

Appendix - 8

Environment Management Plan (EMP) and Environment Monitoring Plan (EMoP)

Environment Management Plan (EMP)

Project Activity	Potential Environmental Impact	Mitigation Action	Monitoring Scope	Standards	Institutional Responsibility	Implementation Schedule
Pre-construction						
Temporary use of lands	Impact to the existing environment of land used for dumping, workshop, construction material stacking etc.	Selection of lands adhering to local laws and regulations and in close consultation with Municipal officials Trenches, construction facilities should be placed away from water bodies, natural flow paths, drainage in residential/commercial areas	Water and air quality	Air quality Standards and CPCB water quality standards	OPTCL Contractor	Detailed design
Substation location and design	Noise generation Exposure to noise, Nuisance to neighbouring properties	Substation designed to ensure noise will not be a nuisance.	Expected noise emissions based on substation design, noise levels	Noise control regulations. Noise levels to be specified in tender documents	OPTCL	Detailed design
	Disturbance to the adjacent lands and the people due to cut and fill operations	Maintain adequate clearance, construction of retaining structures, minimise cut and fill operations adjoining to the dwellings	Proximity to houses and other structures	Safe setback distances to nearest houses	OPTCL	Detailed design
Location of underground cable and line alignment and design	Exposure to safety related risks	Setback of dwellings to underground cable route designed in accordance with permitted level of depth and distances available from adjoining houses etc. and supervision at sites.	Cable alignment selection with respect to nearest dwellings	Setback distances to nearest houses -	OPTCL	Part of cable laying survey and detailed alignment survey and design
	Impact on water bodies / land/ residences	Consideration of site location at where they could be located to avoid water bodies or drainage as much as possible. Careful site selection to avoid	Site location away from water bodies, UG cable alignment selection (distance to dwelling, water	Consultation with local authorities and land owners, CPCB water quality	OPTCL	Part of detailed project sighting and survey and design

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Equipment specifications and design parameters	Release of chemicals and harmful gases in receptors (air, water, land)	existing settlements Battery, transformer oils, SF ₆ stored at substation sites with appropriate care.	and/or drains land)	standards Regulated under Hazardous waste Act	OPTCL	Detailed design
Encroachment into precious ecological areas	Loss of precious ecological values/ damage to precious species	Avoid encroachment by careful site and alignment selection Minimise the RoW wherever possible	Floral and faunal habitats loss	Environment Conservation Act	OPTCL	Detailed design
Involuntary resettlement or land acquisition	Loss of lands and structures	Compensation paid for temporary/ permanent loss of productive land	Public complaints	Rates stipulated in the Resettlement plan	OPTCL	Prior to construction phase
Encroachment into private land - houses/commercial establishments	Loss of income from commercial places	Use existing ROW wherever possible Avoid laying UG cable under houses, farmland etc. wherever possible. Inhabitants compensated for any permanent loss of income	UG cable trench location and line alignment selection Design of Implementation of mitigatory measures (based on affected area)	Consultation with local authorities and design engineers	OPTCL	Part of detailed alignment survey and design
Interference with drainage patterns/drainage channels	Temporary flooding hazards	Appropriate trenching design of UG cable to avoid channel interference	Site location and line alignment selection	Consultation with local authorities and design engineers	OPTCL	Detailed alignment survey and design
Explosions/Fire	Hazards to life	Provision of firefighting equipment to be located close to transformers, power equipment.	Substation design compliance with fire prevention and control codes	Tender document to mention detailed specifications	OPTCL	Part of detailed substation layout and design /drawings

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Construction						
Removal or disturbance to other public utilities	Public inconvenience	<p>Advance notice to the public about the time and the duration of the utility disruption</p> <p>Use of well trained and experienced machinery operators to reduce accidental damage to the public utilities</p> <p>Restore the utilities immediately to overcome public inconvenient</p>	Disruption other commercial and public activities / Public complaints	Technical specification	OPTCL	Throughout the construction period
Acquisition of lands for temporary facilities etc.	Loss of agricultural productivity	<p>Avoid rainy season wherever possible for the project activities.</p> <p>Ensure existing drainage facilities in the area are maintained in working condition</p> <p>Protect /preserve topsoil and reinstate after construction completed</p> <p>Repair /reinstate damaged drains etc. after construction is completed</p>	<p>Usage of existing utilities</p> <p>Status of facilities (earthwork in m³)</p> <p>Implementation of soil conservation measures</p>	Regular monitoring compliance with regulations	OPTCL, Contractor through contract provisions	Throughout the construction period
Temporary outage of the electricity	Loss of power supply to the local community when distribution lines crossing the new line are switched off	<p>Advance notice to the public about the time and the duration of the utility disruption</p> <p>Restore the utilities immediately to overcome public inconvenience.</p>	Houses and commercial premises of power disruption	Regular monitoring during the period of strengthening the conductors	Contractor OPTCL	Throughout the construction period
Cable Trenching lay out and installation	Noise and vibrations due to digging and cutting	Selection of construction techniques and machinery to minimise ground disturbance.	Construction techniques and machinery	Minimal ground disturbance	OPTCL, Contractor through contract provisions	Construction period

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Substation construction	Loss of soil	Fill for the substation foundations obtained by creating or improving local drain system and raising floor height.	Burrow area sighting (area of site in m ² and estimated volume in m ³)	Municipal bye-laws on drainage systems and flooding	OPTCL, Contractor through contract provisions	Construction period
	Water pollution	Construction activities involving significant ground disturbance not undertaken during the monsoon season.	Seasonal start and finish of major earthworks (pH, BOD/COD, Suspended solids, other)	Timing of major disturbance activities - prior to start of construction activities	OPTCL, Contractor through contract provisions	Construction period
Construction schedules	Noise nuisance to neighbouring properties	Construction activities only undertaken during the day and local communities informed of the construction schedule.	Timing of construction (noise emissions, [dB(a)])	Daytime construction only	OPTCL, Contractor through contract provisions	Construction period
	Nuisance to neighboring properties if drains get clogged due to soil from UG cable work.	Complete restriction of construction work during rainy season in highly populated area where the roads are narrow.	Timing of Construction	No construction for specific time	OPTCL, Contractor	Construction period
Provision of facilities for construction workers	Contamination of receptors (land, water, air)	Construction workforce facilities to include proper sanitation, water supply and waste disposal facilities.	Amenities for Workforce facilities	Presence of proper sanitation, water supply and waste disposal facilities	OPTCL, Contractor through contract provisions	Construction period
Surplus earthwork/soil	Runoff to cause water pollution, solid waste disposal	Any excess material will only be used as fill material offsite when the owner's agreement has been obtained and with the disposal site restored in a manner that prevents erosion and does not block any drainage path	Location and amount (m ³) of fill disposal Soil disposal locations and volume (m ³)	Appropriate fill disposal and dispersal locations	OPTCL, Contractor through contract provisions	Construction period
Air Pollution	Loose dust might	Damping of dust by sprinkling of	Soil stacking	Air Quality	OPTCL,	Construction

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	blow in the area causing dusty conditions	water within the work area and stack the loose soil and contain it with covers if required.	locations, access roads, UG cable trenches, substation site	Standards	Contractor through contract provisions	period
Site clearance	Legal and illegal structures	Marking of structures to be removed prior to clearance, and strict control on clearing activities to ensure minimal clearance.	Clearance control (area in m ²)	Municipal Act	OPTCL, Contractor through contract provisions	Construction period
	Soil erosion and surface runoff	Construction in erosion and flood-prone areas should be restricted to the dry season or proper berms to be erected to avoid surface runoff to drains.	Soil erosion	Visual inspection (Turbidity and sedimentation)	OPTCL, Contractor through contract provisions	Construction period
Mechanised construction	Noise, vibration and operator safety, efficient operation	Construction equipment to be well maintained.	Construction equipment - estimated noise emissions and operating schedules	Technical specifications, safety regulations, Noise control regulations of CPCB	OPTCL, Contractor through contract provisions	Construction period
	Noise, vibration, equipment wear and tear	Proper maintenance and turning off equipment not in use.				
Maintain existing roads for accessibility	Increase in airborne dust particles	Existing roads and tracks used for construction and maintenance access to the site wherever possible.	Planning diversion in traffic for access roads, routes (length and width)	Use of established roads wherever possible	OPTCL, Contractor through contract provisions	Construction period
	Increased land requirement for temporary accessibility	UG cable laying to be restricted to a single carriageway width on the road				
Transportation and storage of materials	Nuisance to the general public	Transport loading and unloading of construction materials should not cause nuisance to the people by way of noise, vibration and dust	Water and air quality	Laws and regulations of respective states National Emission Standards and	OPTCL/ CPCB	Construction period
		Avoid storage of construction materials beside the road, around				

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		water bodies, residential or public sensitive locations Construction materials should be stored in covered areas to ensure protection from dust, emissions and such materials should be bundled in environment friendly and nuisance free manner		CPCB water quality standards		
Trimming/cutting of trees within RoW	Fire hazards	Trees trimmed within the RoW to maintain adequate clearances as per the regulations.	Faults due to tripping in network	Clearance as per Electricity Act.	OPTCL, Contractor through contract provisions	Construction period
Health and safety	Injury and sickness of workers and members of the public	Contract provisions specifying minimum setback requirements for construction camps from water bodies, reserved areas etc. Contractor to prepare and implement a health and safety plan and health and safety awareness programs	Contract clauses (number of incidents and total lost-work days caused by injuries and sickness)	Health and safety regulations	OPTCL (Contractor through contract provisions)	Construction period
Nuisance to nearby properties	Losses to neighboring land uses/ values	Contract clauses specifying careful construction practices. Use existing roads or UG cable and existing routes for overhead lines as much as possible. Productive land will be reinstated following completion of construction	Contract clauses Design basis and layout Reinstatement of land status (area affected, m ²)	Incorporating good construction management, design engineering practices	OPTCL (Contractor through contract provisions)	Construction period
Operation and Maintenance Phase						
Electric shock	Death or injury to the workers and public	Security fences around substation Establishment of warning signs	Proper maintenance of fences and sign	Periodic maintenance	OPTCL	Throughout the operation

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		Careful design using appropriate technologies to minimise hazards	boards Usage of appropriate technologies (lost work days due to illness and injuries)	Number of programmes and percent of staff /workers covered		
Noise generation	Nuisance to the community around the site	Provision of noise barriers	Noise level	Noise level (db)- Once a year	OPTCL	Throughout the operation
Maintenance of Distribution line	Exposure to electromagnetic interference	Transmission/distribution line design to comply with the limits of electromagnetic interference from UG cable and overhead power lines	Required ground clearance (metres)	Ground clearance as per OPTCL norms	OPTCL	Throughout the operation
Substation maintenance	Exposure to electromagnetic interference	Substation design to comply with the limits of electromagnetic interference within floor area	Required vibrations level, instrumentation	Technical specifications	OPTCL	Throughout the operation
Oil spillage	Contamination of land/nearby water bodies	Substation transformers located within secure and impervious bundled areas with a storage capacity of at least 100% of the capacity of oil in transformers and associated reserve tanks.	Substation bounding ("as-built" diagrams)	Bounding capacity and permeability	OPTCL	Throughout the operation

Environment Monitoring Plan (EMoP)

Environmental component	Project stage	Parameters to be monitored	Location	Frequency	Standards	Implementation	Supervision
Air Quality	Pre-construction stage (The project once assigned to contractor)	PM ₁₀ , PM _{2.5} , SO ₂ , NO _x , SPM, CO	Inside the proposed site	One time	National Air quality standards of CPCB	Contractor by CPCB approved laboratory	Contractor/PIU
	Construction Stage	PM ₁₀ , PM _{2.5} , SO ₂ , NO _x , SPM,	Inside and outside (0.5 km) of the proposed site	Two times	National Air quality standards of CPCB	Contractor by CPCB approved laboratory	Contractor/PIU
	Operation Stage	PM ₁₀ , PM _{2.5} , SO ₂ , NO _x , SPM,	Stack and outside (0.5 km) of the proposed site	One time	National Air quality standards of CPCB	Contractor by CPCB approved laboratory	PIU
Water Quality	Pre-construction stage (The project once assigned to contractor)	EC, TSS, DO, BOD, P ^H Oil and grease, Pb,	Nearest downstream spring around the site	One time	National water quality standards of CPCB	Contractor by CPCB approved laboratory	Contractor/PIU
	Construction Stage	EC, TSS, DO, BOD, PH, Oil and grease, Pb	Nearest downstream spring around the site	Three times/year	National water quality standards of CPCB	Contractor by CPCB approved laboratory	Contractor/PIU
	Operation Stage	EC, TSS, DO, BOD, P ^H Oil and grease, Pb	Nearest downstream spring around the site	Yearly	National water quality standards of CPCB	Contractor by CPCB approved laboratory	PIU
Noise/ Vibration	Pre-construction stage (The project once assigned to contractor)	Noise level (dB level)	Inside plant and outside the proposed site	A single time	CPCB standards for Noise and vibrations	Contractor by CPCB approved laboratory	Contractor/PIU
	Construction Stage	Noise level (dB level)	Inside plant and outside the proposed	2 times/year	CPCB standards for Noise and	Contractor by CPCB approved laboratory	Contractor/PIU

Environmental component	Project stage	Parameters to be monitored	Location	Frequency	Standards	Implementation	Supervision
	Operation Stage	Noise level (dB level)	site Inside plant and outside the proposed site	Yearly	vibrations CPCB standards for Noise and vibrations	Contractor by CPCB approved laboratory	PIU
Soil	Pre-construction stage (The project once assigned to contractor)	PH,Sulfate (SO ₃), Chloride, ORP, water Soluble salts EC, Organic Matter, Moisture Content	2 locations at the proposed site	A single time	Technical specifications	Contractor by CPCB approved laboratory	Contractor/PIU
	Construction Stage	PH,Sulfate (SO ₃), Chloride, ORP, water Soluble salts EC, Organic Matter, Moisture Content	2 locations at the proposed site	Two times	Technical specifications	Contractor by CPCB approved laboratory	Contractor/PIU
	Operation Stage	PH,Sulfate (SO ₃), Chloride, ORP, water Soluble salts EC, Organic Matter, Moisture Content	2 locations at the proposed site	A single time	Technical specifications	Contractor by CPCB approved laboratory	PIU
Trees Planted	Pre-Construction stage	Survival Rate	Planting locations (if any)	Once	Compensatory Afforestation	Contractor	PMU
	Construction Stage	Survival Rate		Once			

ESMU –Environment & Social Management Unit of PMU

Abbreviations:

SO₂- Sulphur Dioxide; NO₂- Nitrogen Dioxide; CO- Carbon Monoxide; EC – Electric Conductivity;
Pb – Lead; PM_{2.5}. Particulate Matter <2.5;PM₁₀ - Particulate Matter <10; TSPM- Total suspended Particulate Matter;
EC - Electrical Conductivity; DO - Dissolved Oxygen; TSS - Total Suspended Solids;
BOD - Biological Oxygen Demand; NAAQS - National Ambient Air Quality Standards;
NWQS - National water Quality Standards;
ORP – Oxidation Reduction Potential