

# 7

## ENVIRONMENTAL MANAGEMENT PLAN

### 7.1 Purpose and Objectives of the Environmental Management Plan

An EMP provides a delivery mechanism to address the adverse environmental impact of a project during its execution, to enhance project benefits, and to introduce standards of good practice to be adopted for all project works.

The primary objectives of the EMP are to:

- Facilitate the implementation of the mitigation measures for the identified adverse impacts
- Define the responsibilities of the project proponents and contractors in order to effectively implement the environmental management plan
- Suggest guidelines for selection of drilling sites based on environmental considerations
- Define a monitoring mechanism and identify monitoring parameters in order to:
  - Ensure the complete implementation of all mitigation measures
  - Ensure the effectiveness of the mitigation measure
  - Provide a mechanism for taking timely action in the face of unanticipated environmental situations
- Identify training requirements at various levels.

#### 7.1.1. HSE Policy of Block Operator

The use of fossil fuel will depend not only on technical, economic and political decisions but increasingly on environmental considerations and its impact.

Block operator will continue to conduct its activities in a professional and responsible manner. We not only will comply with the laid down legislation requirements but when found inadequate the company will promote creative measures and internal standards for the protection of health, safety & the environment of the highest order for all who may directly or indirectly be affected by any of our activities.

Personal safety and employee health is our greatest responsibility, followed by the protection of our environment and company property.

We will continue to take a proactive approach toward creating safe work environments for all employees and will be accountable for promoting continued safety education and training for all employees, assigning responsibility for all aspects of the program, continuously reviewing the program to identify potential areas of improvement, and ensuring a thorough evaluation of all incidents.

We will continue to address the environmental and health impact of our operations by reducing waste, emissions, and discharges and by using energy efficiently.

We will maintain awareness of HSE matters, so as to be proactive in providing a value-added service to our clients. This awareness is achieved through education, communication and definition of the goals and standards appropriate to our operation and those undertaken on our client's behalf

### 7.1.2 Organizational Structure and Responsibilities

This section provides an organizational structure for environmental management during the proposed drilling project and defines the roles and responsibilities of the various role players for the duration of the project.

### 7.1.3 Management Approach

The organizational roles and responsibilities are summarized below:

*Block operator:* The overall responsibility for compliance with the environmental management plan rests with the project proponents.

*Contractors:* The contractors (civil, drilling, and other) will carry out field activities as part of the exploratory drilling project. The contractors will be subject to certain liabilities under the environmental laws of the country, and under their contract with Block operator.

*Independent Monitors (IMs):* Block operator might utilize the option of hiring independent monitors (IMs) to monitor the environmental performance of the contractors and the environmental impact of project activities.

A certain degree of redundancy is inevitable across all management levels, but this is in order to ensure that compliance with the environmental management plan is crosschecked.

Other essential features of the EMP are:

- Block operator will appoint a Field based HSE Coordinator to oversee HSE compliance throughout the duration of the drilling program.
- Block operator will ensure that all contracts it executes with sub-contractors comply with positive environmental sensibilities and requirements given in the environmental management plan.
- Block operator will cooperate with regulatory agencies (such as the Forest Department, State Pollution Control Board) and other stakeholders who may want to send their own teams in to monitor the activities during the drilling program.

### 7.1.4 Organizational Responsibilities

The salient features of the organisational responsibilities are described below:

#### 7.1.4.1 Primary Responsibilities:

- The primary responsibilities for the environmental performance of the project proponents, the contractors, and the contractors for environmental monitoring

will be assumed by their respective highest-ranking officers in the country during the project.

- Block operator's Chief - QHSE will be responsible for the company's compliance with the EIA and EMP throughout the project.

#### **7.1.4.2 Field Management and Quality Control:**

- Conducting drilling activities in an environmentally sound manner will be the responsibility of the drilling contractor/company.
- Block operator's Company Man (Drilling) will be responsible for the overall environmental soundness of all field operations.

#### **7.1.4.3 On-the-job Supervision and Monitoring:**

- Block operator has a Chief - QHSE, who is responsible for ensuring compliance with the EMP during the drilling operation. He is also responsible for communicating with and training the drilling crews in all aspects of the EMP.
- Block operator has an HSE Coordinator who will be responsible for all environmental issues and for the implementation of the environmental management plan in the field.
- If any monitoring teams from government departments or from NGOs visit the field during the drilling operation, Block operator's HSE Coordinator and the Chief will be responsible for coordinating their visits.

## **7.2 Mitigation Plan**

The mitigation plan is a key component of the EMP. It lists all the potential effects of the project and their associated mitigation measures identified in the EIA. For each Impact/Hazard, the following information is presented in the plan:

- A comprehensive listing of mitigation measures
- Actions required
- The person(s) responsible for ensuring the full implementation of the action
- A time parameter for the implementation of the action to ensure that the objectives of mitigation are fully met.

The mitigation plan for the activities proposed for the exploratory drillings in the block is presented in **Table 7.1** (prior to drilling phase) and **Table 7.2** (during drilling phase).

**Table 7.1: Environmental Management Plan - Mitigation Management Matrix (Prior to Drilling Phase)**

<b>ROUTINE OPERATIONS</b>				
<b>Hazard &amp; Effect(s)</b>	<b>Proposed Mitigation</b>	<b>Required Actions</b>	<b>Responsible</b>	<b>Completion</b>
<b>Land Acquisition</b> Obtain necessary permits for Land acquisition from State government	<ul style="list-style-type: none"> <li>Ensure that all necessary protocols are followed and legal requirements implemented.</li> </ul>	<ul style="list-style-type: none"> <li>Block operator to initiate interaction with the concerned officials in the state government prior to release of actual location to identify necessary permits and the approval mechanism.</li> </ul>	Chief-QHSE	Pre-deployment of topographic survey team.
	<ul style="list-style-type: none"> <li>Ensure that appropriate legal requirements have been met with regard to land occupancy, land ownership or usage rights, notice and compensation, etc.</li> </ul>	<ul style="list-style-type: none"> <li>Apply for approval for Land acquisition with proper maps and prescribed fees.</li> </ul>	- Do -	After site survey, prior to construction.
	<ul style="list-style-type: none"> <li>Establish and clearly document all land agreements with owners, users and state authorities and mark out site boundaries.</li> </ul>	<ul style="list-style-type: none"> <li>Preliminary site survey to be carried out by Block operator's civil works consultants to mark the road &amp; site requirement on ground.</li> </ul>	- Do -	- Do -
	<ul style="list-style-type: none"> <li>Acquiring necessary approvals from State Pollution control Board in a timely manner</li> </ul>	<ul style="list-style-type: none"> <li>Block operator's Drilling &amp; Permit team to meet the local Pollution Control authorities to apprise them of the plan and to identify and apply for necessary permissions prior to construction phase and prior to drilling phase.</li> </ul>	- Do -	Common application covering "Consent to establish" & "Consent to Operate"

<b>ROUTINE OPERATIONS</b>				
<b>Hazard &amp; Effect(s)</b>	<b>Proposed Mitigation</b>	<b>Required Actions</b>	<b>Responsible</b>	<b>Completion</b>
<b>Soil Erosion</b>	<ul style="list-style-type: none"> <li>Minimize the extent of site clearance area, by choosing best layout with respect to existing topography.</li> <li>Minimize removal of trees at site</li> <li>Collect topsoil removed during road development/construction, site preparation, etc. and stockpile the same at edge of site to be used to the extent possible for site restoration later.</li> </ul>	<ul style="list-style-type: none"> <li>Detailed contour maps of the site to be prepared with trees marked on it to work out the best layout to minimize cut &amp; fill &amp; avoid cutting of trees.</li> <li>To see that arrangement is in place for collection.</li> <li>Plan to minimize tree cutting prior to site construction and ensure implementation on ground during site construction phase</li> </ul>	<p>Assit. Manager</p> <p>Civil Contractor</p> <p>Assit. Manager</p>	<p>Prior to site preparation and other construction activities-</p> <p>- Do -</p> <p>To be continued till demobilization.</p>
<b>Habitat Disturbance</b>	<ul style="list-style-type: none"> <li>Mark out road &amp; site boundaries.</li> <li>All bulldozer operators and other manual laborers involved in road and site preparation will be trained to strictly confine to their works within the defined site boundaries.</li> <li>Pits for containment of cuttings and liquid effluents will be dug at site after fencing is in place.</li> </ul>	<ul style="list-style-type: none"> <li>To ensure that clear boundary marks are in place.</li> <li>To ensure that integrity of boundary markers is maintained by the workforce at all times.</li> <li>Ensure that fencing of site is in place prior to cutting of pits at site.</li> <li>To appoint guards to be stationed at site during construction phase.</li> </ul>	<p>Assit. Manager</p> <p>- Do -</p> <p>Drilling Team</p> <p>Civil contractor</p>	<p>Prior to any construction activity (road or site)</p> <p>Throughout the road &amp; site construction operations.</p> <p>- Do -</p> <p>- Do -</p>

**Table 7.2: Environmental Management Plan - Mitigation Management Matrix (during Drilling Phase)**

<b>ROUTINE OPERATIONS</b>				
<b>Hazard &amp; Effect(s)</b>	<b>Proposed Mitigation</b>	<b>Required Actions</b>	<b>Responsible</b>	<b>Completion</b>
<p><b>Waste and Effluent Management</b></p> <p>Poor planning and execution might pose a threat to environment.</p> <p>Contamination of rain/storm water run off with rig wash water &amp; waste mud</p>	<ul style="list-style-type: none"> <li>Block operator to identify different type of waste anticipated during operations, work out estimated quantities, lay down procedures for collection, handling, treatment and disposal of each type of waste.</li> <li>Waste Management Plan to be implemented during operations.</li> <li>Detailed drainage design will be developed as a part of the site design. It will be ensured that mud and associated drainage system is isolated from the rain/storm water drainage system.</li> <li>Pits must have adequate capacity to prevent flooding during high rains (maintain free board) and should be fully bunded.</li> </ul>	<ul style="list-style-type: none"> <li>Finalizing Waste Management Plan (draft plan given in EMP report )</li> <li>Waste management plan to be implemented during drilling and be made available for inspection at site to all regulatory bodies.</li> <li>Block operator to work with Civil works consultants /contractors to develop detailed drainage system addressing concerns outlined here.</li> <li>Block operator to work out required pit volumes based on maximum case scenario including rainwater.</li> </ul>	Chief QHSE in association with Drilling Team	Prior to drilling
			Chief – QHSE/Drilling Manager	Implementation - During all operations at site and during demobilization
			Drilling Team	Site Design phase
			Drilling Team	- Do -

<b>ROUTINE OPERATIONS</b>				
<b>Hazard &amp; Effect(s)</b>	<b>Proposed Mitigation</b>	<b>Required Actions</b>	<b>Responsible</b>	<b>Completion</b>
<p>Wastewater &amp; cuttings may contain trace amounts of drill fluid and residual chemicals.</p> <p>Fuels, Lubricants and Chemicals Management pose threat of major, moderate &amp; minor spills</p>	<ul style="list-style-type: none"> <li>All wastewater, which will be generated from washings &amp; spent mud will be contained in HDPE lined (1 mm thick) pits. The wastewater will be treated through flocculation and dilution to achieve SPCB compliance for discharge.</li> <li>Cuttings will be dried to maximum extent possible using suitable equipment and will be contained in separate pits.</li> <li>Prepare a comprehensive Oil Spill Contingency Plan (OSCP) to handle all major, moderate &amp; minor spills</li> <li>Keeping all fuels, lubricants and chemicals in well-designed storage facility with regular inventory checking.</li> <li>Ensure that OSCP is implemented during operations.</li> </ul>	<ul style="list-style-type: none"> <li>Site design will include adequately sized pits to contain wastewater &amp; also treated water prior to discharge.</li> <li>Block operator will hire Hi -G drier system to treat the cuttings coming from the shakers to achieve fairly dry cuttings.</li> <li>Finalizing the Oil Spill Contingency Plan (OSCP)</li> <li>Checklist of all drums and containers located within footprint of the storage area</li> <li>Live risk assessment trainings and awareness raising among all workers associated with mock exercises.</li> </ul>	<p>Drilling Team</p> <p>Drilling Team</p> <p>Chief - QHSE in association with the Drilling Team</p> <p>Rig's maintenance staff</p> <p>Chief - QHSE and Environmental Advisor</p>	<p>Site Design / Contractor procurement.</p> <p>Planning &amp; Procurement phase prior to drilling Contractor Procurement/drilling operations.</p> <p>Prior to commencement of drilling operations</p> <p>Through out the operations.</p> <p>Pre-Drilling Inductions and during the operations</p>

<b>ROUTINE OPERATIONS</b>				
<b>Hazard &amp; Effect(s)</b>	<b>Proposed Mitigation</b>	<b>Required Actions</b>	<b>Responsible</b>	<b>Completion</b>
Contamination by way of oil/lubricant spills and leaching	<ul style="list-style-type: none"> <li>Used and unused chemicals will be stored in a lined &amp; bunded area.</li> </ul>	<ul style="list-style-type: none"> <li>The lined &amp; bunded area for the diesel tank will have extra space to contain used and un-used lubricants in drums.</li> </ul>	Drilling Team.	Site design phase
	<ul style="list-style-type: none"> <li>Executing delivery of fuel to drilling site under strict supervision and carrying out refueling operations in an area with impervious flooring and surface drainage with oil interceptor.</li> </ul>	<ul style="list-style-type: none"> <li>Keeping an inventory of all fueling and refueling operations.</li> </ul>	Construction contractor during construction phase & Rig's maintenance staff during drilling phase.	Site design & through out the operations.
	<ul style="list-style-type: none"> <li>Use of suitable delivery trucks</li> </ul>	<ul style="list-style-type: none"> <li>Check all delivery trucks for suitability &amp; ensure that they meet safety requirements</li> </ul>	HSE coordinator	- Do -
	<ul style="list-style-type: none"> <li>Impervious liners in place for fuel, lubricants storage area. Fuel/lubricant containment &amp; generator area to have drains with oil entrapment provision.</li> </ul>	<ul style="list-style-type: none"> <li>Impervious liners to be installed in the fuel &amp; lubricant storage area. Fuel/lubricant storage area &amp; generator area to have drains with oil entrapment mechanism.</li> </ul>	Drilling Team	Site design phase.
	<ul style="list-style-type: none"> <li>Effective bunds capable of containing 110% of the volume of the largest container within and enclosing all potentially contaminating materials to be used for fuel/lubricants storage area.</li> </ul>	<ul style="list-style-type: none"> <li>Site design to incorporate bund requirement for the fuel/lubricant storage area.</li> </ul>	- Do -.	- Do -

<b>ROUTINE OPERATIONS</b>				
<b>Hazard &amp; Effect(s)</b>	<b>Proposed Mitigation</b>	<b>Required Actions</b>	<b>Responsible</b>	<b>Completion</b>
	<ul style="list-style-type: none"> <li>• Non-contaminated and potentially contaminated runoff will be kept separate. Non-contaminated runoff will be routed to off-site area. Potentially contaminated runoff will be treated.</li> <li>• Oil drip pans will be used wherever there is significant potential for leakage.</li> <li>• All spills/leaks to be contained reported and cleaned up immediately.</li> </ul>	<ul style="list-style-type: none"> <li>• Ensure separate runoff routes during site design.</li> <li>• Drip pans will be used.</li> <li>• Oil Spill Contingency Plan to be in place and implemented.</li> <li>• Soil contaminated will be scraped and sent to nearest refinery / common hazardous waste management facility for proper disposal.</li> </ul>	<p style="text-align: center;">- Do -</p> <p>HSE Coordinator</p> <p>HSE Coordinator</p> <p>HSE Coordinator</p>	<p style="text-align: center;">- Do -</p> <p>Throughout the drilling operations.</p> <p style="text-align: center;">- Do -</p> <p style="text-align: center;">- Do -</p>

<b>ROUTINE OPERATIONS</b>				
<b>Hazard &amp; Effect(s)</b>	<b>Proposed Mitigation</b>	<b>Required Actions</b>	<b>Responsible</b>	<b>Completion</b>
<b>Noise and Vibration</b>	<ul style="list-style-type: none"> <li>• Checklist of all machineries with record of date of procurement, installation and age.</li> <li>• Regular maintenance of all equipments.</li> <li>• Implement good working practices to minimize noise.</li> <li>• Wearing of ear protector when appropriate</li> </ul>	<ul style="list-style-type: none"> <li>• Inventory of all machineries to be prepared and submitted to Block operator for review.</li> <li>• Maintenance Log Book to be prepared and submitted to Block operator for review.</li> <li>• No machinery running when not required.</li> <li>• Block operator to distribute noise protection equipment and ensure utilization by the work force.</li> </ul>	Rig Contractor	During drilling operations
			Rig Contractor	Prior to and during drilling operations
			- Do -	During Drilling operations
			HSE Coordinator	- Do -
<b>Air Emissions</b>	<ul style="list-style-type: none"> <li>• Operate all equipment within specified design parameters.</li> <li>• Store all dry, dusty material (chemicals, etc.) in sealed containers.</li> <li>• Minimize duration of testing by careful planning.</li> </ul>	<ul style="list-style-type: none"> <li>• Ensure proper Equipment maintenance</li> <li>• Ensure absence of stockpiles or open containers of dusty materials.</li> <li>• Options for MDT, Open Hole DST to be explored for shorter test include in the plan if found suitable</li> </ul>	Rig Mechanic	During Drilling operations.
			Rig's maintenance staff	- Do -
			Drilling Team	Planning phase

<b>ROUTINE OPERATIONS</b>				
<b>Hazard &amp; Effect(s)</b>	<b>Proposed Mitigation</b>	<b>Required Actions</b>	<b>Responsible</b>	<b>Completion</b>
	<ul style="list-style-type: none"> <li>Minimize emissions during well testing (flaring).</li> <li>Minimize dust generated from truck movement</li> </ul>	<ul style="list-style-type: none"> <li>Effective separation of oil &amp; gas to be achieved and the separated oil will be trucked to nearest oil installations and only dry clean gas to be flared.</li> <li>Watering of roads if required.</li> </ul>	<p style="text-align: center;">- Do -</p> <p>HSE Coordinator</p>	<p style="text-align: center;">- Do -</p> <p>During Drilling operations.</p>
<p><b>Solid Wastes</b> Wastes will include organic wastes, scrap metal, waste oil &amp; surplus chemicals, sacks, broken wooden pallets, medical wastes etc.</p>	<ul style="list-style-type: none"> <li>Ensure proper documentation and manifestation of all wastes generated.</li> <li>Litter and debris not to be discarded at site and to be segregated at a segregation pit on the well site</li> <li>Non-toxic biodegradable waste to be buried during operations and at decommissioning, ensuring that local water resources are not contaminated in any way.</li> </ul>	<ul style="list-style-type: none"> <li>Pre-operation inspections to ensure waste disposal facilities are in place.</li> <li>A special segregation pit to have waste types segregated into separate compartment/drums at the well site.</li> <li>All biodegradable waste at the drilling site is to be collected and disposed off into two small humus pits (each of 2m x 2m x 1.5 m) within the drilling site area away from common use by rig crewmembers. The humus pits are to be covered with soil on daily basis to avoid any odor nuisance due to putrefication and check any contact with the flies</li> </ul>	<p>HSE Coordinator</p> <p>HSE Coordinator</p> <p>Drilling Team &amp; HSE Coordinator.</p>	<p>Prior to drilling operations</p> <p>During drilling</p> <p>Site design &amp; drilling operations</p>



<b>ROUTINE OPERATIONS</b>				
<b>Hazard &amp; Effect(s)</b>	<b>Proposed Mitigation</b>	<b>Required Actions</b>	<b>Responsible</b>	<b>Completion</b>
	<ul style="list-style-type: none"> <li>Bulk supply of materials to be preferred for minimization of packaging wastes. Unused materials to be returned to supplier.</li> </ul>	or insects. <ul style="list-style-type: none"> <li>Block operator to include in tender requirements wherever possible.</li> </ul>	Drilling team.	Contractor procurement phase.



<b>ROUTINE OPERATIONS</b>				
<b>Hazard &amp; Effect(s)</b>	<b>Proposed Mitigation</b>	<b>Required Actions</b>	<b>Responsible</b>	<b>Completion</b>
Non-routine events and accidental releases. (Well kicks, blow out)				
		7-13		



<b>ROUTINE OPERATIONS</b>				
<b>Hazard &amp; Effect(s)</b>	<b>Proposed Mitigation</b>	<b>Required Actions</b>	<b>Responsible</b>	<b>Completion</b>
<b>Socio-Economic Impacts</b>	<ul style="list-style-type: none"> <li>• Ensure no water (surface or ground) contamination occurs from drilling operations</li> </ul>	<ul style="list-style-type: none"> <li>• Implement waste management plan and undertake water quality monitoring before, during and after the operations.</li> </ul>	Chief - QHSE/ HSE Coordinator	Planning and during the operations
	<ul style="list-style-type: none"> <li>• Dust emissions on access road to be minimized.</li> </ul>	<ul style="list-style-type: none"> <li>• Regular monitoring of the access road and deployment of water tankers to minimize dust.</li> </ul>	HSE Coordinator	During drilling
	<ul style="list-style-type: none"> <li>• All manual labor and other jobs for which local skills are available are recruited from local people.</li> </ul>	<ul style="list-style-type: none"> <li>• Block operator to keep a record of all jobs and provide monthly feedback on jobs provided to locals and others with clear reporting on each job profile.</li> </ul>	Chief - QHSE	Planning and during drilling
	<ul style="list-style-type: none"> <li>• Undertake social welfare projects for the local communities through well thought out CSR strategy</li> </ul>	<ul style="list-style-type: none"> <li>• Develop a CSR strategy for the area and implement one social welfare project during each drilling well</li> </ul>	General Manager Drilling & Chief - QHSE	Planning phase and during drilling operations

### 7.3 Environmental Training

Environmental training will help to ensure that the requirements of the EIA and EMP are clearly understood and followed by all project personnel throughout the project period. The primary responsibility for providing training to all project personnel will be that of the HSE Coordinator.

The HSE coordinator will train the site staff, the drilling contractor, and other staff engaged by Block operator for the project. Training will cover all staff levels, ranging from the management and supervisory to the skilled and unskilled categories. The scope of the training will cover the requirements of the EIA and the EMP, with special emphasis on sensitizing the project staff to environmental, social, ethnic, and tribal context of the area.

The Chief will conduct on-job live risk assessment trainings to the Block operator staff (including HSE coordinator & Company man) and the contractor staff to better appreciate environmental risks and their mitigation measures. This will be undertaken after conducting audits on the operations.

## 7.4 Waste Management Plan

To facilitate field level implementation, a draft waste management plan is proposed which will be subject to fine tuning before the start of the operations. This draft Waste management plan is presented below in **Table 7.3**.

**Table 7.3: Waste Management Plan**

<i>Category</i>	<i>Waste Type</i>	<i>Proposed Action</i>	<i>Who is Responsible for action?</i>	<i>What needs to be Reported?</i>	<i>Monitoring</i>
<b>Domestic Waste</b>	Sewage (Black Water)	It is expected that less than 0.5 m <sup>3</sup> /day of domestic wastewater (sewage and sullage) will be generated from each exploratory drilling site. The treatment proposed for the domestic water includes allowing domestic wastewater to pass into a septic tank to be provided at a drilling site. The septic tank will be constructed as per the Bureau of Indian Standard IS: 2470 (Part-1): 1985.  All Sewage to be channelised into septic tanks and soak pits.	HSE coordinator	Dimensions of pits, Integrity & maintenance of the pits, Level of sewage in the Pits	Chief - QHSE
	Wastewater from Kitchen and Laundry (Gray Water)	The disposal of the overflow from the septic tank will be done into a soak pit provided at the drilling site. The secondary treatment (soak pit) can be constructed as per the Bureau of Indian Standard IS: 2470 (Part-2): 1985.  All gray water to be channelised into soak pits. Excess waste water will be sprinkled on the project access road	HSE coordinator	Dimensions of pits, Integrity & maintenance of the pits, Level of gray water in the Pits. Check availability of grease collection pit and frequent collection of grease, regular checking of wastewater level in the pit.	HSE Coordinator / Chief – QHSE

	Food Waste	To be properly segregated (no plastics, metal, glass in it) and brought to the segregation pit. Dig two small humus pits (each of 2m x 2m x 1.5 m) within the drilling site area away from common use by rig crewmembers. The humus pits are to be covered with soil on daily basis to avoid any odour nuisance due to putrefication and check any contact with the flies or insects.	Drilling Contractor's Environment Officer	Construction of pits, daily disposal of organic waste and covering it with soil	IHSE Coordinator
	Combustible Waste (Paper, Rags, Packing material)	To be properly segregated (no plastics, metal, glass in it) and brought to the segregation pit. Sent to recycling contractor.	Drilling Contractor's Environment Officer	Ensure daily bringing of the waste to the pit. Periodic sending of waste to recycling contractor	HSE Coordinator
<b>Hazardous waste</b>	Medical waste (Waste generated from clinic)	To ensure the availability of specified boxes, use of syringe cutters. Waste to be properly separated and stored temporarily at site separately from other wastes. Medical waste to be transported to nearest hospital.	Medical Doctor	Segregation of waste Transportation of waste to incinerator at Digboi	HSE Coordinator
<b>Recyclable Waste</b>	Tin packs, plastic and glass bottles and other metallic materials	To be properly segregated and temporary storage at segregation pit at well site. Deliver to approved recycling contractor	Drilling Contractor	Segregation and storing of waste at the site. Sending of waste recycling contractor	HSE Coordinator

<b>Drilling Wastes</b>	Drill Cuttings	<p>To be stored in 1mm HDPE lined pits on the well site.</p> <p>At the close of operations, if leachate analysis performed on properly washed and reasonably dried drill cuttings show that it is non-hazardous in nature, then it can be disposed of as inert material either into a cuttings pit onsite or offsite or taken for beneficial use in construction of roads or spreading on land in the local area or land filling.</p> <p>If found hazardous, disposal can be done onsite or offsite as per the approval of the State Pollution Control Board or to dispose it in some existing secured landfill operating in the region.</p>	HSE Coordinator	<p>Check integrity of the HDPE lined pit. Verify that volume of pit is adequate for storage of cuttings from the drilling site.</p> <p>Leachate analysis to be done once a month from a recognized Lab.</p>	Chief - QHSE
	Un-Used Drilling Mud	To be stored in 1mm HDPE lined pit on site. After the operations it should be transported to another drilling site in the block.	HSE Coordinator / Drilling Engineer	Check integrity of the HDPE lined pit.	Chief - QHSE/ Drilling Manager
	Drilling & Wash Wastewater	After flocculation, the treated wastewater is stored in a holding/buffer pit (1mm HDPE lined) and then disposed in a natural drain if conforms to the stipulated standards. Otherwise repeat treatment required for the non-complying parameters or ensure dilution in case of marginal exceed of standards. Stipulated standards described in <b>Table 7.4</b>	HSE Coordinator	<p>Check integrity of the HDPE lined pit. Volume (cum) of wash wastewater generated.</p> <p>Testing for stipulated standards from recognized Labs before discharge into natural drains.</p>	Chief - QHSE

	Chemical Sludge (generated as a result of wastewater treatment)	<p>The treatment of the sludge so generated can be for pH correction, if any, followed by dewatering either in centrifuge and or solar evaporation. The treatment is to be ensured in a pit properly lined with impervious HDPE liner of 1.0 mm.</p> <p>Disposal is dependent on establishing non-hazardous or hazardous nature after the end of operations</p>	HSE Coordinator	<p>Check integrity of the HDPE lined pit. Volume (cum) of the sludge generated.</p> <p>Testing for stipulated standards from recognized Labs before deciding final disposal.</p>	- Do -
<b>Oily Waste</b>	Used Oil	Oil changing activity is allowed only at the rig site. Oil to be collected in designated containers at the Rig site. Ensure that the used oil drums are safely transported to the approved recycling contractor or to the certified workshop.	HSE Coordinator	Collection and storage of oil. Used oil drums safely transported and sent to approved recycling contractor	- Do -

### **Notes on Handling of Hazardous & Non Hazardous Substances:**

The Hazardous Waste (Management & Handling) Rules 1989 were introduced under Sections 6, 8, and 25 of the Environment (Protection) Act of 1986 (referred to as HWMH Rules 1989). The HWMH Rules, 1989 provide for the control of generation, collection, treatment, transport, import, storage and disposal of wastes listed in the schedules annexed to these rules. The rules are implemented through the State Pollution Control Boards (SPCB) Pollution Control Committees in the states and UTs respectively. The HWMH Rules have been amended in 2000 and 2003, which widened the definition of hazardous waste.

With the recent amendment, these rules have become quite comprehensive. The rules define responsibility of hazardous wastes generators, require safe handling practices and maintenance of manifest system during transport of hazardous waste and also describe technological aspects to be followed up by re-refiners and recyclers of hazardous wastes. The rules also cover liabilities of occupier, transporters and operator of a facility for any damage caused due to improper handling and disposal of hazardous wastes for reinstating or restoring environmental damages caused. The occupier of hazardous waste collection, storage, transportation and disposal requires prior permit called “authorization” under the rules. Under the rules the occupier of a unit requires prior authorization i.e. permission for collection, transport, treatment, reception, storage and disposal of hazardous wastes, to be granted by the competent authority (State Pollution Control Board) as per Form 1 of the Rules.

Under Schedule 1 of the Amendment Rules 2003, the following wastes generated during drilling operation for oil and gas production (under item nos. 2.1, 2.2 and 2.3 under Schedule 1 - refer to Hazardous Waste (Management & Handling) Rules, 1989 and the amendments 2000 & 2003, Schedules 1 & 2 and Forms 1 & 3. Also includes Onshore Discharge Standards for Liquid Effluent from Oil Drilling.) will be treated as hazardous:

- Drill cuttings containing oil;
- Sludge containing oil; and
- Drilling mud and other drilling wastes.

For the proposed drilling, it is expected that the drill cuttings will be free from oil and may not be rendered as hazardous, provided it is out of the purview of concentration criteria laid down under Schedule 2 to the Rules. The sludge from the proposed drilling operations may be rendered as free from oil by providing suitable pre-treatment measures. However, as per the Rules, any chemical sludge generated from wastewater treatment (item nos. 34.3 & 34.4 to the Schedule 1) is considered as hazardous. Therefore, the chemical sludge from the wastewater treatment at the proposed exploratory drilling can be rendered as hazardous. The drilling mud and other drilling wastes also considered as hazardous. However, based on sampling and analysis carried out through a recognized laboratory after the end of the drilling phase, if it is proved that the drilling mud and other drilling wastes do not contain any of the constituents mentioned in Schedule 2 of the HWM rules to the extent of concentration limits specified therein, the wastes may not be treated as hazardous. Block operator would require prior authorization from the State Pollution Control Board for treatment, storage, transportation and disposal of any hazardous waste generated at site during drilling operations.

**Table 7.4: Onshore Discharge Standards for Liquid Effluent from Oil Drilling**

S. No.	Parameter	Onshore discharge standard (not to exceed)
1	pH value	5.5 to 9.0
2	Temperature, °C	40.0
3	Suspended Solids, mg/l	100.0
4	Zinc, mg/l	2.0
5	BOD at 27°C for 3 days, mg/l	30.0
6	COD, mg/l	100.0
7	Chlorides, mg/l	600.0
8	Sulphates, mg/l	1000.0
9	Total Dissolved Solids, mg/l	2100.0
10	Sodium, mg/l	60.0
11	Oil and Grease, mg/l	10.0
12	Phenolics, mg/l	1.2
13	Cyanides, mg/l	0.2
14	Fluorides, mg/l	1.5
15	Sulphides, mg/l	2.0
16	Chromium (Hexavalent), mg/l	0.1
17	Chromium (Total), mg/l	1.0
18	Copper, mg/l	0.2
19	Lead, mg/l	0.1
20	Mercury, mg/l	0.01
21	Nickel, mg/l	3.0

The proposed drilling operations require to discharge treated wastewater only after achieving above standards and or as specifically imposed by the Assam Pollution Control Board in its permit to operate for drilling of proposed exploratory well.

## 7.5 Restoration and Rehabilitation

### 7.5.1 Well Abandonment

After well testing and evaluation, a decision on whether to abandon or develop the well will be taken. If no indications of a commercial quantity of oil are encountered either before or after testing, the well will be declared dry, accordingly plugged and abandoned, and the site restored in line with local regulations and good industry practice. As a minimum, the following steps will be undertaken to restore and rehabilitate the area:

- The wellhead and all casing string will be cut off to a minimum depth of 3 m (10 ft) below ground level.
- All concrete structures will be broken up, and the debris disposed off as per the regulatory requirements.
- All other waste products, solid and liquid, will be disposed of in accordance with the requirements of the EIA and will be treated to render them harmless.
- All fencing and access gates will be removed.
- All pits whose contents would show regulatory compliance for on-site disposal, at the time of site closure, will be backfilled and closed out as per the legal requirements.



- That portion of the access track likely to be of no use for other exploratory wells in the reserved forest will be restored by removing cross drainage structures.
- Waste products, solid and liquid, will be disposed of in accordance with the waste management plan.

### **7.5.2 Well Suspension**

After well testing and evaluation, if it is decided that the oil field is to be further appraised, the well site and the access road will be maintained and a separate EIA conducted for organizing the appraisal and possible development of the oil field. Further development of the well will depend on the outcome of the EIA and the approval of the concerned government agencies. The site will not be restored to its original condition until a decision is taken on the environmental assessment of the field development. Until then, the fencing will be left intact and the site sealed, although a few security men will be posted at the site for its protection. The road will be maintained but barriers installed at suitable locations will control access to it.