

**EXECUTIVE SUMMARY OF
DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT**

FOR

**TUBACHI-BABLESHWAR LIFT IRRIGATION PROJECT
AT**

BAGALKOT DISTRICT, KARNATAKA.

PROJECT BY



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1. Introduction

Tubachi Bableshwar Lift Irrigation Scheme is proposed by KNNL to irrigate 42,500 Ha dry lands in 37 villages of Jamakhandi Taluk, Bagalkot District, MoEF issued the TORs for the project vide its Letter dated 22.05.2015 based on which Draft Environmental Impact Assessment (EIA) Report was prepared along with in line as per generic structure in the EIA Notification, 2006 by MoEF, Govt. of India. The said EIA report includes the data on various field studies undertaken by the accredited experts including baseline environmental data collection from the study area during the study period July 2015 to March 2016, in line with the TORs, anticipated impacts (identified, predicted & evaluated) on different components of the environment, delineating specific Environmental Management Plan (EMP) including Environmental Monitoring Programme along with the budgetary provisions to be undertaken by KNNL stating responsibilities of various parallel departments for effective implementation of the same.

2. Project Description

The villages coming under this scheme are poverty offended drought area. Agriculture is the economic activity of the Bagalkot district. The entire district area of Belagavi, Vijayapura and Bagalkot districts are falling under Northern Transitional Zone. This region receives an annual rainfall between 430 to 635 mm. The dominant soils in this region are deep calcareous black soils and very shallow, gravelly and non-gravelly, loam to clayey soils.

Table 1 Salient Features of the project

1	Name of the Scheme	Tubachi-Bableshwar LIS
2	Name of the river	Krishna
3	Geographical Location of Lift point	Latitude – 16°32'07"N Longitude –75°25'23"E
4	Location of the Lift point	Near Old Janawad Village (Kavatagi Village), Jamakhandi Taluk, Bagalkot District, Karnataka
5	Type of the project	Irrigation
6	Estimated cost of the project	Rs. 2488.97 Cr
7	Command Area	42,500 Ha
8	No. of villages benefitting	36
9	Allocated water	107.60 M.Cum (3.8 TMC)
10	Cropping pattern	Kharif(July - December)
11	Irrigation intensity	100%
13	Submergence area	Nil
14	Rehabilitation and Resettlement	Nil
15	Total Land required	105 Ha
16	Total forest land required	0.73 Ha
17	Power Requirement	9 MW, Source – Hubli Electricity Supply Company Limited (HESCOM).

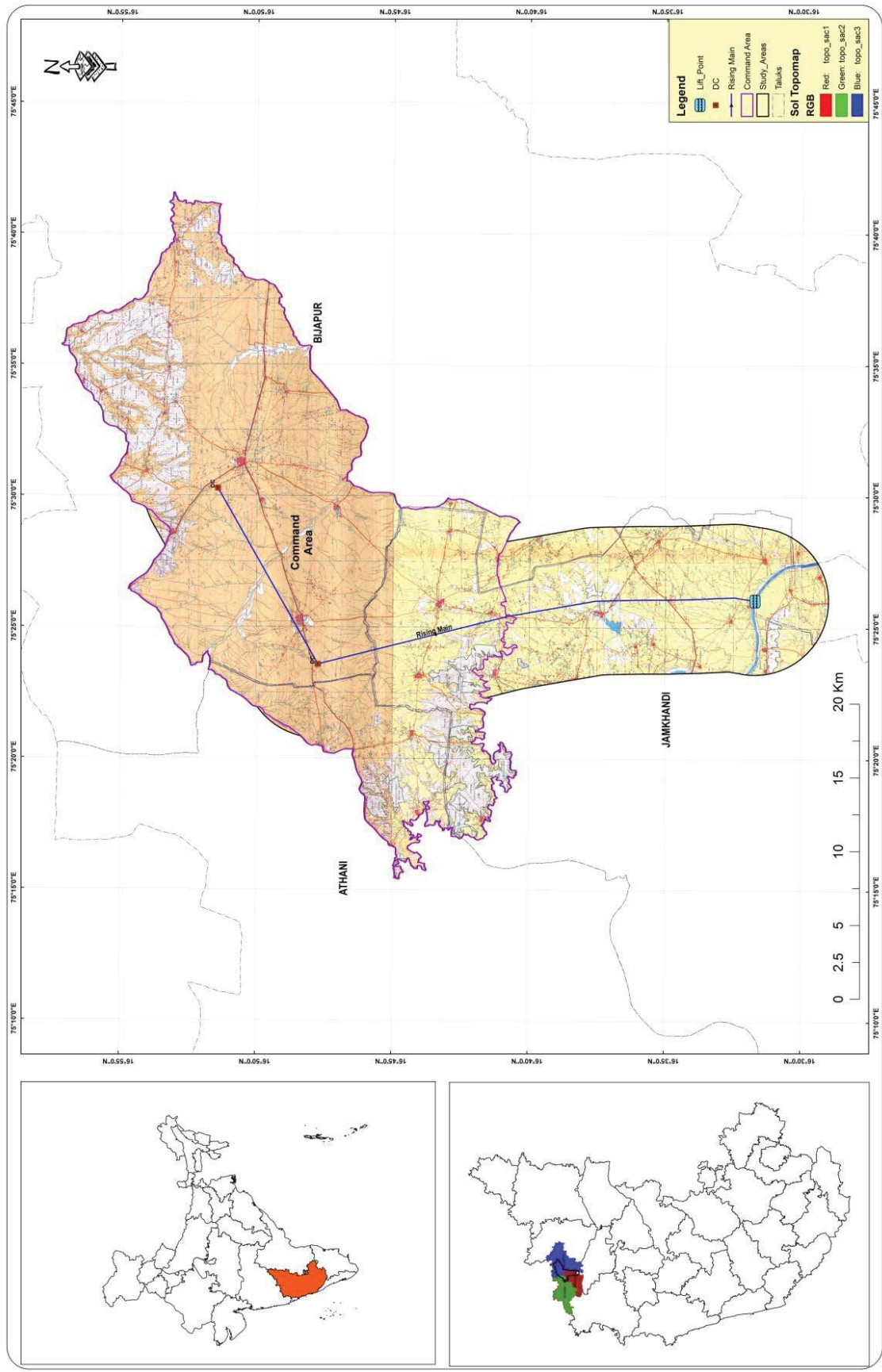


Fig - 1 Location map of the project

2.1 Need for the project

TBLIS is proposed to irrigate dry lands in villages of Jamakhandi, Athani and Vijayapura Taluks. The villages coming under this scheme are drought affected and agriculture is the only source of livelihood and income. The annual average rainfall is 585 mm which is primarily during the monsoon season (June - September). Uncertainty within a year causes the agriculture a risky venture. Therefore, there is a need of the scheme which could benefit the drought affected villages and shall also improve the Irrigation potential and Socio-economic conditions of the above districts.

In this regard, TBLIS is considered to be the feasible for eradication of poverty in the region. The people of the region have no other employment opportunities except agriculture. Hence providing irrigation and stabilizing the agricultural production, provides a much needed relief to the people. It improves the per capita income and standard of living of the people. Further it utilizes the water and land resources and substantially improves GDP contribution from agriculture.

2.2 Water availability

The monthly water availability at the Almatti Reservoir during Khariff season is calculated by taking the average of water yield in the respective month from 1983-2008. The proposed project is planned to utilize water only during June-October. Sufficient flow of around 98% is available for downstream ecosystem services. Hence, there is no impact on Almatti Reservoir due to drawl of water for the proposed project.

2.3 Command area of the project

The command area of 42500 ha is spread across Vijayapura Taluk of Vijayapura District, Jamakhandi Taluk of Bagalkot District and Athani Taluk of Belgaum District. There are 36 villages benefitting under TBLIS. The list of benefitting villages are given below.

Table 2 List of benefitting villages

Sl.No	Taluk	District	Area in Ha	Village Name	No. of Households	Total Population	Total SC Population	Total ST Population
1				Siddapur	228	1208	79	-
2				Bijjargi	1532	8073	1679	27
3				LohagaonTanda	305	1788	542	81
4				Tikota	2235	11984	1626	19
5				Atalattil	570	2943	698	431
6				Babanagar	1103	6084	751	36
7				Kanamadi	1960	10080	1322	270
8				Dhanargi	408	2,162	537	10
9				Hubnur	475	2980	2096	-
10				Takkalaki	277	1357	448	1
11				TakkalakiTanda	-	-	-	-
12	Vijayapura	Vijayapura	29900	Honawad	1845	8942	827	5
13				Somadevanahatti &Tanda	532	3151	1817	1
14				Jalageri	1056	6643	4068	11
15				Itangihal	806	4068	1454	53
16				Dashyal	220	1020	141	0
17				Kotyal	523	2472	197	0
18				Siddapur	719	4400	2214	86
19				Kumate	567	3168	429	0
20				Hossatti	-	-	-	-
21				Ratnapur	450	2444	33	-
22				Itangihal Tanda	-	-	-	-
23				Malkadevanahatti	257	1359	99	89
24				Gothe	1013	5357	875	0
25				Gadyal	664	3598	336	0
26				Kalbilagi	469	2452	247	135
27	Jamkhandi	Bagalkot	8800	Kagbilagi	697	3809	439	1
28				Savalgi	2381	12506	2077	97
29				Kuragod	195	965	5	23
30				Konnoli	661	3815	419	0

Sl.No	Taluk	District	Area in Ha	Village Name	No. of Households	Total Population	Total SC Population	Total ST Population
31				Tungal	1345	7257	1365	5
32				Aratal	570	3236	324	217
33				Badgi	571	2930	245	1
34				Hailali	590	3105	244	17
35				Bannur	285	1553	376	0
36				Telsang	2390	10592	1474	111
			42,500	Total	25509	147501	29483	1727

2.4 Irrigation Planning and structural components of the project

An intake channel (1300 m) is proposed to lift the water from Krishna River. A jackwell cum pump house will be constructed to pump the water to the Delivery chambers through a MS rising main of 30.3 Km length (3.5 m dia). The intake level is kept at RL 525 m. The RL of delivery chamber -1 is kept at RL 682 m and the elevation of delivery chamber-2 is kept at RL 670 m. DC-1 is supplying water for 19600 Ha and from DC-1 a gravity MS rising main of 13.3 Km (2.63 m dia) will be channelized to supply water to DC-2 to cater 22900 Ha of command area. The entire 42500 ha command area will be irrigating under 2 stages.

Table 3 Technical details of the project

A. Lift Location	
Name of the river	Krishna
Lift Point	Near Kavatagi Village, Jamakhandi Taluk, Bagalkot District
Ground Level	RL 625 m
CBL	RL 508.70 m
Delivery Level	RL 682 m
B. Intake Canal	
Length	1300 m
Bed width	3.5 m
Side slope	1:01
Free board	0.6 m
C. Jackwell cum pumphouse	
No. of Pumps	5 + 1 standby
Total Power Requirement	9 MW (12000 HP)
Source	HESCOM
D. Rising Main	
Length	30.30 Km
Diameter	3.5 m
Material	Mild Steel
E. Delivery Chambers	
RL of DC-1	682 m
Dimension	31.5 m x 4 m
Irrigating Area	19600 Ha
RL of DC-2	670 m
Dimension	31.5 m x 4 m
Irrigating Area	22900 Ha

2.5 Land Requirement

The proposed project requires 105.33 Ha for implementation of the project. The land required is only for construction of Jack well cum pump house, Intake canal and Delivery chambers. 0.73 Ha forest land is required for the project for construction of rising main. The required land will be acquired as per the Right to Fair Compensation and Transparency in Land Acquisition Act, 2014.

2.6 Existing cropping pattern details

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

Table 4 Existing cropping pattern in the command area

Sl. No.	Crops	% area	Area in Ha.	Yield Qtl / ha
1	Local Jowar	1.2	123	20
2	Hy. Maize	11.5	1222	30
3	Bajra	3.5	367	24
4	Ground nut	46.0	4885	40
5	Jawar	37.9	4028	20
Total		100	10625	

2.7 Proposed cropping pattern details

In view of introducing Drip Irrigation system in the entire command area of 42500 ha, the following cropping pattern (for Khariff Season) is proposed.

Table 5 Proposed cropping pattern

Sl. No.	Crops	Area in ha	% area
1	Maize	4887.50	11.50
2	Vegetables	8500.00	20.0
3	Jawar	493.0	1.16
4	Ground nut	13166.50	30.98
5	Hy. Jawar	9736.75	22.91
6	Bajra	1466.25	3.45
7	Pulses	4250.0	10.0
Total		42500	100

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 for Monsoon Season (Jul 2015 to Sept 2015), Post Monsoon season (Oct 2015 to Dec 2015) and Summer Season (Jan 2016 to Mar 2016). In addition to the baseline environmental monitoring, field inspection in the study area, collection of primary & secondary information for all the environmental components and discussions with the officials and local public were conducted by the experts.

3.1 Physical Environment

3.1.1 Topography

The area is flat and continuous sloping without undulations towards the Krishna river. The topography of the project area is partly plain and partly sloping. The elevation in the study area ranges from RL 413.00 m to RL 629.00 m.

3.1.2 Ambient air quality

The results of ambient air quality reveal that, PM₁₀ was in the range between 51.3-52.6µg/m³ and whereas PM_{2.5} was in the range between 12-16.1µg/m³. SO₂ and NO₂ are in the range between 3.36-3.53µg/m³ and 11.61- 12.12 µg/m³ respectively. The air quality index in the study area is found to be satisfactory for PM₁₀ and PM_{2.5} and good for gases (SO₂ and NO₂).

3.1.3 Ambient Noise levels

The results of ambient noise levels were compared with Residential standards and results reveal that, the noise levels in the study area ranging from 40.99 - 43.93 d(B)A for day time and 34.06-37.16 d(B)A for night time during monsoon season. The noise levels during Post-Monsoon season is ranging between 50.68-54.86 d(B)A for day time and 41.57 - 43.79 d(B)A for night time and 48.70-50.51dB(A) for day and 37.67-41.14

d(B)A for night time during Pre-Monsoon season respectively. Overall, the noise levels in all the seasons were observed to be well within the CPCB standards.

3.1.4 Seismicity

The proposed project area is located in the Zone-II of Seismic Zoning Map of India. Hence, the area is very less prone to Earthquakes.

3.1.5 Geology and Minerals

The main rock type observed in the command area is Basalt belonging to Deccan Traps of various flows belonging to Upper Cretaceous to Lower Eocene Age. Laterite is observed as patches to a limited extent. Dolomite, Quartzite and Conglomerate of Raidurg Formation belonging to Middle Proterozoic Age are observed in the buffer zone of the lift point.

3.1.6 Soil characteristics

In the study area the soil types found in the command area are predominantly shallow to deep black, moderately well drained, clay soils with slow permeability. vertisol, Entisol and Incept sols are found in the proposed command. The black cotton soil is rich in bases (alkaline condition) and has a very high water holding capacity. Major area of TBLIS is covered by black, clay soils constitute roughly 95 percent, and are shallow to moderately deep (22.5 to 90 cm), clayey, with 45 to 55 per cent clay and contain free calcium carbonate throughout the profile. There is generally a zone of calcium nodules and gypsum in the soil profile at a depth of 45 to 90 cm, the principal salt being gypsum. Below the gypsum layer disintegrated impermeable murrum layer exists, the internal drainage of the soil is lateral rather than vertical within the profile.

The soil types found in the command area are black colored. The study area is experiencing relatively plain not affected by fully erosion in the past, but the analysis indicates that certain areas were with rill and sheet erosion.

3.1.7 Hydrology

The Project site and the command area forms part of the Krishna River Basin. The lift point is over the upper reaches of Almatti Reservoir. This is not in the 10.00 Kms buffer zone of the lift point. Hire Halla, Kud Don Halla, Kunt Don River and Don River are the other major tributaries of River Krishna in the study area. Most of these are seasonal rivers which drain in to River Krishna. Drainage pattern is observed to be dendritic to sub-dendritic with drainage varied density. Dense drainage is observed in the North and Southern portion of the command area while the central part of the command area is occupying sparse drainage.

3.1.8 Surface Water

The baseline status of water quality in the study area was established. Water samples were collected from 5 locations (3 No. surface water & 2 No. ground water) in the study area during the study period.

In Monsoon season, the physico-chemical parameters for Krishna river (upstream, lift point and downstream) are well within the standards. Total dissolved solids in upstream and downstream locations are reporting 182 mg/l and 167 mg/l respectively and whereas near lift point the TDS was observed to be at 178 mg/l. Dissolved oxygen was observed to be in the range of 4.8-5.3 mg/l. Total Coliform and E. Coli were present in all the locations due to improper sanitation facilities.

In post monsoon season, Total dissolved solids at all the locations are considerably increased in post monsoon season compared to monsoon season and reporting

1231–1423 mg/l. Iron was ranging between 0.09-0.15 mg/l. Dissolved oxygen was observed to be in the range of 5.3-5.5 mg/l.

In pre monsoon season, Total dissolved solids at all the locations are considerably regained its situation when compared to monsoon season and ranging 210 mg/l and 264 mg/l at lift point and downstream locations. In upstream location TDS was observed to be 1992 mg/l which is close to the permissible limits. Iron back to the normal situation and well within its prescribed limits. Dissolved oxygen was observed to be in the range of 5.2-7.0 mg/l.

3.1.9 Ground Water

In monsoon season, Total Hardness in ground water was ranging from 300- 716 mg/l and whereas the Nitrate levels are well within the standards. Fluoride levels are ranging between 0.7-0.9 mg/l and E.coli was absent in Honawad and present in Kalbilagi. Heavy metals absent in all the locations. Overall, the ground water quality was found to be good and confirming to IS standards.

In post monsoon season, the ground water quality analysis results reveal that, the Total Hardness was found in the range of 884-972 mg/l.

In pre monsoon season, the Total Hardness was exceeding the standard at both locations i.e., 884 mg/l at Kalibilagi and 972 mg/l at Honawad. Calcium(241.6-273.6 mg/l), Magnesium (68.04-69.98 mg/l) was exceeding the standards. Nitrate was within permissible limit (8.06-8.88 mg/l).

3.1.10 Land use assessment

The results indicate that the core zone is dominated by crop lands followed by forest and water body.

Table 6 Land use / land cover classification in the study area

Sl. No	Land use classification	Area (Sq Km)
1	Agricultural Plantation	7.22
2	Barren rocky/Stony waste	194.61
3	Built-up	6.53
4	Crop-Land	11908.29
5	Eucalyptus Plantation	0.57
6	Forest Blank	2.06
7	Land with/without scrub	10.26
8	Mining/Quarrying	0.16
9	Mixed Forest Plantation	1.88
10	River Island	1.39
11	Scrub-Forest	71.24
12	Water body	340.25
13	Waterlogged	0.47
	Total	12544.92

3.2 Biological Environment

3.2.1 Flora

A total of 177 plant species were recorded in both core and buffer area of the proposed project site. Of which 49 belong to tree species, 19 belongs to shrub species and 109 species belongs to herbs respectively.

Out of the 177 plant species recorded in quantitative study, 3 species one belong to various categories of IUCN. Among these, two are trees and one is herb. We have also grouped *Ficus* species as Keystone species, that means this tree is sacred to local

community, where people worshiping and protecting and promoting in the rural areas.

3.2.2 Fauna

The field sighting and published records for the region indicated that 14 mammals were reported for the region. Of which only jackel is belongs to rare category. There are about 37 birds recorded for the region, which are more common found in outside the project area. There are 11 species of butterflies were observed in core and buffer area of the project. A total of ten reptiles and two amphibians were also observed in the project area. Majority of the fauna recorded or reported for the region were also observed outside the project area in semi-arid region of Karnataka.

3.2.3 Protected Areas

There is no protected areas or eco-sensitive areas within the 10 Km radius of main project components and command area.

3.2.4 Forest land

For construction of rising main, 0.73 ha of forest land is required for the scheme. Necessary application submitted to Karnataka Forest Dept., for diversion of forest land.

3.3 Aquatic Ecology

Detailed Physico-chemical and Biological studies carried-out in the river Krishna, in and around the project site, presents 'optimum' features to support/sustain varieties of aquatic life present. The river is found to be 'free' from pollution threat.

The Plankton community, Phyto- and the Zooplankton constituents, in effect, presented 'low' status, by diversity and numerical density. However, scores of planktivores fish species recorded subsists on the food available presently which, during the prime season(monsoon and thereafter) is likely to improve for the resident and migrating fish germplasm. The littoral fauna also were in 'low' concentrations, constituted by Insects and Molluscs: the latter group had a fairly good representation by Castrapods and Bivalves and members belonging to the Crustacean group.

Fish species constituted by Carps and Predatory fish species presented a 'poor' picture – could be on account of the low-level of water in the river and on-set of lean season when even the fishing activity was quite minimal, as reported. The Immigrant African Catfish ,Clarias gariepinus, recorded in the upper reaches may migrate to other parts of the said lotic water body, may establishes itself dominating the fishery as a whole. The situation is quite alarming which calls for initiating concrete steps for its total elimination from the area/river as such.

Fish stocking and its augmentation has been highlighted which should be taken-up with all sincerity and seriousness in order to enhance the fish production to facilitate scores of local and migratory fishermen to ekk-out their livelihood.

4. Anticipated Environmental Impacts & Mitigation Measures

Due to the activities of the project, there will be potential impacts on the environment of varying magnitude. Most of the impacts are likely to occur during the construction phase of the project. The following section reveals the prediction of impacts due to the project on the physical, biological and social environment. Impacts have been assessed based on the information collected from the primary and secondary data.

4.1 Ambient Air Quality

The construction of the project is expected to last approximately in 24 months. The initial site clearing will be followed by site preparation activities

Fugitive dust emissions from the project will result from:

- Dust entrained during onsite travel on paved and unpaved surfaces;
- Dust entrained during aggregate and soil loading and unloading operations; and
- Wind erosion of areas disturbed during construction activities.

Combustion emissions during construction will result from:

- Exhaust from the Diesel construction equipment used for site preparation, excavation, trenching and construction of onsite structures;
- Exhaust from pickup trucks and Diesel trucks used to transport workers and materials around the construction site;
- Exhaust from Diesel trucks used to deliver concrete, fuel, and construction supplies to the construction site; and
- Exhaust from automobiles used by workers to commute to the construction site.

The following mitigation measures will be followed to control potential emissions of fugitive dust during construction of the project:

- HSD with low sulphur content will be used for the construction equipments/ vehicles which has low ash content.
- Unpaved roads in the project construction site are watered frequently as necessary to prevent fugitive dust. All vehicles carrying construction materials will be covered with tarpaulin to avoid spillage of construction materials.
- All the trucks carrying construction materials to the site shall be inspected regularly and shall have valid Pollution Under Control (PUC) certificate.
- Labors camps shall be provided with LPG facilities.
- Usage of PPEs like nose masks will be provided.

4.2 Ambient Noise Level

During construction phase, various sources of noise pollution arise due to operation of machineries like concrete plant, cranes, batch plants, material lifting operations, communication noise, including DG sets etc., Other source of noise pollution includes movement of vehicles for unloading of construction materials, fabrication, handling of equipments. Construction activities are expected to produce noise levels in the range of 80 – 95 dB (A).

- PPEs such as, ear plugs and ear muffs will be provided to the workers.
- Six monthly maintenance and servicing of construction equipments/ vehicles.
- Acoustic enclosures will be provided for DG sets
- Construction activities shall be restricted only to day time and there will not be any construction during evening and night hours to avoid the psychological effects on surrounding population and biota.

4.3 Water Environment

The quality of water resources both surface and ground water may also deteriorate if solid waste management practices are not adopted in the labour camps of the project during peak construction phase.

Improper treatment of sewage from labor camps leads to infiltration into the subsurface soil and finally affects the ground water of the region. This will create unaesthetic conditions in the site, attracts mosquitoes/fly, thereby chances of deteriorating the health of the workers in unhygienic conditions. Improper disposal of construction debris, used oil, diesel for DG sets, etc will result in ground water contamination and in turn affecting drainage of the area.

The mitigation measures include;

- The sewage generated from the labour camps shall be treated in the Septic Tank and Soak Pits designed and constructed as per IS 2470 Part-I & Part-II.
- There will be no open discharge of sewage from labour camps and the labour camps will be provided with sufficient bathrooms and toilets. Periodical health check-ups for labors will be done.
- Construction debris will be reused at site, used oil generated from the DG sets will be stored separately and handed over to KSPCB authorized recyclers.
- During construction of intake canal, the river course and the point of contact of intake canal will be provided with sand bags

4.4. Land Environment

Temporary loss of soil may be envisaged during the construction phase during construction of temporary offices, workers camps, stockyards, borrow areas etc.

Compaction of soil may occur, particularly on haul roads during site clearance due to movement of heavy machinery and vehicles and during setting up of construction camps and stockyards.

Mitigation measures:

- Labour camps will be constructed in the vacant/ barren lands so that impact on agricultural lands are nullified.
- Maintenance and period repair of machineries will not be taken up in the project site vicinity. Maintenance of DG sets will be done at the vendors place and will not be taken up near project site.

4.5 Biological Environment

- During construction, due to the fugitive dust, photosynthetic activity would be reduced and leads to wilting of plants.
- Use of river water for domestic needs by labors will bear riverine water pollution and affects aquatic biota.
- Use of fire wood for labor camps results in cutting of trees.
- Construction equipment / vehicles washing leads to oil spillages into river and leads to reduction in dissolved oxygen levels.
- Improper disposal of construction materials and domestic wastes leads to eutrophication.

Mitigation measures:

- Compensatory afforestation will be undertaken to for diversion of 0.73 Ha of forest land as per F(C) Act, 1986.
- Periodical water sprinkling in and around the construction areas including access roads to avoid fugitive dust generation.
- Labor camps shall be located 1 Km away from the river course and imposing restrictions for not using the river water for domestic purpose.
- Labors camps shall be provided with LPG facilities.
- Construction equipment / vehicles washing shall be undertaken at authorized service stations.
- Security personnel near river course and sign boards will be erected to educate the labors.

4.6 Evaluation Impacts

Matrix method was used to identify interactions between various project activities and environmental parameters and components. Later, a weightage of 1-10 shall be given to the impacts based on the significance of the impacts. The impacts are quantified 'with' and 'without' EMP. The criteria adopted for weightage are given below;

Table 7 Criteria for evaluation of impacts

Sl.No	Criteria	Score
1	Minor impact	1-2
2	Medium impact	3-4
3	Significant impact	5-8
4	Major impact	9-10

Table 8 Evaluation of Impacts

Sl.No	Environmental Attributes	Project Activities	Nature of Impacts										Without EMP	With EMP		
			Magnitude	Reversible	Irreversible	Long Term	Short Term	Direct	Indirect	Positive	Negative					
A. Construction Phase																
1. Impacts on Land Environment																
1	Land	Construction of Intake canal, jack well cum pump house, sumps, disnets	M	✓				✓	✓	✓			✓	Orange	Green	
		Excavation for laying pipes	L	✓				✓	✓	✓				✓	Green	Green
		Vehicular movement	M	✓					✓	✓	✓			✓	Green	Green
2	Change in Topography	Construction of Intake canal, jack well cum pump house, sumps, disnets	M	-	✓		✓			✓			✓	Orange	Green	
		Excavation for laying pipes	M	✓				✓	✓	✓			✓	Green	Green	
3	Loss of Productive Soil	Construction site, temporary offices, workers camps, stockyards	M	✓				✓				✓		Orange	Green	
		Construction of Haul roads	L	✓				✓	✓	✓			✓	Green	Green	
4	Compaction of Soil	Site Clearance	L	✓				✓	✓	✓			✓	Green	Green	
		Movement of vehicles	L	✓				✓	✓	✓			✓	Green	Green	
5	Contamination of Soil	Machinery and operation of the Diesel	M		✓							✓		Orange	Green	

Sl.No	Environmental Attributes	Project Activities	Nature of Impacts										Without EMP	With EMP			
			Magnitude	Reversible	Irreversible	Long Term	Short Term	Direct	Indirect	Positive	Negative						
		Generator Sets labor camps	H	✓			✓					✓					
2. Impacts on Water Environment																	
1	Eutrophication	Sewage from labor camp Muck disposal	H	✓			✓			✓					✓		
		Construction of Intake canal, jack well cum pump house, sumps, disnets	M	✓							✓				✓		
		Diversion of river water	H		✓					✓							
2	Change in River Water Quality	Decomposition of sediments and deposition of organic matter	M	✓						✓					✓		
		Washing of equipments	L	✓						✓					✓		
		Muck disposal	M	✓						✓					✓		
3	Change in surface and ground water quality	Sewage from labor camp	H	✓							✓				✓		
3. Impacts on Air Environment																	
1	Increase in dust concentration	Construction equipments, operation of DG sets, Excavation	M	✓						✓					✓		
		Vehicular movement	H	✓						✓					✓		
2	Fugitive Emissions from	Loading and dislodging	M	✓						✓					✓		

Sl.No	Environmental Attributes	Project Activities	Nature of Impacts										Without EMP	With EMP				
			Magnitude	Reversible	Irreversible	Long Term	Short Term	Direct	Indirect	Positive	Negative							
3	various sources	Use of sand, fine aggregates																
		Batching plant	M	✓		✓	✓	✓			✓							
		Vehicular movement	M	✓		✓	✓	✓			✓							
		Operation of DG sets	M	✓		✓	✓	✓			✓							
4	Increase in SO ₂ , PM ₁ , NO _x	Fuel Combustion in equipments and Vehicles	M	✓		✓	✓			✓								
		Burning of fuels from construction workers	M	✓		✓	✓			✓								
4	Impact on Human Health	Emission of Dust particles	M	✓		✓	✓			✓								
4. Impact on Noise Environment																		
1	Increase Noise Level	movement of vehicles	M	✓		✓	✓			✓								
		Operation of D.G sets	L	✓		✓	✓			✓								
		Movement of vehicles carrying raw materials	M	✓		✓	✓			✓								
5. Impact on Biological Environment																		
1	Pressure on existing natural resources	Immigration of labor population	L		✓				✓		✓							
2	Reduced Photosynthetic activity, Wilting of plants	Transportation of construction materials	M		✓				✓			✓						
		Site Clearance	M		✓				✓			✓						
3	Diversion of forest land	Construction of rising main	M		✓				✓									

Sl.No	Environmental Attributes	Project Activities	Nature of Impacts										Without EMP	With EMP				
			Magnitude	Reversible	Irreversible	Long Term	Short Term	Direct	Indirect	Positive	Negative							
3.	Impacts on Fishes and Aquatic Ecosystem	Increase in turbidity of water due to Washing of machineries Sewage from labor camp	M	✓		✓	✓		✓		✓							
6. Impact on Socio-economic Environment																		
1	Land acquisition	Affecting livelihood	H		✓		✓				✓							
2	Impact on Human Health	Due to water/air borne diseases, traffic movement	H	✓				✓				✓						
B. Operation Phase																		
1	Impacts on Land Environment	Application of natural fertilizers and pesticides	H		✓					✓				✓				
2	Impact on water environment	Application of fertilizers and pesticides	M		✓							✓						

5. Analysis of Alternatives

The command area villages are deprived of irrigation facilities from the existing Savalagi - Tungal LIS under Hipparagi project. The western side of the command area is covered under Hipparagi project and the east side of the command area is covered under Mulawad LIS of Upper Krishna Project. Thus, the villages under the proposed command area are deprived of irrigation facilities and it is difficult to extend the existing irrigation schemes due to elevation difference and to reach the water to tail end remains problematic. Therefore, it is proposed to irrigate this area by providing new LIS is the only alternative measure. Hence, TBLIS is conceived as a suitable project to irrigate the left out areas.

6. Environmental Monitoring Program

The purpose of the monitoring programme is to ensure that the objectives of the project is achieved through the mitigation measures and result in desired benefits to environment and local population of the region.

Table 9 Environmental Monitoring Plan for construction phase

Environmental Parameters	Parameters to be Monitored	Frequency of Monitoring	Locations	Responsibility	Estimated Cost in Rs.
Surface water quality of Krishna river	pH, Temperature, EC, TDS Alkalinity, TH, DO, BOD, COD, NO ₃ , PO ₄ , Cl, SO ₄ , Na, K, Ca, Mg, Silica, Oil & grease, MPN, Total coliform	Fortnightly once until completion of Intake canal	Near Intake canal (1 No.)	Contractors or agencies appointed by KNNL	20,000/-
Ground water quality	pH, Temperature, EC, TDS Alkalinity, TH, NO ₃ , PO ₄ , Cl, SO ₄ , Na, K, Ca, Mg, Silica, Oil & grease, MPN, Total coliform	Once in a month	Labor camp, Kawatagi village (2 Nos.)	Contractors or agencies appointed by KNNL	72,000/-
Soil Quality	pH, EC, Mg, Ca, Alkalinity, Cl, Na, K, Organic Carbon, K, PO ₄ , SAR, N and Salinity	Once in a month	Near Labor camp (1 No.)	Contractors or agencies appointed by KNNL	43,200/-
Air Quality	PM ₁₀ , PM _{2.5} , NO ₂ and SO ₂	Monthly	Kawatagi Village, Janawada village and Savalagi village 3 Nos.	Contractors or agencies appointed by KNNL	1,53,600/-
Noise Levels	Leq Day, Leq Night in dB(A)	Monthly once until completion of construction works	Kawatagi Village, Janawada village and Savalagi village 3 Nos.	Contractors or agencies appointed by KNNL	1,44,000/-

Environmental Parameters	Parameters to be Monitored	Frequency of Monitoring	Locations	Responsibility	Estimated Cost in Rs.
Aquatic life	Limnological and biological studies	Six monthly once until completion	Near intake canal (1 No.)	Contractors or agencies appointed by KNNL	1,50,000/-
Health check ups	Spirometry, Pulse Oxymetry, Blood Test, Lung Function Test, Eye test, Physical fitness tests	Six monthly once until completion	Labor camp (1 No.)	Contractors or Doctors / PHC appointed by KNNL	2,00,000/-
Total					7,82,800/-

Table 10 Environmental Monitoring Plan for operation phase

Environmental Parameters	Parameters to be Monitored	Frequency of Monitoring	Locations	Responsibility	Estimated Cost in Rs.
Surface water quality of Krishna river	pH, Temperature, EC, TDS Alkalinity, TH, DO, BOD, COD, NO ₃ , PO ₄ , Cl, SO ₄ , Na, K, Ca, Mg, Silica, Oil & grease, MPN, Total coliform	Quarterly once for 3 years	Near Intake canal (1 No.)	Agencies appointed by KNNL	30,000/-
Ground water quality	pH, Temperature, EC, TDS Alkalinity, TH, NO ₃ , PO ₄ , Cl, SO ₄ , Na, K, Ca, Mg, Silica, Oil & grease, MPN, Total coliform	Quarterly once for 3 years	Savalagi village, Gothe (2 Nos.)	Agencies appointed by KNNL	43,200/-
Soil Quality	pH, EC, Mg, Ca, Alkalinity, Cl, Na, K, Organic Carbon, K, PO ₄ , SAR, N and Salinity	Quarterly once for 3 years	Thikota village, Gothe, Savalagi, Honawada, Telsang(5 Nos.)	Agencies appointed by KNNL	1,08,000/-
Aquatic life	Limnological and biological studies	Yearly once for 3 years	Near intake canal (1 No.)	Agencies appointed by KNNL	1,00,000/-
Total					2,81,200/-

Based on the above and as per the guidelines of MoEF under the supervision of Executive Engineer, HBC Division, KNNL, Athani, six monthly compliance reports shall be submitted to Regional Office of MoEF, Bangalore.

In order to verify the effectiveness of monitoring program, Regional Office, MoEF, Bangalore and Regional Office, KSPCB, Bagalkot will be the enforcing agency to monitor the project activities.

7. Social Impact Assessment

7.1 Project affected villages

One of the direct impacts of the project is Land acquisition and this project requires land from six villages as detailed in the Table below.

Table 11 Details of project impacted villages

Sl.No	District	Taluk	Impacted villages
1	Bagalkot	Jamakhandi	Kavatagi
2	Bagalkot	Jamakhandi	Todalbagi
3	Bagalkot	Jamakhandi	Gadyal
4	Bagalkot	Jamakhandi	Gothe
5	Vijayapura	Vijayapura	Honawada
6	Vijayapura	Vijayapura	Tikota

7.2 Impact of the project

- Tubachi-Babaleshwara Lift Irrigation scheme is proposed to irrigate an area of 42500 ha spread across 37 villages of Jamakhandi ,Athani taluka ,and Vijayapura Taluk ,utilizing 3.80 T.M.C water from Krishna River during Khariff season. This will help to increase the agricultural production during kharif season which in turn will raise their economic status and standard of living. This will have major impact on the area, especially since 80% of the population depends on agriculture for their subsistence.
- Employment Generation due to the project.- During the project construction phase and operation-management phase additional employment will be generated and local labourers will be engaged for works. Around 300 people (50 Technical and 250 construction labourers) are expected to be employed temporarily for the construction work of intake channel, jack well cum pump house, raising main, delivery chambers and distribution network consisting of piped conveyance system with drip irrigation. During operation phase labourers will be appointed for operation and maintenance of the jack well.
- The only negative impact is that 260.15 acres of agricultural land spread across 6 villages and owned by 1863 titleholders will be lost for the project construction purposes, but they will be sufficiently compensated as per the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement (Karnataka) Rules applicable in the State. None of the residential or commercial properties are impacted and there is no displacement of PAPs .

So overall impact of the project is progressive for the development of the villages and the agricultural production will increase contributing to the economy of the region. Villagers, generally welcome such irrigation projects and cooperates with the land acquisition process .The Department takes due care to consider the development needs of the people and due care will be taken to avoid all negative impacts.

8. Project 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. The details before and after the advent of irrigation is given below.
- It allows a greater area of land to be used for crops in areas where rain fed production is impossible or marginal. Presently, 10625 Ha practicing rain fed agriculture and due to the implementation of the scheme 42500 ha will be under irrigation.
- Extensive agricultural production supplies raw materials to the nearby small scale industries thereby increasing the economy in the region.
- Increased benefits from flood control, soil erosion, etc.
- Altogether, population of 147501 belongs to 25509 families in the command area will be benefitted directly under the scheme.
- Direct employment opportunities for 100 members during construction phase and 30 members during operation phase of the project. Further, indirectly labor opportunities will be substantially improved since larger area will be brought under irrigation.
- It improves fodder crops and in turn dairy farming in the command area.
- Increased benefits of water conservation through adoption of drip irrigation for the entire 42500 command area.
- Zero water logging and salinity problems. Weed and disease reduction due to adoption of micro irrigation.
- Labor requirements will be considerably reduced.
- The project requires only 105 Ha for implementation of the scheme and does not envisage rehabilitation and resettlement.
- No tree cutting involved and only 0.73 Ha of forest land required for implementation of the scheme. Agro forestry shall be taken up in command area and it improves the ecosystem services.

9. Environmental Management Plan

Although agriculture is usually associated with its positive impacts on human life, irrigation practices may be associated with impacts on environmental conditions, which may eventually curtail the sustainability of irrigation projects. For this reason, Environmental Impact Assessment (EIA) has been recognized as an integral part of the early planning studies of irrigation projects in order to identify any expected negative impacts and suggest the necessary mitigation plans to curb these impacts through formation of Environmental Management Plan (EMP).

Project Activity	Impacts	Mitigation measures	Advantage	Location	Responsibility & Monitoring Agency	Time frame
A. Construction Phase						
1. Air Environment						
Fuel combustion from construction equipments	Emission of pollutants (PM, SO ₂)	High speed Diesel with low sulphur content will be used for the construction equipments/ vehicles which has low ash content	Reduction in pollutants level	Intake canal, jack well cum pump house	Contractor & KNNL	Thorough out the construction period (24 months)
Vehicular movement and operation of batching plants	Dust pollution	Water sprinkling and vehicles should be covered with tarpaulin, speed limit restrictions	Reduction in fugitive emissions	Intake canal, jack well cum pump house, access roads, around construction site, disnets	Contractor & KNNL	Water sprinkling - 3 times/day
Burning of fire wood	Emission of pollutants (C, SO ₂)	Labor camps supplied with LPG facility	Reduction in emission levels	Labor camp	Contractor & KNNL	Thorough out the construction period (24)
Operation of DG sets, excavation	Health problems to labors	Usage of Nose masks	Healthy working environment	Intake canal, jack well cum pump house, access roads, around	Contractor & KNNL	Thorough out the construction period (24)

Project Activity	Impacts	Mitigation measures	Advantage	Location	Responsibility & Monitoring Agency	Time frame
2. Noise Environment						
Operation of DG sets and usage of construction equipments	Increase in noise levels	PPEs such as ear plugs and ear muffs will be provided to the workers, Acoustic enclosures for DG sets	Reduction in noise levels	Intake canal, jack well cum pump house, access roads, around construction site, disnets	Contractor & KNNL	Thorough out the construction period (24 months)
Vehicular Movement	Increase in noise levels	Construction activities shall be restricted only to day time	Reduction in noise levels	Intake canal, jack well cum pump house, access roads, around construction site, disnets	Contractor & KNNL	Thorough out the construction period (24 months)
3. Water Environment						
Sewage from labor camps	Surface and ground water pollution	Treatment through septic tank and soak pit	Reduction in pollution load	Labor camps	Contractor & KNNL	Thorough out the construction period (24 months)
Stagnation of water	Mosquito breeding grounds	Providing proper sanitary facilities	Healthy environment	Labor camps	Contractor & KNNL	Thorough out the construction period (24 months)
Excavation and operation of DG sets	Muck generation, blockage of natural drains and contamination of ground water	Reuse of muck at site, disposal of used oil KSPCB authorized preprocessors	Reduction in surface and ground water contamination	Intake canal, jack well cum pump house, disnets	Contractor & KNNL	Thorough out the construction period (24 months)

Project Activity	Impacts	Mitigation measures	Advantage	Location	Responsibility & Monitoring Agency	Time frame
Construction of intake canal	Increase in turbidity levels in river	Provision of sand bags	Healthy aquatic ecosystem	intake canal	Contractor & KNNL	4 Months
4. Soil Environment						
Construction of labor camps, stock yards	Loss of fertile soil	Waste land will be used for erection of labor camps	Land resource optimization	Waste land	Contractor & KNNL	Thorough out the construction period (24 months)
Maintenance of DG sets and construction machineries	Soil contamination	Maintenance at service centres	Reduction in soil contamination	Intake canal, jack well cum pump house, access roads, around construction site, disnets	Contractor & KNNL	Thorough out the construction period (24 months)
5. Solid and Hazardous waste Environment						
Excavation	Change in hydraulic regime	Reuse of excavated earth	Natural drainage pattern maintained	Intake canal, jack well cum pump house, disnets	Contractor & KNNL	Thorough out the construction period (24 months)
Improper dumping of solid waste from labor camps	Water pollution	Labor camps at 1 km away from river, Disposal to Municipal Authorities	Reduction in siltation and eutrophication	Intake canal and river course	Contractor & KNNL	Thorough out the construction period (24 months)
6. Biological Environment						
Construction activities	Wilting of plants	Water sprinkling	Normal photosynthetic activity	Intake canal, jack well cum pump house, access roads, around	Contractor & KNNL	Thorough out the construction period (24 months)

Project Activity	Impacts	Mitigation measures	Advantage	Location	Responsibility & Monitoring Agency	Time frame
Labor camps	Riverine water pollution	Labor camps at 1 km away from river, restrictions for not using the river water	Zero water pollution	construction site, disnets Labor camps	Contractor & KNNL	Thorough out the construction period (24 months)
Use of fire wood	Cutting of trees	LPG for labor camps	Positive ecosystem services	Labor camps and its surrounding	Contractor & KNNL	Thorough out the construction period (24 months)
Washing of construction equipments	Reduced DO levels	Washing at authorized service stations	Aquatic system maintained	Krishna river	Contractor & KNNL	Thorough out the construction period (24 months)
Diversion of 0.73 ha of forest land	Loss of forest area	Compensatory afforestation in an area equal to the forest land to be diverted	Loss of forest can be compensated as per the guidelines	The identification of CA land under progress	KNNL	As per KFD requirement
7. Socio-economic environment						
Land acquisition	Affecting livelihood	Compensation as RFCLA&TRR Act 2013	Sustainability for livelihood opportunities	Kavatagi, Todalabagi, Honawada, Tikota, Gothe, Gadyal,	KNNL	6 months
Vehicular movement	Health problems	Water sprinkling and movement of vehicles carrying raw materials only during night time.	Healthy environment	Kavatagi village	Contractor & KNNL	Thorough out the construction period (24 months)

Project Activity	Impacts	Mitigation measures	Advantage	Location	Responsibility & Monitoring Agency	Time frame
B. Operation phase						
Excess application of fertilizers and pesticides	Soil and water contamination	Awareness on organic farming practices	Reduction in pollution load	Command area	KNNL and Water user Associations	3 years

9.1 Command Area Development Plan

9.1.1 Water Users' Association (WUA)

The modern irrigation management aims at high efficiency of water conveyance and appropriate methods of water application, through participatory irrigation management at each stage of irrigation development. In Karnataka, it is essential to promote and implement the theme of participatory irrigation management in all the irrigation projects through formation of Water Users' Association. The construction of OFD works will be taken up after formation of WUAs under the supervision of CADA, Belgaum.

The efficient management of irrigation water for maximizing productivity requires, firstly the efficient on farm water management and secondly the optimization of the use of water and land, through appropriate methods of water application. The efficient on-farm water management is related to water delivery system and allied works in the command area, which distributes the water to each farm. The items of works pertaining to on farm water management are termed as "On Farm Development Works".

The On Farm Development works comprise of the following,

- Maintenance of disnets, sumps
- Control structures
- Maintenance of Automation
- Surface Drainage system
- Farm roads
- Land forming (Smoothing / grading/leveling)

9.1.2 Green belt development plan

9.1.2.1 Plantation around intake canal and jack well cum pump house

Green belt development activities will be taken up on either side of the intake canal and in and around jack well cum pump house. The details are given below;

9.1.2.2 Agro forestry activates in command area

Agro-forestry refers to the practice of Agriculture and Forestry in the same piece of land. The Karnataka Forest Department (KFD) has accorded high emphasis on farm forestry as a component in the afforestation programmes. The sector of Agro-forestry or Farm Forestry has a good potential as most of the agriculture lands are devoid of any trees, in the district. The trees if planted on the bunds and on the boundary of the lands, protect the crops from the desiccating high winds and also provide additional income from the trees to the farmer apart from providing him fodder and fuel as well.

Silvi-Pasture refers to the planting of the trees in a predominately grassland so as to provide fodder all the year round. This afforestation is aimed at not only addition of tree species, but also addition of highly nutritive and palatable grass species in the area, thereby providing much needed nutritious fodder to the livestock population.

Table 12 Green belt development Plan around intake canal and jack well

Area proposed for Green belt	No. of saplings	Source for saplings	Time frame	Responsible agency for implementation
Intake canal	30	Bagalkot KFD Nursery	After completion of inspection path works	KNNL
Jack well cum pump house	80	Bagalkot KFD Nursery	After completion of site works	KNNL
Command area	10/ ha	Bagalkot KFD Nursery	First 2 years - 212500 Next 2 years - 212500	KNNL and KFD

Table 13 Species recommended for green belt development

Sl.No	Local Name	Botanical Name	Sl.No	Local Name	Botanical Name
1	Ala	<i>Ficus bengalensis</i>	17	Kaduguru	<i>Semecarpus anacardium</i>
2	Basari	<i>Ficus infectoria</i>	18	Kadivala	<i>Stephegyne parviflora</i>
3	Beete	<i>Dalbergia latifolia</i>	19	Kadnugge	<i>Moringa pterygosperma</i>
4	Buruga	<i>Bombax ceiba</i>	20	Kakke	<i>Cassia fistula</i>
5	Dindiga	<i>Anogeissus latifolia</i>	21	Kanagalu	<i>Dillenia pentagyna</i>
6	Godda	<i>Lannea coromandlica</i>	22	Kaval	<i>Careya arborea</i>
7	Goni	<i>Ficus mysorensis</i>	23	Mathi	<i>Terminalia tomentsa</i>
8	Halasu	<i>Artocarpus heterophyllus</i>	24	Muthuga	<i>Butea monosperma</i>
9	Honne	<i>Pterocarpus marsupium</i>	25	Nandi	<i>Lagerstroemea lanceolata</i>
10	Hunalu	<i>Terminalia paniculata</i>	26	Nelli	<i>Emblica officinalis</i>
11	Ippe	<i>Madhuca indica</i>	27	Nerale	<i>Syzygium cumini</i>
12	Jagalaganti	<i>Diospyros montana</i>	28	Shivani	<i>Gmelina arborea</i>
13	Jambe	<i>Xylia xylocarpa</i>	29	Tadasalu	<i>Grewia tilaefolia</i>
14	Saguvani	<i>Tectona grandis</i>	30	Tare	<i>Terminalia bellerica</i>
15	Yethiga	<i>Adina cordifolia</i>	31	Hunase	<i>Tamarindus indica</i>
16	Mavu	<i>Mangifera indica</i>	32	Honge	<i>Pongamia pinnata</i>

9.2 Fisheries Development Plan

Around 10 lakhs fish fingerlings comprised of Indian major carp – *catla catla* -40.0% *Labeo rohita* -30.0% and *Cirrhinus mrigake* -30.0% in the size of over 75 mm are to be introduced in the Krishna river annually in and around the project site. Fisheries division at Narayanpur reservoir complex, Bijapur, saudatti and Thungabhadra dam (Pellary) will definitely meet the requirement needed. The project site authorities related to this project could also contribute their service and also submit their indents well in advance say during January –February of each year to the respective officers of the department of fisheries who, on their part, will make sure to effect the supply required, around august –September, the process helps in increased fish production from the river Krishna and their reservoir/impounded to be formed. The entire profession since years, generation after generation to modestly ekk out their livelihoods.

9.3 Muck Disposal plan

Table 14 Muck disposal plan

Total excavated quantity cum	Service Road and Inspection Path	Formation of embankment	Filling trenches	Land leveling	Construction of CD works
3187500	956250	478125	1275000	318750	159375

9.4 Cost for implementing EMP

Table 15 Cost for implementing EMP

Item	Particulars	Estimated Cost in Rs.
I. Construction Phase		
A. Air Pollution Control		
Water sprinkling	400/- x 2 tractors x 3 trips per day x 24 months (excluding rainy season and holidays)	10,80,000.00
Personnel protective equipments	Lumpsum	50,000.00
Chimney to DG sets	Lumpsum	75,000.00
LPG as cooking fuel	4 cylinders per unit x 50 units x 550 x 2 years	26,40,000.00
Sub-total A		38,45,000.00
B. Noise Pollution Control		
Personnel protective equipments	Lumpsum	50,000.00
Sub-total B		50,000.00
C. Water Pollution Control		
Septic and soak pit	Lumpsum	3,00,000.00
Sand bags	Lumpsum	50,000.00
Sub-total C		3,50,000.00
D. Solid & Hazardous Waste Management		
Solid waste collection bins with shed	Lumpsum	50,000.00
Hazardous waste collection area with shed	Lumpsum	50,000.00
Sub-total D		1,00,000.00
E. Biological Environment		
Plantation around intake canal and jackwell	110 saplings x 500 rs	55,000.00
Agro forestry development	425000 saplings x 10 rs	42,50,000.00
Fisheries development	Lumpsum	10,00,000.00
Compensatory afforestation	As per NPV	6,00,000.00
Sub-total E		59,05,000.00
F. Socio-economic Environment		
Land acquisition	105.33 ha x 2.74 cr x 2 x 100 solatium	10,96,00,000.00

Awareness and Training	10 lakhs per year x 3 years	30,00,000.00
Sub-total F		11,26,00,000.00
G. Environmental Monitoring during construction period		7,82,800.00
Sub-total G		7,82,800.00
Total (A-G)		12,36,32,800.00
II. Operation Phase		
Environmental Monitoring for 3 years		2,81,200.00
Green Belt maintenance for 3 years		8,00,000.00
Awareness and Training for 3 years		2,00,000.00
Soil conservation measures and implementation of CAT plan for 5 years		25,00,00,000.00
Total		25,12,81,200.00