common species are worms and small crabs.

**Plankton (microscopic plants and animals)**

- Common species recorded.



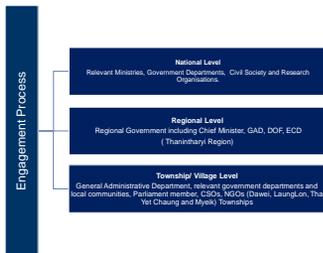
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Social Setting and Stakeholder Engagement

### Stakeholder Engagement



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### Outcome of Scoping Consultation (infill drilling)

- Thanintharyi fishermen mostly fish within 10 miles (16 km) from the coast
- Some larger boats may be present in Blocks M-12, M-13 and M-14
- Trawlers and purse seiners are the two types of offshore vessels in Thanintharyi
- The majority of questions related to impacts on the environment and fisheries

**Scoping Consultation**



Dawei (2-4-2018)



Myeik (3-4-2018)

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### Planned ESIA Consultation Programme

Township	Meeting and Venue
Thayetchaung Township	Meeting with Thayetchaung GAD and stakeholders
Launglon Township	Meeting with Launglon GAD and stakeholders (including Kyauksin, Thirbawesek, Pandan Inn, and Sanhlan villages)
Dawei Township	Meeting with Dawei GAD and stakeholders (Zaryar Htet San Hotel, Dawei)
Myeik Township	Meeting with Myeik GAD and stakeholders (Grand Jade Hotel, Myeik) Meeting with KyunSu stakeholders

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Impact and Mitigation Measures

### Impact Assessment Methodology

- To ensure that the potential impacts are properly addressed and mitigated
- ERM identify all the "receptors" i.e., things that could be impacted such as local communities and water quality
- Then we assess the "magnitude" of the impact, i.e., the size and effect the Project may have

Magnitude of Impact	Sensitivity/Vulnerability/Importance of Resource/Receptor			
	Low	Medium	High	Very High
Negligible	Negligible	Negligible	Negligible	Negligible
Small	Negligible	Minor	Moderate	Moderate
Medium	Minor	Moderate	Major	Major
Large	Moderate	Major	Major	Major

### Impacts and Mitigation Measure (Infill Drilling Campaign)

Issue	Mitigation Measures	Residual Impact Significance
<ul style="list-style-type: none"> <li>Drilling wastes</li> <li>Sewage, deck drainage &amp; food waste</li> <li>Solid and Hazardous Waste</li> </ul>	<ul style="list-style-type: none"> <li>Waste Management Plan – include, reuse, recycling</li> <li>Treatment of waste on derrick before discharge</li> <li>Compliance with MARPOL</li> <li>Correct storage and labeling of waste</li> <li>Chemical assessment</li> </ul>	Minor
<ul style="list-style-type: none"> <li>Cuttings and drilling fluids discharges</li> </ul>	<ul style="list-style-type: none"> <li>Monitoring of muds, where possible, to minimize discharges</li> <li>Minimize generation of cuttings through well design</li> <li>Environmental assessment of drill fluids prior to selection</li> </ul>	Minor
<ul style="list-style-type: none"> <li>Interfere with fishing &amp; commercial vessels</li> </ul>	<ul style="list-style-type: none"> <li>Notice to fisherman</li> <li>Support vessels assist in communication</li> </ul>	Minor
<ul style="list-style-type: none"> <li>Unplanned discharges from the well, rig or vessel</li> </ul>	<ul style="list-style-type: none"> <li>Well design engineering controls e.g. Blow Out Preventer (BOP), drilling practices and procedures</li> <li>Response plan</li> </ul>	Minor (unlikely)

### Impacts and Mitigation Measure (Seismic Survey)

Issue	Mitigation Measures	Residual Impact Significance
<ul style="list-style-type: none"> <li>Impacts from towed equipment by collision with or entrapment of marine turtles</li> </ul>	<ul style="list-style-type: none"> <li>Install guards on tail trawls</li> <li>All sightings of marine mammals / turtles should be recorded and reported to MONRECC following survey completion.</li> </ul>	Minor
<ul style="list-style-type: none"> <li>Impacts from underwater sound on marine fauna</li> </ul>	<ul style="list-style-type: none"> <li>Optimum airgun configurations to ensure that the lowest practicable size of airgun array is selected.</li> <li>Implement a strict procedure to allow adequate time for marine fauna to leave the area.</li> <li>Two experienced Marine Mammal Observers will be on-board to undertake pre-shooting visual scans.</li> <li>The vessel to postpone start-up if mammals observed within 500 m.</li> <li>All sightings of marine mammals / turtles should be recorded and reported MONRECC following survey completion.</li> </ul>	Moderate to Minor
<ul style="list-style-type: none"> <li>Impacts from unplanned spills on marine fauna</li> </ul>	<ul style="list-style-type: none"> <li>Good practice operating procedures.</li> <li>Contingency plans, e.g. vessel Shipboard Oil Pollution Emergency Plans (SOPEPs)</li> </ul>	Minor
<ul style="list-style-type: none"> <li>Impacts on marine users, fisheries and fishing communities from physical presence of seismic vessel, and equipment, unrigged cutlasses</li> </ul>	<ul style="list-style-type: none"> <li>A mobile navigational exclusion zone around the seismic.</li> <li>Support vessels manage potential interactions with Fishermen and have Myanmar speaking Fishing Liaison Officers.</li> <li>Flag states in Myanmar will be available on all vessels.</li> <li>Grievance mechanism.</li> </ul>	Minor



Next Steps

### EIA and IEE Disclosure

#### Summary of EIA & IEE Study

- EIA Study identified no Major impacts on environment and people
- IEE Study likely to have no Major impacts on environment and people
- Mitigation Measures in place to prevent and reduce potential impacts
- Proponent will monitor emissions and discharges to comply with Myanmar law and International Standard
- Proponent will be responsible for consequence of any environmental impacts from the Project
- Consultation will continue throughout the lifetime of the Project
- Proponent will implement a Grievance Mechanism to address any concerns

#### Disclosure of EIA and IEE

- Proponent's Website
- Advertisement in Local Newspapers (The Global New Light of Myanmar (English) and The Mirror (Myanmar))
- EIA Executive Summary Document (Myanmar Language) will be disclosed to GAD, DOF, MFF in Dawei, Longlon, Thayet Chaung, Myeik and Kyaukse Townships



How to Contact



## Thank You

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## **Appendix O - CSR Program and Proposed Budget for 2019**

ရဲတံခွန်လူမှုစီးပွားစီမံချက် ၂၀၁၉ခုနှစ် လုပ်ငန်းစဉ်များ

စဉ်	အစီအစဉ်	ဒေသ	အရေအတွက်	လျာထား	ကုန်ကျစရိတ်
				ဘတ်ဂျက်	
				အမေရိကန်	
				ဒေါ်လာ	
<b>၁ ပညာရေး ကဏ္ဍ</b>					
(က)	နွမ်းပါး၍ ထူးချွန်သော ကျောင်းသား /သူများအား ပညာရေး အထောက်အပံ့များပေးခြင်း နှင့် ဆုပေးပွဲ။ - အစိုးရ အလယ်တန်းနှင့်အထက်တန်း ကျောင်းသားများ - အစိုးရစက်မှုတက္ကသိုလ်ကျောင်းသားများ	စီမံကိန်းနယ်နိမိတ်အတွင်းရှိ ကျေးရွာများ	၂၃၇ ဦး	၁၉၂၀၀	
(ခ)	အစိုးရ အလယ်တန်းနှင့်အထက်တန်း သိပ္ပံနှင့် နည်းပညာ လက်တွေ့သင်ခန်းစာများသင်ကြားပေးခြင်းအစီအစဉ်နှင့် ဆရာများ၏ စွမ်းရည်မြှင့်သင်တန်း	စီမံကိန်းနယ်နိမိတ်အတွင်းရှိ အလယ်တန်း၊ အထက်တန်းနှင့် ဆရာ၊ ဆရာမများ		၁၅၀၀၀	
(ဂ)	- စာကြည့်တိုက်စီမံခန့်ခွဲမှု သင်တန်း - စာဖတ်ခြင်းဖြင့်ရရှိလာသော ဗဟုသုတများကို ပြန်လည်ပေးခြင်းအစီအစဉ်	စီမံကိန်းနယ်နိမိတ်အတွင်းရှိ ကျေးရွာများ		၃၀၀၀	
(ဃ)	မြန်မာနိုင်ငံရှိအစိုးရနည်းပညာတက္ကသိုလ်များနှင့် မလေးရှားနိုင်ငံအစိုးရနည်းပညာတက္ကသိုလ်တို့ ပူးပေါင်းဆောင်ရွက်သည့်အစီအစဉ်	ရန်ကုန်နှင့် သန်လျင် နည်းပညာတက္ကသိုလ်		၅၀၀၀၀	
(င)	စွမ်းရည်မြှင့်သင်တန်းများ - ကလေးသူငယ်ဘက်စုံဖွံ့ဖြိုးရေးကိုပံ့ပိုးသူများ၏ စွမ်းရည်မြှင့်တင်ခြင်း - မူကြိုကျောင်းနေကလေးများအား တက္ကသိုလ်ဝင်တန်းအောင် ဆုပေးပွဲအစီအစဉ်နှင့် ဂုဏ်ထူးကျောင်းသားများအား စွမ်းရည်မြှင့်တင်ခြင်းသင်တန်းပေးခြင်း	ကလေးသူငယ်ဘက်စုံပြုစုပေးတောင်ရေးအစီအစဉ်ဆောင်ရွက်နေသော ကျေးရွာ ၃၂ ရွာ	၂၃၅ ဦး	၄၄၀၀၀	
(စ)	လူငယ်များအားစွမ်းရည်မြှင့်တင်ရေးအစီအစဉ် - လူငယ်များစွမ်းရည်မြှင့်သင်တန်း - သက်မွေးဝမ်းကျောင်းသင်တန်း - ကာယစွမ်းရည်ဖွံ့ဖြိုးရေး	မြန်မာနိုင်ငံရှိတက္ကသိုလ် ကျောင်းသူ/သားများနှင့် စီမံကိန်းနယ်နိမိတ်အတွင်းရှိ ကျေးရွာများ		၃၀၂၀၀၀	
<b>၂ ကျေးရွာများအန္တရာယ် ကင်းရှင်းရေးနှင့် ပတ်ဝန်းကျင် ထိန်းသိမ်းရေး</b>					
(က)	သဘာဝဘေးအန္တရာယ်ကူညီကယ်ဆယ်ရေးအစီအစဉ်	သဘာဝဘေးအန္တရာယ်ကျရောက်သောဒေသများ		၄၀၀၀၀	
(ခ)	သဘာဝ ပတ်ဝန်းကျင် ထိန်းသိမ်းစောင့်ရှောက်ရန် တနင်္သာရီသဘာဝသစ်တောကြီးပိုင်း TNRP ရန်ပုံငွေ ထောက်ပံ့ခြင်း အစီအစဉ်	တနင်္သာရီ သဘာဝသစ်တောကြီးပိုင်း		၁၅၀၀၀၀	
<b>၃ အခြေခံ အဆောက်အအုံများ ဆောက်လုပ်ခြင်း</b>					
(က)	အစိုးရလူလတ်တန်းနှင့်အထက်တန်းကျောင်းတည်ဆောက်ပေးခြင်း	ပယ		၅၀၀၀၀	
(ခ)	အစိုးရလူလတ်တန်းကျောင်းများ၏ကလေးကစားကွင်းများတည်ဆောက်ပေးခြင်း	စီမံကိန်းနယ်နိမိတ်အတွင်းရှိ ကျေးရွာများ		၅၃၅၂၉	
(ဂ)	မူကြိုကျောင်းဆောင်နှင့်ကလေးကစားကွင်းများပြုပြင်မွမ်းမံခြင်း	စီမံကိန်းနယ်နိမိတ်အတွင်းရှိ ကျေးရွာများ		၅၆၄၃၇	
(ဃ)	ကျေးရွာလိုအပ်ချက်များနှင့် လမ်း၊ တံတားများ ပြုပြင်ထိန်းသိမ်းရေး	စီမံကိန်းနယ်နိမိတ်အတွင်းရှိ ကျေးရွာများ		၃၀၀၀	
	စုစုပေါင်း			၇၈၆၁၆၆	

မှတ်ချက်။ ။ ပတ်ဝန်းကျင် ကုမ္ပဏီမှ အထက်ဖော်ပြပါ လူမှုစီးပွားတိုးတက်မှု ဆောင်ရွက်ချက်များ အပြင် အောက်ပါ လုပ်ငန်းများကိုလည်း နှစ်စဉ် ဆောင်ရွက်လျက်ရှိပါသည်။

၁ မလေးရှားနိုင်ငံ နည်းပညာတက္ကသိုလ် စကောလားရှစ် ကျောင်းသားများ စေလွှတ်၍ ပညာသင် ထောက်ပံ့ခြင်း အစီအစဉ် (အမေရိကန်ဒေါ်လာ ၂၀၀၀၀၀ ခန့် .)