Executive Summary

Block No: AA-ONHP-2017/11

Prepared For:

Vedanta Limited

(Division: Cairn Oil & Gas)

Prepared By:

AECOM India Private Limited

Executive Summary

Introduction

Vedanta Ltd. (Division: Cairn Oil and Gas), formerly known as Cairn India Ltd. has been allocated hydrocarbon Block namely AA-ONHP-2017/11 by Government of India under the revenue sharing contract (RSC) for exploration and exploitation of hydrocarbon. RSC (Revenue Sharing Contract) has been signed between Vedanta Ltd and MoP&NG on 1st October 2018. Vedanta Limited (Division: Cairn Oil and Gas) proposes to carryout Exploration & Appraisal (11 no. of wells) and setting up of early production units in the block. The Block encloses an area of 785 Sq. Km.

In case of a discovery (ies), the exploratory and appraisal well(s) would be tested for extended duration by flowing hydrocarbons to ascertain the reservoir parameters and assess the quality and commercial viability. The exploratory and appraisal wells would be drilled to explore the reservoirs in the range of 1750 m to 5000m.

The proposed exploratory and appraisal drilling activities fall under category 1(b) of the EIA Notification, 2006 and require Environmental Clearance (EC) from the Ministry of Environment and Forests and Climate Change (MoEF&CC). The Terms of Reference (ToR) for the Project have been approved by MoEF&CC vide letter F.O. IA-J-11011/132/2019-IA-II(I) dated 4th May 2019.

AECOM India Private Limited, a NABET-QCI Accredited firm has been entrusted to conduct the Environmental Impact Assessment (EIA) study for the proposed Block AA-ONHP-2017/11. The EIA study comprised of initial scoping, site visits, environmental monitoring and surveys, conduct of Public Hearing (PH) and the preparation of draft and final EIA-EMP reports.

Block location and Accessibility

The AA-ONHP-2017/11 Block is located at Deragaon, Golaghat and Sarupathar Tehsils of Golaghat and Jorhat west Tehsil of Jorhat districts, of Assam. The Block is accessible through road network. NH 37, NH-715, , SH 32, SH 33 and SH 1 is present within the block. Jorhat railway station is 3 km east from the eastern block boundary. Jorhat Airport is 0.76 km east from the, eastern block boundary.

Land Requirement

During the site selection process, all legal requirements would be considered and surface location of the exploratory well would be finalized. Once surface drilling location is finalized, short term lease of the land would be taken from concerned owners. If well location falls in agricultural lands or other private lands, land and crop compensation would be provided to the land owner, and in case of government. land, land allotment from government would be applied. Initially temporary short-term lease would be taken for 3 - 5 years for exploration purpose and in case of commercially viable discovery of hydrocarbon resources; the land lease would be converted into long term lease up to life of the project. The estimated land required per drill site is maximum 9 ha. No forest land would be used for drilling purpose, so forest clearance is not applicable for the proposed project.

Description of the project

The proposed project includes drilling of 11 nos of onshore exploratory and appraisal wells and Setting up of Early Production Units (EPUs)/ Quick Production Units (QPUs) for produced well fluid processing and production up to 8000 BOPD crude oil and up to 1.6 MMSCFD associated natural gas. Block Location on SOI Toposheet is presented below.

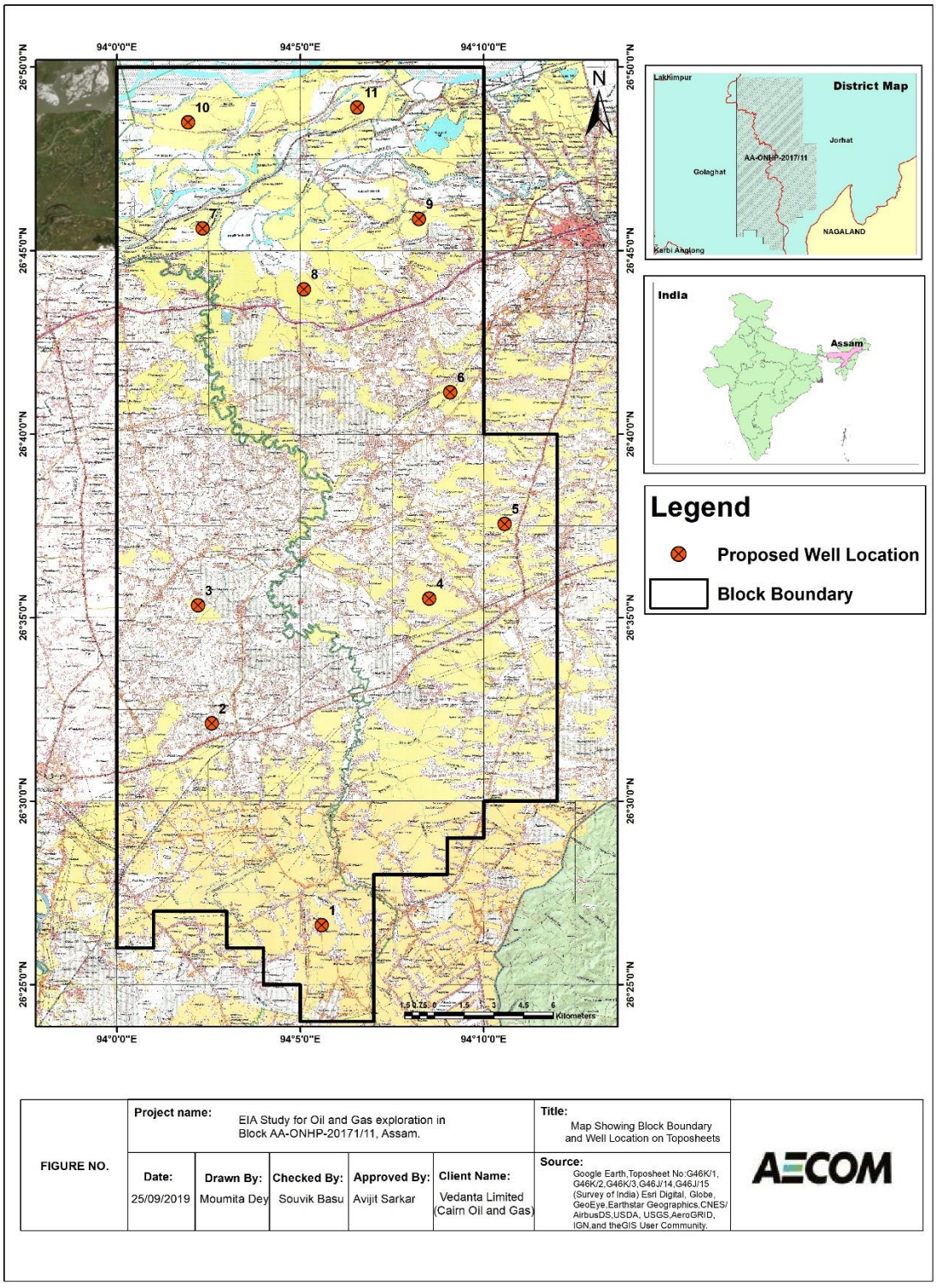

FIGURE NO.	Project name: EIA Study for Oil and Gas exploration in Block AA-ONHP-20171/11, Assam.					Title: Map Showing Block Boundary and Well Location on Toposheets	AECOM
	Date: 25/09/2019	Drawn By: Moumita Dey	Checked By: Souvik Basu	Approved By: Avijit Sarkar	Client Name: Vedanta Limited (Cairn Oil and Gas)	Source: Google Earth,Toposheet No:G46K/1, G46K/2,G46K/3,G46J/14,G46J/15 (Survey of India) Esri Digital, Globe, GeoEye,Earthstar Geographics,CNES/ AirbusDS,USDA, USGS,AeroGRID, IGN,and theGIS User Community.	

Drill Site Preparation

Drill Site Selection

An initial assessment of the exploratory well site would be carried out through analysis of satellite imageries. Field surveys would be carried out to earmark the drill site location maintaining maximum possible distance from any settlement and sensitive receptors. Ease of accessibility to the site would also be considered.

Site Preparation

Detailed site surveys would be carried, and the boundary of the drill site earmarked. Site levelling, and excavation works would be carried out for site preparation. Individual sites would be duly fenced. New approach roads to drill sites would be constructed or existing village roads would be strengthened to provide access for the drilling equipment and machinery. If the earmarked site has vegetation cover, clearance of vegetation is the first activity that would be undertaken during drill site construction. Following this, the preparation and construction of drill site would involve top soil scraping and storage for future use, elevating the drill platform by excavated material from the drill site and authorized quarry area. Reinforced Cement Concrete (RCC) platforms would be used as foundation for drill pad and all other heavy equipment systems or machinery. Cast in-situ bored under-reamed piles of specified lengths would be used as foundation for main rig structure. Additionally, there will be other ancillary facilities of a Drilling mud system, Effluent Treatment Plant (ETP), Cuttings disposal, Drill Cementing equipment along with utilities to supply power (DG sets), water and fuel (HSD) and provision of proper Storm water drainage system.

Rig Mobilization

After completion of the construction/site preparation activities and with the provision of the basic facilities, drill rig would be transported to the site. The drill equipment is designed as standard land rig or a “Mobile Land Rig” type, which facilitates quick mobilization and demobilization. Rig essentially comprises of a Drilling mud system.

Drilling Operation

A rig would be installed at the potential site of drilling after thorough inspection for its working capability and quality standards. Well spudding would be the start of drilling activity. Wells would be drilled in sections, with the diameter of each section decreasing with increasing depth. Before commencing the actual drilling, large diameter pipe (Conductor) would be lowered into a hole and cemented/grouted. Top-hole section would be drilled to a desired depth based on well design. After drilling top-hole section, it would be cased with a pipe called “Casing”. Once each section of the well is completed, the drill string is lifted, and protective steel pipe or casing lowered into the well and cemented into place. The lengths and diameters of each section of the well would be determined prior to the starting of the drilling activities and are dependent on the geological conditions through which the well would be drilled. This process of drilling and casing the hole section continues until the final well depth (target) is achieved.

Drill cuttings generated from the drilling activity, would be collected and separated using a solid control system and temporarily stored on-site in HDPE lined pits. Drilling and wash wastewater generated would also be stored at an onsite HDPE lined pit. The waste water would be adequately treated in a

mobile ETP to ensure conformance to the S No. 72 A (ii) Schedule I - Standards for Emission or Discharge of Environmental Pollutants from Oil Drilling and Gas Extraction Industry of CPCB.

Hydraulic Fracturing Activity

Hydraulic fracking may be conducted in wells with low permeability formation and the wells with low pressure. Fracking fluid would typically be 99% water and sand (or other granulated material) and approximately 1% gelled chemicals that would be pumped at a high rate (in excess of 20 bpm) and high pressure (up to 5000 psi) to fracture the formation and improve the well deliverability. Sites for the wells with more than 2 fracs per well (multi-stage fracturing) would have provision of additional space for water storage for better continuity of operations.

Well Testing & Flaring

During the exploration and appraisal drilling, where a hydrocarbon formation is found, initial well tests (generally about one month of duration) would be carried out to establish flow rates, formation pressure and other parameters. However, depending on the need, based on nature of the reservoirs, the exploratory and appraisal wells would be tested for longer/extended durations to ascertain the reservoir parameters.

Associated Facilities

Each drill site would be provided with facilities such as drilling rig foundation and cellar pit, waste and water storage pits, chemical storage area including fuel storages, drill cutting disposal pit, flare pit and Mobile STPs. The drill cutting and spent mud disposal pits would be provided with a HDPE lining for temporary storage. Adequate drainage system for storm water and wastewater would be provided.

Liquid Mud Plant (LMP)

The Liquid Mud Plant (LMP) would be located at suitable location in the field to prepare synthetic/water-based mud for the drilling operations. Water Base Mud (WBM) will be used as drilling fluid for initial, shallower sections where massive shale not encountered. The deeper and difficult to drill geological formations will be drilled using Synthetic Base Mud (SBM) as drilling fluid.

Appraisal

When, exploratory drilling is successful, more wells (termed as Appraisal wells) would be drilled to determine the size and the extent of the field. The technical procedures and activities in appraisal drilling would be the same as those employed for exploration wells deviated or directional drilling at an angle from a site adjacent to the original discovery well may be used to appraise other parts of the reservoir.

Quick Production Unit (QPU)

In case of commercially viable discovery, QPUs would be installed for the processing of produced well fluid processing and early production of up to 8000 BOPD crude oil and up to 1.6 MMSCFD associated natural gas for captive power generation. A QPU would be a packaged/ modular mobile unit and would mainly consist of a three-phase separator & production heater or heater-treater, oil storage tanks, oil tanker loading system, produced water (PW) separation and disposal system, power generation (GEG or DG), utility systems such as fuel gas, flare & Inst. Air packages, firefighting equipment, etc. Each QPU capacity would be ~2,000 BFPD (Barrels of Fluid per Day).

Accommodation and Camp Site

Temporary camp site (porta cabin) for the drilling of exploratory (including appraisal wells) are envisaged, which would be dismantled after drilling of the wells. At any point of time, it is anticipated that about 50 personnel per shift would be housed in the campsite during the well drilling campaign.

Well decommissioning

After the completion of the drilling activity, partial de-mobilization of the drilling rig and associated infrastructure would be initiated. As discussed earlier, well testing may be carried out immediately after the drilling is completed. The complete de-mobilization of the facilities at site would happen once well-testing completed successfully. In case of commercially viable discovery (s) of hydrocarbons in the Block and having established the size of the hydrocarbon field (s), proposes to immediately bring the field (s) into production using one or more of the appraisal wells for the production of crude oil by setting up of QPU (Quick Production Unit). All other equipment, materials, fuel and wastes would be removed from the drilling site and reused for other drilling activities or disposed as per the applicable regulatory requirements.

If hydrocarbons are not found, a full abandonment plan would be implemented. All concrete or steel installations would be removed to at least 1m below ground level, to ensure that there would be no protruding surface structures. All waste from the site would be removed and the pits would be closed. The drill sites and camp sites would be restored to its original conditions or as required by the landowner.

Utilities and Resource Requirement

Water: Total of 102 m^3 per day fresh water would be required per well. From the total water, 22 m^3/day water would be used for mud preparations, 50 m^3/day would be required for drilling activities and 30 m3/day freshwater would be used for domestic purposes including drinking, washings and domestic use. The water requirement for all the project activities would be sourced locally through approved/authorized sources of surface water and/or ground water (e.g. PHD bore wells, privately owned bore wells, irrigation Department/water resources Dept. Of State Govt.). In case, required water would not be sourced locally available approved sources, ground water will be extracted after obtaining permission from CGWA/State Govt. During early production, the installation of typical EPU/QPU unit water requirement for process, domestic consumption, greenbelt and miscellaneous use will be15-18 m^3/day.

Power – For a drilling operations site, the power would be provided through diesel generator (DG) sets (Camp site - 2x350 KVA (including one as standby), Drilling site - 3x1000 KVA (including one as standby) or 2X1850 KVA (1 Working + 1 Standby) depending on the rig capacity / availability during E&A drilling phase and Radio Room -2*x100 KVA (including one as standby).

For early production power requirement will be met through the State Electricity and or installation of Diesel/Gas Engine Generator (GEG) of 1 MW output using produced natural gas and a 500 KVA DG will be used as backup in emergency conditions for each early production unit.

Labour - It is anticipated that, at any given time, there would be about 80 - 100 personnel working on site including technical staff, drilling crew, security staff etc.

Project Cost

The cost of the proposed project has been estimated would be about INR 352 Crores.

Pollution Sources

Air emissions: Point source air emissions would be generated from DG sets. Fugitive emissions would occur from vehicles involved in the drilling operations, resuspension and from windblown dust from storage and staging areas within the drill site. During Early production stage emission would be generated from GEG/DG sets and Flaring.

Noise & Vibrations: Noise and vibration would be generated due to operation of drilling rig, DG sets and vehicles.

Liquid wastes: During the drilling phase, approximately 30-40 m^3 per day of waste water would be generated from the drilling activity and 15-25 m^3 per day of domestic waste water would be generated from each drill site. Produced water would be generated from early production units during EP stage.

Drill cuttings & spent mud: Approximately 250 - 700 Tons/well of drill cuttings from WBM, 500 – 1500 Tons/well of drill cuttings from SBM and 250-500 Tons/well of spent mud would be generated per site.

Existing Baseline Environment of the Project Area

Baseline information about the Block was collated by review of other published literature, site surveys, stakeholder interactions and primary monitoring carried out during the period of March-May 2019 by a NABL Accredited Agency.

Sub-surface Geology

The Block is situated in Jorhat and Golaghat district. Geological set-up of both the district is represented by hilly tract and alluvial flood plain of River Brahmaputra. foot hill region is marked by the older terrace deposit. Two terrace surfaces have been identified as the Harmuti and Joyhing surfaces that represent high- and low-level terraces. These terrace deposits are characterised by undulating surface comprising boulders, pebbles of quartzitic and gneissic rocks with fine sand, silt and clay. The alluvial flood plain consists of younger and older alluvial deposits. It represents various sub-features, viz., palaeochannel, swampy/marshy land, river terraces, flood plains, point bars, channel bar and river channel.

Hydrology

drainage pattern of Jorhat district is characterized by river Brahmaputra, and its tributaries like south Dhansiri, Bhogdoi and Kakodonga drain the district. The tributaries originate in Naga-Patkai range and flow northward to join the Brahmaputra River, almost at right angles which give rise to subparallel type of drainage.

The Golaghat district is underlain by Quaternary formation followed by Archaean group of rocks. The cumulative thickness of aquifer zones has the tendency to increase towards the north and in the south eastern parts, the thickness reverses considerably. Hydro-geologically, the district is proved to be very potential. Ground water occurs under water table to confined conditions

Hydrogeology and Groundwater Quality

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Ground water in Jorhat district mainly present in under water table to semi-confined conditions in the near surface conditions and in the deeper horizon, under semi-confined to confined conditions. Depth to water level in the water table zone varies from 3.79 to 8.32 m bgl in the pre-monsoon period and 0.50 to 4.26 m bgl during post-monsoon period.

Total of 8 ground water samples have been collected and analysed for parameters as per IS: 10500, 2012 standards. Concentrations of various heavy metals like mercury, arsenic, lead, barium, cadmium and selenium were found below detectable limits at all the sampling locations. Presence of Faecal Coliforms has not been observed in any of the water sampled.

Climate and Meteorology

The temperature in Golaghat district reaches around 42.0°C during the month of June. Summer is generally wet in nature with very humidity in the air. Whereas, winter experience very low temperature. The lowest temperature recorded in the month of January which reaches up to 2.2°C. Annual mean rainfall of 1239.2 mm throughout the year

Jorhat district, climate is classified as mesothermal wet climate with forest type of vegetation. January is the coldest month with temperature of 6.1°C. July and August are the hottest period with average monthly temperature of about 29°C.Whereas, winter experience very low temperature, particularly during night time. nThe lowest temperature recorded in the month of December which reaches up to 4°C.

Ambient Air Quality

Ambient air quality was monitored at 8 locations (for a period of 12 week - March to May'19). The PM_{10} values of all monitored locations were below were NAAQS value, the average value observed would be in the range of 52.98 - 61.09 µg/m^3, which is typical of the region, due to presence of huge vegetation and rainfall. The $PM_{2.5}$, SO_2, NOx and NH_3, Ni values were in the range of 29.07 – 32.55 µg/m^3, µg/m^3, 6.52 – 6.95 µg/m^3 , 21.21 – 24.10 µg/m^3 respectively and are well within the National Air Quality Standards (NAAQS) and Ni was found at only AAQ 2 , for a week only.

Ambient Noise Levels

Noise levels were monitored at 8 locations within the study area. The locations for the noise levels are selected on the basis of sensitive receptors such as health centre, educational centres, market place etc. The day time and night time noise levels were found would be within the permissible standards of 55 and 45 dB respectively during day and night time for rural areas.

Soil Quality

Soil samples were collected from 8 locations. The soil in general indicates slightly acidic to slightly alkaline properties in the study area. Soil texture at all locations was observed would be loam to Clay loam. pH of the soil samples ranged from 4.91 to 7.07. The concentrations of heavy metals namely cadmium, mercury, antimony was observed would be below detectable limit. The values for Zinc, Lead, Cadmium, Copper, Nickel were found would be much below soil remediation intervention values.

Ecology

Quadrat based survey was carried out across the Block and it was observed that major portion of the study area comprises of moderate vegetation. Total 66 species of trees, 27 species of shrubs, 19 species of climbers and Liana has been cited within the study area. 57 species of birds and three mammals were observed in the study area during primary survey.

Socio- Economic Conditions

A total of 11 villages are located in core area, where wells are located, and 38 villages were regarded as buffer area which are present in the close proximity of the well area. Major population in the study area are farmers by occupation. Paddy is the main crops sown in the area along with presence of some scattered tea garden. Among the core zone villages Birina Sayek has the highest population of 1780, whereas the average household number is 5. Literacy rate in core zone villages is range between 48.69 – 97.60. Male literacy is little higher than the female literacy among the core zone villages. Presence of SC and ST population has been observed in core zone villages. As a source of drinking water people depend on Tube well. The most prevailing religion in this area is Hinduism followed by Muslims. It is observed that 38 % of the villages in the core zone area has the facility of primary health centre. Governmental scheme like Pradhan Mantri Awas Yojana, grant for making pukka Toilet etc are implemented in these villages. Electricity is available and consistent in the study area villages.

Impact Assessment and Mitigation Measures

Site Selection & Land Requirement

Impact

An area of approximately 300m X 300m would be taken on temporary short-term lease basis for the construction of well pad (drill site) for exploratory and appraisal wells and for Quick Production Unit/ Early Production Unit. For the preparation of suitable access roads connecting to well pads, accommodating OHL and other utilities in future, a width of 30m (approx.) RoU would be required. The drill sites are planned would be located in agricultural land. Their procurement for project purposes would result in loss of landowner's income for the lease period. The procurement of land on lease can lead to moderate impact mainly due to expectations on compensation package.

Mitigation Measures

- During the construction of the access road adequate cross drainage structures would be provided considering the topography of the alignment.
- Consultations would be carried out with land owners for finalizing compensation packages.
- The excavated material from the drill site would be stored (temporarily /permanently) in uncultivated land and would be away from any drainage channel.

Site Clearance and Grading

Impact

The site preparation works at campsite and drill site may result in clearance of vegetation, dust generation and loss of topsoil. The earthworks to be carried would typically involve excavation, levelling / grading; and rolling and compaction.

Mitigation Measures

- Water sprinkling would be carried out, while working in proximity of agricultural fields or settlements/habitations;
- Runoff from drill sites located near natural water bodies would be channelized properly.
- if tree felling is involved, permission from the concerned department would be undertaken.

Construction / site preparation of Drill Site / well pad

Impact

Construction of cellar pit, water storage pit and drilling waste storage pits would result in excavation of soil from each site. Noise from construction activity would be generated from bull dozer, DG sets and concrete-mixing plant.

Mitigation Measures

- Temporary storage sheds would be provided for storing of construction material.
- Excavated soil would be used for construction at other project sites;
- Detailed Health & Safety Plan would be provided to all civil contractors, as part of their contract with Vedanta Ltd. (Division: Cairn Oil & Gas).

Campsite Installation

Impact

The campsites would be located in the vicinity of the drill site. A typical campsite would require portable cabins to accommodate about drilling crew and the contractor personnel. Installation of porta-cabins with associated facilities would involve Health and Safety issues pertaining to transportation, loading - unloading of cabins and installation of cabins.

Mitigation Measures

- Crane would be is equipped with a legible, durable load chart that shows the manufacturer's recommended load configurations and maximum load weights; and
- Surface conditions would be examined prior to movement of crane.

Transportation of Drilling Rig and Other Components –

Impact

Transportation of drilling rig, drilling equipment, materials and manpower would involve movement of trailer through the use of existing roads till they reach the access road for each well site. The potential impacts may include congestion of roads, wear and tear of existing roads and oil leaks from vehicle maintenance areas.

Mitigation Measures

- Movement of rig & associated machinery would be avoided to the extent possible during peak traffic hours

- All vehicles (light, medium and heavy) would be required to have valid PUC (Pollution under Check) certificate.
- Periodic maintenance of all project vehicles and machinery would be carried out

Drilling and Well Testing

Impact

During drilling operation, water for WBM preparation would be 600-1000m^3/well, for SBM preparation would be 150-300 m^3/well. For drilling, water consumption would be 25-50m^3/day/well and water for domestic use would be 20-30m^3

Mitigation Measures

Water requirement for all the project activities would be sourced locally through approved/ authorized sources of surface water and/ or ground water (e.g. PHD bore wells, privately owned bore wells, Irrigation Dept./ Water Resources Dept. of State Govt.). In case, required water could not be sourced from locally available approved sources, ground water would be extracted after obtaining permission from CGWA/ State Govt.

Handling, transport and storage of Chemicals and wastes

Impact

The drilling operations would involve generation of spent drilling mud, drill cuttings, waste oil, used containers, etc. The drill site would also involve storage of hazardous chemicals and fuels which has the potential to contaminate soil and groundwater.

Mitigation Measures

- Separate drill cutting disposal pits would be provided for WBM and SBM
- Drill pits would be provided with HDPE lining on bottom and side surfaces
- The drill cuttings from the drilling operations associated with water-based mud would be used for filling low lying areas as a sub grade construction material in construction of well pads, etc.. Synthetic base mud would be re-used in further drilling activities.
- Used hazardous chemical barrels and waste oil would be sent to SPCB authorized vendors
- Fuel tanks would be provided with secondary containment facilities and maintained as per statutory requirements.
- All mixing tanks and chemical storage area would be paved and provided with secondary containment.

Noise Generation

Impact

The noise generation sources would include DG sets, pumps for rig and other miscellaneous equipment.

Mitigation Measures

- Installation of adequate engineering control on equipment and machinery (like mufflers & noise enclosures for DG sets and mud pumps) to reduce noise levels at source.
- The DG set would be kept in an acoustic enclosure.
- Providing Personnel Protective Equipment (PPEs) like ear plugs/muffs to workers at site.
- Undertaking periodic maintenance of vehicles to reduce noise levels.

Air emissions

Impact

The drilling activities would lead to emissions from operation of diesel generator sets and flaring during well testing. Fugitive dust emissions due to the proposed project would be principally associated with emissions of dust during the site preparation. The dust generated would be primarily from the handling and transportation of fill material and re-entrainment of dust during movement of the vehicles on unpaved roads.

Mitigation Measures

- DG set emissions would be as per CPCB standards
- In case of ground flaring to minimize the effects of flaring will be designed meeting the CPCB / MoEF requirements.
- In case of elevated flaring system : Elevated flare system would be adopted, and designed with proper enclosure height;
- Location of the flare stack would be decided at the design stage taking into consideration nearest habitations, vegetation, public amenities or any sensitive locations
- Efforts will be made to avoid Flaring of crude oil and crude oil would be effectively separated at the drill site and stored in barrels/tankers for transportation to the nearest terminal for management;
- No cold venting would be resorted instead flaring would be done with combustion efficient elevated flare tip; and
- Location of flare stacks would be chosen considering the sensitive receptors adjoining the site

Surface water quality

Impact

Site clearance and stripping of top soil during site construction would result in an increase in soil erosion potential leading to an increased sediment load in the surface run-off during monsoon. Also, surface run off from drilling waste (cuttings and drilling mud), hazardous waste (waste oil, used oil etc) and chemical storage areas may lead to the pollution of receiving water bodies viz. natural drainage channels etc.

Mitigation Measures

- Proper treatment of all wastewater and produced water and any water discharge from well site would comply with CPCB Water Discharge Standards for Oil and Gas Industries
- Waste mud would be stored in the HDPE lined pit
- Drainage systems at the well site would be provided.
- All chemical and fuel storage areas, process areas would have proper bunds so that contaminated run-off cannot escape into the storm-water drainage system.

Ground water

Impact

In absence of supply of surface water resource, the potential impacts on groundwater resource would be due to ground water abstracted for domestic needs and for Drilling activities.

Mitigation Measures

• All water storages in the drill sites would be kept covered and leakage prevented;

Soil Quality

Impact

During the site preparation stripping of soil would be happened during the construction phase. Site preparatory activities would involve the sourcing of earth-fill from borrow areas. Since in most of the cases efforts would be made to procure the fill material from nearby existing borrow areas. Storage of drill cuttings associated with WBM/SBM, spent drilling mud and sludge containing oil and other waste are likely would be generated, would be stored at HDPE lined pit. Fuels, lubricants and chemical used for the drilling operations (especially daily consumption) would be stored at site.

Mitigation Measures

- The top soil would be stored properly.
- Manage spills of contaminants on soil using spill kits;
- Storage of MSW in designated areas within drill sites/production facilities;
- Adopt best practices e.g. use pumps and dispensing nozzle for transfer of fuel, use drip trays etc.

Road and Traffic

Impact

During various phases of projects like, drilling, early production and decommissioning various types of vehicle / equipment movement would be involved. The vehicular movement is expected would be more in drilling phase due to movement of machinery & manpower.

Mitigation Measures

- Speed limits would be maintained by vehicles involved in transportation of raw material and drilling rig.
- Regular supervision would be done to control vehicular traffic movement along defined traffic routes.
- Adequate awarness on traffic and road safety operations would be imparted to the drivers of project vehicles.
- Entry of vehicles into the drilling site area is prohibited except for material movement.
- Adequate parking would be provided outside the drilling location.

Terrestrial Ecological environment

Impact

The Potential Impacts on the existing floral and faunal diversity may arise due to following activities

1. Vegetation Clearance.
2. Illimitation from Site.
3. Generation of noise.

Mitigation Measures

1. The working area always be kept minimum.

2. For felling of trees prior approval from State Forest Department would be obtained;
3. Appropriate shading of lights to prevent unwanted scattering.
4. Fencing would be done on the camp site to avoid any unfortunate encounter with faunal species.

Socio economic environment

Impact

Influx of population is anticipated in all stages of the project cycle particularly during exploratory drilling. The drill site would involve the operation of about 50 onsite workers during drilling phase. Interaction between workers with villagers of nearby areas might give rise to various issues like conflict of workers with the local population, nuisance caused by workers due to improper sanitation facilities, etc.

Mitigation

- The shortest distance as far as avoidable/feasible would be considered for access road,
- The village road identified for accessing proposed project footprints, would be strengthened and widened as per requirement
- Concerns of local panchayat regarding any impact on their common property resources (like of use of village road, water resource etc.) due to project activities, would be proactively identified and addressed;

Occupational Health & Safety Risks

Impact

The health and safety risks associated with drilling operations may include well kick or blow out, crane failure, fire Hazards and radiation hazard from well logging tool handling and storage.

Mitigation Measures

- Blowout preventers would be provided;
- Flare pit would be placed at a safe distance from the well head and fuel storage areas;
- Fire-fighting measures would be provided.

Operation of Campsites

Impact

It is anticipated that, at any given time, there would be about 80 - 100 personnel working on site including technical staff, drilling crew, security staff etc. who would be accommodated at each campsite associated with drilling. Water for domestic use would be 20-30 m^3/day/well. Each campsite is anticipated to generate 25-30 kg/day/well of domestic waste. Inadequate disposal and handling of waste would pollute the surroundings.

Mitigation Measures

- Safe drinking water would be provided at campsite.
- Segregation of waste at the source of generation would be put in practice.
- Food waste would be stored in a closed container and composted.
- The sewage from each porta-cabin would be connected to a mobile modular STP.

Demobilization and Abandonment

Impact

If hydrocarbons are not found, a full abandonment plan would be implemented. The impacts from decommissioning of drill sites may include noise generation and soil contamination due to demolition of cutting pits and chemical storage areas.

Mitigation Measures

- All the wastes would be removed from the site and sent to designated authorized disposal facilities prior to commencement of demolition work.
- Prior to commencement of any demolition, a planned programme of site clearance would be formulated. All pits, cellars and holes would be removed, and filled to ground level, any oil or otherwise contaminated soil would be removed and disposed properly.
- Roads and other paving would be removed to sufficient depth to allow soil replacement and revegetation.

Environment Management and Monitoring Plan

A comprehensive environmental monitoring plan has been developed for the project. Monitoring of ambient air quality, noise levels, soil and groundwater quality would be carried out by MoEF&CC/NABL/ASPCB recognized laboratories for pre and post drilling operations to assess the effectiveness of the environment management plan and adopt appropriate corrective measures if it found that those are not functioning properly.

HSE Organization Structure

Vedanta Limited (Division: Cairn Oil & gas) has an existing established Health, Safety and Environment (HSE) management system for its operations. The HSE structure comprises of a corporate HSE team based in Gurgaon office and an on-site team.

A significant portion of the project activities would be undertaken by contractors. Vedanta Limited (Division: Cairn Oil & Gas) would ensure that the contractual documentation emphasizes on the need to comply with all legal requirements and Environment Management and Monitoring Plan (EMMP). Vedanta Ltd. (Division : Cairn Oil & Gas) would either directly or through its contractors, to arrange for periodic trainings of the project crew on legal requirements and EMMP. Vedanta Limited (Division: Cairn Oil & Gas) would undertake regular inspections of the drill and camp sites and document them to ensure compliance to legal requirements and the EMMP.

Proposed CER Strategy

As per MoEF&CC office memorandum number F. No 22-65/2017-IA-III dated 1st May, 2018, Corporate Environmental Responsibility requirement would be fulfilled.