

EXECUTIVE SUMMARY

INTRODUCTION

M/s Sai Spurthi Power Pvt. Ltd. (SSPPL), Bangalore is a private company involved mainly with the activities of civil construction, has business interest in developing mini hydel schemes in Karnataka. Government of Karnataka (GoK) has approved a mini hydel project across Arkavati River.

SSPPL intends to set up this mini hydel project with 10.25 MW (2x4.5 MW & 1x1.25 MW) capacity across Arkavati river near Churchidoddi Village in Kanakpura Taluk of Bangalore Rural District in Karnataka. The project called, Churchidoddi Mini Hydel Project (CMHP), has been allotted to SSPPL by Government of Karnataka (GoK) vide its allotment order GO No. 304/NCE/2002 dated 12/12/2002.

PROPOSED PROJECT

The proposed mini hydel project intends to utilize the flows in the Arkavati River and a gross head of around 109 m available in the river for power generation. This is a run-of-the-river type project. The river water will be diverted by constructing a diversion structure across the river, to run three turbines of which two with a capacity of 4.5 MW and one with a capacity of 1.25 MW respectively. After power generation the water will be released back into the river. The generated power will be evacuated from the powerhouse to the substation located at Haribole village, which is about 16 km from the project site. It is understood that the annual generation capacity will be 42.5 Mu.

OBJECTIVES

The proposed CMHP is expected to achieve following major objectives and benefits.

SATISFYING POWER DEMAND IN THE REGION

The proposed power project is designed to generate 10.25 MW of electric power, which can be utilised to partially satisfy the increasing power demand in the region.

LOWER COST FOR POWER GENERATION

The proposed project is a mini hydel project with simple design of turbines, generators and civil works. Also, it does not involve use of any fuels such as coal, natural gas or naphtha which need substantial expenditure towards their procurement (indigenously or import) and transportation. As a result, the cost of generation of power will be much less compared to thermal power.

MINIMAL ENVIRONMENTAL IMPACTS

Hydropower is a free gift of nature – clean, economical, perennial and renewable. The small hydel projects are considered to have minimal impacts on the surrounding environments due to small area of submergence, no

gaseous emissions and solid waste generation such as fly ash. Hydro power plants are simple to operate and easy to maintain.

SOCIO-ECONOMIC BENEFITS

Setting up the proposed hydel project will provide direct employment to local persons helping to better the socio-economy in the area. Also, during the construction phase, approximately 50 temporary labours will be employed for a period of about 20 months, thus providing a direct employment benefit to the area. Moreover, indirect employment will be generated due to the power project in view of creation of secondary supporting job opportunities.

PROJECT SITE LOCATION

The site of the proposed mini hydro scheme is located across Arkavathi River about 20 km from Kanakapura town and about 80 km from Bangalore. River Arkavathi is one of the major tributaries of River Cauvery. It originates in Nadidurg Hills of Kolar District and flows in Doddaballapura, Nelamangala, Magadi, Ramanagaram and Kanakapura taluks of Bangalore District before joining the main River Cauvery at Sangam which is located about 9 km downstream of the proposed project site. Kumadavathy, Marinalla, Vrishwabhavathi and Suvarnamukhi are some of the important streams that join River Arkavathi along its course. In addition to a number of tanks in the catchment, three reservoirs have been constructed in the upper reaches at Hesaraghatta, Tippugondanahalli and Manchenabale in the catchment.

The geographical coordinate of the project site is Latitude 12°21'N and Longitude 77°26'E.

The project site is about 80 km from Bangalore by road. It can be accessed by road by NH 209 up to Kanakapura town then by road, which leads to Sangam. There is no approach road to the project site. However, the nearest road is a village road at a distance of around 0.5 km. The nearest railway station is Bangalore. The Bangalore Airport is the nearest airport to the project site.

ALTERNATIVE SITES CONSIDERED

Hydel project is a site-specific project for the following two major reasons.

- There should be sufficient flow of water in terms of discharge and head in the stream to generate power throughout the year.
- The project site should be located in a river valley as it is an ideal site for construction of diversion structure.

The proposed project site at Chunchidoddi satisfies the above criteria. In addition, the site offers following advantages.

1. The height of the diversion structure is kept to a minimum (average height 4m above the riverbed) to minimise submergence of land behind the structure. The normal water spread is well within the riverbed. Thus, there is no submergence of private or forest land as well as no displacement of population.
2. There is no submergence of private or forest land under the project and hence nil/minimum impact on the economic and ecological status of the area.

3. There is availability of required infrastructure facilities near the project site.
4. No major human habitation in the vicinity. There is also no rehabilitation or resettlement of any human habitation.
5. There is availability of a flat terrain so that there is easier accessibility to the site. These will lead to less excavation of earth.

In view of the above, the proposed project site at Chunchidoddi has been considered appropriate for construction of the mini hydel project.

DETAILS OF THE HYDEL SCHEME

POWER GENERATION

The general layout of the hydro scheme comprises construction of diversion structure to divert water from the river to the adjacent power canal intake structure, power canal and power house. The powerhouse is located on the right bank of the river due to ease of approach and land acquisition considerations. After power generation, flows are released back to the river by a short length of tailrace canal.

The power generated is proposed to be evacuated to Harebole substation located 16 km.

SOURCE OF WATER

Arkavathi River is the source of water for this hydro scheme. River Arkavathi originates in Nandidurga and flows for a total length of 210 km before joining River Cauvery at Sangam, located about 8 km downstream of the project location.

INFRASTRUCTURE FACILITIES REQUIRED

CMHP will require provision of certain infrastructure facilities for carrying out construction, operation and maintenance of hydro power station. The details of such infrastructure works are discussed below.

LAND

Land has to be acquired for the project components and housing for the staff of the project. The total land requirement for the project is 23.5 acres. Nearly 10.5 acres is forest land, 2 acres private land, 10 acres revenue land and 1 acre irrigation land. This land has to be acquired or leased from the respective departments. Forest land will be required to erect transmission towers and powerlines. This will be finalized after the land acquisition is complete.

WATER

Water for construction purpose will be drawn by digging borewells in the vicinity of the project site. Potable water for SSPPL staff and construction personnel can be obtained from borewells.

POWER SUPPLY

Power for construction purpose could be tapped from nearby KPTCL lines. Further, a 160 kVA rated DG Set will act as stand-by when power supply is not available. Subsequently, after commissioning of the hydro scheme, this

DG Set would be used for powerhouse auxiliary requirements whenever regular supply is not available.

MANPOWER

It is understood that 50 temporary labours will be engaged for the construction phase. During the operational phase 12 employees will be required.

APPROACH ROADS

The hydro scheme is proposed to be located on the Right Bank of Arkavathi river. There are private lands on the right bank while the land on the left bank belongs to Forest Department. Except for the proposed diversion structure, intake structure and power canal stretch, approach to powerhouse and tailrace is very difficult in view of the very high and steep banks. Existing road from Churchidoddi village leading to the Picnic Spot has to be extended till the diversion structure.

SERVICE ROADS

New service road has to be constructed for access and maintenance of power canal. From the forebay and the penstock intake, approach to powerhouse and tailrace will have to be a Rail-Trolley-Winch arrangement. Overall, a total road length of about 2 km has to be constructed apart from the Rail-Trolley-Winch arrangement for the 360 m length of penstock from the forebay till the proposed power house involving a gross head of about 100 m.

SITE OFFICES AND QUARTERS

Residential accommodation for staff during construction and subsequently during operation is necessary. Permanent offices of operation staff will be located at the forebay and penstock intake area and if found necessary, some additional buildings such as store sheds and store yards could be constructed in the vicinity of the power house. Actual allocation of space for site offices and quarters would be finalised only after the process of land acquisition is complete.

ENVIRONMENTAL IMPACT ASSESSMENT

SSPPL has appointed Centre of Symbiosis of Technology, Environment & Management (STEM) to carry out a Rapid Environmental Impact Assessment (REIA) study of their proposed Mini Hydel Project near Churchidoddi village. The objective of the REIA study is to identify, predict and evaluate the likely environmental impacts of the proposed hydel project during its construction and operational stages. The REIA study also aims at developing an appropriate Environmental Management Plan (EMP) for mitigating adverse environmental impact of the proposed project, if any.

BASELINE ENVIRONMENTAL STATUS

The Arkavathi River, which flows in the project area, is the main source of surface water. However, the nalas that are also present in the area are seasonal in nature. Water supply in the village is mostly by public taps provided through stand posts and power pumps. There is no industrial activity in the study area. As the village is sloping away from the surface watercourse the wastewater generated is traversing away from the village. The few

houses, which have toilet, have a septic tank for disposal. Hence, the quality of water is expected to be within the acceptable limits.

In order to ascertain the quality of surface water, samples were collected at two locations. Ground water sample was collected at a village borewell.

The results of the surface water quality indicate that the river water is of acceptable limits even though there is washing and bathing practices in the area. Ground water quality is found to within the acceptable limits when compared to the quality limits as prescribed by IS 10500.

AIR ENVIRONMENT

The proposed CMHP is located in a remote scenic location away from any source of air pollution. There are no industrial activities existing in the immediate vicinity of the proposed project site. Also, there are not any major highways near the project site. Hence, the air quality is expected to be within the acceptable limits.

The proposed project uses river water for running the turbines for power generation. The power generation process does not involve any combustion of fossil fuels and hence, there will not be any gaseous emission from the power plant during its operational phase. However, there will be occasional movement of vehicles to & fro from the site. The movement of vehicles may result in dust pollution and vehicular exhaust emissions, which are expected to have insignificant impacts, as this will be a very limited activity.

To establish the baseline scenario of ambient air quality in the study area, the monitoring was carried out at two locations. The results of ambient air quality showed that the ambient air quality at all the monitoring locations in the study area are within the CPCB standards.

NOISE LEVEL

To establish the baseline noise scenario, results of noise level monitoring carried out during the study period at two locations in the study area have been considered. On comparison of the noise monitoring results with the residential noise standards shows that the average noise levels during day-time and night-time at both the monitoring locations conform to the applicable standards.

LAND ENVIRONMENT

The land is an important part of the ecosystem as it supports the vegetation of the area. It is a broken and rugged topography. The general level declines as one moves south towards the Cauvery. The study area is mostly composed of gneisses and granitic gneisses. The soils of the area consists of mostly the red loams and red gravelly sand loams. Typical alluvial soils are absent in the area.

The excavation of land for this project is estimated to be in the order of about 79000 cum. Nearly 64 per cent of this will be excavated for the power canal and 13 per cent of the powerhouse. Nearly 67 per cent of the total excavated earth will be soft rock.

TERRESTRIAL ECOLOGY

Forest

The study area of 10km radius includes small areas of Muguru State Forest in the Southeast, Chikkayalur Reserved Forest beyond Sangam in the south, Schilandvadi State Forest in the West, Munishvarabetta State Forest in the Northeast and Chunchidoddi East Forest on the left bank opposite to the project site.

Flora

The natural vegetation of the area may be broadly grouped into two types: the hilly vegetation, and pond and river-bed vegetation apart from the roadside and avenue trees, which are planted. The vegetation in general is regarded as deciduous jungle type with the exception of the valleys, and a majority of species inhabiting these areas exhibit xeromorphy. Vast areas are covered by thickest of extensive growth of lantana (bonthegalli/rojanhuvu) and other xeromorphic thorny shrubs rendering the impenetrable and forming a most strict feature of the vegetation.

Fauna

As mentioned earlier the study area has small portions of forest. The fauna of the study area comprises of the following animals, birds and reptiles. Domestic animal consists principally of horses, cows, bullocks, buffaloes, sheep, goat, asses, pigs, dogs and cats.

Aquatic Ecology

The study area is not well developed in the field of fisheries. Common carps are the important exotic fishes introduced in the area and the exotic carps. The common carps are the most popular owing to their easy acclimatization, fast growth and self-sustenance in lentic environment.

AESTHETICS

Aesthetics is an important component of environmental quality relating to visual and cultural aspects of natural and man-made structures in the study area. It also predicts the probable environmental impacts on the existing aesthetic quality in terms of issues such as domestic activities at the site, existing landscape, historical and archaeological sites, and picnic spots and visual aesthetics.

Domestic Activities

The main domestic activities at the project site include washing clothes, washing of domestic animals which includes goat, cow, etc, bathing by villagers and grazing by domestic animals which includes goat, cow, etc. Presence of the washing and bathing activities seem to be confined to the 10-30 m downstream of diversion structure area and the upstream area. Grazing Activity was observed in most areas of the site as they fed on the dry natural vegetation present in the area. This activity was also seen on the left bank of the river, which is a forest area.

Existing Landscape

Natural landscape forms another important component of aesthetics as a clean and greener environment is a visual treat. The proposed project is located in a beautiful scenic setting partly in plateau and partly in a valley. There is a Picnic Spot and the river Arkavati meandering amidst the fair dense mixed jungle. The natural beauty of the location can be enhanced by developing a systematic green belt at the facility gelling with the existing landscape of the area.

Historical and archaeological sites

As per the data available and the observations made, there are no places identified as historical and archaeological sites of importance. However since the project is mini hydel so it does not have any adverse effects if at all there exists any sites if importance.

Also, there is a Picnic spot near the project site on the river course usually visited during the monsoon months of the year. In the 10 km radius of the project location, there is a Picnic spot called "Sangam" which is around 35 km from Kanakpura. This is a point where the tributary Arkavathi joins the Cauvery River. This spot is around 18 km from the project site by road.

SOCIO-ECONOMIC ENVIRONMENT

For assessing the baseline socio-economic data, information from secondary data sources i.e. the 1991 Census data has been considered. The 2001 census data has not been published yet however, the present socio-economic status of the study area has also been assessed on the basis of the field observations and interviews during the site visit. . Based on the 1991 census data, total population of the study area is 44851, of which 23790 are males and 21025 are females. Average population density in the study area is approximately 113 persons/km². The overall literacy rate in the study area is 30 per cent whereas male and female literacy rates are 67 per cent and 33 per cent respectively. About 56 per cent of the population is cultivators. Other than these there are 28 per cent agricultural labourers and 16 per cent other workers respectively.

Basic infrastructure facilities such as drinking water supply, electricity supply, transportation were found to be adequately available in the study area. Most of the villages in the study area are served by private medical practitioners. Good medical facilities are available at Dodda Halli (about 9 km by road from project site), Kanakpura (about 27 km by road), and Sathnur (about 25 km by road). Modern communication facilities such as STD telephone are not present in Chunchidoddi village but are available at Shivanahalli, which is about 2 km from the project site.

POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATIVE MEASURES

The impacts on the surrounding environment in the 10 km radial distance of project site during construction and operational stages on various environmental components are also summarized below in Table 1 and Table 2 respectively for ready reference.

Table 1
Construction Phase
Potential Impacts and Mitigative Measures

Environmental components	Potential impacts	Source of impacts	Mitigative measures	Remarks
1. Water	Demand of water supply in addition to extraction from borewells, if required. Local increase in suspended solids	Construction equipment cooling, concrete mixing & curing, cleaning, workers' domestic needs, dust suppression etc. Erosion due to excavation activities	Equipment selection, steam curing, high pressure hose for cleaning. Plantation around site before construction. Scientific Disposal of Excavated material.	Minor negative impact
2. Air quality	Increased SPM concentration in ambient air.	Construction equipment, vehicular traffic, excavation, concreting, etc.	Vehicular check; water spraying for dust suppression;	Minor negative but temporary & localized
3. Noise	Increased noise levels	Construction equipment, various construction activities	Equipment selection & maintenance; usage of ear plugs/muffs by the construction workers	Minor negative impact
4. Land	Construction wastes, unstable slopes, soil erosion	Construction waste	Appropriate waste disposal measures; slope stabilization and greenbelt development.	Minor negative impact
5. Terrestrial Ecology	Impact on top soil & existing ecosystem in the vicinity of the site.	Construction activities	Low noise generating equipment, soil binding vegetation, greenbelt development	Minor negative impact
6. Aquatic Ecology	Loss of habitat, change in flow	Construction activity of power house & penstock	Provision of mesh before the Proposed diversion structure to stop fish from	Short term Minor

Environmental components	Potential impacts	Source of impacts	Mitigative measures	Remarks
		and power canal	passing beyond that point	negative impact
7. Aesthetics	Impact on Picnic Spot	Construction activity of power canal and canal service road	Provision of proper accessibility for the visitor to approach the Picnic spot.	Minor negative impact
8. Socio-economic factors				
• Population	No impact	Construction jobs	Employing local people, Providing proper facilities and community services for the workers	No impact
• Education	No impact	None	Employing local people	No impact
• Employment	Increase in employment opportunities	Construction jobs to the local manual labourers and professionals	-	Beneficial
• Infrastructure facilities & Community services	Medical & transportation facilities	Increased project & social need for infrastructure	-	No impact

Table 2
Operational Phase
Potential Impacts and Mitigative Measures

Environmental components	Potential impacts	Source of impacts	Mitigative measures	Remarks
1. Water	None	None	Minimise water usage by water conservation measures such as reuse of treated sewage for greenbelt irrigation.	No impact
2. Air quality	None	Occasional vehicular movement	Green belt development, usage of good quality fuel	No impact
3. Noise	Increased noise levels but below the prescribed standard.	Operation of noise generating equipment such as turbines, pumps & compressors located within the power plant	These equipment will be provided with noise reduction measures such as acoustic barriers, vibration pads etc. Green belt development. Two door arrangement.	Minor impact
4. Land	None	Project activities	Development of a systematically managed green belt to maintain ecology of the area. Appropriate disposal of solid waste, garbage.	No impact
5. Terrestrial Ecology	Minor loss of habitat, obstruction to animals to access the river.	Project activities	Greenbelt development. Providing suitable access to river for the animals.	Minor negative impact
6. Aquatic ecology	Loss of habitat	Diversion of flow	Provision of appropriate meshing at the beginning of power canal to stop the aquatic species from entering into canal	Minor impact
7. Aesthetics	None	None	Keeping the flow of the water stream free from impediment.	No impact

Environmental components	Potential impacts	Source of impacts	Mitigative measures	Remarks
8. Socio-economic factors				
• Population	Small increase in population.	Direct / indirect job opportunities, secondary services	Employment of local people to the extent possible	No impact
• Education	None	None	Employment of local people to the extent possible	No impact
• Employment	Better employment opportunities	Operational phase direct & indirect project and social requirements	Employment of local people to the extent possible	Beneficial
• Infrastructure facilities & Community services	Improvement in infrastructure requirements	Operational phase project and social requirements	-	Beneficial
• Population displacement and rehabilitation	None	No displacement of population	-	No impact