



KRISHNA BHAGYA JALA NIGAM LIMITED

GOVERNMENT OF KARNATAKA

EXTENSION OF BUDIHAL PEERAPUR LIFT IRRIGATION SCHEME NEAR SIDDAPUR VILLAGE, MUDDEBIHAL TALUK, VIJAYAPURA DISTRICT

DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT FOR CONDUCTING ENVIRONMENTAL PUBLIC CONSULTATION



Schedule 1(c) of EIA Notification, 2006, Category-B1, Command area: 17,805 Ha)
Project Cost: 549.70 Crores (Revised Cost: 697.50 Cr.)
Study period: December, 2020 to February, 2021

Project by
Chief Engineer, Krishna Bhagya Jala Nigam Ltd., O&M Zone,
Narayanapura-585219

Environmental Consultants



**Environmental Health & Safety
Consultants Pvt. Ltd., Bengaluru - 560044**
(QCI-NABET accredited)
Certificate No.: NABET/EIA/1821/SA 0123



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Environmental Laboratory



**Environmental Health & Safety
Research & Development Centre**
Bengaluru - 560010
(MOEF&CC recognized & NABL accredited)

APRIL 2021

Document No. EHSCPL/KBJNL/2020-21/EBPLIS-M

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OF
EXTENSION OF BUDIHAL PEERAPUR
LIFT IRRIGATION SCHEME**

IN

NEAR SIDDAPUR VILLAGE, MUDDEBIHAL TALUK, VIJAYAPURA DISTRICT



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EXECUTIVE SUMMARY

ES 1. Introduction

Extension of Budihal-Peerapur Lift Irrigation Project has been proposed by the Krishna Bhagya Jala Nigama Limited, Govt. of Karnataka to provide irrigation to the drought prone villages for the deprived areas of Muddebihal taluk of Vijayapura district and Shorapur & Shahpur taluks of Yadgir district. The adjacent villages are irrigated with other projects under UKP. There is a representation from local farmers and elected representatives to provide irrigation facilities to the left out area. To eradicate regional imbalance and equitable distribution of water, the proposed project is essential.

The proposed command area is the left out/unserved area between Narayanapur Left Bank Canal and existing Budihal-Peerapur LIS in Shorapur taluk, Yadgir district. The proposed command area taluks (Shorapur Taluk, Shahpur Taluk and Muddebihal Taluk) is severely prone to erratic droughts due to lack of south-west monsoons. The people of the region have no other employment opportunities except agriculture and there is potential land bank to grow suitable crops in the region. Hence, Extension of Budihal-Peerapur LIS provides irrigation thereby stabilizing the agricultural production and providing a much needed relief to the people. Hence, the proposed project has been perceived.

ES 2. Project Description

Extension of Budihal-Peerapur Lift Irrigation Scheme envisaged lifting of 2.22 TMC of water from Krishna River to provide irrigation facility to 17,805 Ha of command area and benefiting 4 villages of Muddebihal taluk in Vijayapura district and 20 villages of Shorapur taluk and 1 village of Shahpur taluk in Yadgir District. The proposed irrigation is for Kharif, Rabi and Bi-seasonal period and the intensity of irrigation is 100%.

The proposed project requires a total of 50 Ha of land and neither involves submergence nor Rehabilitation and Resettlement. Further, there are no Ecologically Sensitive Areas, National Parks, Wildlife Sanctuaries in the command area and no forest land is required to implement the scheme.

The total cost of the project is 549.70 Crores (2015-16 price level) and the administrative approval for the project was issued vide Government of Karnataka Order No. WRD 54 KBN Bangalore dt: 19.11.2020. However, as per the revised estimate, the project cost is Rs. 697.50 Crores (2018-19 price level).

Table ES 1: Salient Features of the project

Type of project	Irrigation
Type of irrigation	Piped irrigation
River	Krishna
Location of Lift Point	Latitude: 16°13'46.69"N and Longitude: 76°19'45.70"E Near Siddapur village, Muddebihal Tq, Vijayapura District
Water Utilization	2.22 TMC
Command Area	17,805.00 Ha
Villages Benefitted	25 villages of Vijayapura and Yadgir Districts
Cost of the Project	Rs. 549.70 Crores (2015-16 price level) Revised cost Rs. 697.50 Crores (2018-19 price level)
Land required for Project	50 Ha.
Forest Land requirement	Nil

Submergence	Nil
R & R	Nil
Power requirement	5.5 MVA, Source: HESCOM
B.C Ratio	1.21
Irrigation intensity	100%
Government order	No. WRD 54KBN Bangalore dt: 19.11.2020

ES 2.1 Water availability

Proposed Extension of Budihal Peerapur Lift Irrigation Scheme pump is located in the backwaters of Narayanapura Reservoir. The annual inflow between Almatti and Narayanpur from 1961-62 to 2013-14 have been worked out by the WRDO considering to existing utilizations as per KWDT – II Final award of 19th October, 2016.

ES 2.2 Command area of the project

Sl. No.	Name of District	Name of taluk	Name of taluk
1	Vijayapura	Muddebihal	Kaerkal, Hagartagi, Bilebhavi, Boodihal
2	Yadgir	Shorapur	Teerth, Maralabhavi, Gulbal, Malnoor, Ramnagar, Ketgin tanda, Kolihal, Gundalgere, Karibhavi, Amlihal, Hoovinahalli, Chikkamadanur, Talhalli, Alahal, Kachapur, Malkapur, Ainapur, Fotepur, Munirbommanahalli, Yaktapur
		Shahpur	Bevinahalli

ES 2.3 Land Requirement

The proposed project requires 50 Ha of land for construction of Intake Canal, Jackwell cum pump house, rising main, Delivery chamber-1 and Delivery chamber-2 and the land will be acquired as per the Right to Fair Compensation and Transparency in Land Acquisition Act, 2014.

ES 2.4 Existing cropping pattern details

The present agricultural practices including the crops grown are tuned to the rainfall regime. The crops grown are Kharif and Rabi crops which are as under. The estimated percentage area of these crops and their corresponding yields are given below.

Table ES 2: Existing cropping pattern in the command area

Season	Crop	Percentage
Kharif	Kharif Paddy	0.4
	Jowar	4.22
	Ground nut	9.7
	Maize	2.04
	Bajra	9.04
	Pulses	11.2
	Other oil seeds	5.7
Subtotal (A)		42.3
Rabi	Wheat	3.2
	Jowar	28.8
	Cotton	18.4
	Onion	7.3
Subtotal (B)		57.7
Total (A+B)		100

ES 2.5 Proposed cropping pattern details

In view of introducing piped irrigation system in the entire command area of 17,805 Ha, the following cropping pattern (for Kharif, Rabi and Bi-seasonal) is proposed.

Table ES 3: Proposed cropping pattern in the command area

Sl.No	Crop Details	Percent (%)	Area (Ha)
Kharif Crops			
1.	Maize (Hy Br)	15	2670.75
2.	Jowar	15	2670.75
3.	Ground nut	20	3561
4.	Sun Flower	5	890.25
5.	Pulses	5	890.25
Sub-Total		60	10,683.00
Rabi Crops			
1.	Local Jowar	10	1780.50
2.	Saf Flower	2.5	445.13
3.	Gram	5	890.25
4.	Sun Flower	2.5	445.13
5.	Wheat	5	890.25
6.	Ground nut	2.5	445.13
Sub-Total		27.5	4,896.38
Bi-Seasonal			
1.	Cotton	5	890.25
2.	Vegetables/Red Gram	5	890.25
3.	Chillis	2.5	445.13
Sub-Total		12.5	2,225.63
Total		100	17,805.00

ES 3. Description of baseline environment

In order to assess the baseline environmental status, command area, 10 Km radius from the main project components were considered and the data was collected during the period of Pre-monsoon (December 2020 to February, 2021) season. In addition to the baseline environmental monitoring, field inspection in the study area, collection of secondary information for all the environmental components and discussions with the officials and local public were conducted by the experts to establish realistic information on the area w.r.t the project.

ES 3.1 Physical Environment

ES 3.1.1 Ambient Air quality

Ambient Air Quality Monitoring was carried out at 2 locations for assessment of the existing status of air environment within the study area. The minimum and maximum level of Particulate Matter $<2.5\mu$ and $<10\mu$ recorded within the study area were in the range of 24.13 to 24.71 $\mu\text{g}/\text{m}^3$ and 71.50 to 72.14 $\mu\text{g}/\text{m}^3$ respectively. The minimum and maximum level of SO_2 and NO_x recorded within the study area was in the range of 4.74 $\mu\text{g}/\text{m}^3$ to 5.11 $\mu\text{g}/\text{m}^3$ and 14.36 $\mu\text{g}/\text{m}^3$ to 16.55 $\mu\text{g}/\text{m}^3$ respectively. As per Air Quality Index, Good and satisfactory ambient air quality can be observed in the study area.

ES 3.1.2 Ambient Noise levels

Ambient Noise Level Monitoring was carried out at 2 locations. The noise level was found to be ranging between 50.84 dB(A) to 51.49 dB(A) during day time and 41.99

dB(A) to 44.31 dB(A) during the night time. The results at all the locations were found to be within the prescribed standards by CPCB.

ES 3.1.3 Surface Water

Surface water sampling was carried out at 4 locations in the Krishna river and the results shows that the pH ranges from 7.80 to 8.26, DO- 4.30 mg/L to 5.30 mg/L, BOD- 3.20 mg/L to 4.00 mg/L, EC- 889.00 $\mu\text{S cm}^{-1}$ to 1157.00 $\mu\text{S cm}^{-1}$, TDS- 574.00 mg/L to 748.00 mg/L, Alkalinity- 168.00 mg/L to 180.00 mg/L, TH- 220.00 mg/L to 420.00 mg/L, Calcium- 56.00 mg/L to 92.00 mg/L, Fluoride- 0.32 mg/L to 0.76 mg/L, Chloride- 94.44 mg/L to 167.89 mg/L, Total coliform - 170 MPN/100 ml to 280 MPN/100 ml, E. coli - 17 MPN/100 ml to 79 MPN/100 ml. Water quality criteria of CPCB shows that, out of 4 samples, 1 sample belong criteria 'D' and 3 samples belongs to criteria 'E'. Therefore, all the water from the above locations is suitable for irrigation purposes.

ES 3.1.4 Ground Water

Ground water sampling was carried out at 5 locations and results shows that the pH ranges from 7.39 to 7.93, Temperature- 23.4- 26 °C, EC- 2143 to 3167, Total Dissolved Solids- 1588 mg/L to 2051 mg/L, Total Alkalinity- 120 mg/L to 320 mg/L, TH- 510 mg/L to 850 mg/L, Calcium-120 mg/L to 200mg/L, Bicarbonates- 120 mg/L Fluoride- 0.61 mg/L to 0.76 mg/L and Chloride- 157.4 mg/L to 487.93 mg/L. All the values are well within the standards (IS 10500:12 second Revision).

ES 3.1.5 Soil characteristics

The soil samples were collected from 10 locations and type of soils is mostly deep black soil, medium black soil & lateritic soils. The black cotton soil is medium to deep. The results of physico-chemical analysis of the soil samples shows that the soil pH values range between 7.12 and 8.75 and most of the values belong to soil reaction index II and III, which shows that the soils of the study area are under the neutral range to Alkaline. The electrical conductivity of the soil samples was observed to be in the range between 221 to 389.7 $\mu\text{S/cm}$. Based on the rating chart of soil tests, all the soil samples belong to normal i.e., salt index I, whereas organic carbon content of soil samples were observed to range from 0.15 to 2.88%. As per the nutrient index, the organic carbon in soil samples was at high level in the study area. Similarly, the available phosphorus values are in low range.

ES 3.1.6 Land use assessment

Land use land cover of the study area of 614 Sq.Km indicates that, the area is predominantly covered with Fallow land (62%) followed by Scrubland (16%) and cropland (12%). Water bodies comprises of (6%).

Table ES 4: Land use / land cover classification in the study area

Sl.No.	Classes	Area in Sq. Km.	Area in Percentage
1	Cropland	72.0	12.0
2	Fallow land	378.0	62.0
3	Current Fallow	21.0	3.0
4	Water body	35.0	6.0
5	Scrubland	97.0	16.0
6	Built-up	5.0	1.0
7	Barren Rock	6.0	1.0
Total		614.0	100.0

ES 3.2 Biological Environment

A total of 20 trees species (n=175) belonging to 12 families were found in Project area (Jackwell cum Pump house, Rasining Main and DC), the predominant tree species recorded are *Azadirachta indica* A. Juss. (n=76), *Vachellia nilotica* (L.) P.J.H. Hurter

& Mabb. (n=28). As per the IUCN conservation status 2021, Species namely *Chloroxylon swietenia* DC., *Santalum album* Linn., are Vulnerable to the region and rest of the species were belongs to Not Assessed and Least concern category. All the recorded species are common to region and no RET species were recorded. Further, a total of 48 avifaunal species (n=586) with the predominant ones being recorded are Brahminy Duck, River tern, Jungle Babbler and little egret. Similarly, Indian grey Mongoose and Indian Palm Squirrel were recorded in the project area.

Similarly, a total Number of 19 trees species (n=222) belonging to 10 families were found in Command area, the predominant tree species recorded are *Butea monosperma*(Lam.) Taub. (n=70), *Albizia amara* (Roxb.) B. Boivin (n=49) and *Morinda tinctoria* Roxb. (n=32). All the recorded species are common to region and no RET species were recorded. A total of 56 avifaunal species (n=613) were recorded at the command area with predominant species namely little egret (n=99), River tern (n=64) and little cormorant (n= 44). As per Wildlife (Protection) act 1972 Black-shouldered Kite and Black Kite were Schedule-I species recorded in Command area.

The study area belongs to Northern Dry Zone and Northern Eastern Dry Zone representing the dry climate with scanty rainfall. No Reserve Forest found within the comamnd area and no Ecologically Sensitive Areas found in the study area.

ES 3.3 Socio-economic Environment

The total land required for the construction of the proposed project components is 50 Ha and the project does not involve any R&R activities. A micro level assessment of the socio-economic environment obtaining in the Project Impact Area (comprising villages and habitations within 10 km radius from the proposed project site) was made through field surveys of 70 households were selected randomly across 7 villages with in the study area, for Household and Focus Group Discussion survey methods. The focus of micro level assessment was on understanding the socio-economic conditions of the households in terms of family size, livelihoods pursued, income and expenditure patterns, housing conditions, education and health status. In addition, impression and perceived both positive and negative impacts of the proposed project was gathered during household surveys and in-depth discussions with key informants.

During the Household and Focus Group Discussion surveys, it was revealed that nearly 90% of the respondents were aware of the proposed lift irrigation project and feels that the project is necessary to fulfill Irrigation needs. Irrigation projects are necessary to uplift standard of living of the people, revives economies and alleviate poverty. The proposed project increasing agricultural jobs, Rain fed lands have been converted into irrigated/wet lands. With rising literacy levels and awareness about growing opportunities, the youth in the area are focused more on non-farm sector and service sector employment. There are however apprehensions about the negative impacts of land acquisition for the proposed project. The perceptions of the respondents in surrounding areas are summarized as follows:

- The groundwater resources in the command area may increase.
- Development of the secondary sector in the area has positively contributed to induced development leading to creation of multiplier self and wage employment opportunities.
- It would help further strengthen infrastructure development in the area.
- Expected high agricultural crop yields and change in existing cropping pattern.

ES 4. Anticipated Environmental Impacts and Mitigation measures

Sl. No.	Environmental attribute	Activity	Impact	Mitigation Measures
1	Air Pollution	Site preparation, construction activities, transportation of raw materials, earth work, DG operation etc.	<ul style="list-style-type: none"> Emission of dust due to site clearance & excavation activities and exhaust gases due to use of heavy vehicles & machinery and unloading construction materials etc. Operation of hot mix plants and DG sets leads to the gaseous emission of high levels. Gaseous emissions from vehicular movements carrying construction materials Dust emissions may cause reduction in growth rate, deposition of dust on leaves, photosynthetic activity, necrosis, leaf curling, abscission, etc. in the plants. Continuous exposure to dust emissions may cause respiratory disorders, eye irritation, cough, chest pain, infections, etc. in human. The typical day Air Quality model output reveals that the predicted GLC for Particulate matter of maximum concentration will be 38.24 $\mu\text{g}/\text{m}^3$ (without mitigation measures) 2.62 $\mu\text{g}/\text{m}^3$ (with mitigation measures). 	<ul style="list-style-type: none"> Water Sprinkling will be carried out thrice a day during non-monsoon season to avoid fugitive dust emissions. In order to avoid fugitive emissions, vehicles delivering loose and fine materials like sand and fine aggregates will be covered by tarpaulin sheets to reduce spills on roads and speed will be restricted to 15-20kmph within construction zone. Periodic maintenance of all vehicles, equipments and machineries used for construction shall be done to ensure that the emissions levels are as per norms of CPCB. DG sets will be engaged in the construction site will comply as per the CPCB guidelines and equipped with suitable stack height. As per KSPCB Guidelines, the hot-mix plants with dust extraction unit will be installed in downwind direction from nearby settlement and located at least 500 m from the nearest habitation. Monthly Ambient Air Quality Monitoring as part of EMoP will be carried out to assess the pollution load during construction phase. Green Mesh will be used to cover debris where ever excavated muck is dumped & demolition activities are carried, to suppress fugitive dust emission. Use of Personal Protective Equipment's (PPE) for all the labor.

Sl. No.	Environmental attribute	Activity	Impact	Mitigation Measures
2	Noise Pollution	Concrete Batch Plant, movement of construction Machinery, movement of vehicles unloading construction materials etc.	<ul style="list-style-type: none"> Construction activities are expected to produce noise levels in the range of 80 – 95 dB (A). Noise generation will be due to pump houses and DG sets during operation which is affecting the health on working and residing population. 	<ul style="list-style-type: none"> Selection of low noise generating machinery/equipment and provided with proper sound proof enclosures. Provision of protective devices like ear muff/plugs to the workers and construction activity will be limited to day time only. The high noise zones at site will be demarcated and provided with enclosures & barriers. Provision of insulating caps and enclosures will be provided at the exit of noise source on the machinery. Construction equipment generating minimum noise and vibration will be chosen Speed limit for vehicles carrying construction materials will be maintained within 15-20 kmph. D.G. Sets with acoustic enclosures complying to Environment (Protection) Rules will be provided.
3	Water Pollution	Improper disposal and management of earth work, debris, sewage from labour camps, waste disposal activities,	<ul style="list-style-type: none"> Impact on ground water (through leachate) and sub-surface soil quality during construction phase will be mainly due to sewage generation from labor camp. Improper collection, handling & disposal of solid wastes from labour camps which also creates unhygienic conditions. Stagnated water in construction sites will result in creation of mosquitoes breeding sites thereby affecting human health. 	<ul style="list-style-type: none"> For the construction worker's temporary sanitation facility will be created for the disposal of sewage generated. Mobile Sewage Treatment Plant will be installed and the treated water will be reused for Sprinkling activities. Waste water generated during construction activities shall be collected in a slump with impervious lining to avoid seepage of wastewater in groundwater. Temporary drainage arrangements will be undertaken around construction spots to avoid stagnation of water. Solid wastes from the labour camps will be segregated into organic & inorganic wastes

Sl. No.	Environmental attribute	Activity	Impact	Mitigation Measures
			<ul style="list-style-type: none"> • Further, untreated sewage creates eutrophication in the reservoir. • Construction of Intake canal, jack well cum pump house and Muck disposal into the river water and washing of equipments leads to increase in turbidity of the water. 	<p>through different coloured bins located at different places within the camps and will be disposed to authorized scrap dealer's/waste recyclers.</p> <ul style="list-style-type: none"> • The muck and other waste will not be dumped on/near the river bank and machines will not be washed near river thereby avoiding entry into the reservoir.
4	Hydrology and Geology	Construction activities	<ul style="list-style-type: none"> • Impact on Geology due to top soil excavation, Blasting of Rock if any in the foundation pits pertaining to Infrastructure Building. • Collapse of blasted portion of rock and fly rock due to blasting anticipated. • Providing irrigation facilities to the 17,805 ha of the command area of Muddebihal Taluk, Shahpur Taluk and Shorapur Taluks enhances the ground water table of the region. 	<ul style="list-style-type: none"> • The collapse can be avoided by formation of benches of 1.5 m to 3.0 m height for working conveniently and making access to sub surface levels for pit formation. • As the underlying rock Granite gneiss which is massive and hard it requires blasting and fly rock is inevitable for which controlled blasting by deploying time delay detonators, placing of moist clay bags. Provision of earplugs and goggles to workmen is suggested. • Catchment area treatment will be planned to enhance the ground water levels and to increase the surface flow.
5	Soil Quality	Land acquisition, removal of vegetation, construction activities, improper storage of muck, labour camps.	<ul style="list-style-type: none"> • Temporary loss of soil will be envisaged during the construction phase near construction site, temporary offices, worker's camps, stockyards, borrow areas, etc.,. • Compaction of soil will occur, particularly on haul roads during site clearance due to movement of heavy machinery and vehicles and during 	<ul style="list-style-type: none"> • Non agriculture land will be chosen for construction of labor camps. • All the existing roads will be upgraded to avoid creation of haul roads. • Maintenance works will be undertaken at the designated construction yards with leak proof polythene as floor material to avoid spillage of oil and any other contamination of soil.

Sl. No.	Environmental attribute	Activity	Impact	Mitigation Measures
			<p>setting up of construction camps and stockyards.</p> <ul style="list-style-type: none"> Contamination of soil will take place due to maintenance of machinery, operation of DG sets, oil spills from the operation of mechanical works, etc., Leaching of solid waste generated from labour camps affects the soil quality. Over usage of water for crops leads to salinity of the soil. 	<ul style="list-style-type: none"> The solid waste generated from the labor camp will be segregated and handover to authorized vendor. The piped irrigation is providing for command area which will not create soil salinity.
6	Solid & Hazardous Waste	Improper storage and management of earth works, sewage and solid waste from labor camps,	<ul style="list-style-type: none"> Construction activities generate wastes such as; excavated earthworks, construction waste, and municipal wastes etc. which causes unaesthetic conditions leading to health problems. Improper disposal of sewage (7.5 KLD) and solid wastes (45 Kg/day) from labor camps area leads to the formation of leachate thereby causing soil pollution, surface and ground water pollution. Indiscriminate plastic waste disposal on land makes the land infertile due to its impervious nature. Used oils generated from DG sets affects soil and aquatic biota upon entry into soil and water environment. 	<ul style="list-style-type: none"> Solid and hazardous wastes generated will be stored in the leak proof bins. Scientific segregation of solid waste at site and regular disposal to Muddebihal landfill. Storage area of 10 x 10 m will be covered with zinc sheets and the ground will be covered with impervious layer to avoid leachate run off. Plastic waste will be segregated at source and handed over to KSPCB authorized recyclers. Mobile STPs are used to treat the sewage generated from labor camps and solid waste generated shall be segregated, stored in separate bins and disposed off to KSPCB authorized disposal sites. The leftovers of welding electrodes and iron components will be handed over to the nearby engineering works centre so as to remould and reuse them for making other iron works.

Sl. No.	Environmental attribute	Activity	Impact	Mitigation Measures
			<ul style="list-style-type: none"> Unused iron and welding electrodes (5% of total steel requirement) is expected during construction activities. Improper handling of these affects surface water quality and aquatic life. 	
7	Land Use	Construction activities	<ul style="list-style-type: none"> The change of land use land cover/topography in the command area is comparatively very less due to its Piped Network project and the maximum project components are constructed below ground level with less construction area. The only above ground structure is Jack well cum Pump house and hence no impact. 	--
8	Ecology and Biodiversity	Construction activities, movement of vehicles	<ul style="list-style-type: none"> Deposition of dust due to construction activities will affect the photosynthetic activities of the vegetation. Construction activities and movement of vehicles creates noise which may affect the behavior of faunal species in the region. The project requires about 50 Ha of land for the construction of project components which also falls in the agricultural land which leads to loss of habitat and affects the behavioral activities of the faunal species adapted to these agricultural lands. 	<ul style="list-style-type: none"> Regular sprinkling of water alongside of construction activity is necessary to avoid dust deposition on the vegetation. Construction activities and vehicular movements will be restricted in day time to minimize the disturbance to the faunal and avi-faunal species resident to the area Agroforestry activities will be done in the command area to enhance the greenery in the region thereby providing the habitat for the faunal and avifaunal species. Awareness programmes and conservation plan for schedule I species will be implemented so as to avoid injuring animals, hunting and poaching activities during construction activities.

Sl. No.	Environmental attribute	Activity	Impact	Mitigation Measures
			<ul style="list-style-type: none"> The excavated earth, much boulders etc., as a routine practice in such locations, is likely to be dumped in close-by area, which may affect the aquatic life – fish species in particular, which migrate to their feeding and breeding formalities. Impacts on Fishes and Aquatic Ecosystem Increase in turbidity of water due to washing of machineries leads to death of aquatic organism. Fish species, as a result of the change in their environment, may get induced to enter the canal for sustenance of their biological processes such as feeding etc. 	<ul style="list-style-type: none"> Proper care will be taken while construction near river bed through utilization of mesh to avoid dust deposition in surface water body In order to prevent the sliding-back of earth, mucks, rocks, etc. into the reservoir area, the generated product are to be safely stacked away from the site at the earliest. Also screens of desirable mesh-sizes depending upon the height and width of the canal and at the in-take be installed so as to prevent movement of fish along with the reservoir water. Limnological and fisheries investigations, for a period of 3-5 yrs be organised to assess the impacts of ecological changes, if any, in order to introduce corrective measures for the over-all sustainable development of the aquatic life prevailing based on the scientific know-how.
9	Social	Land acquisition	<ul style="list-style-type: none"> Project requires acquisition of 50 Ha of land. Livelihood may be affected due to land loss. Improvements in the annual incomes of about 10% p.a in the surrounding areas. The lifestyles changes are expected due to availability of good water source. 	<ul style="list-style-type: none"> Compensation will provide as per 2013 Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act. Creation of employment opportunities for skilled & semi-skilled workers a total 100 nos. during construction and operation phase.

ES 5. Environmental Monitoring Programme

Environmental Monitoring Programme will be carried out during both construction phase (2 years) and Operation phase (3 years) which involves Ambient Air Quality Monitoring, Ambient Noise Level Monitoring, Soil Quality Analysis, Surface Water Quality Analysis, Ground Water Quality Analysis, Aquatic life studies and periodic Health check-ups for labors as per the CPCB guidelines through MoEF&CC recognized laboratories under the supervision of KBJNL. Rs. 49,75,320/- was estimated for environmental monitoring during construction phase and Rs. 23,27,760/- is estimated for operation phase of the project. Other activities include, monitoring of green belt/tree plantation, labor camps, land acquisition, etc.

KBJNL will convene a meeting quarterly once in a year and review the progress of environmental and social mitigation measures including management plans. KBJNL will also review the compliance conditions of various statutory clearances and public grievances. Accordingly, six monthly compliance reports to EC conditions and also to other clearance conditions will be prepared and submitted to Regional Office, MOEF&CC, Bangalore and also to Regional Office, KSPCB on 01 June and 01 December of every calendar year without fail for monitoring of EC conditions.

ES 6. Risk and Hazard studies

This section involves studying the risk and hazards associated with the various aspects of the proposed project such as excavation, accidental falls, occupational hazards, vehicular transportation of chemicals and hazardous materials, blasting, floods etc. during its construction and operation phase.

ES 6.1 Risks and hazards during construction phase

- Flooding due to heavy inflow of water
- Epidemics/ Communicable diseases due to water contamination, by pests, insects, rodents etc. in the construction camp. Animal/snake bites.
- Fires due to Short circuit.
- Leakage of Diesel fuel and flammable chemicals– fire hazard
- Fall from height
- Trench collapse
- Landslides during excavation.

ES 6.2 Mitigation measures to be adopted during construction phase

- Major constructions near the flood prone area i.e. near the reservoir shall be carried out in dry season, Weather forecasting shall be referred before starting the civil and other activities. Storm water drain network shall be maintained
- Drinking water facility shall be made in the camp site. Disinfestation activity will be carried out periodically in the camp site to prevent the entry of pests, insects, rodents etc.
- Permit to work system, deployment of trained and authorized person for the work shall be followed.
- Secondary containment shall be provided in diesel storage area, Sand buckets and spill kit materials such as absorbent rolls shall be provided. Access to the area is provided only to authorized person, Area shall be restricted to carry flammable items
- Lifeline support, height work permit, safety nets. personnel protective equipments
- Ground survey to identify ground conditions in advance of construction works. Benching or battering shall be done, Trench sheets shall be placed on both sides to prevent collapsing

- Excavation work permit will be followed with the measures of installation of ground

ES 6.3 Risks and hazards during operation phase

- Operation of LT and HT power panels.
- Fall from height in pump stations, Jackwell areas.
- Fire in Transformer station and power control room and on site spill of fuel or chemicals used for preventive maintenance.
- Water hammer from the main pipeline after stopping the pumps.
- Noise hazard in pump operation area.

ES 6.4 Mitigation measures to be adopted during operation phase

- Trained person shall be deployed. Presence of electrical safety measures like rubber mats, electrical safety gloves shall be ensured. Approved tools and equipments shall be used to carry out the preventive maintenance of power panels.
- Adequate barricades and use of fall protection measures such as lifeline, harness shall be ensured.
- Periodic preventive maintenance shall be done by trained electricians. Ensure cabling connections are proper and intact. Firefighting equipment shall be provided.
- Surge tanks shall be considered in pipeline design at high points with non-return valves to fill the pipe when under vacuum.
- Use of hearing protection devices shall be ensured, Periodic noise monitoring activity shall be carried out. Medical examination shall be done periodically to the personnel

ES 7. Project benefits

Ecological benefits:

- Agro forestry will be taken up in the command area thereby improving the ecosystem services in the region.
- Improved agriculture attracts various faunal species strengthening the food chain or food web.
- Agricultural development/improvement gives rise to dairy farming.
- Agriculture gives rise to animal husbandry that produces various types of manure which in turn helps in maintain the fertility of the soil.
- Irrigation leads to rise in ground water table that supports the floral growth which attracts the various land animals, Avi-fauna, arboreal animals, small animals etc.
- Irrigation creates the suitable environment for soil microorganisms for their survival and to keep the soil rich in nutrients.

Financial benefits:

- Agricultural linkages will be considerably improved.
- The project improves total farm output and hence raises farm income.
- Project improves yields through reduced crop loss due to erratic, unreliable or insufficient rainfall.

- Extensive agricultural production supplies raw materials to the nearby small scale industries thereby increasing the economy in the region.
- Agriculture leads to the growth of Animal husbandry which creates various job opportunity/ Self-employment.
- The increased economy in the region due to agriculture leads to openings of new Agricultural Produce Market Committee (APMC), Markets and other agriculture based shops.

Social benefits:

- All the households (5,614 Nos.) in the command area will be benefitted directly under the scheme.
- The project requires only 50 Ha of land for implementation of the scheme and the scheme does not envisage any rehabilitation and resettlement.
- Direct employment opportunities for 100 peoples (30 Technical and 70 construction labourers) are expected to get employment during construction phase. During operation phase labourers will be appointed for operation and maintenance of the jack well.
- Implementation of the project enhances indirect employment opportunities for the local people.
- Migration of People in search of job towards urban and cities will reduces and also burden on cities will be reduced.
- The employment increases the socio-economical status of the benefitted villages, which in turn increases the education of children by avoiding discontinuation of schools and avoids child labour.
- Increased crop yield leads to export of agricultural material/products which require transportation facility, hence agricultural growth creates job opportunity in transportation.

ES 8. Environmental Management Plan

Construction Phase Management Plan		
Environmental Safeguards: Water sprinkling, erection of barricades, covering by green mesh/ sheets, Provision of stack and acoustic enclosed for DG.	Land acquisition plan: Land acquisition will be planned in consultation with PAFs as per the provisions of RFC&TLA, 2013.	Reservoir RIM Treatment Plan: Construction of embankment for 500 m on either sides of the intake canal
Muck disposal plan: all the muck generated will be reused for covering the project components, construction of service roads, embankments land levelling and CD Works.	Public health delivery system & labor Management Plan: Provision of Periodical health check-up for labors, medical facilities during emergencies, Creches for labor's Children and provision of Personal Protective Equipments.	Sanitation and Solid waste management plan: Provision of Solid waste and Hazardous waste bins with shed
Energy conservation measures: Provision of solar lighting near Jack well cum Pump House.	Environmental monitoring programme: Monitoring of Air, Noise, Surface & ground water, Soil, Aquatic life and health check-ups.	Air, Noise & Water Management Plan: Barricades, Green mesh PPEs for laborers, Insulation Caps and safety enclosures for machineries, Oil interceptors, Slump with impervious lining to avoid seepage, Installation of STP.
Operation Phase Management Plan		
CAT plan: involves Soil Conservation Practices , Reclamation of salt affected soils, Management of saline and sodic soils and construction of check-dams.	Command Area Development: Development of communication network, Water Users' Association, Training and Agriculture Extension Program.	Conservation of Schedule I species: Awareness programmes regarding importance of Schedule I and RET species.
Agroforestry activities: plantation activities in the command area.	Fisheries Conservation & Management Plan: Stocking of fingerlings and reintroduction of Critically Endangered / near threatened fingerlings	Local area development plan: Up gradation of school furnitures, health centres and Identification of folk, art and cultural activities, Smart classes.
Air, Noise & Water Management Plan: PPEs for laborers, Regular Service and Maintenance of machines, Operation and maintenance of STP.	Environmental monitoring programme: Monitoring of Air, Noise, Surface & ground water, Soil, Aquatic life and health check-ups.	Ground water management plan: measures to avoid salinity in the command area by extracting ground water.

The cost for implementing Environmental Management Plan is Rs. 94,06,16,580/- (Construction phase – Rs. 75,01,83,320/- and operation phase - 19,04,33,260/-).