EXECUTIVE SUMMARY

INTRODUCTION

Oil India Ltd. (OIL) is currently planning for drilling of 89 wells and laying of approximately 480 km of pipelines in Moran Block in Dibrugarh, Sibsagar and Charaideo Districts under Moran, Moran Extension, Dholiya and some portion of Dumduma (Block A) PMLs.

The exploration of oil and gas is included under activities has been categorized as "A" level project in EIA Notification, 2006 that requires an Environmental Clearance (EC) from the Ministry of Environment, Forests and Climate Change (MoEF&CC). MoEF&CC has issued an approved Terms of Reference ToR vide J-11011/156/2017-IA.II (I) dated 31st May 2017 to OIL for conducting the EIA study.

The scope of the EIA study will be to establish the likely effect of drilling and production activities in Moran Block on the physical, social and biological environment of the surrounding areas. The scope of the EIA is delineated in line with the approved ToR received from MoEF&CC.

PROJECT DESCRIPTION

Location and Accessibility

The Moran Block is located in Dibrugarh, Sibsagar and Charaideo Districts of Assam. Total area of the Block is extended over 902 sq. km. National Highway 37 (NH-37) traverses through the Moran Block connecting district headquarters Dibrugarh town (Dibrugarh district), Sibsagar town (Sibsagar district) and Sonari (Charaideo district) with the Moran Block. State Highway 27 (SH 27) connecting NH 37 near Moran town with Naharkatia town traverses through Moran Block. Railway line of Northeast Frontier Railway (NFR) zone traverse within the Moran block connecting Dibrugarh and Sibsagar town. Dibrugarh is the nearest Airport located about 18kilometres from the Moran Block.

Environmental Settings of the Moran Block

Moran Block areas falls within the depositional plains of Brahmaputra River and its tributaries Buri Dehing and Disang River. Disang and Buri Dehing River traverses through south-eastern corner and north-western corner of the Moran Block respectively, and finally meets the Brahmaputra River. Land use classes in the Moran Block comprise of agricultural lands, settlements, tea gardens, homestead plantations and forestlands. Major industries like tea processing plants and oil production installation of OIL are scattered within the Moran Block. Panidehing Bird Sanctuary is located within 8.3 km from the Moran Block.

Environment setting of the Well sites and Production Facilities

Among the 89 wells, 37 wells are located in agricultural land, 18 wells located in homestead plantation area, 20 wells located in tea garden, 5 wells located in Open Ground and 9 wells in existing sites of OIL. Among the 9 production facilities 6 will be located in agricultural land, 2 in tea garden and 1 in open scrub areas.

Project Activities

Land Procurement

Generally, OIL will procure the required land through private negotiation. In few cases, OIL may request district authority to acquired land under LARR act 2013, if private negotiation is not successful. Land procurement will be done including crop compensation. Land from the tea garden would be taken on long-term lease from the tea garden authority.

Site Preparation & Construction Drill site

Site preparation will involve levelling, filling and consolidation of the site for staging equipment and machinery. Individual sites will be duly fenced to a height of about 2 m using jingle wired fencing or Xpm fencing.

Preparation and construction of drill sites and production facilities will involve top soil scraping and storage for future use, elevating the drill platform by excavated material from the site and material brought from authorized quarry area. Reinforced Cement Concrete (RCC) will be used for the construction of foundation system at drill sites. For making foundations of the main rig structure, cast in-situ bored under- reamed piles of specified lengths will also be used.

Drilling & Testing

The exploitation of hydrocarbons requires the construction of a conduit between the surface and the reservoir. This is achieved by the drilling process. The exploration wells will be drilled using a standard land rig or a "Mobile Land Rig" with standard water based drilling fluid treatment system. This rig will be suitable for deep drilling up to the desired depth of 3900 metres as planned for the project.

During drilling operations, a fluid known as drilling fluid (or 'mud') is pumped through the drill string down to the drilling bit and returns between the drill pipe –casing annulus up to surface back into the circulation system after separation of drill cuttings /solids through solids control equipment. Drilling fluid is essential to the operation and helps in controlling down hole pressure, lift soil/rock cuttings to the mud pit, prevent cuttings from settling in the drill pipe, lubricate, cool and clean the drill bit.

Drill cuttings generated will be collected and separated using a solid control system and temporarily stored on-site in HDPE lined pits. Drilling and wash wastewater generated will also be stored at an onsite HDPE lined pit. The water will be adequately treated in a mobile ETP and reused.

There will be other ancillary facilities like Drilling mud system, Effluent Treatment System (ETP), Cuttings disposal, Drill Cementing, equipment etc. and utilities to supply Power (DG sets), water, fuel (HSD) to the drilling process and will be set up as a part of the project.

Between drilling operations for different zones, logging operations will be undertaken to provide information on the potential type and quantities of hydrocarbons present in the target formations.

Well Site decommissioning

On completion of activities, the wells will be either plugged and connected with flow lines or suspended. In the event of a decision to suspend the well, it will be filled with a brine solution containing very small quantities of inhibitors to protect the well. After the activities, the well will be sealed with a series of cement plugs, all the wellhead equipment will be removed leaving the surface clear of any debris and site will be restored.

Production Installations

Nine Production installations planned within the Moran Block. The production installation may include Oil Collection System (OCS), Gas Compressor Station (GCS), Field Group Gathering Station (FGGS) or Quick Production System (QPS).

Utilities and Resource Requirements

Power: The power requirement for each drill site construction will be met through the 100 KW DG Sets. During drilling, 2 DG sets of 1000 KW capacities, will be used to meet the power requirement for drilling and one will be kept as standby. Lighting and other power requirements at drill sites will met through 200KW DG sets. It is estimated that 3.5 KLD of diesel will be required during drilling phase. Power requirement for the production installations will be met through Gas Generator (GG) sets of 216 KW capacity.

Water: During the drilling operations, water requirement at a drill site is expected to be 50 m^3 per day. The water requirement at the drilling sites during construction and drilling phase will be met groundwater after obtaining necessary permission. Potable water requirement at site will be met through packaged drinking water. In addition, a water storage pit of around 1000 m^3 is proposed to store water for fire water supply the likely source being surface water. For production facility approximately, 5 m^3 per day water will be required for construction and 3 m^3 per day for workers during construction phase. Approximately 20 m^3 per day water is required during the operation of the production installations. The water requirement will be met groundwater after obtaining necessary permission.

Manpower: The drilling rig will be operated by approximately 50 persons on the rig at any particular time. The manpower will operate in two shifts with continuous operations on the rig. This will include technical experts (including expats), who will be responsible for

various drilling related activities and some local workers who will be hired from nearby villages for the entire duration of the Project. Production facilities are operated in three shifts with approximately 10 persons operating per shift. Production facilities are operated in three shifts with approximately 10 persons operating per shift.

Pollution Sources

- *Air emissions*: Point source air emissions will be generated from DG sets. Fugitive emissions will occur from vehicles involved in the drilling operations and from windblown dust from storage and staging areas within the drill sites and production facilities.
- *Noise & Vibrations*: Noise and vibration will be generated due to operation of drilling rig, DG/GG sets and vehicles.
- *Liquid wastes*: During the drilling phase, wastewater will be generated as a result of rig wash and dewatering of spent mud and washing of drill cuttings .The wastewater will be treated in an Effluent Treatment System (ETP) at site. The treated water would be reused. Domestic wastewater will be generated from the drill sites would be treated in septic tanks and soak pits. In production facilities, produced formation water will be disposed to the shallow wells after necessary treatment; surface Runoff after treatment through Oil Water Separator (OWS) and sedimentation tank.
- *Drill cuttings & spent mud*: Approximately 350-400 m^3 of drill cuttings and 900-1200 $m^3$of spent mud will be generated per site. Drill cuttings and spent mud will be disposed off in a well-designed pit lined with impervious liner located on site.

BASELINE ENVIRONMENTAL STATUS

Land use and land cover: The land-use and land-cover of the Moran Block has been interpreted from the satellite data, toposheet of the area, and subsequently by ground truthing during field surveys. Out of 902.1 sq. km of the study area, about 528.79 sq. km of land i.e. 58.62% of Block area is used for agricultural purposes. Rivers and riverbed areas including the courses of Burhi Dehing River. Disang River etc. cover 15.1 sq. km i.e. 1.67% of the study area. Tea garden covers the area of 112.43 sq. km, which is 12.46% of the study area. Homestead plantations located around human settlement covers about 202.6 sq. km i.e. 22.46%. Forest area covers only 39.3 sq. km., which is only 4.36% of the total land.

Soil Quality: Soil samples were collected from five locations spread across different types of land cover. The soil samples were found to be sandy to clayey loam type and grayish is color. They are acidic in reaction with pH ranges from 4.6 to 5.9. The macronutrient contents viz. nitrogen values of the soil samples were found to be good, however, the phosphorus and potassium contents were found to be very less. Metal contamination was been observed.

Climate and Meteorology: The study area experiences a humid sub-tropical climate zone with warm seasons, except for a moderately cold winter from December to February. Hourly micro-meteorological data collected during the post monsoon season (October 2017-December 2017) reveal that the pre-dominant wind direction is from the north-east with an average speed of 3 km/hr.

Air Quality: Ambient air quality was monitored at eight locations within Moran Block. The primary air quality monitoring results show that average PM_{10} varies from 54.79-60.88 $\mu g/m^3$; average $PM_{2.5}$ varies from 27.83 to 33.71 $\mu g/m^3$. Average values of PM_{10}, $PM_{2.5}$ and other gaseous parameters like SO_2, NO_2, CO were observed to be well within the levels specified in the National Ambient Air Quality Standards (NAAQS) for industrial, residential and other areas.

Noise Quality: Ambient noise was monitored at 14 locations within Moran Block. The equivalent noise level as measured at the residential areas range from 52.0 dB(A) to54.8 dB(A) during day time and from 38.5 dB(A) to 44.6 dB(A) during night time. The equivalent night time noise values in all the locations were in compliance to the day time and night time standard of 55 dB(A) and 45 dB(A) respectively for residential areas.

Groundwater Quality: Groundwater monitored at six locations was found to be slightly acidic (pH-6.22 to 6.92). All other parameters were in compliance to the drinking water standard IS: 10500:2012.

Surface Water Quality: Surface water samples were analyzed from Buri Dehing River, Disang River, Diroi Nala and Demow Nala. The analyzed values reveal that all the samples were in compliance to the CPCB Class D i.e. Propagation of Wild life and Fisheries.

Baseline data collection 2022

Two weeks additional baseline data for air, noise, soil, water quality have been collected in the Block during February-March 2022. Comparison of parameters between data collected in 2017 as part of EIA and monitoring conducted during 2022 reveal that that no major change happened in baseline conditions.

Biological Environment: Panidehing Bird Sanctuary is located approximately 8.3 km from the Moran Block. However, no proposed well or production installation is located within 10 km of Panidehing Bird Sanctuary. 17 Schedule I species was recorded from the study area which includes two species of reptiles, nine species of birds and six species of mammals.

Socioeconomic Environment: 123 villages lie within 1 km of proposed well locations and production facilities. Major population in the study area villages are involved in agriculture as a source of their livelihood. Water requirement is catered through household bore well/tube well facility in the village areas. Almost every village has a primary school; however, percentage of students pursuing higher education is comparatively less. Three primary health centers are present in the influenced area. The patients were taken to sub divisional hospitals in Dibrugarh and Sivasagar district.

IMPACT ASSESSMENT

The potential impacts arising due to the construction and operation of the drilling activities are given below:

Air Quality: The operation of DG/GG sets, movement of vehicles and machineries during construction and drilling at drill sites and production operations will result in the generation of air pollutants viz. PM, NOx and SOx that may affect the ambient air quality temporarily. Air pollutants like particulate matter, hydrocarbons and NOx will also be generated during drilling operations.

Noise Quality: Operation of heavy machinery/equipments and vehicular movement during site preparatory and road strengthening/construction activities may result in the generation of increased noise levels. Operational phase noise impacts are anticipated from therunning of drilling rig and ancillary equipment *viz*. shale shakers, mud pumps and diesel generators, gas generators.

Soil Quality: Stripping of top soil will affect the soil fertility of the well sites temporarily. Potential adverse impacts on soil quality may also result from improper storage and handling of fuel, lubricants, drilling mud and drill cuttings.

Water Quality and Hydrogeology: All wastewater from the drilling and production operations will be treated in the ETP and reused. Uncontrolled surface runoff from the drill sites and production facilities may compose of waste fluids or storm water mixed with oil and grease and may pollute the surface water quality. However, the surface runoff will be treated with sedimentation tank and oil water separator at site.

Biological Environment:
The existing vegetation at the proposed drill sites, production installations, approach roads and RoU of the pipeline will be felled for site development.
Noise generated from drilling operations and vehicular movement within the drill sites and approach roads may affect the reptiles, birds and mammals adversely and may result in their moving away from the project area for a temporary period. Surface runoff from the drill sites and production facilities contaminated with sediment, may reach surface water channels and increase the suspended solids load of the channel water. Increase of suspended solid will increase the turbidity of river water that ultimately will adversely affect the DO level in the water. The turbid water and lower DO may affect the primary productivity of the impacted areas of the rivers. The process effluent will be adequately treated in the ETP and reused.

Socio-Economic Environment: Approximately 3 ha. land would be required for each well and 7 ha. land would be required for each production facility. Land will be purchased from local communities however; no physical displacement during land procurement is anticipated. Additionally, land will also be procured for construction of 100-200 m approach road to the drill site and production facilities from existing roads. Anticipated number of families directly impacted would be limited to 2-5 nos. for each of the drill sites. The dependency of the landowner in case of generation of livelihood is limited as the land is classified as monocropped agricultural land.

OIL/its contractors would endeavour to provide maximum employment to the local people; however, certain percentage of semi-skilled and highly skilled migrant labour would be used by contractors for manning technical activities. It is anticipated that occasional conflicts

would arise with the local community over the recruitment of migrant workers. Discomfort due to dust and noise to adjoining communities, influx of people are likely to occur.

The construction phase of the project is likely to generate both direct and indirect opportunities for employment. The estimated direct employment would be approximately 50 un-skilled workers during the peak construction phase that will primarily sourced from nearby areas. Indirect employment would be primarily in the supply chain as vendors, which are anticipated to be set up to support the construction.

Impact on Community Health & Safety: Community health and safety of inhabitants residing close to the proposed well sites and production facilities stand to get affected from frequent heavy vehicular movements along village access roads and due to noise from drilling rig operations, movement of heavy vehicles during construction etc.

ENVIRONMENT MONIROING PROGRAM

Environmental monitoring Program for each well will include the following

- Ambient Air Quality Monitoring – at 3 monitoring location; once during construction, twice during drilling and once during site decommissioning phase
- Stack emission monitoring at 3DG sets during drilling
- Ambient Noise Monitoring – 3 locations, once during construction, twice during drilling and once during site decommissioning phase
- Workplace noise monitoring -5 locations, twice during drilling
- Surface Water Quality Monitoring- 2 locations once during construction, 4 locations once during drilling and 2 locations once during site decommissioning phase
- Treated water -2 from ETP and 1 from oil/water separator- once at each month for 3 months during drilling phase
- Ground Water Quality Monitoring, three location, once during drilling phase and once during decommissioning phase
- Soil Quality Monitoring - three locations, once each during pre-construction, drilling and post drilling phase

At the production facilities ambient air, stack emission monitoring from GG sets, ambient and workplace noise monitoring, surface and groundwater quality monitoring, treated wastewater monitoring and soil quality monitoring would be conducted twice a year.

RISK ASSESSMENT AND MITIGATION

Risk Assessment (RA) aims to provide a systematic analysis of the major risks that may arise as a result drilling and production activities in Moran Block. The RA process outlines rational evaluations of the identified risks based on their significance and provides the outline for appropriate preventive and risk mitigation measures.

Three major categories of hazards that can be associated with proposed Project which includes:

- Blowouts leading to uncontrolled well flow, jet fires, pool fires;
- Hydrocarbon leaks due to loss of containment while drilling;
- Non-process fires / explosions, the release of a dangerous substance or any other event resulting from a work activity which could result in death or serious injury to people within the site; and
- Any event which may result in major damage to the structure of the rig.

Risk Reduction Measures

Blow Out Risk reducing measures include:

- Kick simulation training for personnel;
- Presence of well-trained engineers;
- Appropriate well design;
- Good well control procedures;
- Appropriate mud weight formulations;
- Installation of primary and secondary blow out preventors; and
- Trained and skilled operation staff.

Accidents related to leaks from equipment can be minimised by:

- Ensuring that equipment is designed, installed and maintained as per international standards;
- Implementing a robust preventive maintenance system of all safety critical equipment; and
- Efficient test separator;

Risk from storage areas can be minimized by;

- Proper preventive maintenance and robust safety management and security systems.
- For the storage tank, secondary containment to be provided.

Other risk management can be achieved by;

- A hydrocarbon gas detection system with suitable alarm system will be provided at the drilling sites and production facilities.
- Management of Oil Spills/Leaks and Soil contamination

PROJECT BENEFITS

- Provision of more royalty to Assam Government and more cess to Govt. of India;
- Provision of more employment opportunity to local people;

- Development of infrastructure (roads, culverts, schools etc.) in the area;
- Increase in business opportunity for the local people;
- Energy security for the country;
- Programs related to livelihood generation, health improvement programmes.

ENVIRONMENTAL MANAGEMENT PLAN

Air Quality Management Plan

- Vehicles delivering raw materials like fine aggregates will be covered to prevent fugitive emissions.
- Sprinkling of water on earthworks, material haulage and transportation routes on a regular basis during construction and decommissioning phase of the wells.
- Flare stacks of adequate height would be provided.
- DG/GG set stacks would have adequate height, as per statutory requirements, to be able to adequately disperse exhaust gases
- Periodic monitoring of DG/GG set stack emission will be carried out in accordance with the Environmental Monitoring Plan to assess compliance with CPCB DG set exhaust standards.

Noise Management Plan

- Selection and use of low noise generating equipment with in-built engineering controls viz. mufflers, silencers, etc.
- Appropriate PPEs (e.g. ear plugs) will be used for by workers while working near high noise generating equipment.

- All vehicles utilized in transportation of raw materials and personnel will have valid Pollution under Control Certificates (PUC).
- All high noise generating equipment will be identified and subjected to periodic preventive maintenance.
- No night time operation of vehicles and construction activities will be undertaken.
- Use of noise barrier

Soil Quality Management Plan

- Drip trays to be used during vehicular/equipment maintenance and during re-fuelling operations.
- Spill kits will be made available at all fuel and lubricant storage areas. All spills/leaks contained, reported and cleaned up immediately.
- Dedicated paved storage area will be identified for the drilling chemicals, fuel, lubricants and oils within the drill sites and production facilities.
- 1.5 mm HDPE lined pits will be considered for the disposal of unusable drilling mud cuttings.

Surface Water Quality Management Plan

- Levelling and grading operations will be undertaken with minimal disturbance to the existing site contours thereby maintaining the general slope and topographical profile of the site.
- Spill kits will be used to contain chemical spillages.
- During site preparation and construction, surface water run-off will be channelized through appropriately designed drainage system.
- Sediment filters and oil-water separators will be installed to intercept run-off and remove sediment before it enters water courses.
- Domestic wastewater generated from drill sites and production facilities will be treated through septic tank and soak pit system.
- Process wastewater would be treated in Effluent Treatment Plant (ETP) at drill sites and production facilities.

Ground Water Quality Management Plan

- Water based mud would be used as a drilling fluid for the proposed project.
- Eco-friendly synthetic based mud if required for deeper sections, will be used after providing intimation to the Pollution Control Board;
- The drill cutting along with spent mud will be stored in HDPE lined pit.

Waste Management Plan

- Use of low toxicity chemicals for the preparation of drilling fluid.
- Management of drill cuttings, waste drilling mud, waste oil and domestic waste, wastewater in accordance with Standards for Emission or Discharge of Environmental Pollutants from Oil Drilling and Gas Extraction Industry of CPCB as modified in 2005. The waste water will be treated in an ETP and will be reused.
- The hazardous waste (waste and used oil) will be managed in accordance with Hazardous Waste (Management, Handling & Transboundary Movement) Rules, 2016.
- The kitchen waste will be disposed in nearest municipal/village dumping site on a daily basis through approved waste handling contractors.
- The sewage generated will be treated through septic tank and soak pit system.
- Used batteries will be recycled through the vendors supplying lead acid batteries as required under the Batteries (Management & Handling) Rules, 2001.
- The drill cuttings pit will be bunded and kept covered using tarpaulin sheets during monsoon.

Blowout Management Plan

In case of blowout, OIL will engage its own resource along with hired services from organizations of National repute to control blowout related environmental impacts. Actions planned by OIL to mitigate the environmental impacts in case of blowout include:

- Environmental Assessment,
- Spillage cleaning and bio-remediation,
- Picking up of spilled oil manually and by turbo pump,
- Assessment of Environmental Contamination,
- Assessment of impact/ damage to the biodiversity,
- Assessment of Health Hazard for local public,
- Vibration assessment.

Wildlife Conservation Plan

- Provide portable noise barriers high noise generating areas and along the fence line adjoining sensitive locations;
- Appropriate shading of lights to prevent scattering;
- Strict no hunting policy to be implemented by contractors.
- Sedimentation tank and oil-water separator will be installed at peripheral drains developed along the well pad sites to control any accidental discharge before it reaches any surface water body;
- Spill kits to be used for removal of any oil or chemical spillage on site;
- Oil booms, sorbents, dispersants will be kept on site to contain any oil spill to the nearest receiving waterbody.
- Contributing to Forest Departments habitat improvement program
- Contribution to conservation of Panidehing Bird Sanctuary
- Capacity building of forest department staffs
- Awareness Generation Meetings at villages
- Engaging a NGO for Identification of Hoolock Gibbon roosting sites and vulture nesting sites.

Road Safety & Traffic Management Plan

- The condition of roads and bridges identified for movement of vehicles and drilling rig will be assessed and if required strengthened by OIL to ensure their safe movement.
- Precautions will be taken by the contractor to avoid damage to the public access routes including highways during vehicular movement.
- Traffic flows will be scheduled wherever practicable during period of increased commuter movement.

Occupation Health & Safety Management Plan

- All machines to be used in the construction will conform to the relevant Indian Standards (IS) codes, will be kept in good working order, will be regularly inspected and properly maintained as per IS provisions and to the satisfaction of the site Engineer.
- Hazardous and risky areas, installations, materials, safety measures, emergency exits, etc. shall be appropriately marked.

Emergency Response Plan

- Drilling rig and related equipment to be used for drilling will be conformed to international standards specified for such equipment.
- Blow-out preventers and related well control equipment shall be installed, operated, maintained and tested generally in accordance with internationally recognized standards.
- Appropriate gas and leak detection system will be made available at each of the drill sites and production facilities.
- Adequate fire-fighting equipment shall be provided at each drilling site.

Social Management Plan

- Locals will be given preference for unskilled jobs
- CSR plans will be implemented as necessary
- CER Plans will be implemented for development of the local areas
- The sites will be fenced

PROJECT COST

Total cost of the project would be approximately INR 3470 crore. Detail of cost breakup of implementation of Environmental Conservation measures for each well would be INR 10.87 lakhs and for each production installation would be INR 6.27 lakhs per annum.