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ENVIRONMENTAL MONITORING PLAN

An environmental monitoring plan provides a delivery mechanism to address the adverse environmental impacts of a project during its execution, to enhance project benefits, and to introduce standards of good practice to be adopted for all project works. An environmental monitoring program is important as it provides useful information and helps to:

- Assist in detecting the development of any unwanted environmental situation, and thus, provides opportunities for adopting appropriate control measures, and
- Define the responsibilities of the project proponents, contractors and environmental monitors and provides means of effectively communicating environmental issues among them.
- Define monitoring mechanism and identify monitoring parameters.
- Evaluate the performance and effectiveness of mitigation measures proposed in the Environment Management Plan (EMP) and suggest improvements in management plan, if required,
- Identify training requirement at various levels.

An environmental monitoring plan is suggested to monitor environmental parameters during survey, drilling and post drilling phase of the project. The Monitoring plan is given in **Table 5.1, 5.2** and **5.3** below.

Table 5.1: Recommended Environmental Monitoring Protocol – Pre Drilling Phase

Receptor	Location	Monitoring Mechanism	Monitoring and Reporting Frequency
Ambient Air Quality	At project Location	Monitoring NO _x , SO ₂ , SPM, RPM, CO and HC	Twice a week for a month prior to drilling
Surface water Quality	Water bodies within the radius of 1 km of the project site	pH, conductivity, Total Suspended Solids (TSS) and Total Dissolved Solids (TDS), heavy metals, Biological Oxygen Demand (BOD), COD	At least three samples prior to drilling
Groundwater Quantity	Within the radius of 1 km the of project site. Water sources used for construction purposes and	Physico-chemical parameters, heavy metals and toxic organic compounds	At least three samples from one location prior to drilling. The monitoring should be done for minimum four



Receptor	Location	Monitoring Mechanism	Monitoring and Reporting Frequency
	dug wells within 500 m from wastewater and mud ponds		locations, one location on each direction
Noise Levels	At Project location	For Background Noise Levels (using Noise meters)	Daily for a month prior to drilling
Physical Infrastructure	At Project Site	<ol style="list-style-type: none"> 1.Lining of waste ponds, drill cutting ponds with 1 mm HDPE sheets layer 2.Oil & grease traps on outlets; storm water runoff points. 3.Presence of impervious liners in place for fuel, lubricants storage area and drains with oil entrapment provision 4.Mud and work associated system is separated from rain/storm drainage system 5.Separate run off routes for non-contaminated and contaminated run off. Treatment facilities for the contaminated run off 6.Septic tank & soak pits of adequate size and presence of bunds around the pit 7.Suitable covering of soak pit to arrest fly and rodent nuisance 8.Impervious flooring in fuel storage and refuelling areas 9.Chemical storage should be suitability 	During site preparation



Receptor	Location	Monitoring Mechanism	Monitoring and Reporting Frequency
		covered and imperviously lined	
Clearance of Trees	At Project Location	Inventory of trees likely to be cut and number of trees to be planted as part of Compensatory Tree Plantation program	During site preparation

Table 5.2: Recommended Environmental Monitoring Protocol - During Drilling Phase

Receptor	Location	Monitoring Mechanism	Monitoring and Reporting Frequency
Natural Resource	At Project site	<ol style="list-style-type: none"> Quantity of each type of material used including water consumption Quantity of fuel used for power Quantity of fuel used by transportation to/from rig location & base Percentage of material used that have been reused or recycled from waste 	Daily during drilling phase
Ambient Air Quality	At project Location	Monitoring NO _x , SO ₂ , SPM, RPM, CO and HC	Twice a week for 24 hours
Surface Water Quality	Water bodies within the radius of 1 km of project site that will be utilized for consumption and disposal	pH, conductivity, TSS, TDS, heavy metals, BOD, COD etc	Every fortnight. The monitoring should be done on the same location where monitoring was done in pre drilling phase
Groundwater Quantity	Water sources used for construction purposes and dug wells within 1km m from wastewater and mud ponds	Physico chemical parameters, heavy metals and toxic organic compounds	Every fortnight. The monitoring should be done on the same location where monitoring was done in pre drilling phase
Noise & Vibration	At Rig Site, near DG sets and drilling pumps.	<ol style="list-style-type: none"> Noise level monitoring Machineries maintenance 	Hourly during drilling operation Weekly during drilling



Receptor	Location	Monitoring Mechanism	Monitoring and Reporting Frequency
		<ol style="list-style-type: none"> 3. No machinery running when not required 4. Use of ear plug by workforce 5. Presence of minimum 10 ft high barrier around the well site 	operation
Drilling wastes	At drilling site	<ol style="list-style-type: none"> 1. Drill cuttings wash water: its quantification, characteristics (TSS, TDS, organic compounds, heavy metals, oil & grease), its treatment and safe disposal 2. Cutting are dried to maximum extent in Hi-G drier system and dried cutting are disposed in separate waste pits 3. Drill cuttings: Categorization for parameters given in EPA disposal standards prior to disposal, quantification and storage 4. Spent drilling fluid: its treatment and reuse 5. Un used drilling mud: its categorisation, storage, transportation and safe disposal 6. Maintenance of Drill cutting pit, waste mud pit and waste water pit 	Daily during drilling phase
Solid waste Generation	At Project Location	Waste segregation and disposal as per waste management plan	Daily during drilling phase
Wastewater Generation	At Project Site	<ol style="list-style-type: none"> 1. Waste water generation rate 2. Treatment of wastewater by clariflocculator and treated water meeting the wastewater discharge standard (SPCB) 3. Integrity and maintenance of the septic tanks and soak pits 	Daily during drilling phase



Receptor	Location	Monitoring Mechanism	Monitoring and Reporting Frequency
		4.Maintenance of waste water treatment Units: Flocculators and Centrifuges	
Oil wastes	At Drilling Site	<ol style="list-style-type: none"> 1.Generation, collection, processing, storage facilities, reuse and safe disposal 2.Facilities to control the accidental oil spill 3.Separate storage facilities for the fuel, lubricants and chemicals and their inventory 	Daily during drilling phase
Oil Spills	At Drilling Site	<ol style="list-style-type: none"> 1.Inventory of all oil spills/leakages and quantity of each spill 2.facilities according to oil spill contingency plan 3.Availability of shovels, sands and native soil at camp sites and well site 4.Presence of oil drip pans in potential oil leakages areas 	Daily during drilling phase
Soil Erosion	At Project Location	Visual observations	Daily during routine monitoring by Contractor and reported on a weekly basis by Project Environment Officer (PEO).
Socio-Economics	At Project Location	Local people recruited for all manual labour and other job for which local skill are available	During drilling operation



Table 5.3: Recommended Environmental Monitoring Protocol - Post Drilling

Receptor	Location	Monitoring Mechanism	Monitoring and Reporting Frequency
Drilling waste	At project Location	Quantification of Drill cuttings, its transportation and safe disposal	At the end of the drilling operation
Land	At Project Location	<ol style="list-style-type: none"> 1. Restoration and rehabilitation through: 2. Wellhead and casing string should be cut off to minimum depth of 3 m below ground level 3. Demolition of concrete structures and disposal of debris as per regulatory requirements 4. Treatment and disposal of waste products, solids and liquid in accordance with regulatory requirements 5. Removal of fencing and gates 6. Backfilling and closing of all on site disposal pits as per legal requirements 	At the end of the drilling operation
Surface Water Quality	At Project Location within radius of 1 km	pH, conductivity, TSS and TDS, and BOD, COD	At the same location where pre and during drilling phase monitoring was done. Once a week for one month after drilling is complete.
Groundwater Quantity	Water sources used for construction purposes and dug wells within 1km from wastewater and mud ponds	Physico chemical parameters, heavy metals and toxic organic compounds	At the same locations where pre and during drilling monitoring was done. once in pre and post monsoon season for 3 years
Soil Erosion	At drilling site and along the aligned	Visual observations	Monitored by Contractor and reported by PEO at the end of



Receptor	Location	Monitoring Mechanism	Monitoring and Reporting Frequency
	water courses		the drilling operation
Habitat Disturbance	Within the Project site boundary	Visual Observation	At the end of the drilling operation
Compensatory tree plantation	Tree plantation locations	Survival rate of tree saplings	Once in a year for three years.

The post operational monitoring programme will be under the supervision of the Block Operator and the Monitoring shall be get carried out by recognized laboratories/institutions/by Block Operator.