

EXECUTIVE SUMMARY (ENGLISH)

**NAND PRAYAG - LANGASU HEP(100 MW),
DISTRICT CHAMOLI,
UTTARAKHAND**

**Submitted by:
UJVN LIMITED,
UJJWAL, MAHARANIBAGH, GMS ROAD,
DEHRADUN**

EIA Consultant:



EQMS INDIA PVT. LTD. INDIA

304-305, 3rd Floor, Plot No. 16, Rishabh Corporate Tower,
Community Centre, Karkardooma, Delhi – 110092

Phone: 011-30003200, 30003219; Fax: 011-22374775

Website: www.eqmsindia.com ; E-mail – eqms@eqmsindia.org

EXECUTIVE SUMMARY

1.0 BACKGROUND

Considering the vast and untapped potential and availability, of the hydro resources in India, the development of hydropower projects is required to be explored fully. Power generation from such projects is also comparatively less damaging for the environment. Though power production from hydro resources does have its environmental concerns such as large inundations, disposal of muck and rehabilitation and resettlement (R&R) problems, they can be suitably handled with appropriate plans. e.g. the problem of muck disposal is always resolvable if the restoration of disposal areas is carried out in a scientific way. It would also be appropriate to state here that the problems related to large inundations and R&R issues may be tackled by going in for run-of-the-river schemes in place of large reservoir schemes as the quantum of inundation and displacement will be much less in run-of-the-river scheme projects.

2.0 NEED FOR THE PROJECT

The need for the Nandprayag-Langasu HEP, installed capacity 100 MW, in the middle reach of the Alaknanda Basin, has therefore been considered in context of power shortage in the Northern region in general and in the country as whole. The project has been conceptualized as a run-of-the-river scheme, as most of the state's HEPs are R-O-R type, the power shortage is less in summer months compared to winter months when the discharges are strikingly at the barest minimum. The project presents itself as techno-viable and an attractive scheme for statutory clearance and development.

3.0 LOCATION AND APPROACH

The Project Site is located on NH-58 (New Delhi-Badrinath) almost midway between Karanprayag and Nandprayag in district Chamoli of Uttarakhand State and is about 190 Kms from the nearest railhead Rishikesh. The nearest airfield Jolly Grant is about 210 km from the barrage site. The geographical location of the diversion site for the scheme is at Longitude 79° 18' 28" E and 30° 19' 43" N whilst the Power House is at longitude 79° 16' 31" E and latitude 30° 17' 39" N. The barrage site is approachable from NH-58 (Delhi-Badrinath Road) upto Nandprayag and thereafter by Nandprayag – Devikhal – Gopeshwar district road. The power house site can be approached from NH-58 via link road from village Uttaron by crossing river Alaknanda through suspension bridge near village Jillasu. The vicinity map of the project is shown in **Figure 1.1**.

4.0 PROJECT FEATURES

The proposed Nandprayag Langasu Hydro Electric Project comprises the following structures:

- 162 m wide gated barrage comprising of one under sluice (11.6 m wide) and 7 barrage bays of 18m width each with crest level at 845 masl and 847 masl respectively designed for 10923 cumec.
- Two Intake structure with 3 bays of 5m each with crest level at El. 847 m for 322.15 cumec design discharge
- Two number of D-shaped 7 m diameter Feeder tunnel.

- 4 number desilting chamber to exclude silt particles >0.20 mm.
- 3.2m diameter, 1300m long flushing tunnel with design discharge 18 cumec.
- 9 m diameter D-Shaped, 4.812km long Head race tunnel for design discharge 268.46 cumec.
- 18 m diameter, 64 m high surge shaft.
- 5.1m internal diameter pressure tunnel
- Surface Power House of 76.0 m (L) x 21.75 m (W) x 39.9 m (H)
- 105.44 m long tail race channel.

The layout plan of the scheme is shown in **Figure 1.2**.



Figure 1.1 : Vicinity Map of the Project

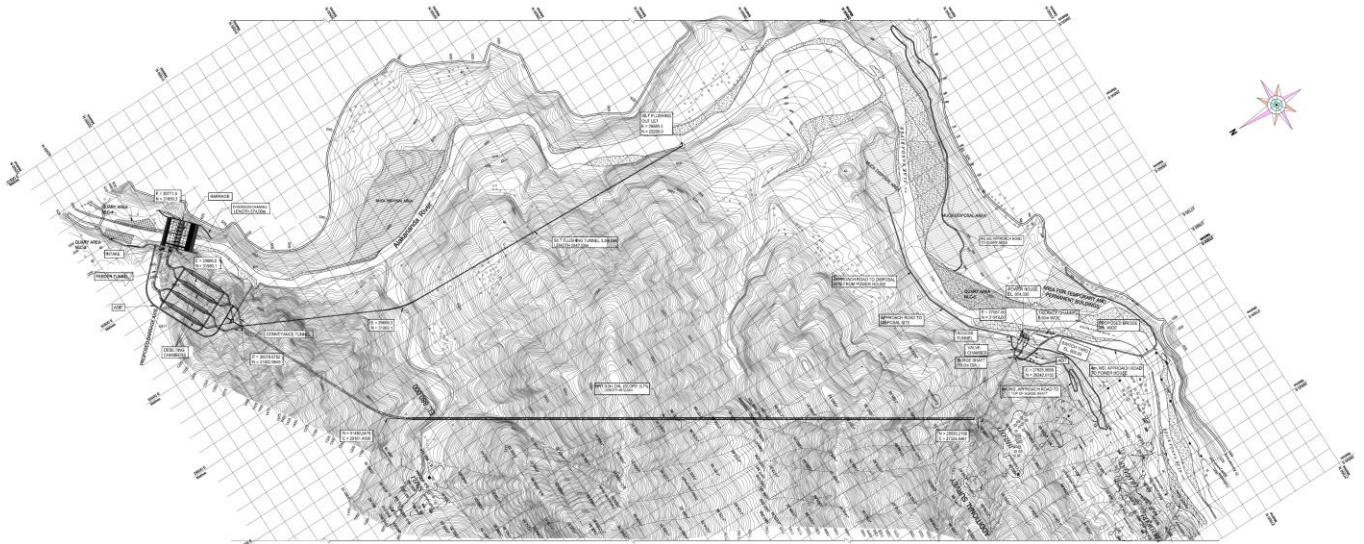


Figure 1.2 : Layout Plan of Project

5.0 ENVIRONMENT IMPACT ASSESSMENT

The EIA study was awarded by the project proponent to EQMS India Pvt. Ltd., who have conducted the Environment Impact Assessment study, as per ToR issued by the MoEF&CC, New Delhi, vide letter no. J-12011/36/2010-IA-I dated 21-10-2010 (100 MW). Environment Management Plans have been formulated on the basis of the findings of EIA study.

6.0 EXISTING STATUS OF ENVIRONMENT

6.1 Physical Environment

The study area lies in Western Himalayas in physiographic province of Garhwal Himalayas in District Chamoli of State of Uttarakhand. Chamoli district lies in the northeastern part of Uttarakhand state. The study and catchment area is having variable physiography, climate, geology, slope, soil types and land use/land cover. The rocks occurring in the Project area and around it belong to the Garhwal Group of rocks of Palaeoproterozoic age. As per seismic zoning map of India (IS 1893:2002), the study area falls within Zone V.

6.1.1 Climate

The climate of the area is generally temperate and varies with elevation. It is warm in summer, humid in monsoon and cool in winter months. The winter months are from December to March. The summer or pre-monsoon months are from April to May. The monsoon months are from June to September. The post monsoon months are from October to November. The cold weather is characterized by cloudless day and very cold night with much fog and dew.

The mean annual precipitation at Chamoli is 1225 mm. The maximum and minimum temperature recorded are 31.7 °C and -1.6 °C respectively. The relative humidity of the area varies from 30 to 95%. Winds are generally moderate and lies in the range of 1-19 km/hr. during the season.

6.1.2 Landuse/Land Cover

The land use pattern of the study area shows that the predominant land use pertains to Dense and open forest followed by agricultural and settlement. (Table 1.1)

Table-1.1: Land Use Details of the Study Area

Class Name	Area (Sq km)	% of total Area
Dense forest	189.99	45.9
Open forest	153.37	37.1
Agricultural land	50.32	12.2
Agri. Fallow land	3.65	0.9
Settlement	10.78	2.6
Water body	5.62	1.3
Total Area	413.73	100

6.1.3 TOTAL LAND REQUIREMENT FOR CONSTRUCTION OF THE PROJECT

For execution of the project 89.174 ha land of three Tehsils of District Chamoli, shall be required of which the private land to the tune of 10.411 ha from shall be acquired from five villages viz. Langasu, Uttaron, Kandasu (Nandprayag), Masson and Jilasu. The rest of the land shall be forest/van panchayat/civil soyam and state land.

6.1.4 ARCHAEOLOGICAL / HISTORICAL MONUMENTS/SENSITIVE AREA

No archaeological monument of national importance either lies in the project area or in its submergence area. No National Park, Sanctuary, Defense Establishments, Archeological Monuments, Notified Eco-sensitive areas or protected area under Wild Life (Protection) Act exists within the project area or within 15 km distance from it. Nandadevi Biosphere Reserve is about 28.5 Km away from the barrage site

6.1.5 SOIL QUALITY

The soils of study area are mountainous soil and the soil texture is sandy loam. The soil pH ranges from 7.20 to 8.01, thereby indicating the soil is neutral to slightly alkaline. The Organic Carbon content of soil varied from 2.2% to 3.5%, thereby implying that soils are high in organic content. The soils are low in available nitrogen content; medium to high in available phosphorus; low in potassium content.

7.0 AIR AND NOISE ENVIRONMENT

The pollutant concentration in the air is well below the permissible limit as there are no industries in the area and the density of vehicular traffic is not alarming. The noise monitoring shows that day and night time noise levels are higher at barrage site and near power house site due to flow of river. The noise level is within the prescribed limit in all the monitoring stations except barrage and power site.

8.0 WATER ENVIRONMENT

The quality of surface and ground water is generally good. pH varies from 7.21 to 7.78 and Dissolved Oxygen varies from 7.8 to 10.2 mg/l in surface water samples. This indicates that surface water is good for aquatic life. The other parameters are also meeting the requirements of drinking water quality standard except the bacteriological parameters in surface water samples.

9.0 STATUS OF BIOLOGICAL ENVIRONMENT

9.1 FOREST AND FOREST TYPES OF STUDY AREA

The study area falls under two forest divisions; right bank of river comes under Kedarnath Wildlife Forest Division whereas the left bank comes under Badrinath Forest Division. The forests present in study area belong to Tropical Dry Deciduous Forests (Group 5), Himalayan Moist Temperate Forests (Group 12), Subtropical Pine Forests (Group 9), Himalayan Dry Temperate Forests (Group 13), Sub Alpine Forests (Group 14), Moist Alpine Scrub (Group 15) and Dry Alpine Scrub (Group 16)

9.2 FLORA OF THE STUDY AREA

The floristic and faunal study have been carried out at 9 locations. A total of 154 plant species were recorded in the study area belonging to various taxonomical groups viz. Angiosperms (137), Pteridophytes (4), Gymnosperm (1), Lichens (5), Orchids (4), and Fungi (3).

Tree species of *Pinus roxburghii* and *Albizia lebbeck* were the two most important species in terms of Importance Value Index (IVI) along with the fellow important species like *Quercus leucotricophora*, *Bombex Ceiba* and *Sapium insigne*.

Eupatorium adenophorum, *Woodfordia fruticosa*, *Lantana camara*, *Euphorbia royleana*, and *Rubus ellipticus* were the important shrub species at different sampling locations. In herb flora, *Ageratum conyzoides* and *Parthenium hysterophorus* showed the great ecological amplitude and regenerative potential. *Ageratum conyzoides* showed its presence in the eight sampling locations followed by *Parthenium hysterophorus* with five sampling locations. *Artimesia capillaris* and *Urtica dioica* were the other species which showed higher IVI values at different sampling locations.

9.2.1 Economically Important Flora

The Economically important plant species observed in the study area are *Dalbergia sissoo*, *Pinus roxburghii*, and *Toona ciliata* are the major timber species whereas *Albizia lebbeck*, *Pinus roxburghii*, *Rhus parviflora* and *Grewia optiva* are the potential fuelwood species

The important fodder species recorded at lower elevation areas are *Celtis australis*, *Grewia optiva*, *Arthraxon lancifolius* *Chrysopogon gryllus* and *Thysanolaena maxima*
The frequently used medicinal plants in the study area are *Asparagus racemosus*, *Zanthoxylum armatum*, *Abrus precatorius*, *Achyranthes aspera*, *Senecio nudicaulis*, *Solanum nigrum* and *Sonchus asper*. Some medicinal plants, like *Berberis aristata*, *Bergenia ciliata*, *Hedychium spicatum*, *Micromeria biflora*, *Valeriana jatamansi* are also present in the study area.

9.2.2 Endemic and Rare and Endangered (RET) Species

During the course of primary survey, no plant species recorded as threatened in the study area. Only one species, *Zanthoxylum armatum* and *Valeriana jatamansi* were found in primary study.

9.3 FAUNA

While spotting the faunal components of the catchment area nearly 13 mammals, 29 birds sp. (1 migratory), 11 butterflies spp. belonging to 5 families, 7 herpetofauna spp. and 15 fishes spp. have been present (primary and secondary information). 6 species from 3 families of phytoplankton were found in primary study. 4 species of zooplanktons belonging to 2 taxa and 7 species of Periphyton belonging to 3 families were recorded.

10.0 SOCIAL AND CULTURAL BACKGROUND OF THE AREA

10.1 DEMOGRAPHIC PROFILE AND LITERACY RATE OF THE STUDY AREA

As per the Census of India 2011, the total population of the project affected villages comprising of 730 households aggregates to 2947 of which male and female population is 1487 and 1460 respectively. The overall sex ratio is 991 females per thousand males, however the sex ratio for SC and ST population is 1026 and 1111 females per thousand males. The cast – wise composition of the total population of the project affected villages is made up of SC (26.3%) and ST (6.7%) while the General Category is (70%). The literate male and female in the study are 1193 and 1020 which implies that the literacy rate is 75.1%. It is revealed that the main workers are 580 (19.69%) and marginal workers are 651 (22.1%) respectively of the total population while the remaining 58.21% constitute non-workers. Agriculture is the main source of income and employment as more than 75% of the population directly or indirectly derive their livelihood from it.

Table 1.2 Demography of Project Affected Villages

S. No	Village	Tehsil	No. of Household	Population									Sex Ratio
				Total	Male	Female	SC Male	SC Female	ST Male	ST Female	Male lit.	Female lit.	
1	Mason	Chamoli	121	508	250	258	17	20	41	50	205	176	1032
2	Nandprayag NP Ward-2		130	481	259	222	81	78	47	53	200	158	857
3	Girsa	Pokhri	116	543	270	273	81	86	0	0	234	188	1011
4	Jilasu		99	414	204	210	96	83	0	0	151	132	1029
5	Uttraon	Karanprayag	175	636	329	307	73	91	2	5	269	235	933
6	Langasu		89	365	175	190	34	34	0	0	134	131	1086
Total			730	2947	1487	1460	382	392	90	108	1193	1020	991 (average)

10.2 Village-wise Project Affected Families

The village-wise details of project affected families and total private land to be acquired in the village is shown in **Table 1.3**.

Table 1.3: Categorization of Project affected families

S. No.	Village	Tehsil	No. of Household	No. of PAF	Land to be Acquired (ha)
1	Mason	Chamoli	121	45	0.46
2	Nandprayag NP Ward-2		130	44	2.68
3	Girsa	Pokhri	116	-	-
4	Jilasu		99	75	5.483
5	Uttraon	Karanpraya g	175	55	1.363
6	Langasu		89	11	0.425
Total			730	230	10.411

11.0 IDENTIFICATION, PREDICTION AND EVALUATION OF IMPACTS

11.1 IMPACTS ON THE MICRO-CLIMATE OF THE AREA

Due to construction activities there shall be temporary and nominal effect on the ambient temperature and humidity. The operation stage of a hydroelectric project with small reservoir and underground water conductor system shall not create any impact on the meteorology and climatology of the area.

11.2 CHANGE IN LANDUSE / LANDCOVER

Construction Phase

- For construction of the project about 89.174 ha land will be acquired from private owners, revenue and forest department. Out of this the forest and agriculture land coming under submergence shall have their landuse class changed to water body.
- The landuse class of forest land and agriculture land required for project components and internal roads shall have landuse class changed to builtup area.
- The landuse class of forest land required for quarry sites shall remain unchanged.
- The present landuse of private land involved in quarry sites/muck sites shall permanently change into forest landuse after completion of the work and creation of vegetal canopy by way of plantation over the spoil tips.
- The landuse category of agriculture land acquired for construction of buildings shall change to land use category settlement.
- The landuse class forest in respect of forestland required for underground components will not cause any change in the present land use.

Operational Phase

- During the operation phase no change in land use is expected. Many of the redundant areas having no further usage will be brought under plantation.

11.3 SOIL EROSION AND SILTATION

Construction Phase

- Soil erosion due to excavation of different components of the project, construction of roads and dumping of muck into disposal yards will accelerate soil erosion.

Operational Phase

- Soil erosion due to project activities will not exist in the operation phase as the construction would be completed and landscape restoration work would also be implemented.

11.4 IMPACT ON GEOLOGY

The intensity of anticipated environmental impact on geology of the area will be weak and extent of anticipated impact will be local. No impact is anticipated on the geology of the area during the operation phase.

11.5 IMPACT ON HYDROLOGY

Impact on the Surface and Ground Water Hydrology: - The water requirement during construction shall be met from surface water sources at different locations besides using the seepage water from tunnel. This will ensure that there is no excessive water demand on any single water resource point. Further the existing drainage system in the area will not be modified or affected during the construction phase. Hence, the intensity of anticipated environmental impacts is judged as low, based on environmental value and degree of disturbance.

11.6 ENVIRONMENTAL DEGRADATION DUE TO LABOUR IMMIGRATION

During the construction phase congregation of approximately 1200 workers is likely to take place in the project area, which will increase pressure on land and water resource.

11.7 IMPACTS ON AIR & NOISE ENVIRONMENT

Temporary changes in air quality during construction phase are expected due to emission of fugitive dust emission from excavation and hydrocarbons from vehicles and gases from blasting operations. Temporary increase in noise levels are expected during construction phase only. The ambient air quality and noise level during the operation phase are not expected to deteriorate as there shall be no additional source for pollution.

11.8 IMPACTS ON WATER ENVIRONMENT

Construction Phase

- The river water on d/s of barrage is supposed to catch considerable amount of sediment. The silt laden water emanating from open air works, underground works and from the foundation works of power house, however will require sediment extraction before releasing the water into the river section.
- The muck disposal yards, quarry areas would be the areas of concerns for leaching of sediments during rains.
- The discharge coming out of batching and crushing plants would also bring considerable sediments in water due to washing of plants and aggregate material.
- The sewage generated at the labor camps and other residential areas may also bring considerable pollutants to river sections, if disposed of in the river section without treatment.

Operation Phase

- The water environment in general will not deteriorate d/s of the power house owing to project being a run-of-the-river scheme whereby the abstracted water will be continuously used for power generation and released simultaneously.
- Due to abstraction of water from intake for power generation, the 7 km reach of the river d/s of barrage shall have reduced discharge. The river course will have a minimum environmental flow of 3.7 cumec released downstream of barrage site for downstream riparian use of d/s, during lean months (December-March).

11.9 IMPACT DUE TO CHANGE IN HYDROLOGICAL CYCLE

The quantity of the water abstracted from the river for non-consumptive use of power generation is again returned to the system without any consumption, there shall not be any remarkable change in hydrological cycle in context to the project absolutely.

11.10 IMPACTS ON FLORA

- It is evident from this study that from the submergence and influence zone of the proposed project none of tree species, shrub, herb or any climber or grass species are either vulnerable or endangered except for two species i.e. *Zanthoxylum armatum* and *Valeriana jatamansi*.
- Interestingly the vegetation composition of the submergence zone is also widely distributed in the influence zone in abundance and there will be no significant loss to the habitat. However, any loss of riverine vegetation during the project activity period will be restored in the reservoir periphery in due course of time.
- Floral characteristics especially in the areas where the project components are going to be underground would not change.
- Due to construction of proposed dam, riverine regime of submergence area will change into lacustrine environments.
- The floral abundance of the project area in post construction phase will increase by many folds as the plantation under catchment area treatment, reservoir rim treatment, green belt, restoration and landscaping will be completed.

11.11 IMPACTS ON FAUNA

As the project activity is not going to submerge all the major habitats, there is little concern for these niche birds. There will be no alteration to the existing habitat of endangered and threatened species. There is also no wildlife sanctuary, national park and biosphere reserve near the project area. As the project is having its submergence mostly along the valley section, the project is not likely to be a threat to any of the recorded butterfly species. Increase in temporary stress levels of wildlife during construction phase due to noise, human interference and reduction in present habitat. Threat due to poaching might increase. Due to pond creation, there will be improvement in the habitat for mainly water birds, reptiles, mammals, amphibians and plankton and Improvement in food chain of some reptiles, birds and carnivorous mammals due to creation of reservoir and increase in humidity level. The butterfly diversity in the area would be enhanced as scrub habitat around the submergence will receive substantial amount of moisture, which will help in natural regeneration of forest canopy. Due to fragmentation of river by construction of barrage, the aquatic

life mainly migratory fishes shall be impacted. For spawning movement of fishes through the barrage, a provision for fish ladder (1.2m x 1.2m) has been incorporated into the design of the barrage.

11.12 IMPACTS ON THE SOCIO-ECONOMICS

- Total 5 villages shall be partially affected due to acquisition of 10.411 ha. of agriculture land for project purpose and in submergence.
- Due to acquisition of land 230 families shall be partially affected.
- The livelihood of PAF shall be affected.
- Due to acquisition of village panchayat forest there shall be loss in the grazing land and the PAF shall be impacted on account of it.
- There will be no impact due to the project on the health care facilities, electric supplies, school, fair price shop, as the project proponent shall develop these facilities in colonies for workers and labors.
- Additional infrastructural facilities such as schools, hospital, drinking water, bank etc. will have an access to the project affected people and local population.
- Subsidized gas connections for all project affected families may be provided to decrease the dependency of locals on forest for firewood.
- The project affected people may be provided training and financial help for entrepreneurship development.
- Preferential employment in semi-skilled and skilled categories will enhance the socio-economic status of project affected families.
- Pressure on the existing provincial / state road will increase.
- No cultural conflicts are foreseen due to the migratory labor population having different culture and habits, as they will be largely settled in separate conglomerates having all inbuilt facilities.

11.13 SUMMARY OF POSITIVE AND NEGATIVE IMPACTS

The positive impacts are enlisted below: -

- Power Generation to meet power shortage in Northern grid and country.
- The Employment opportunities to locals
- Benefits to economy and commerce
- Increased infrastructure
- Recreation and tourism potential
- Improvement in environment through implementation of CAT, Compensatory Afforestation, Green belt Development and different other plans

The negative impacts are-

- The loss of agriculture land and consequent decrease in production
- The change of river status from riverine to lacustrine regime
- The loss of forest due to construction of barrage and appurtenant works and due to submergence in reservoir.
- Likely decrease in agriculture and horticulture production due to air pollution in construction phase
- Temporary disturbance to the fauna of the study area during construction phase.

12.0 IMPACT MANAGEMENT

In order to ameliorate the negative affects of the project construction and overall improvement of the environment following management plans are formulated for implementation concurrent to the project construction. The cost of the management plans is shown in **Table 1.4**.

Table 1.4: Summary of Total Cost Estimate

S. No.	Plans	Cost (Rs. Lac)
1.	Catchment Area Treatment Plan	2281.00
2.	Green Belt Development Plan	23.00
3.	Compensatory Afforestation Scheme	365.00
4.	Bio-diversity and Wildlife Conservation plan	110.00
5.	Fisheries Development and Management Plan	95.00
6.	Resettlement & Rehabilitation Plan	1630.00
7.	Fuel Management and Energy Conservation Measures	224.00
8.	Muck Disposal Plan	694.00
9.	Barrage Break Analysis and Disaster Management Plan	55.00
10.	Restoration and Landscape and Restoration Plan of working areas and quarrying sites	41.00
11.	Public Health Delivery System	69.00
12.	Sanitation and Solid Waste Management Plan	268.00
13.	Water & Air, Noise Management	122.00
14.	Forest Protection Plan*	0.00
15.	Reservoir Rim Treatment Plan	42.00
16.	Human Resource Development and Skill development plan	570.00
17.	Environment Monitoring Plan	65.00
18.	Environment Management in Road Construction	55.00
Grand Total		6709.00

N.B. :

* The cost of forest protection plan is already included in cost of Catchment Area Treatment Plan and thus not included in the Grand Total.