

ENVIRONMENT IMPACT ASSESSMENT

NAYAGAON PUMPED STORAGE PROJECT

(2000 MW)

(Sector 1(c); Cat "A")



Executive Summary

Prepared for:

M/s Greenko Energies Pvt. Ltd.

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1. INTRODUCTION

Greenko Energies Pvt. Ltd., (GEPL) has proposed to develop Nayagaon Pumped Storage Project falling near Nayagaon, Wadi Sutonda, Jangli Kotha, Palashi, Banoti, Ghorkhund, Gondegaon villages of Soegaon Tehsil and Wadhod village of Kannad Tehsil of Aurangabad District, Maharashtra. The geographical co-ordinates of the proposed upper reservoir are at Latitude 20°27'17.77"North and Longitude is 75°21'45.71" East and that of lower reservoir are at 20°27'26.25" North and 75°20'54.62" East.

The nearest railhead is Pachora Railway Station, 25 kms from project site. Nearest airport is Aurangabad is about 111 kms from project site. The distance of SH 184 is about 24 kms and Jawaharlal Nehru Port Trust-is about 400 kms from project site. The location of the project is shown in Figure 1.

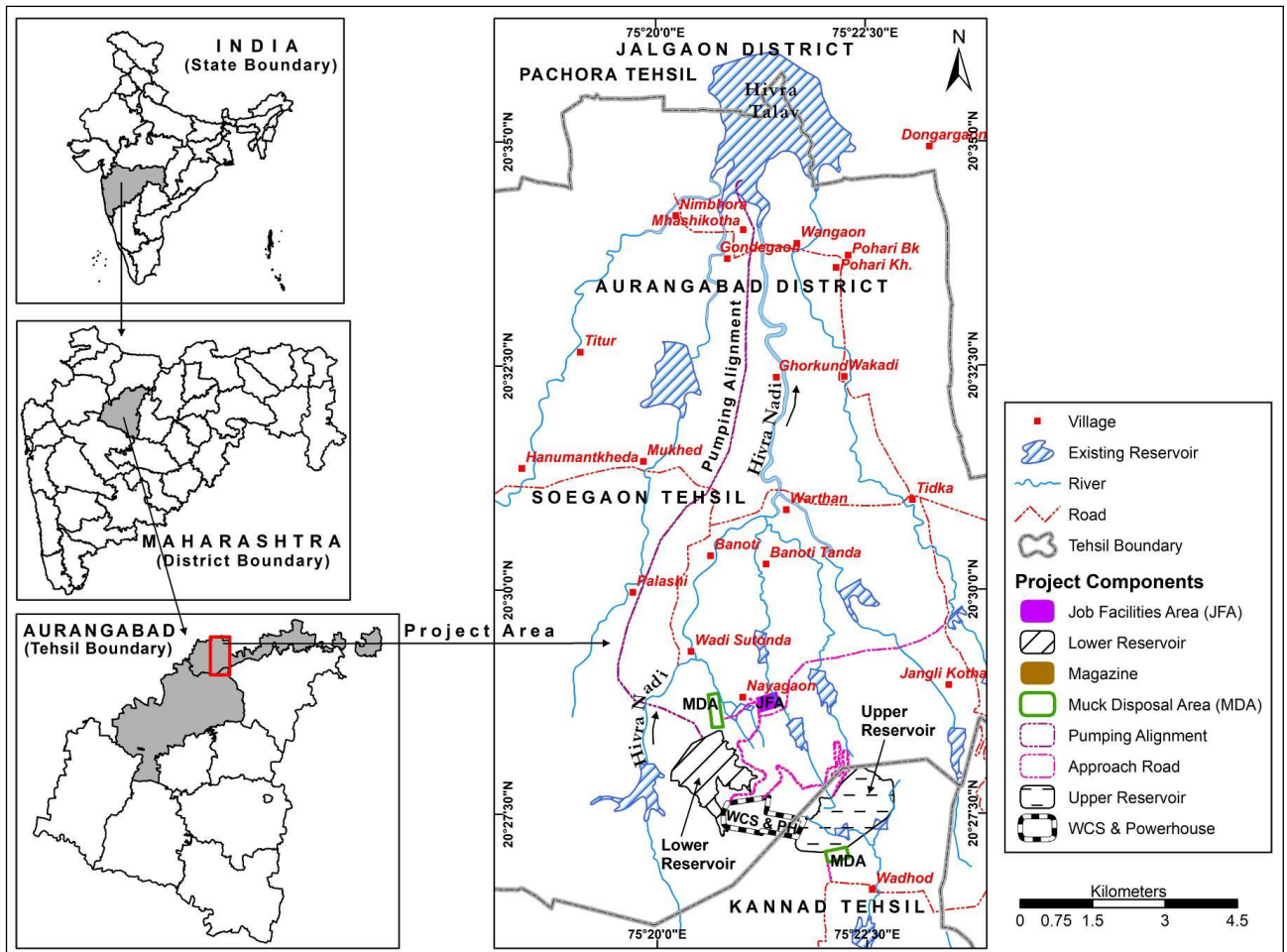


Figure 1: Location Map of Nayagaon Pumped Storage Project

2. PROJECT DESCRIPTION

The Nayagaon PSP comprises of two reservoirs which are to be constructed newly. The upper reservoir is proposed to be located on flat / gradually sloping land which is suitable for creating the desired gross storage capacity of 0.65 TMC. Out of 0.65 TMC, the live storage capacity is 0.62 TMC and the dead storage capacity is 0.03 TMC by keeping FRL & MDDL at EL 710.00m & EL 690.00m respectively. For creating this storage, it is proposed to construct a rockfill embankment/dam for the average height of around 16m (with maximum height of 30m) for the length of 3985m.

Similarly, the lower reservoir is proposed to be located in the natural depression which is suitable for creating the desired gross storage capacity of 0.65 TMC. Out of 0.65 TMC, the live storage capacity is 0.63 TMC and dead storage capacity is 0.02 TMC by keeping FRL and MDDL at EL 400.00m & EL 376.00m respectively. For creating this storage, it is proposed to construct a rockfill embankment/dam for the average height of 23 m (with maximum height of 38 m) for the length of 1400 m.

Water will be lifted one time from Hivra Nadi and this Project envisages non-consumptive re-utilization of 0.58 TMC of water for recirculation among two proposed reservoirs for power generation. Evaporation losses, if any will be recouped periodically from existing seasonal nala (which is right bank tributary of Hivra Nadi). The salient features is given in **Table 1** and Layout map of proposed Nayagaon PSP is given at **and Figure 2 & 3**.

Construction of Nayagaon PSP is planned to be completed in a period of 42 months, including Pre-construction works, creation of infrastructure facilities viz. additional investigations, improvement of road network and colonies.

Table 1: Salient features of Nayagaon PSP

| S. No. | Parameter | Description |
|--------|---|--|
| 1 | Location | |
| | a Country | India |
| | b State | Maharashtra |
| | c District | Aurangabad |
| | d Village near Powerhouse | Nayagaon |
| 2 | Geographical Co-Ordinates | |
| | Nayagaon Standalone PSP Upper Reservoir- (Now Proposed) | |
| | Latitude | 20°27'17.77" N |
| | Longitude | 75°21'45.71" E |
| | Nayagaon Standalone PSP Lower Reservoir - (Now Proposed) | |
| | Latitude | 20°27'26.25" N |
| | Longitude | 75°20'54.62" E |
| 3 | Access To Project Site | |
| | a Airport | Aurangabad Airport – 111 kms from project site |
| | b Rail head | Pachora Railway Station, 25 kms from project site |
| | c Road | SH 184 |
| | d Port | Jawaharlal Nehru Port Trust- 400 kms from project site |
| 4 | Project | |
| | a Type | Pumped Storage Project |
| | b Storage Capacity | 12367 MWH |
| | c Rating | 2000 MW |
| | d Peak Operation Duration | 6.18 Hours |
| 5 | Nayagaon Standalone PSP - Upper Reservoir | |
| | a Live Storage | 0.62 TMC |
| | b Dead Storage | 0.03 TMC |
| | c Gross Storage | 0.65 TMC |
| | Upper Dam | |
| | a Top Bund Level (TBL) | EL + 713.00 m |

| S. No. | Parameter | Description | |
|--------|-----------|--|---|
| | b | Full Reservoir level (FRL) | EL + 710.00 m |
| | c | Min. Draw Down Level (MDDL) | EL + 690.00 m |
| | d | Type of Dam | Rock fill Embankment with central clay core |
| | e | Avg. Height of Rockfill Embankment | 16m |
| | f | Max. Height of Rockfill Embankment | 30 m |
| | g | Length at the top of Rockfill Embankment | 3985 m |
| | h | Top width of the Rockfill Embankment | 7.0 m |
| 6 | | Nayagaon Standalone PSP - Lower Reservoir | |
| | a | Live Storage | 0.63 TMC |
| | b | Dead Storage | 0.02 TMC |
| | c | Gross Storage | 0.65 TMC |
| | | Lower Dam | |
| | a | Top Bund Level (TBL) | EL +403.00 m |
| | b | Full Reservoir level (FRL) | EL +400.00 m |
| | c | Min. Draw Down Level (MDDL) | EL +376.00m |
| | d | Type of Dam | Rock fill Embankment with central clay core |
| | e | Avg. Height of Rockfill Embankment | 23m |
| | F | Max Height of Embankment | 38 m |
| | g | Length of Embankment | 1400 m |
| 7 | | Intake Structure | |
| | a | Type | Diffuser Type |
| | b | No. of Vents | 2 nos. |
| | c | Size of Each Intake | 23 m (W) including piers x 10.5 m (H) |
| | d | Length of each Intake | 75.0 m (covered with RCC slab at top up to Intake Gate) |
| | e | Elevation of Intake center line | EL + 676.85 m |
| | f | Elevation of Intake bottom | EL + 674.00 m |
| | g | Design Discharge of each Intake (Turbine mode) | 125 Cumec |
| | h | Trash rack type | Vertical with inclination of 15° |
| | i | Size of Trash Rack | 3 nos. of 5.67 m (W) x 10.35 m -Inclined height (H) for each unit |
| | j | Numbers & Size of Intake Service Gate | 6 nos. of 5.70 m (W) x 5.70 m (H) |
| | k | Numbers & Size of Intake Emergency Gate | 2 No. – 5.70 m (W) x 5.70 m (H) with Moving Gantry |
| 8 | | Penstock /Pressure Shafts | |
| | a | Type | Finished steel lined - circular |
| | b | Number of Pressure Shaft | Total 5 No. of Independent Penstocks and 1 No. bifurcated into 2 nos. near powerhouse to feed smaller units. |
| | c | Diameter of Main Pressure Shaft | 5.7 m |
| | d | Length of Main Penstock/Pressure Shaft | 1311 m Length of surface penstock from Intake to Vertical Pressure Shaft (1)- 206 m Length of Vertical Pressure Shaft (1) - 229 m Length of Penstock from Vertical Pressure shaft 1 to Vertical Pressure Shaft (2)- 485 m Length of Vertical Pressure Shaft (2)- 94 m |

| S. No. | Parameter | Description |
|--------|--|---|
| | | Length of Horizontal Main Pressure Shaft-297 m |
| e | Diameter of Branch Pressure Shaft | 4.0. m |
| f | Length of Branch Penstock/Pressure Shaft | 96.4 m |
| g | Design Discharge of each Main Penstock | 125 Cumecs |
| h | Design Discharge of each Branch Penstock | 62 Cumecs |
| i | Velocity in the Main Penstock | 4.898 m/sec |
| j | Velocity in the Branch Penstock | 4.93 m/sec |
| 9 | Powerhouse | |
| a | Type | Surface Powerhouse |
| b | Centre line of Unit | EL +329.00 m |
| c | Dimensions (Excluding Service bay) | 240.00 m (L) x 24.0m(B) x 50.50 m (H) |
| d | Size of Service bay | 35.00 m (L) x 24 m (W) |
| e | Service bay level | EL +348.00 m |
| f | Size of Unloading Bay | 30.00 m (L) X 24.00 m (W) |
| g | Unloading Bay Level | EL +348 m |
| 10 | Tail Race Tunnel | |
| a | Type & Shape | Concrete Lined – Circular |
| b | Number of Tunnels | 6 Nos. |
| c | Dia. of Tunnel | 6.10 m (For larger units) 4.5 m (For smaller units) |
| d | Length of the Tunnel | 253 m |
| e | Design Discharge | 126 cumecs (For larger units) 62 cumecs (For smaller units) |
| 11 | Tailrace Outlet | |
| a | Type | Diffuser Type |
| b | No. of Outlet | 7 Nos. |
| c | Size of each outlet | 23.00 m (W) including piers x 9.00 m (H) Larger Unit and 20.00 m (W) including piers x 5.60 m (H) Smaller unit |
| d | Length of each Outlet | 61.70 m (covered with RCC slab at top up to Intake Gate) for larger unit & smaller unit |
| e | Elevation of outlet center line | Larger Unit - EL + 364.05 m Smaller Unit - EL + 363.25 m |
| f | Elevation of Outlet bottom | Larger Unit - EL + 361.95 m Smaller Unit - EL + 364.75 m |
| g | Trash rack Type | Vertical with inclination of 15° |
| h | Size of Trash rack | 3 no. of 5.67m (W) x 9.32 m (H) for each large unit and 3 no. of 4.67m (W) x 5.80 m (H) for each smaller unit |
| i | Tailrace outlet Service Gate | 5 nos. of 4.8 m (W) x 6.10 m (H) 2 nos. of 3.8 m (W) x 4.5 m (H) |
| j | Tail Race outlet Emergency Gate | 1 No.- 4.8 m (W) x 6.1 m (H) with Moving Gantry 1 No.- 3.8 m (W) x 4.5 m (H) with Moving Gantry |
| 12 | Tail Race Channel | |
| a | Type & Shape | Concrete lined & Trapezoidal |
| b | Length of channel | 1770 m (including forebay) |
| c | Bed width | 90 m |
| d | Full supply depth | 5.00 m |
| e | Bed slope | 1 in 5800 |
| 13 | Electromechanical Equipment | |

| S. No. | Parameter | Description |
|--------|--|--|
| | Pump Turbine | Francis type, vertical shaft reversible pump-turbine |
| | Total No of units | 7 nos. (5 X 334 MW + 2 x 165 MW) |
| | Total Design Discharge (Turbine Mode) | 749 Cumec |
| | Rated Head in Turbine mode | 305.07 m |
| a | 334MW Turbines | |
| | Total No. of units | 5 Units |
| | Turbine Design Discharge | 125 Cumec |
| | Pump Capacity | 367 MW |
| | Rated Pumping Head | 316.47 m |
| | Rated Pump Discharge | 110.00 Cumec |
| | Synchronous Speed | 250.00 rpm |
| i | Generator-Motor | |
| | Type | Three (3) phase, alternating current synchronous/asynchronous generator motor semi umbrella type with vertical shaft |
| | Number of units | 5 Units (334 MW) |
| | Rated Capacity | Generator – 334 MW; Pump Input – 367 MW |
| | 165 MW Turbines | |
| ii | Total No. of units | 2 Units |
| | Turbine Design Discharge | 62 Cumec |
| | Pump Capacity | 182 MW |
| | Rated Pumping Head | 318.63 m |
| | Rated Pump Discharge | 54 Cumec |
| | Synchronous Speed | 300.00 rpm |
| iii | Generator-Motor | |
| | Type | Three (3) phase, alternating current synchronous/asynchronous generator motor semi umbrella type with vertical shaft |
| | Number of units | 2 Units (165 MW) |
| | Rated Capacity | Generator – 165 MW; Pump Input – 182 MW |
| | Rated Voltage | 21.0 KV |
| iv | Main Power Transformer | |
| | Type | Outdoor Single-Phase Power transformers with Off-Circuit tap changer (OCTC) |
| | Number of units | 21 Nos. i.e. 3 nos. per unit |
| | Rated Capacity of each unit | Single Phase, 21 kV/400kV, 120 MVA |
| | Rated Voltage | Primary – 21.0 kV; Secondary - 400 kV adjustable range of the secondary voltage: -10% to +10%(3kV/tap) |
| 14 | 400 KV Gas Insulated Switchgear | |
| 1 | Type of GIS | Indoor Type |
| 2 | No. of GIS units | One No. |
| 3 | Location | Inside Powerhouse |
| 4 | Scheme | Double Busbar Arrangement with bus coupler |
| 15 | POWER EVACUATION | |
| a | Voltage Level (KV) | 400 KV |
| b | No. of Transmission Lines | Two Transmission line with double circuit |

| S. No. | Parameter | Description |
|--------|-----------|---|
| | c | Total Length |
| | | Two 400 KV Double Circuit Transmission Line of length 70 KMs from PSP will be connected to 400 KV MSETCL substation at Waluj, Aurangabad, Maharashtra for evacuation of generated Power and for Supply of power during pumping mode |
| 16 | | Estimated Cost (Cr) |
| | a | Civil Works & Other works |
| | b | E & M Works incl. transmission |
| | c | I DC |
| | | Total Project Cost with IDC |
| | | 9564.31 |

Source: Feasibility Report of Nayagaon Pumped Storage Project

2.1 Land Requirement

For the development of Nayagaon PSP, land would be acquired for construction of project components, reservoir area, muck dumping, construction camps and colony, etc. Based on the final project layout (**Figure.2**), land requirement has been worked out as 529.32ha (**Table 2**). Out of which 333.35 Ha is forest land, 195.97 Ha is non-forest land.

Table 2: Project component wise land requirement

| S. No. | Components | Forest | Non-forest | Total |
|--------|---|---------------|---------------|---------------|
| 1 | Upper Reservoir (UR) | 109.23 | 99.12 | 208.35 |
| 2 | Lower Reservoir (LR) & Lower Intake | 119.87 | 32.24 | 152.11 |
| 3 | Water Conductor System (WCS), Powerhouse (PH) | 81.36 | 0.00 | 81.36 |
| 4 | Muck Disposal Area-1 | 0.00 | 10.00 | 10.00 |
| | Muck Disposal Area-2 | 0.00 | 15.00 | 15.00 |
| 5 | Job Facility Area (JFA) | 0.00 | 15.00 | 15.00 |
| 6 | Approach Roads | | | |
| | Road to PH & Upper Reservoir | 16.06 | 0.00 | 16.06 |
| | Road to Lower Reservoir& WCS, JFA, MDA | 6.00 | 2.18 | 8.18 |
| | Road to Upper Reservoir | 0.00 | 1.60 | 1.60 |
| | Road to Job Facility Area | 0.83 | 3.89 | 4.72 |
| | Road to Muck Disposal Area-2 | 0.00 | 0.78 | 0.78 |
| 7 | Magazine | 0.00 | 0.10 | 0.10 |
| 8 | Adit | - | - | |
| 9 | Pumping Alignment | 0.00 | 16.06 | 16.06 |
| | Total (in Ha) | 333.35 | 195.97 | 529.32 |

Source: Feasibility Report of Nayagaon Pumped Storage Project

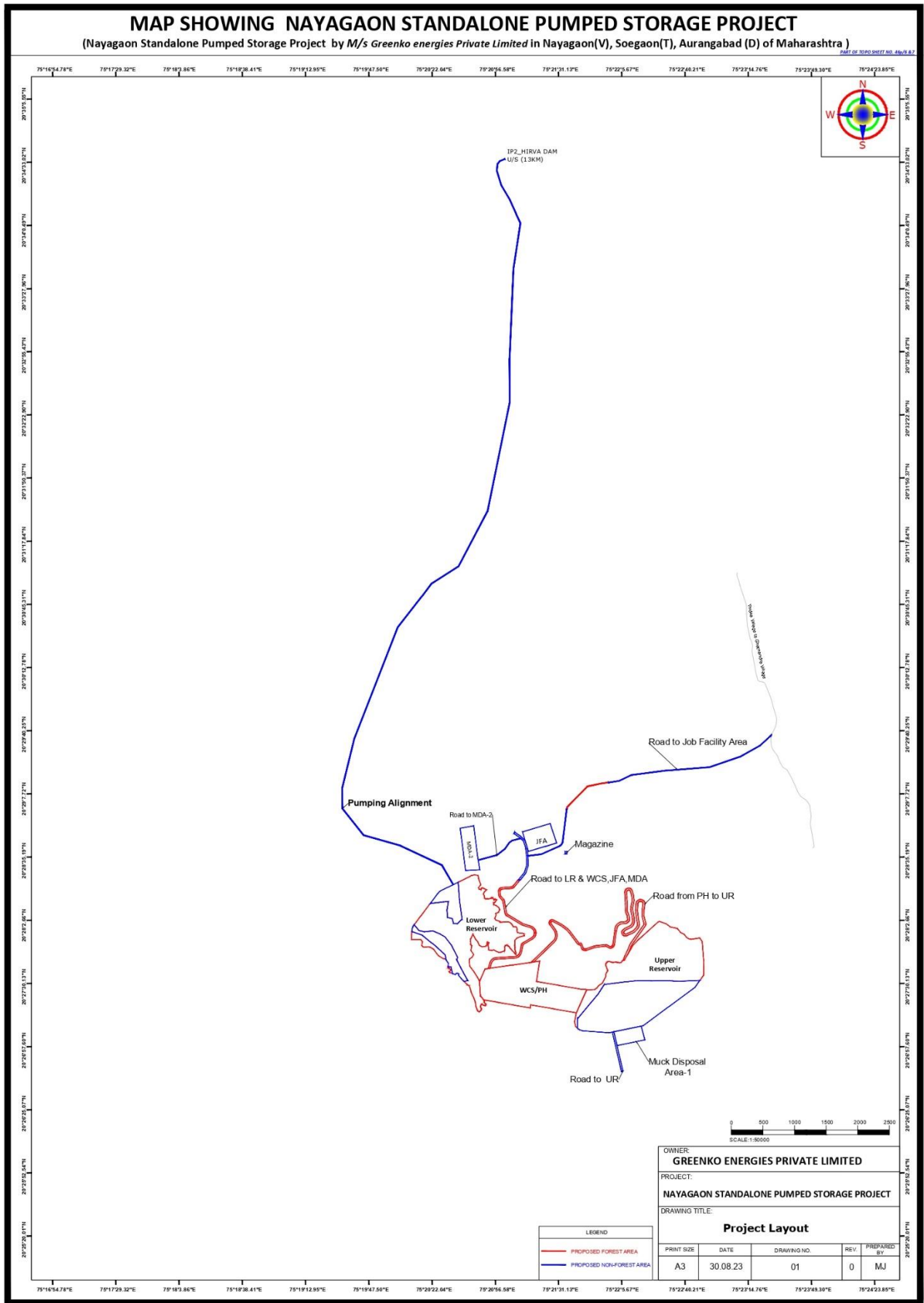


Figure 2: Project layout Map of Nayagaon Pumped Storage Project

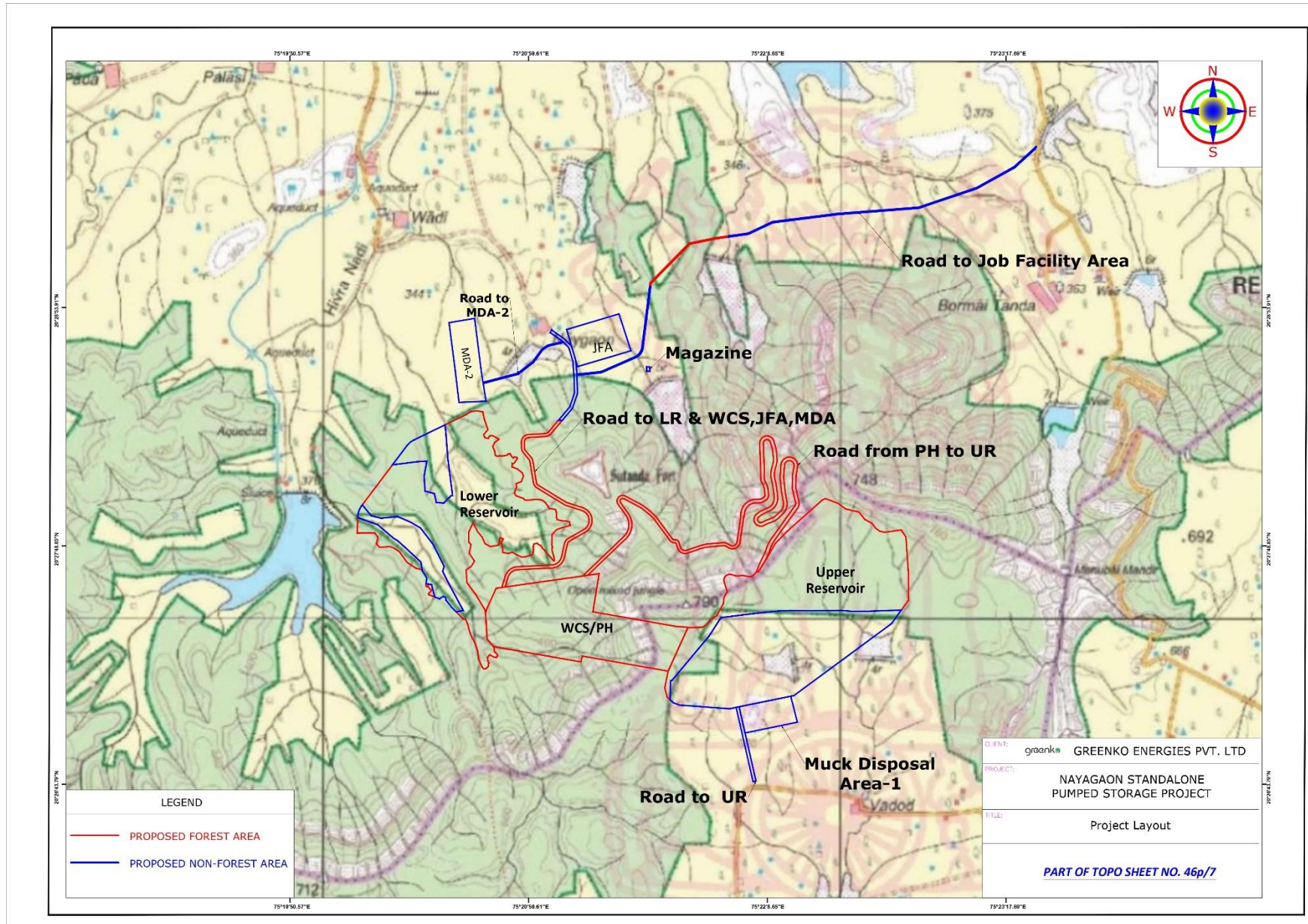


Figure 3: Project layout Map of Nayagaon Pumped Storage Project on Toposheet

3. DESCRIPTION OF THE ENVIRONMENT

Data on the existing environmental parameters in the study area delineated as per the approved Terms of Reference (TOR) for EIA studies by Ministry of Environment, Forests & Climate Change (MoEF&CC), Government of India were collected to understand the present setting of the environment at the project site. A map of the study area prepared based on the above criteria is given in **Figure 4**. The base line status is described briefly in the following sections.

3.1 Physiography

The study area is characterized with hard rock undulating and hilly topographic features. Accordingly, Digital Elevation Model (DEM) the study area lies between 271m and 906m elevation. The data on relief shows the majority of the study area lies in the 300m to 400m elevation band. The slope map of the study area shows that around 52.59 % of the study area falls under the Moderately Sloping category, while 30.66% is under Gentle Slope category.

3.2 Land Use/ Land Cover

The land use/ land cover of the study area is classified into 7 different classes. Deciduous and Scrub Forest constitutes 22.13% of the study area. While agriculture is the predominant land use in the study area (more than 59%). Settlement covers around 0.78% and 2.67% are under waterbodies.

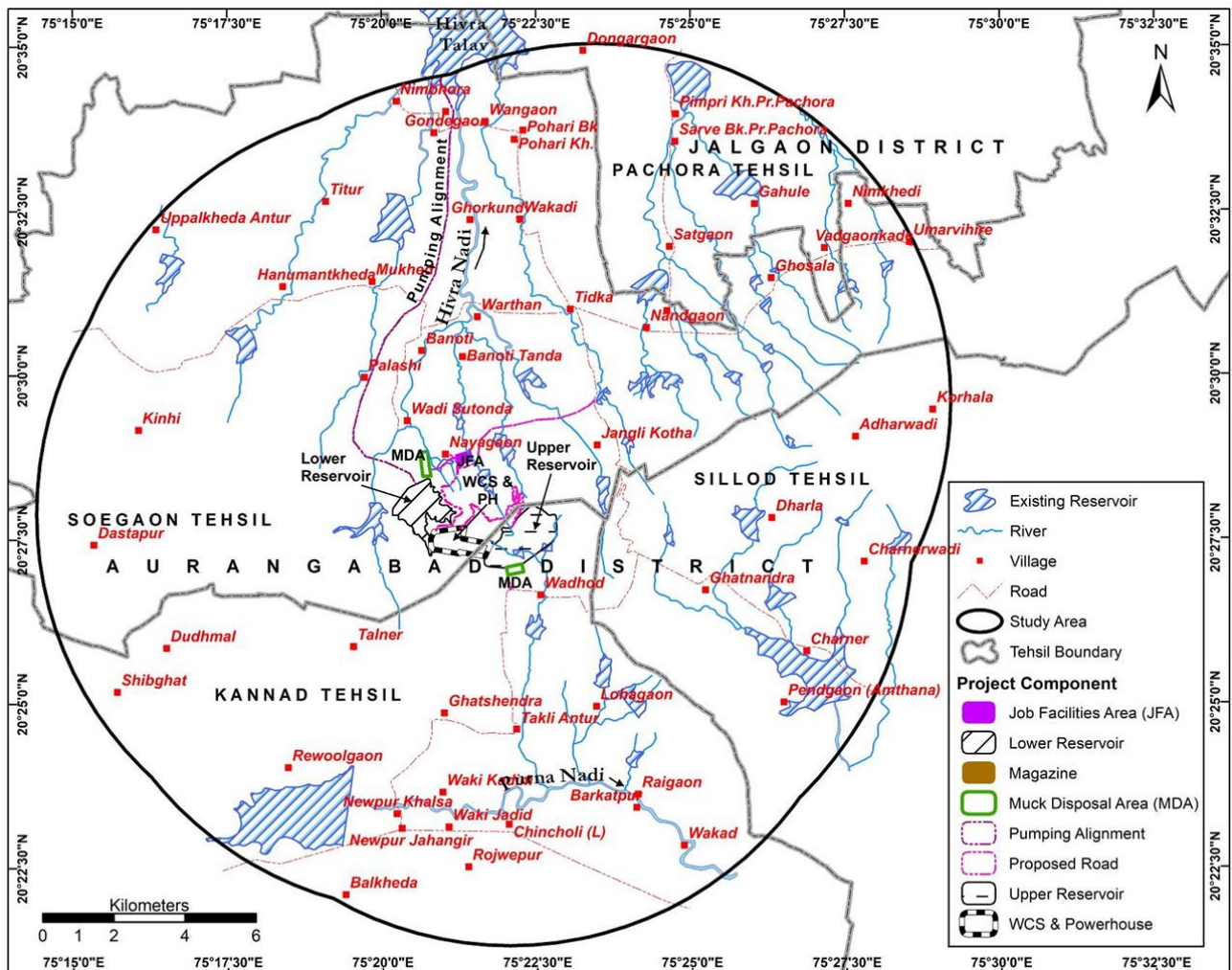


Figure 1: Map Showing Study Area

3.3 Hydrology

The Nayagaon PSP is proposed between two reservoirs i.e., Nayagaon PSP Upper and Lower Reservoirs (both to be constructed newly). Both Upper and Lower reservoir is located in the flat/sloping ground with low height embankment to create the desired storage capacity and is away from all existing river systems and have no/ very small catchment area.

This Project is envisaged as Pumped Storage Project in nature and have no/negligible catchment area. Water will be lifted from an intake point identified across Hivra Nadi. The water from intake point located at about 13 Km will be conveyed to the proposed lower reservoir for its initial filling and will be used cyclically for energy storage and discharge within the two reservoirs. This Project envisages 0.58 TMC of water (considering 6hrs power generation) for recirculation among two proposed reservoirs for power generation.

The annual evaporation losses have been considered as 20% of average live storage of upper and lower reservoir i.e., about 0.65 TMC (18.4 MCum) which is equal to 3.68 M Cum (i.e., 0.13 TMC). However, the exact quantum of evaporation loss and quantum of water to be filled up through precipitation and recouped periodically from Hivra Nadi will be worked out during DPR stage.

3.4 Geology

Aurangabad District that can be broadly divided into three physiographic units namely, Ajanta hill ranges, Satmala hill ranges and Godavari Plains. Geologically, Basaltic lava sequence (Deccan Traps) is the major rock formation in the district. Alluvium occupies a small portion.

The project area forms a part of the Deccan Volcanic Province (DVP), which occupies a contiguous exposed area. The project area lies over Upper Ratangad and Ajanta formations belonging to the Sahyadri Group of Deccan Basalts. The Upper Ratangad Formation is restricted to the lower elevations, viz. lower reservoir area and the Ajanta Formation is exposed in upper elevations, viz. upper reservoir and water conductor system. While the Upper Ratangad Formation is dominated by compound "pahoehoe" lava flows, the Ajanta Formation is made of compound "pahoehoe" as well as simple flows.

The project area lies in basaltic terrain which is characterized by flat topped hills formed by a sequence of lava flows one above the other. The project area has two levels of planation surfaces - upper at about 700m elevation and lower at 380m elevation from msl, that are separated from one another by the escarpment zone that has a cumulative height of about 300 m.

3.5 Meteorology

The study area of the project lies in the Sabha ji Nagar District erstwhile Aurangabad, which experiences mostly hot summer. The southwest monsoon rainfall occurs from June to September in the study area with maximum rainfall occurring between these months. The temperature in the study area starts rising in February and attains its maximum value in May and then decreases. May and January are the hottest and coldest months of the year,

respectively. In summer, though the day temperature remains high, nights are colder and pleasant.

3.6 Soil

As per taxonomic classification, Predominant soil type is Clayey-skeletal, mixed isohyperthermic Lithic Udorthents characterized by Very shallow, excessively drained, clayey soils on moderately steeply sloping undulating to rolling lands with mesas and buttes with severe erosion and strong stoniness; associated with very shallow, excessively drained, loamy soils with severe erosion and strong stoniness. Loamy-skeletal, mixed isohyperthermic, Lithic Ustorthents are the second predominant soil type found near the ridge slopes and is characterized by Extremely shallow, well drained, loamy soils on gently sloping undulating lands with mesas and buttes with severe erosion and strong stoniness; associated with very shallow, well drained, clayey soils with moderate erosion and moderate stoniness.

In general, all the physical and chemical soil quality indicators reflect the good quality of the soil. The soil fertility based upon Nutrient Index in terms of NPK shows that Nitrogen is in the 'Low' range Phosphorus fertility rating 'Medium to High' range whereas, Potassium fertility status of soil in the 'High' range.

3.7 Ambient Air and Noise Quality

The results of monitoring show that PM_{2.5}, PM₁₀, SO₂, and NO₂ levels at all the sites are well within the Residential & Rural area permissible limits prescribed by National Ambient Air Quality Standard 2009 notified by CPCB. Air quality was also assessed using 24h averages of PM_{2.5}, PM₁₀, SO₂, and NO₂ levels in the AQI calculator of CPCB. All the locations fall under the 'Good' to Satisfactory category in the different seasons in the study area.

3.8 Water Quality

The data on water quality has been collected to evaluate surface and ground water quality in study area. The water quality in the study area, in general, is good.

Surface water

- All the samples except SW1 in the study area falls in Class 'D' i.e; designated best use of Propagation of Wildlife and Fisheries according to CPCB, Water Quality Criteria. This is because of higher Biochemical Oxygen Demand i.e. >3mg/l even though count of total coliform is less than 500 MPN/100 ml, pH is between 6.5 and 8.5 and Dissolved oxygen is more than 5 mg/l.
- Sample SW1 (Nalla in Lower Reservoir) fall under class 'C' i.e. Drinking water source after conventional treatment and disinfection according to CPCB, Water Quality Criteria. This is because of Biochemical Oxygen Demand i.e. <3mg/l even though count of total coliform is less than 5000 MPN/100 ml, pH is between 6.0 and 9.0 and Dissolved oxygen is more than 4 mg/l.
- Based upon CPCB guidelines as well the WQI calculated above, the water of Hiwara River and Reservoir in the study area lies in 'Medium' to Good' category.

Groundwater

- According to BIS standards for Drinking Water (2012) all the Groundwater samples collected from the study area fall within permissible limits of the same.
- According to DWQI tabulated in the table below all the samples of groundwater fall in 'Excellent' water quality class in all the seasons.
- In general, Groundwater is under the 'Moderately' to Very Hard category, water from hand pumps or bore wells can be fit for drinking after conventional treatment.

3.9 Floristic Diversity

Agriculture is the predominant land use in the study area (more than 59%) and Forest constitutes 22.13% of the study area. The forests in the study area have been classified following the 'A Revised Survey of the Forest Types of India' by Champion and Seth (1968), under Group 5 Tropical Dry Deciduous Forests and classified under Sub-group 5A Southern Tropical Dry Deciduous Forest.

The forest in the area is dominated by under Dry Teak Bearing Forest and Open Mixed Forests, mostly distributed along the hills and undulating terrains on the foot hills. They are primarily mixed forests consisting of a variety of species the occurrence of which is considerably influenced by biotic interferences and management. The species occurring in the forests can be enlisted as follows in the descending order of their incidence and commercial importance.

The forest in the proposed Upper reservoir is dominated by dry *Tectona grandis* (Teak) which covers considerable portions in area). Another important species is *Hardwickia binata* (Anjan) which is predominantly found in parts of lower reservoir. The other important species found in the forests are *Anogeissus latifolia* (Dhauda), *Boswellia serrata* (Salai), *Buchanania lanzan* (Char), *Lannea coromandelica* (Moyen), *Madhuca longifolia* (Mhowa), *Butea monosperma* (Palash), *Terminalia tomentosa* (Ain), *Terminalia bellirica* (Beheda), *Terminalia arjuna* (Kahu), etc.

The common shrub and climber growth consists of *Colebrooka oppositifolia* (Bhandara), *Gymnosporia spinosa* (Bharati), *Wrightia tinctoria* (Dudhi/Kalakuda), *Woodfordia floribunda* (Dhavati), *Carrissa spinarium* (Kari Korando), *Helicteres isora* (Muradsheng/Marorphal), *Gymnosporia montana* (Henkal), *Justicia adhatoda* (Adulsa), *Caesalpinia sapiaria* (Chilar), *Butea superba* (Palasveo), etc.

Herbaceous flora in the area is mainly comprised of species like *Tephrosia hamiltonii* (Divali), *Parthenium hysterophorus* (Gajargawat), *Tribulus terrestris* (Gokru), *Stylosanthes hamata* (Hamata), *Argemone mexicana* (Pivla Dhotra), *Cleome viscosa* (Pivili tilwan), *Hyptis suaveolens* (Rantulsi/Bantulsi), *Atylosia scarabaeoides* (Rantur), *Stylosanthes scabra* (Scabra), *Senna tora* (Tarota). The forests have also extensive grassy areas. The species of grass found are: *Heteropogon contortus* (Kusal), *Paonyh* and *Sehima nervosum* (Sheda). *Sofia* and *Motia* varieties of *Cymbopogon martini* (Rosha), *Eragrostis tenella* (Bhurbhusi), *Apluda varia* (Kodmor), *Andropogon annulatus* (Marvel), *Cynodon dactylon* (Dub), *Sehima sulcatum* (Paonya) grass species are also found.

A total of 126 species of flowering plant species belongs to 43 families were recorded during three season field survey. The detailed inventory of Plant species reported from the study area has been prepared based on primary survey and same has been supplemented with available secondary data. A total of 192 plant species were reported in the study area. This list includes 188 species of angiosperms and 4 species of lower plants (Pteridophytes). These flowering plants was represented by 55 species of trees, 49 species of shrubs, 57 species of herbaceous plants, 18 species of grasses and 9 species of climbers. Fabaceae was found to be the most dominant family having 36 plant species.

As per Red Data Book of Indian Plants no RET species were found from the area during Survey. *Aegle marmelos* and *Pterocarpus marsupium* are listed under Near Threatened (NT), and *Tectona grandis* is listed under Endangered (EN) category of IUCN Red List of Threatened Species 2022-2.

3.10 Faunal Diversity

Mammals: During field surveys, only Common langur (*Semnopithecus entellus*), Jackal (*Canis aureus*) and Rhesus macaque (*Macaca mulatta*) were sighted in the study area. Common Langur was the most commonly sighted species in the entire study area. Forest officials mentioned the presence of Common Leopard (*Panthera pardus*), Hanuman Langur (*Semnopitheaus entellus*), Wild Boar (*Susscrofa cristatus*), Sloth Bear (*Melursus ursinus*) and Nilgai (*Boselaphus tragocamelus*) in the proposed study area and same was confirmed by villagers in the study area. According to the list prepared as described above, 21 species of mammals are reportedly found in the area.

Avifauna: A list of 42 species, belonging to 17 order and 30 families, has been prepared of the birds sighted during the field survey. A large portion of avifauna species comprised of resident birds in the project study area. Red wattled lapwing, Black Bittern, Cattle egret, River Lapwing, Common Sandpiper and Little cormorant are the frequently sighted bird species near waterbodies in the study area. etc. Other common bird species sighted during survey area Large-billed crow, House crow, Pied bushchat, Black drongo, House sparrow, Common myna, Brown rock chat, Brahminy starling, Grey wagtail, Bay-backed shrike, Laughing dove, Spotted dove, Asian green bee-eater, Red-vented bulbul, Indian Peafowl, Greater coucal, etc.

Butterflies: A total of 8 species of butterflies belonging to 2 families and 1 species of dragon fly were recorded from the surroundings of proposed project area.

Herpetofauna: During the survey, Stream frog (*Amolops Formosus*), Oriental Garden Lizard (*Calotes versicolor*), Common Dotted Garden Skink (*Lygosoma punctata*) and Indian Softshell Turtle (*Nilssonina gangetica*) were the species sighted in the area. Based on sighting and information available from secondary literature a list of 15 species has been prepared.

Fish fauna: During sampling *Labeo rohita*, *Catla catla*, *Cirrhinus mrigala* and *Oreochromis mossambica* were captured from Hivra Nadi. Major species cultured in reservoirs/tanks and ponds are Catla (*Catla catla*), Rohu (*Labeo rohita*), Mrigal (*Cirrhinus mrigala*), Grass

carp (*Ctenopharyngodon idellus*). Apart from the reservoir fisheries, commonly found fish species reported from the natural drainages in the study area are *Channa punctate*, *Puntis ticto*, *Puntis stigma*, *Labeo rohita*, and *Oreochromis mossambicus*.

Conservation Status: As per “The Wild Life Protection Amendment Act, 2022”, 8 species of mammals, 2 species of avifauna and 5 species of herpetofauna reported from the study area are listed as Schedule-I.

IUCN Red List of Threatened Species Version 2022-2, categories Sambhar Deer (*Rusa unicolor*), Sloth Bear (*Melursus ursinus*) Common leopard (*Panthera pardus*), Indian Python (*Python molurus*) and Tilapia (*Oreochromis mossambicus*) are the species under the Vulnerable (VU) category. Stiped Hyena (*Hyaena hyaena*), Bengal Monitor (*Varanus bengalensis*) and River Lapwing (*Vanellus duvaucelii*) are the species listed under Near Threatened (NT) category. Indian Softshell Turtle (*Nilssonina gangetica*) is under Endangered category.

3.11 Proximity to Protected Area

There is no notified Protected Area is in the vicinity of the proposed Nayagaon Pumped Storage Project. All project components are outside the boundary of Wildlife Sanctuary and notified Eco-Sensitive Zone (ESZ) boundary. Nearest Protected Area to the proposed project is the Gautala Autramghat Wildlife Sanctuary situated in Aurangabad and Jalgaon Districts of Maharashtra and extends over an area of 260.61 sq km. Its nearest boundary is about 11.50 km from nearest proposed project components.

3.12 Social Environment

Greenko Energies Pvt. Ltd., (GEPL) has proposed to develop Nayagaon PSP falling within The villages near to the project area are Nayagaon, Wadi Sutonda, Jangli Kotha, Palashi, The majority of the project study area falls under Soegaon and Kannad tehsil in Aurangabad district of Maharashtra.

The demographic profile of the 8 surveyed villages shows that these villages comprise 3638 households with a total population of 17415 of which 9084 are males and 8331 are females. The sex ratio is 917 females per thousand males.

The total Scheduled Castes (SC) population in the project/surveyed area are 1387 which is 7.96% of the total population with 739 SC male & 648 SC female. The total Scheduled Tribes (ST) population are 2281 which is 13.09% of the total population with 1180 ST male & 1101 ST female.

In the surveyed area, there are 10843 literates which constitute 71.54% (above 6 years old population), among the male literacy rate is 81.93% and the female literacy rate is 60.08%.

Agriculture is the main occupation of the people in the area with 91.88% of the total working population engaged in agriculture and allied activities, while 0.95% is engaged in Household industries service and about 7.16% in other works. Among major field crops, cotton, Maize, Pearl millet, Pigeon Pea, Sorgham are the crops shown during Kharif season while during Wheat, Sugarcane, Chickpea, Gram, Sunflower are rabi season crops. Mango,

Sweet orange, Custard apple, Pomegranate and Sapota are the main horticultural fruit crops while the main vegetable crops are Potato, Tomato, Onion, Cauliflower etc. Medicinal and Aromatic plants cultivated in the area are Ginger and Turmeric are an important agricultural produce cultivated in the area.

Open well, Tube well and Hand pump are the main source of drinking water around upper reservoir area located on the hill, while around lower reservoir most of the houses have tap water facility at their residence in the study area. Almost all the villages are electrified in the area for domestic as well as agriculture purpose. Villages in project area are connected with the roads which are black topped (pucca) or gravel (kaccha) road. The transport and telecommunication facilities are fairly good in the study area.

3.13 Historical, Religious and Archaeological Importance Places

Among the historical places Sutonda Fort and Jain caves also known as Jagonmaiche Gharte are in the area. Both the places are in Wadi Sutanda Village near Nayagaon hemlet. The Sutonda Fort and Jain Caves do not fall under the Archaeological Sites of Archaeological Survey of India (ASI). Both the historical places are outside the impact zone of project. Every village in the vicinity of the project area has a few cultural or religiously significant locations, such as temples, mosques, etc.

4. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

4.1 Ambient Air Quality

Construction Phase Impacts: The air environment around project site is free from any significant pollution source at present. The sources and activities that might affect air quality in the project area during construction phase are vehicular traffic, material handling and storage, dust arising from unpaved village roads, construction activities including operation of construction plant and machinery and domestic fuel burning.

Additionally, construction activities including operation of crushers, concrete batch plants, construction work and movement of vehicles along unpaved road will generate dust & gaseous emission and impact air quality. The burning of waste will also affect air quality. In absence of proper fuel, construction workers at the project site may use wood for fuel burning and space heating. This will also impact air quality. Therefore, needs to be managed properly.

Operation Phase Impacts: In pumped storage projects, no impacts are envisaged on air environment during operation phase.

4.2 Noise Environment

Construction Phase Impacts: Noise in and around the construction site may affect the wildlife in the nearby areas. Sources of noise will be increased vehicular traffic due to project construction on approach roads and at construction sites. Due to construction activity in the area, noise levels will increase during the period of construction, however, they will remain limited to the work area. Other sources of noise and vibration will be the operation of various equipment and use of explosives for blasting purposes for construction activities.

Operation Phase Impacts: No major impacts are envisaged on noise environment during project operation phase.

4.3 Water Environment

Construction Phase Impacts: Water is used in construction activities leading to wastewater generation with high suspended solids. Similarly, effluents due to washing from truck or equipment etc. would have high concentration of oil and grease. Assessment of quantum of wastewater from such activities is difficult, however, they can impact the nearby water bodies if surface run off with high suspended solid is discharged into them.

Domestic wastewater will be generated from project and worker's colony to be set up during construction phase, which can find its way to river/ ground water without any treatment will cause significant impact on water environment therefore needs to be managed properly.

Operation Phase Impacts:

The project envisages creation of two artificial reservoirs viz. upper & lower, upper reservoir is located on hill plateau, while the lower reservoir is located across seasonal nala. The alteration of water flow and downstream discharge may have impact on water quality and habitat of aquatic fauna. The alteration of the habitat would bring changes in physical, chemical, and aquatic life. To maintain the downstream discharge in the natural course of the river, inflows and outflows at same level shall be maintained as the required water for operation of project from nearby Hivra Nadi.

During operational phase only a small number of O&M staff will reside in the area in a well-designed colony with sewage treatment plant and other infrastructural facilities, the problems of water pollution due to disposal of sewage are not anticipated. The treated sewage will be reused for gardening and green belt around the colony.

4.4 Land Environment

Construction Phase: The following positive impacts are anticipated on Land environment during construction phase:

- **Impact due to Land Requirement and change in land-use:** Major impact of land acquisition is permanent change of land use, which is irreversible impact. These impacts cannot be mitigated; however, compensation in terms of implementation of Compensatory Afforestation Plan, Biodiversity Conservation Plan, Green Belt Development Plan, etc. will help in managing and reducing the magnitude of such impacts.
- **Impact Due to Muck Generation:** Muck generation, transportation and disposal can significantly impact the land environment, if not managed properly.
- **Impact due to Waste Generation:** The main sources of waste generation can be categorized as:
 - i. Municipal waste (includes commercial and residential wastes, excluding industrial hazardous wastes and bio-medical wastes)

- ii. Construction and demolition debris (C&D waste)
 - iii. Bio-medical waste
 - iv. Hazardous waste (generated from construction machinery and equipment)
 - v. e-Waste (computer parts, Printer cartridges, electronic parts, etc.,).
- **Impacts due to Road Construction:** The impacts likely to accrued because of the construction of the roads and widening of roads cause loss of vegetation cover and geological changes.

4.5 Impacts on Forests and Forest Land

For the proposed project 333.35 ha of forest land will be diverted for the construction of various project components. This shall lead to loss of vegetation cover of that area. This impact will be mitigated by implementation of Compensatory Afforestation Plan, Green belt, Biodiversity Conservation and Wildlife Management Plan, etc.

4.6 Flora and Fauna

Construction Phase

Impact on Terrestrial Flora: Increase in human interference could have an impact on terrestrial ecosystem. The workers may cut trees to meet their requirements for fuelwood, construction of houses, furniture etc. *Tectona grandis* and *Terminalia tomentosa* are the important trees species in the area. Thus, it is necessary to provide alternative fuel, training and awareness, community kitchens, fencing of critical areas, maintain cooking fuel supply and adequate surveillance to mitigate the adverse impacts on terrestrial flora during project construction phase.

Impact on Terrestrial Fauna: Loss of forest cover leads to loss of wildlife habitat. Also, during the construction period, large number of machinery and construction workers shall be mobilized, which may create disturbance to wildlife habitat in the vicinity of project area, however, these will be temporary and last during the construction period. To minimize the impact of wildlife habitat around the project area, Biodiversity Conservation and Wildlife Management Plan, including conservation Plan of Schedule-I species has been proposed in Environmental Management Plan.

Operation Phase

On completion of the construction of the project, the land used for construction activities will be restored. Construction workers who have resided in that area will move out of the project area. Operation phase impacts on flora and fauna will be positive due to green belt development, restoration of construction areas, etc. Increase of greenery in the area and creation of reservoir will have positive impact on faunal species.

4.7 Socio-Economic Environment

a) Positive Impacts on Socio-Economic Environment

- The following positive impacts are anticipated on the socio-economic environment of the villages in vicinity of project area during the project construction and operation phases:

- i) A number of marginal activities and jobs opportunities with employment with contractors, new market ventures, etc. would be available to the locals during construction phase.
- ii) Developer bringing large scale investment to the area will also invest in local area development and will benefit the locals. Education, medical, transportation, road network and other infrastructure will improve.
- iii) The availability of alternative resources provided by developer in the rural areas will reduce the dependence of the locals on natural resources such as forest.

b) Negative Impacts on Socio-Economic Environment

- i) Loss of agriculture land have impact on social environment of the area. While the loss of land will be compensated but the loss of natural habitat will lead to human wildlife conflict by means of damage of agriculture crops and loss of livestock.
- ii) Villagers in the area also depend on forest resources for their day-by-day needs, other than fodder and fuel, villagers also collected NTFP like Behda (*Terminalia bellirica*), Saja (*Terminalia elliptica*), Amla (*Phyllanthus emblica*), Tendu (*Diospyros melanoxylon*) leaves & fruit, Bamboo, etc. from the forest area. Scrub forest in the area is also used as grazing land for livestock's. Loss of forest and grazing land have impact on social environment of the area.
- iii) This influx of people in otherwise isolated area may lead to various social and cultural conflicts during the construction stage. Therefore, provision of permits/ restrictions will be imposed on movement of labours.
- iv) Increased incidence of Diseases.

5. MITIGATION MEASURES FOR AIR, WATER AND NOISE POLLUTION

The proposed project involves construction of dam, powerhouse, reservoir, roads, and other associated infrastructure in a period of 3.5 years. Major construction activities have potential of pollution generation as discussed above. Impacts arising out of construction activities can be mitigated significantly by taking appropriate mitigation measures, as discussed below.

Control of Air Pollution: For the control of air pollution during construction phase of the project, it is suggested that it should be made mandatory for the contractor/s engaged in the construction works to ensure the implementation of pollution control measures as per CPCB guidelines with regular monitoring of ambient air quality in the project area. Vehicles should have valid PUC and all project roads should be metaled.

Control of Noise Pollution:

- Diesel Generator sets are to be placed in acoustic enclosures to reduce the noise.
- Proper and regular maintenance/lubrication of machines should be done.
- Noise producing machines (such as crushers, aggregate processing plants, etc.) should be provided with sound barriers.
- Quieter machines and vehicles with high quality silencers should be used.
- Ambient noise should be monitored periodically at different locations.

Control of Water Pollution:

- Provision of septic tank/ soak pit of adequate capacity for labour camp.
- Commission of suitable treatment facilities to treat the sewage generated from the colony & offices.
- Oil interceptors/ catchers will be provided and residue of petroleum products, batteries, e-wastes, etc. will be disposed in accordance with SPCB guidelines.
- Provision of sedimentation cum grease traps to prevent entry of contaminants to the water bodies.

A lump sum budget of **Rs. 25.0 lakh per annum** for period of 4 years has been proposed for the mitigation measures for control of air, noise and water pollution during project construction phase.

6. ENVIRONMENTAL MONITORING PROGRAMME

Environmental Monitoring shall be performed during all stages of the project (namely: construction and operation) to ensure that the impacts are no greater than predicted, and to verify the impact predictions.

The monitoring will be carried out by an NABL accredited laboratory during the project construction phase or extended if the project construction period gets extended. The monitoring program for the proposed project will be undertaken to meet the following objectives:

- To monitor the environmental conditions of the project area and nearby villages.
- To check on whether mitigation and benefit enhancement measures have actually been adopted and are proving effective in practice.

A total of **Rs. 154.72 lakh** have been allocated to implement various activities envisaged under Environmental Monitoring Programme during construction stage of the project.

7. RESETTLEMENT & REHABILITATION PLAN

For the development of Nayagaon PSP, land requirement has been worked out as 529.32 ha. Out of which 333.35 ha is forest land and 195.97 ha is non-forest land. The project villages comprise of Nayagaon, Wadi Sutonda, Jangli Kotha, Palashi, Banoti, Ghorkhund, Gondegaon villages of Soegaon Tehsil and Wadhod village of Kannad Tehsil of Aurangabad District, Maharashtra.

Of the total non forest land required for the project, 170.25 ha constitutes private land and 25.72 ha constitute Government land. The Government land identified for the Project will be transferred to the project from the competent authority as per the laid-out process.

The 170.25 ha of private land proposed for procurement belongs to a total of 448 land owner nuclear families. Of the total land owners 403 are project affected families and 45 are project displaced families.

Private land identified for the project will be acquired as per the **Section 2 and Part (a) of Sub-Section 3** of The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act (RFCTLARR), 2013.

8. Public Consultation

Draft EIA report and its Executive Summary in English and vernacular language (Marathi) will be submitted to Maharashtra Pollution Control Board to initiate the process of Public Hearing (PH).

9. LOCAL AREA DEVELOPMENT FUND

The aim of Local Area Development Activities is focused sustainable development to improve the quality of life of neighborhood communities through equitable and proactive smart initiatives in spheres of education, health, rural development, environment, and livelihoods resulting in improvement of the overall social and economic conditions of locals as well as improvement of environmental conditions of their surroundings.

Based on the local consultations in project affected villages, the focus areas covering many important components of the sustainable development such as social, economic, livelihoods and environment will be identified and set of development activities shall be proposed under each focus area for the benefit of the local people under the Project. An amount of **Rs. 15.00 crore** has been earmarked for local area development activities.

10. PROJECT BENEFITS

Employment Generation: Nayagaon PSP is planned to be completed in 42 months, at the time of peak construction work in the project, around 6000 persons may be engaged. Out of 6000 nos. the majority of about 2000 nos. will be from the local population/surrounding Villages and balance persons of about 4000 nos. will be skilled /semiskilled from other area. Then after commissioning of the project, about 300 persons will be required for operations, which might be from local areas or migrated from another area.

In addition, the project would lead to creation of direct and indirect employment opportunities as new factories would come up in and around the project due to reliable power supply/availability, contract works for the locals during construction and operation phase, etc.

Local Area Development: Total project cost is Rs. **9564.31 Cr.** (with IDC); an investment of this magnitude in the area will improve the local infrastructure in the region. The amount of **Rs. 15.00 crore** has been earmarked for local area development with a view to improve the quality of life of local residents in the project vicinity especially for those whose land will be acquired for the project construction. They will have opportunities for skill development, education, better medical and health care, improved local infrastructure, etc.

11. ENVIRONMENTAL MANAGEMENT PLAN (EMP)

Based on baseline status of physical, biological and social environment and impacts predicated due to construction and operation of proposed project, management plans has been prepared to mitigate and minimize the impact. To ensure the successful implantation of the proposed management plans a project level Environment Monitoring Cell (EMC) will be constituted. The committee would coordinate with stakeholders for effective implementation of all environmental safeguard measures prescribed in the EMP &

conditions stipulated with environment and forest clearance of proposed project.

Based on baseline status of physical, biological and social environment and impacts predicated due to construction and operation of proposed project, management plans has been prepared to mitigate and minimize the impact. To ensure the successful implantation of the proposed management plans a project level Environment Monitoring Cell (EMC) will be constituted. The committee would coordinate with stakeholders for effective implementation of all environmental safeguard measures prescribed in the EMP & conditions stipulated with environment and forest clearance of proposed project.

11.1 Catchment Area Treatment (CAT) plan

The Catchment Area Treatment (CAT) plan highlights the management techniques to control erosion in the catchment area of a water resource project. The life span of a reservoir is greatly reduced due to erosion in the catchment area. Adequate preventive measures are thus needed for the treatment of catchment for its stabilization against future erosion.

Purpose of the study is preparation of CAT plan for the Catchment Area of Nayagaon Pumped Storage Project. Since the project involves construction of two different reservoirs therefore catchment area of both the reservoirs has been considered as study area. The total catchment area of both the reservoirs is 11.20 sq km. The overall objectives of watershed management under CAT Plan are to:

- increase infiltration into soil;
- control excessive runoff;
- manage & utilize runoff for useful purpose.

The catchment area treatment involves:

- Understanding of the erosion characteristics of the terrain and,
- Suggesting remedial measures to reduce the erosion rate.

The estimated cost of implementation of CAT plan including monitoring and evaluation is **Rs. 34.32 lakh.**

11.2 Compensatory Afforestation Plan and Net Present Value

The Nayagaon PSP being constructed in the jurisdiction of Aurangabad Forest Division in Aurangabad District, Maharashtra. The total land required for the construction of proposed project activities is 529.32 ha with 333.35 ha of forest land and 195.97ha as non-forest land.

The Compensatory Afforestation is proposed to be undertaken on non-forest land identified in consultation with the State Forest Department and District administration. The estimated cost of the Compensatory Afforestation Programme with the cost of non-forest land acquired for afforestation programme is **11,167.225 lakh.** This is a budgetary estimate, and the actual cost will be determined by the forest department during the Forest Clearance (FC) process.

Forest in the project area fall in the Eco Class III as being of type Tropical Dry Deciduous Forests with open forest type, therefore NPV @ Rs. 9,57,780/ha would be required to be

deposited in the Compensatory Afforestation Fund. The total cost of NPV has been estimated as **Rs. 3192.76 lakh**.

The total cost of the compensatory afforestation plan, NPV, compensation of trees and cost of damage to fence and infrastructure is **Rs. 14,359.975 lakh**.

11.3 Biodiversity Conservation & Wildlife Management Plan

Keeping in view of the anticipated impacts of proposed project on the biodiversity of area, the mitigation measures suggested for biodiversity conservation and wildlife management plan and conservation of Schedule-I species are as follows:

- i. Habitat Improvement of Schedule-I species through conservation and preservation of natural habitats in project surrounding
- ii. Anti-Poaching measures
- iii. Training Programme for Techniques of faunal species Rescue
- iv. Prevention of Forest Fire
- v. Creating all round awareness regarding conservation and ensuring people's participation in the conservation efforts and minimizing human wildlife conflict.

The total budget allocated focusing on Biodiversity and Wildlife Conservation and Management Plan including conservation and management measures for Schedule-I species is **Rs 198.50 lakh**.

11.4 Fisheries Development Plan

Fishing is one of the occupations under the allied sector of Agriculture of the area as well as in state. The proposed project has not any impact on habitat of fish fauna. However, considering the fact that fisheries as an important source of income for the people in the area, the Fisheries management has been proposed under this plan. Proposed Fisheries Development Plan has been prepared with the following objectives:

- Conservation, Management and Stocking by Enrichment of riverine fish fauna
- Strengthen of fishing techniques and skills of fishermen/ women societies
- Upgradation of existing Govt. Fish farms.

The total budget for implementation of Fisheries Development Plan has been proposed as **Rs. 61.00 lakh**.

11.5 Muck Management Plan

The construction would involve about 9.08 Mcum cum of soil and rock excavation. About 6.36 of rock excavation is expected to be used for producing coarse and fine aggregate for concrete production and in fillings for developing areas for construction facilities. Considering the swelling factor of 40% for excavated material, the total quantity of muck to be disposed is worked out as **3.81 Mcum**.

The entire excavated material is proposed to be dumped in two locations i.e, Muck disposal Site-1 and Site-2 having area of 15.0 ha and 10.0 ha respectively which can accommodate more than 5.65 Mcum. The estimated cost of the relocation and rehabilitation of excavated material will be **Rs. 1441.55 lakh**.

11.6 Landscaping and Restoration of Construction Sites

During construction phase of the project, number of temporary construction sites and working areas will come up. For the restoration of proposed project affected areas to its original landscape as much as possible and retain its aesthetic values. Various engineering and biological measures will be implemented for the restoration of proposed project affected areas. The estimated cost of restoration of construction is **471.75 lakh**.

11.7 Sanitation and Solid Waste Management

Solid waste generated from temporary and permanent colonies in construction as well as operation phase requires special management for disposal. The project authorities will ensure sewage generated from labour colonies and site office is treated and disposed as per the CPCB guidelines. It is proposed to provide adequate septic tanks with soak pits for treatment and disposal of sewage. Various aspects of solid waste management include:

- Reuse/Recycling
- Storage/Segregation
- Collection and Transportation
- Disposal

The waste generated from the project area will be collected, segregated and disposed off in line with the provisions laid down in Solid Waste Management Rules, 2016. The total budget in order to manage the solid waste generated from this population, has been proposed as **Rs. 505.80 lakh**.

11.8 Public Health Delivery System

Project construction and operation will bring about several changes in the socio-economic environment of the area including increased threats to health of the community.

- i. New Diseases due to Migratory Population
- ii. Chances of increase in water borne diseases as malaria, and dengue are high
- iii. Chances of increase in respiratory troubles due to increase in suspended particles during the construction phase.
- iv. Chances of occurrence of gastroenteritis, cholera and typhoid in the labour camps.

Medical services at secondary level play a vital and complimentary role to the tertiary and primary health care systems and together form a comprehensive district-based health care system. Following activities are proposed:

- Ambulance: 2 no. with all the basic Medicare facilities and small DG set, etc. to cater for villages in the project area.
- Budget for running the ambulances including driver, fuel and maintenance for 4 years.
- First aid posts (03 nos.) including sheds, furniture and basic equipment.
- Budget for running the first aid post including cost of medico, para-medico/Nurses and attendant, consumables, etc. for 4 years.
- Budget for strengthening existing medical facilities.
- Budget for Health Awareness/ Vaccination Camps for 4 years.
- Mitigation measures to avoid spread of COVID19 among workforce.

Budgetary estimates for public health delivery system to be implemented have been

worked out as **Rs. 353.00 lakh**.

11.9 Energy Conservation Measures

The existing facilities will become insufficient for supply of kitchen fuel for the migrant population during the construction of the project. Therefore, the project authorities would make adequate arrangements such as Community kitchen, Supply of Kitchen fuel, efficient cooking facilities and solar lantern either directly by developer or through contractor to reduce the pressure on natural resources in the project area and minimize impacts on this count. A total budget of **Rs. 969.00 lakh** have been proposed under Energy Conservation Plan.

11.10 Labour Management Plan for their Health and Safety

Construction work has many associated risks and health impacts for the workers who are directly exposed to such health and safety risks. Therefore, there is a need to prepare complete health and safety documents for workers either by project proponent/contractor and proponent shall ensure its implementation. A detailed plan will be prepared covering the above activities before start of construction work. A tentative budget of **Rs. 190.00 lakh** for labour management have been proposed under EMP.

11.11 Green Belt Development Plan

Green belt development will comprise of plantations at various places like periphery of alongside roads, powerhouse area and at different project offices and colonies. The green belt helps to provide habitat for faunal species and capture the fugitive emission and to attenuate the noise generated apart from improving the aesthetics environment in the area. The estimated cost for the plantations and creation of green belt around colony and working sites would be **Rs. 83.45 lakh**.

11.12 Disaster Management Plan

In order to visualize the worst-case scenario Dam Break Modeling exercise was undertaken and an inundation map was prepared. Based upon the outputs generated from this modeling, a Disaster Management Plan has been formulated. This plan presents warning and notification procedures to be followed in case of failure or potential failure of the embankments. The purpose is to provide timely warning to the population likely to be affected and alert key people who have to take respective actions in case of an emergency. The estimated total cost of execution of disaster management plan including the equipment would be **Rs. 350.00 lakh**.

12. SUMMARY OF COST

The capital and recurring costs involved for implementation of Environmental Management Plan for Nayagaon Pumped Storage Project is summarized in **Table 3**.

Table 3: Cost for Implementing Environmental Management Plan

| S. No. | Component of EMP | Capital Cost (Rs. in lakh) | Recurring Cost (Rs. in lakh) | | | | | Total Cost (Rs. in lakh) |
|--------|--|----------------------------|------------------------------|----------------|----------------|---------------|--------------|--------------------------|
| | | | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | |
| 1 | Catchment Area Plan | 34.32 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 34.32 |
| 2 | Compensatory Afforestation and NPV | 14359.975 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 14359.975 |
| 3 | Biodiversity Conservation & Wildlife Conservation Plan | 198.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 198.50 |
| 4 | Fisheries Development Plan | 35.00 | 6.00 | 7.00 | 7.00 | 6.00 | 0.00 | 61.00 |
| 5 | Muck Dumping and Management Plan | 253.20 | 883.35 | 137.00 | 134.25 | 23.50 | 10.25 | 1441.55 |
| 6 | Landscaping, Restoration of Construction Sites | 26.25 | 260.25 | 121.65 | 51.60 | 6.00 | 6.00 | 471.75 |
| 7 | Sanitation and Solid Waste Management Plan | 355.00 | 37.70 | 37.70 | 37.70 | 37.70 | 0.00 | 505.80 |
| 8 | Public Health Delivery System | 145.00 | 52.00 | 52.00 | 52.00 | 52.00 | 0.00 | 353.00 |
| 9 | Energy Conservation Measures | 123.00 | 211.50 | 211.50 | 211.50 | 211.50 | 0.00 | 969.00 |
| 10 | Labour Management Plan | 75.00 | 10.00 | 35.00 | 35.00 | 35.00 | 0.00 | 190.00 |
| 11 | Green Belt Development Plan | 20.00 | 10.15 | 18.20 | 17.10 | 13.00 | 5.00 | 83.45 |
| 12 | Pollution Mitigation Measures | 0.00 | 25.00 | 25.00 | 25.00 | 25.00 | 0.00 | 100.00 |
| 13 | Environmental Monitoring Program | 0.00 | 38.68 | 38.68 | 38.68 | 38.68 | 0.00 | 154.72 |
| 14 | Local Area Development Plan | 0.00 | 375.00 | 375.00 | 375.00 | 375.00 | 0.00 | 1500.00 |
| 15 | Disaster Management Plan | 225.00 | 31.25 | 31.25 | 31.25 | 31.25 | 0.00 | 350.00 |
| | Total | 15850.245 | 1940.88 | 1089.98 | 1016.08 | 854.63 | 21.25 | 20773.065 |

*Cost of CA and NPV shall be finalized as part of diversion proposal.

**Cost of private land acquisition (R&R) will be part of DPR cost.