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Anticipated Environmental Impacts & Mitigation Measures

Due to the activities of the proposed project, there will be some potential impacts on the surrounding environment of varying magnitude. Most of the impacts are likely to occur during the construction stages and very few impacts occur during the operation stage of the Project. The subsequent sections deal with the prediction of impacts due to the project on the natural, biological and social environment. Impacts have been assessed based on the information collected from the screening and feasibility study reports, field surveys and additional secondary data collected as part of the study. The impacts on the natural, biological and social environment can be direct or indirect. The environmental impact assessment process involves following basic steps:

- Identification of Impacts
- Prediction of Impacts
- Evaluation of impacts
- Identification of mitigation measures for impacts

4.1. Identification of Impacts

4.2.1. Positive Impacts of the Project

The potential positive environmental impacts due to the proposed project include the following.

- As per the MoEF recommendation, with the adoption of Sprinkler Irrigation system 10.77 Mcum (0.38 TMC) of water will be saved.
- The project requires only 45 ha dry land for the implementation of the project, i.e. 0.0045% of the total command area of the project.
- The project doesn't require any diversion of forest land and cutting of trees for its implementation.
- There is no displacement of families in the proposed project.
- The proposed project is benefiting drought affected areas comprising of 30 villages in Shiggaon, Savanur and Hanagal Taluks.
- The proposed project boosts total farm output and hence, with unchanged prices, raises farm income.
- Project improves yields through reduced crop loss due to erratic, unreliable or insufficient rainwater supply.
- It allows for the possibility of multiple-cropping, and so an increase in annual output.

- It allows a greater area of land to be used for crops in areas where rain fed production is impossible or marginal.
- The proposed project enables the use of complimentary inputs, such as high yielding varieties (HYVs).
- The proposed project requires labour for construction and on-going maintenance of Raising Main, wells and pumps etc. This is likely to be an important sector of employment for the poor, especially the landless rural poor or rural households.
- It aims to increase the farm output as a result of irrigation will stimulate demand for farm labour both within the main cropping season and across new cropping seasons, increasing both numbers of workers required and length of employment period. Rural poverty levels may therefore be reduced by increased employment opportunities.
- It reduces migration to urban areas, and so reduces the pool of job-seekers and relieves the downward pressure on urban areas.
- The project envisages providing opportunity to switch farm use away from staples to higher value, market-oriented products.
- By making employment and incomes more reliable (as well as higher) the project aims to protect farmers from loss of assets and also prevents peasants from getting into debt-traps.
- Access to irrigation in the project area may have very positive impacts on nutritional outcomes, through the availability of increased and more stable food supplies and, sometimes, cleaner water. In addition, increased income levels will allow rural producers, assuming transport costs are not prohibitive, to purchase a wider variety of foods. This should help to ensure that not only calorie intake is sufficient but that also diets are better balanced, with adequate intake of micro-nutrients.
- Filling of existing MI tanks in the command area of the scheme will be subjected to stabilization which in turn helps in sub soil replenishment and also providing drinking water facility through recharge of under ground water table.

4.2.2. Negative Impacts of the Project

The potential Negative environmental impacts due to the proposed project include the following.

- Increased air pollution due to the movement of vehicles and laying pipes during the construction phase.
- Use of Pesticides/Fertilizers leads to surface as well as ground water pollution.
- Irrigation-induced land degradation - Soil salinity and water logging – on-farm and off-farm impacts, Loss of soil fertility due to irrigation induced crop intensification, Increase in biological imbalances due to irrigation (weeds, pests)
- Surface water pollution – nutrients/chemicals
- Groundwater pollution – nutrients/chemicals

- Toxic concentration of substances in surface and groundwater.
- Saline return flows
- Health impacts in terms of increased water borne diseases (schistosomiasis, malaria)

Matrix method is adopted for qualitative and quantitative assessment of impacts on various environmental components from the proposed Project. The Activity - impact identification matrix is presented below in Table 4.1.

Table 4.1. Activity-Impact Identification Matrix

| Sl.No | Environmental Attributes | Project Activities | Nature of Impacts | | | | | | | | |
|--------------------------------------|--------------------------|---|-------------------|------------|--------------|-----------|------------|--------|----------|----------|----------|
| | | | Magnitude | Reversible | Irreversible | Long Term | Short Term | Direct | Indirect | Positive | Negative |
| A. Construction Phase | | | | | | | | | | | |
| 1.Impacts on Land Environment | | | | | | | | | | | |
| 1 | Landslide | Construction of Jack Well cum Pump house, minor head works, Bandarasetc. | M | ✓ | | | ✓ | ✓ | | | ✓ |
| | | Excavation | M | ✓ | | | ✓ | | ✓ | | ✓ |
| | | Heavy earth moving vehicles | H | | ✓ | ✓ | | ✓ | | | ✓ |
| 2 | Change in Topography | Construction of Jack Well cum Pump house, minor head works, Bandararas, MI tanks etc. | M | ✓ | | ✓ | | ✓ | | | ✓ |
| | | Excavation | M | ✓ | | ✓ | | | ✓ | | ✓ |
| | | Construction of labor camps | H | | ✓ | | ✓ | ✓ | | | ✓ |
| 3 | Change in Geology | Excavation | H | ✓ | | | ✓ | ✓ | | ✓ | |
| | | Quarrying Operation | H | | ✓ | ✓ | | ✓ | | | ✓ |
| 4 | Loss of Productive Soil | Construction site, temporary offices, workers camps, stockyards, borrow areas | L | ✓ | | | ✓ | | ✓ | | ✓ |
| | | Construction of Haul roads and traffic detours | L | | ✓ | | ✓ | ✓ | | | ✓ |
| 5 | Compaction of Soil | Site Clearance | L | | ✓ | ✓ | | ✓ | | ✓ | |
| | | Movement of heavy machinery and vehicles | H | ✓ | | | ✓ | ✓ | | | ✓ |
| 6 | Contamination of Soil | Machinery and operation of the Diesel Generator Sets | L | | ✓ | | ✓ | | ✓ | | ✓ |

| Sl.No | Environmental Attributes | Project Activities | Nature of Impacts | | | | | | | | |
|--|--|--|-------------------|------------|--------------|-----------|------------|--------|----------|----------|----------|
| | | | Magnitude | Reversible | Irreversible | Long Term | Short Term | Direct | Indirect | Positive | Negative |
| | | Construction labor camps | L | ✓ | | | ✓ | | ✓ | | ✓ |
| 7 | Soil Borrow areas and quarry Sites. | Muck Disposal | M | ✓ | | | ✓ | | ✓ | | ✓ |
| 8 | Soil erosion and change in land forms | Construction of Jack Well cum Pump house, minor head works, Bandaras, etc | M | ✓ | | | ✓ | | ✓ | | ✓ |
| | | Site clearance | H | | ✓ | ✓ | | ✓ | | | ✓ |
| 2. Impacts on Water Environment | | | | | | | | | | | |
| 1 | Eutrophication | Sewage from labor camp | L | ✓ | | | ✓ | ✓ | | | ✓ |
| | | Muck disposal | M | ✓ | | | ✓ | ✓ | | | ✓ |
| | Siltation and sedimentation | Washing off from crusher | L | ✓ | | | ✓ | ✓ | | | ✓ |
| | | Muck disposal | M | ✓ | | | ✓ | ✓ | | | ✓ |
| 2 | Change in River Water Quality | Construction of Jack Well cum Pump house, minor head works, Bandaras, etc. | L | ✓ | | | ✓ | | ✓ | | ✓ |
| | | Diversion of river water | L | | ✓ | | ✓ | | ✓ | | ✓ |
| | | Decomposition of sediments and deposition of organic matter | H | ✓ | | | ✓ | ✓ | | | ✓ |
| | | Washing of crusher | M | ✓ | | | ✓ | ✓ | | | ✓ |
| | | Muck disposal | M | ✓ | | | ✓ | ✓ | | | ✓ |
| 3 | Change in surface and ground water quality | Sewage from labor camp | L | ✓ | | | ✓ | | ✓ | | ✓ |
| 4 | Change in Hydraulic Regime | Creation of Impoundments in the Construction yard | L | ✓ | | ✓ | | ✓ | | | ✓ |
| | | Construction of Jack Well, Bandaras etc. | L | | ✓ | ✓ | | | ✓ | | ✓ |

| Sl.No | Environmental Attributes | Project Activities | Nature of Impacts | | | | | | | | |
|---|--|--|---|------------|--------------|-----------|------------|--------|----------|----------|----------|
| | | | Magnitude | Reversible | Irreversible | Long Term | Short Term | Direct | Indirect | Positive | Negative |
| 3. Impacts on Air Environment | | | | | | | | | | | |
| 1 | Increase in dust concentration | Construction activity, operation of crusher, structural and erection works | H | | ✓ | | ✓ | ✓ | | | ✓ |
| 2 | | Excavation | H | | ✓ | | ✓ | ✓ | | | ✓ |
| | | Vehicular movement | H | | ✓ | | ✓ | ✓ | | | ✓ |
| | | Fugitive Emissions from various sources | Loading and dislodging Use of sand, fine aggregates | H | | ✓ | | ✓ | ✓ | | ✓ |
| 3 | Increase in SO ₂ , SPM, NO _x | Crushing | H | | ✓ | | ✓ | ✓ | | ✓ | |
| | | Vehicular movement | H | | ✓ | | ✓ | ✓ | | ✓ | |
| | | Operation of DG sets | M | | ✓ | | ✓ | ✓ | | ✓ | |
| | | Fuel Combustion in equipments and Vehicles | M | | ✓ | | ✓ | ✓ | | ✓ | |
| | | Burning of fuels from construction workers | M | ✓ | | | ✓ | ✓ | | ✓ | |
| 4. Impacts on Noise Environment | | | | | | | | | | | |
| 1 | Increase Noise Level | During Construction from movement of heavy earth moving vehicles. | M | | ✓ | | ✓ | ✓ | | ✓ | |
| | | Operation of D.G sets | L | | ✓ | | ✓ | ✓ | | ✓ | |
| | | Movement of vehicles carrying raw materials | M | | ✓ | | ✓ | ✓ | | ✓ | |
| 5. Impacts on Biological Environment | | | | | | | | | | | |
| 1 | Pressure on existing natural resources | Immigration of labor population & technical staff | L | ✓ | | | ✓ | ✓ | | ✓ | |
| 2. | Reduced Photosynthetic | Transportation of construction materials | L | ✓ | | | ✓ | | ✓ | ✓ | |
| | | Site Clearance | M | | ✓ | ✓ | | ✓ | | ✓ | |

| Sl.No | Environmental Attributes | Project Activities | Nature of Impacts | | | | | | | | | |
|---|---|---|-------------------|------------|--------------|-----------|------------|--------|----------|----------|----------|---|
| | | | Magnitude | Reversible | Irreversible | Long Term | Short Term | Direct | Indirect | Positive | Negative | |
| | activity, Wilting of plants, loss of floral diversity | | | | | | | | | | | |
| 3. | Impact on Bankapura Peacock Conservation | Construction activities | L | ✓ | | | ✓ | | ✓ | | ✓ | |
| | | Immigration of labour population | L | ✓ | | | ✓ | | ✓ | | ✓ | |
| | | Vehicular movement | M | ✓ | | | ✓ | | ✓ | | ✓ | |
| 4. | Impacts on Fishes and Aquatic Ecosystem | Construction of Jack Well | L | ✓ | | | ✓ | | ✓ | | ✓ | |
| | | Increase in turbidity of water due to Washing of crushers | | ✓ | | | ✓ | ✓ | | | ✓ | |
| | | Construction of weir across river | H | | ✓ | ✓ | | ✓ | | | ✓ | |
| | | Sewage from labor camp | L | ✓ | | | ✓ | ✓ | | | ✓ | |
| 6. Impacts on Socio economic Environment | | | | | | | | | | | | |
| 1 | Increase in job opportunity | During Construction | H | ✓ | | | ✓ | ✓ | | ✓ | | |
| 2 | Increase in income level | During Construction | M | | ✓ | | ✓ | | ✓ | ✓ | | |
| | | Urbanization and developments | M | | ✓ | ✓ | | | ✓ | ✓ | | |
| 3 | Pressure on existing infrastructure facility | Immigration of labor and technical staff | M | ✓ | | | ✓ | ✓ | | | | ✓ |
| 4 | Impact on Human Health | Due to water/air borne diseases | L | ✓ | | | ✓ | | ✓ | | ✓ | |
| | | Increased Traffic | L | ✓ | | | ✓ | | ✓ | | ✓ | |
| B. Operation Phase | | | | | | | | | | | | |
| 1 | Change in climate and meteorology | Improvement in Agro-Bio diversity | H | | ✓ | ✓ | | ✓ | | ✓ | | |
| | | Replenishment of underground water table | H | | ✓ | ✓ | | | ✓ | ✓ | | |
| 2 | Impacts on Land | Due to good yield of crops | H | | ✓ | ✓ | | ✓ | | ✓ | | |

| Sl.No | Environmental Attributes | Project Activities | Nature of Impacts | | | | | | | | | |
|-------|---------------------------------------|--------------------|---|------------|--------------|-----------|------------|--------|----------|----------|----------|---|
| | | | Magnitude | Reversible | Irreversible | Long Term | Short Term | Direct | Indirect | Positive | Negative | |
| 3 | Impacts on Water Environment | Environment | Soil Salinity, Soil Erosion, Soil Properties, etc | M | ✓ | | | ✓ | | ✓ | | ✓ |
| | | | Application of natural fertilizers | H | ✓ | | ✓ | | ✓ | | ✓ | |
| | | | Addition of Gypsum for Irrigation Water | H | ✓ | | ✓ | | ✓ | | ✓ | |
| | | | Changes in surface and ground water quality due to soil erosion | L | ✓ | | | ✓ | | | ✓ | |
| | | | Application of fertilizers and pesticides | M | | ✓ | ✓ | | | ✓ | ✓ | |
| 4 | Impacts on Air Environment | | Impounding of water | L | | ✓ | | ✓ | | ✓ | | ✓ |
| | | | DG sets Operation | L | | ✓ | | ✓ | ✓ | | | ✓ |
| 5 | Impacts on Noise Environment | | Spraying of pesticides | M | | ✓ | ✓ | | ✓ | | | ✓ |
| | | | Operation of Jack well | L | | ✓ | ✓ | | | ✓ | | ✓ |
| 6 | Impacts on Biological Environment | | Repair of Equipments | L | ✓ | | | ✓ | | ✓ | | ✓ |
| | | | Increase of Agro-biodiversity | H | ✓ | | ✓ | | ✓ | | ✓ | |
| | | | Change in cropping pattern | H | ✓ | | ✓ | | ✓ | | ✓ | |
| 7 | Impacts on Socio economic Environment | | Bankapura Peacock Conservation | M | ✓ | | | ✓ | | ✓ | ✓ | |
| | | | Employment opportunity | H | ✓ | | ✓ | | ✓ | | ✓ | |
| | | | Yield of the crops | H | ✓ | | ✓ | | ✓ | | ✓ | |
| | | | Economic status of the region | H | ✓ | | ✓ | | ✓ | | ✓ | |
| | | Health Status | H | ✓ | | ✓ | | ✓ | | ✓ | | |

4.2. Evaluation of Impacts

The various factors that influence the degree of impact of the proposed project on different environmental aspects are:

4.3.1. Impacts on Physical Environment

4.3.1.1. Impacts on Topography & Physiography

The construction of the proposed project, including its various appurtenances e.g. jack well cum pump house, construction of bandaras, labour camps, project colony, etc. would disturb the existing topography and physiography to the small extent. Since the project site is located in plain area, erosion and land sliding are not envisaged. The impact on the topography and physiography is not going to alter due to the minor construction activities which will relieve the water requirement of the people and providing positive impacts during the operation stage of the project. Hence, the overall impact on topography and physiography is low.

4.3.1.2. Impacts on Climate & Meteorology

There will not be any changes in the micro meteorology of the study area during the construction phase due to the proposed project. Improvement in the agro – biodiversity, replenishment of underground water table, etc of the region during the operation phase shall improve status of climate and micro meteorology of the study area. Hence, the overall impact on the same is low and positive.

4.3.1.3. Impacts on Geology

Likely impact on the geological resources will occur from the extraction of materials (borrow of earth, aggregates, sand for construction activities). The raw materials will be procured from the authorized suppliers as recommended from KNNL and prevalent rules will be followed for borrowing of soil, sand and aggregates. Hence, the impact on general geology of the region is insignificant. At the construction sites, no blasting is envisaged. Therefore, there will not be any impact on the geology of the area.

4.3.1.4. Impacts on Soil

A. Construction Phase

1. Loss of Productive Soil

Temporary loss of soil may be envisaged during the construction stage, if construction site, temporary offices, workers camps, stockyards, borrow areas etc are located on fertile areas and if haul roads and traffic during construction etc are routed through agricultural lands.

2. Compaction of soil

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.

3. Contamination of Soil

In this project contamination of soil may take place, from the following activities at the construction zones, construction of labour camps, and the auxiliary facilities required for the construction. Details of the activities from which the contamination can occur are presented below;

- Maintenance of the machinery and operation of the diesel generator sets on site
- Oil spills from the operation of the mechanical work shops, diesel pumps, diesel storage and during transportation and transfer, parking places and diesel generator sets.
- Operation of the residential facilities for the labour and officers

Hence the overall impact on contamination is minimal and negative.

B. Operation Phase

1. Soil Salinity

During the operation phase of the project soil salinity may occur due to the following reasons.

- Solutes applied to the soil in the form of artificial and natural fertilizers as well as some pesticides will not all be utilized by the crop;
- The transfer from rain fed to irrigation of a single crop, or the transfer from single to double irrigation may create a "humidity/salinity bridge" in the soil, between a deep saline groundwater and the salt-free surface layers of the soil. Careful soil monitoring is highly recommended whenever the irrigated regime is intensified, even though the saline layers might be far below the soil surface and the irrigation water applied is of high quality.
- Climate is the most important factor responsible to change and formation of saline soils in a specific region. They mainly occur in regions with arid and semi-arid climate, where low rainfall found and transport the soluble salts formed during weathering. Arid climate is commonly characterized by maximum evaporation rates, which leads to more and more concentration of salt in the soil surface. Since the project area is falling under arid climate, the chances of soil salinity are likely to be more.
- Controlled Drainage is another important contributing factor, during the formation of saline soils, having a direct connection with the deeper ground water table or low permeability of soils. The depth of the water table often depends upon the topography of the land. In the case of arid regions of low rainfall area, the surface drainage ways are poorly developed, and this leads to drainage basins without outlets to permanent streams. The salty drainage waters enter from the higher lands of the basin leading to increase in the ground water level to the soil surface on the low lands.

The proposed project lies in the arid climate having scanty rainfall, the chances of soil salinity is likely to be more. Proper mitigation measures shall be proposed as part of EMP to mitigate the same.

2. Soil Properties

The accumulation of salts in soils will lead to irreversible damage to soil structure essential for irrigation and crop production. Effects are most extreme in clay soils where the presence of sodium will bring about soil structural collapse. This makes growing conditions very poor, makes soils very difficult to work and prevents reclamation by leaching using standard techniques. Gypsum in the irrigation water or mixed into the soil before irrigation is a practice that is used to reduce the sodium content of soils. Since the project area doesn't have clay soil, the problem of accumulation of sodium is less.

3. Saline Drainage

Drainage may not be required initially but it should be allowed for if there is insufficient natural drainage since the project area is having a flat topography or with water tables that have a low hydraulic gradient. Hence, the project area is at a risk of salinization as areas with soils of a low permeability which are difficult to leach. Groundwater drains pipe (tile) drains or deep ditches, carry out the dual task of controlling the water table and through leaching, counteracting the build up of salts in the soil profile. Normally, water is applied in excess of the crop water requirement and soluble salts are carried away in the drainage water although in some areas leaching can be achieved during the rainy season.

4. Soil Erosion and Sedimentation

Upstream erosion may result in the delivery of fertile sediments to delta areas. However, this gain is a measure of the loss of fertility of upstream eroded lands. A major negative impact of erosion and the associated transport of soil particles is the sedimentation of reservoirs and abstraction points downstream, such as irrigation intakes and pumping stations. Desilting intakes and irrigation canals is often the major annual maintenance cost on irrigation schemes. The increased sediment load is likely to change the river morphology which, together with the increased turbidity, will affect the downstream ecology.

Soil erosion rates are greatest when vegetative cover is reduced and can be 10 to 100 times higher under agriculture compared with other land uses. However, there are a wide range of management and design techniques available to minimize and control erosion. For erosion to take place, soil particles need to be first dislodged and then transported by either wind or water. Both actions can be prevented by erosion control techniques which disperse erosive energy and avoid concentrating it.

4.3.2.5. Impacts on Hydrology

A. Construction Phase

1. Impact on River Water Quality

The proposed project activities envisage diversion of water from Varada River by constructing diversion weir and construction of jack well cum pump house. Minor impacts are anticipated on the surface water drainage in the project area

during the construction phase. Precautions need to be taken during the construction work across the river such that the flow of the water body is not obstructed.

During the construction activities deposition of sediments and the breakdown of sediments shall be envisaged. Decomposition of sediments and deposition of organic matter in the river may lead to enrichment of nutrients and may cause Eutrophication resulting in increased BOD and COD in the longer run. Proper mitigation measures are suggested as an EMP to avoid the river water pollution.

B. Operation Phase

1. Change in Hydraulic Regime

This section is intended to describe the consequences of impacts resulting from a change in the flow regime of river or a change in the movement of the water table, through the seasons. The proposed consumptive nature of irrigation means that some change to the local hydrological regime will occur when new schemes are constructed. The ecology and uses of a river will have developed as a consequence of the existing regime and may not be able to adapt easily to major changes. Since the proposed project doesn't involve major changes in the flow of the river, hence the impacts on the ecology and the downstream users of the river.

2. Down Stream Flow

Changes to the low flow regime due to the proposed project may have significant negative impacts on downstream users, since they abstract water for irrigation schemes, drinking water supplies, etc. Minimum demands from both existing and potential future users need to be clearly identified and assessed in relation to current and future low flows.

Habitats both within and alongside rivers are particularly rich, often supporting a high diversity of species. Large changes to low flows ($\pm 20\%$) will alter micro-habitats of which wetlands are a special case. It is particularly important to identify any endangered species and determine the impact of any changes on their survival. Such species are often endangered because of their restrictive ecological requirements.

For the proposed project, the monthly water availability at the proposed diversion weir site is derived from Marol gauge site on catchment area ratio basis. The monthly 75% dependable flow at the proposed weir site for June to December were analysed (as described in Chapter 2). Based on the results of water availability it can be concluded that there will not be any shortage of water for the downstream users of the Varada River and hence the above impacts are not envisaged on the downstream users and ecology.

4.3.2.6. Impacts on Surface and Ground Water Quality

A. Construction Phase

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. The excreta going to be generated must be disposed off in proper septic tanks and soak pits designed as per IS 2470 Part-I & II guidelines in order to check the propagation of faecal coli and e-coli and also quality check of the surface water and nearby ground water should be done.

B. Operational phase

1. Change in hydraulic regime and downstream flow

Water resources development will have direct impacts on water quality, especially if fairly large impoundments are created. Reservoir discharge may differ from natural stream water in many physicochemical characteristics. The discharge of this water from the impoundment can strongly influence the quality of water downstream. The major water quality parameters likely to be affected are water temperature, dissolved oxygen, nutrient transport and turbidity.

2. Water pollution due to disposal of sewage

Since, only a small number of Operation and Maintenance (O & M) staff will reside in the area in a colony with sewage/ septic tank facilities and other infrastructure facilities, the problems of water pollution due to disposal of sewage are not anticipated.

4. Impact from leaching of fertilizers and pesticides

Minor impacts are anticipated due to the leaching of fertilizers and pesticides during the operation phase of the project. In the present trend, the paradigm shift in the agriculture industry from fertilizers and pesticides to eco friendly organic farming practices shall help to mitigate the above impacts on a permanent basis. To achieve the same, support and cooperation from Agriculture Department shall be sought for creating awareness and implement the program effectively.

4.3.2.7. Impacts on Air Environment

Construction Phase

In an irrigation project, air pollution occurs mainly during project construction phase. The major sources of air pollution during construction phase are:

- **Pollution due to fuel combustion in equipments:** The operation of construction equipments requires combustion of fuel. Normally diesel is used in such equipments. The major pollutant which gets emitted as a result of combustion of diesel is SO₂. The SPM emissions are minimal due to low ash content in diesel. In the campsite, labour activities such as cooking using firewood may affect the air quality. The short-term increase in SO₂ will have no major impact on ambient air quality. The D.G Sets used during the construction stage will be provided with stack/chimney as per the guidelines of the KSPCB.
- **Dust pollution:** The operation of the crusher during the construction phase is likely to generate fugitive emissions, which can move even up

to 1 km in predominant wind direction. During the construction phase, two to three crushers are likely to be commissioned at major construction sites. During crushing operations, fugitive emissions comprising mainly the suspended particulate will be generated. Structural works and erection work will also result in dust pollution. Since, there are no major settlements close to the project area; no major adverse impacts are anticipated. In addition, water sprinkling activities will be carried out to suppress the dust.

- **Fugitive emissions from various sources:** During construction phase, there will be increased vehicular movement. Construction material like sand, fine aggregate are stored at project site during the project construction phase. Normally due to blowing of winds, especially when the environment is dry, some of the stored material can get entered in to the atmosphere. However, such impacts are visible only in and around the storage sites. The impacts on this account are generally insignificant in nature when raw materials are stored by tarpaulin sheets when not in use and also providing greenbelt around the storage sites.

4.3.2.8. Impacts of Noise on Environment

A. Construction Phase

Increase in Noise Levels: Adverse impact on noise pollution due to the construction activity and vehicular traffic at the project site areas can be noticed. The major impacts on ambient noise levels are expected only during the project construction phase, due to operation of multiple construction equipment, noise due to crushing and batching plants and the movement of heavy earth vehicles may generate significant noise, which may cause some disturbance to the nearby population for a short span of time. The noise pollution however can be checked by the project proponents by installing sound barricades around crushing plants and by taking up regular maintenance of heavy earth moving vehicles including greenbelt development around the major construction sites.

The noise level effect on the nearest inhabitants due to construction activity will be negligible as villages such as Halasur, Kudala & Kunimellihalli are at a distance of 1.2 Km, 1.1 Km & 2.12 Km respectively.

B. Operational Phase

There will not be any impact on environment from noise due to the operation of the Jack well. Acoustic enclosures will be provided for the pumps operating jack well.

4.3.2. Impacts on Biological Environment

Impact on Flora

A. Construction phase

1. Pressure on existing natural resource

As mentioned earlier, a population of 500 in the peak season and 250 to 300 in the lean season including technical staff, workers and other group of people are likely to congregate in the area during the project construction phase. It can be assumed that the technical staff will be of higher economic status and will live in a more urbanized habitat and will not use wood as fuel, if adequate alternate sources of fuel are provided. However, workers and other population groups residing in the area too, there is heavy dependence of surrounding villagers on the forests for their fuel/ fodder requirements. Hence to minimize such impacts, fuel management not only for the labour force but for the villagers as well needs to be formulated. It is also required that project proponents ensure that no illegal tree felling takes place in the project area. Similarly options for community kitchen in the labour camps and providing LPG for construction camp, etc for the labour force will be provided to reduce the overall fuel requirements.

2. Wilting of Plants

The dust emanated from the transportation of construction materials will check the transpiration of rate of plants present on either side of the road and can cause wilting/dyeing of plants. Hence, proper watering of mud roads will be undertaken to avoid the same.

3. Loss of Floral Diversity

The proposed project activities doesn't involve cutting of trees and doesn't require diversion of forest land. Hence there will not be any loss to the floral diversity due to the project activities which is considered to be positive impact.

B. Operational phase

1. Enhancement of Agro biodiversity

During the operation phase of the project, due to the extensive irrigation activities, farmers shall be intended to plant more trees in their agricultural as well as horticultural gardens. Hence, the overall microclimate of the area shall be improved which is positive.

Impact on Fauna

A. Construction Phase

Considering the fact that, the proposed scheme of sprinkler HDPE alignment passes approximately 1.0 km away from the outer periphery the Bankapura Peacock Conservation Reserve. Hence, there will not be any impacts envisaged on the Peacocks and other birds found inside the reserve. The construction activities of project are restricted to the construction of Jack well cum pump house and the water shall be carried to the fields through HDPE pipes. Hence there will not be any impacts envisaged on the riparian flora and fauna of the region. But, even then proper mitigation measures are suggested in the EMP during the construction phase for without even causing secondary impacts on Bankapura Conservation Reserve.

B. Operational Phase

There will not be any impact on fauna due to project activities during the operation phase of the project. But in turn the change in cropping pattern due to irrigation in and around the reserve shall help the peacocks and other avifauna found in the study area to meet their feeding requirements during the off season and avi-faunal population will also improve.

Impact on Production of Plankton, Fish Species and their Breeding Grounds

There will 'not' be any type of 'negative' impact on the commissioning of the proposed project during both the 'construction and the operations' phases on the fish food organisms - the plankton biomass and the benthic/littoral faunistic elements as also on the fish species present and their breeding grounds. Their biological performances will continue to be so all the times. Hence, as suggested, certain developmental programmes like fish seed stocking in the rivers studied are to be undertaken in order to enrich the over - all fish stock in these to augment considerable fish production which will help the fishermen community towards improving their economic status.

A. Construction phase

During this phase, huge quantity of stones/muck is generated at various points which, if not properly disposed off, would invariably slides down into the river during heavy precipitation. Such a condition would lead to adverse impacts on the performance and development of the aquatic life present.

Also, the labour force engaged for the work, may resort to illegal fishing activity by employing certain destructive methods like poisoning, dynamiting etc. Care, hence, be taken to totally prevent such happenings.

B. Operation phase

There will not be any adverse impacts on the aquatic life - fish in particular, on account of the commissioning of the Shiggaon Lift-Irrigation Project across the Varada River.

4.3.3. Impact on Socio - Economic Environment

A. Construction Phase

The construction phase will last for about 2 years. During this period, 500 labours in the peak season and 250 to 300 in the lean season including technical staff, workers and other group of people are likely to congregate in the area during the project construction phase. It is required that the project proponents provide a self sustaining system to the workers in close proximity of the project and ensure enforcement of law and order in a very stringent manner to its labour force so that no confrontation with the nearby community takes place. The project proponents are required to provide all the infrastructure facilities to its work force such as health care, free fuel, sanitation facility and water supply in order to reduce dependency on local infrastructure and confrontation with the society.

For the project-affected persons, the loss would be their historical and cultural links with lands. But, there would be a positive impact on the socio-economic conditions of the people in the command area of the project.

At present, only Malaria is water borne disease which is occasional in few villages of the command area. Also, health risk includes potential disease hazards due to lack of hygienic / sanitation (water supply and human waste disposal) vector and water borne diseases. Sanitation facilities should be included in the project planning estimation to take care of cost to be borne towards human waste disposal facilities. During construction period, about 500 in the peak season and 250 to 300 in the lean season including technical staff, workers and other group of people are likely to congregate in the area during the project construction phase would need health coverage and emergencies. There is need for regular visit of doctors to the project site from the nearby Public Health Centres and district hospitals would be necessary in addition to manning the dispensary on regular basis.

B. Operational Phase

Post construction period would provide employment opportunities for the local people due to irrigation activity, increased food crops, improve in the living conditions of the people of the command area and also increase in the GDP of the region of the district. Also, there will be revitalization of commercial and service activities in the surrounding areas due to the increased demand for the project population in the command Area viz., Shiggaon, Savanur and Hanagal Talukas and in turn improves the socio-economic status of the people.

4.4. Mitigation of Impacts

4.4.1. Mitigation of Impacts on Physical Environment

4.4.1.1. Mitigation of Impacts on Topography and Physiography

- The construction activity mainly involves construction of Jack well cum pump house, delivery systems which are of short duration. Since the project site is located in plain area, erosion and land sliding are not envisaged.
- The impact on the topography and physiography is not going alter due to the minor construction activities which will relieve the water requirement of the people and providing positive impacts during the operation stage of the project. Hence, the overall impact on topography and physiography is low.

4.4.1.2. Mitigation of Impacts on Climate and Meteorology

- No change in the micro climatic parameters is envisaged due to the project, but the temporary impacts are envisaged due to the minor construction activities. Trees shall be planted in and around the construction area to avoid the above impacts. Improvement in the agro - biodiversity, replenishment of underground water table, etc of the region during the operation phase will improve status of climate and

micro meteorology of the study area.

4.4.1.3. Mitigation of Impacts on Geology

- Only licensed quarries will be used as sources of coarse and fine aggregates.
- The contractor will ensure that the quarries have all appropriate licenses and an approved quarry development plan before taking the minerals.
- The raw materials for the construction will be procured from the authorized suppliers.

4.4.1.4. Mitigation of Impacts on Soil Environment

- The facilities like temporary houses for the construction worker will be provided within the site in such a way waste land shall be used for labor camp construction.
- The domestic solid waste generated from the labour camps will be disposed to near by municipal landfills. The excavated soil shall be utilized for the formation of service roads.
- Used oil from the use of D.G. Sets during the construction stage will be stored in leak proof barrels and disposed to the KSPCB authorized recyclers.
- The proposed project work envisages very less quantities of borrow earth, aggregates and sand for the construction.
- The required quantity of Gypsum will be added to the irrigation water or mixed into the soil before irrigation to reduce the sodium content of soils.
- The accumulation of salts in the soil will be monitored regularly to avoid the addition of excess salts in the soil.
- Soil erosion and sedimentation shall be avoided by planting trees and vegetative cover shall be reprojected /rehabilitated at the earliest practicable time to minimize the extent of soil erosion in the construction area. Soil erosion shall also be avoided during the operation phase through reformed agricultural methods.
- Impervious concrete base and a sump will be constructed at all the fuel, waste oil emission and chemical storage yards. A berm shall also be constructed along the periphery of the concrete platforms in the construction area. An oil interceptor will be constructed for providing for treating the oil wastes collected in the sumps
- Some of the waste will be reused for the development of access roads to the construction plant sites, labour camps, internal roads, access roads to the soil Borrow areas,.
- Measures for minimization of wastes and use of surplus materials by local communities should be encouraged.
- Proper collection, storage and disposal mechanism will be in place for the solid and liquid wastes generated from site facilities during the construction stage.

- All petroleum products and chemicals meant for construction will be stored in accordance with guidelines provided in Materials Safety Data Sheet and also as per the guidelines of the KSPCB.
- Procedures and Plans shall be in place for cleaning up of any accidental spills.
- Proper checks for ensuring erosion control structures are in place before earthworks are started.
- Washing bay with oil interceptor shall be constructed for the effective collection of oil spills generated during washing.
- Platforms of the workshop shall be paved for the effective collection of oil spills.
- Oil trays shall be used for the collection of oil spills during emergency repairs of the machinery on site and the same shall be disposed to KSPCB authorized dealers.

4.4.1.5. Mitigation of Impacts on Hydrology

- The deposition of sediments and other breakdowns resulting from the construction activities will be checked and maintained regularly to avoid decomposition of sediments to avoid eutrophication.
- The down stream users will not be affected due to the shortage of water. Proper checks and monitoring shall be envisaged to maintain the welfare of ecology and down stream users.
- During the construction phase it shall be ensured that the earth works, disposal of sewage and other solid waste shall not entered into the river. The sewage will be treated in Septic tank and Soak pits and Solid wastes shall be disposed to nearby municipal landfills.
- Since the project is run-of-the-river scheme, flow of river will not be disturbed.

4.4.1.6. Mitigation of Impacts on Surface and Ground Water Quality

- 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 and domestic solid waste will be disposed to nearby municipal landfills. Thus, no impacts are anticipated as a result of disposal of effluents from the project colony. And frequent monitoring of surface and ground water will be done and care shall be taken not to deteriorate the quality of the river.
- Frequent check of septic tank and soak pits will be done to repair and replacement of leaking and malfunctioning. And it will be designed in such a way that no adverse change in groundwater quality as a result of the discharge.
- Project assures there will not be any direct discharge of sewage into the water.
- Machines oil spills from the machinery maintenance will be collected in leak proof barrels and then disposed off to KSPCB authorized dealers.

- BOD and COD limits of the water will be checked regularly as part of Environmental Monitoring Programme to monitor on eutrophication.
- Restrictions on the time, method and rate of application of fertilizers and pesticides will be imposed to avoid surface run-off and leaching into the ground water.
- Farmers will be advised to use nutrient management plans to reduce excess application of nutrients.
- To minimize pesticide impacts, farmers shall be advised to practice Integrated Pest Management (IPM) techniques (which can include biological pest control) to maintain control over pests, reduce reliance on chemical pesticides, and protect water quality.
- Impoundment of water shall be avoided in the fields.

4.4.1.7. Mitigation of Impacts on Air Environment

- During Construction period, there is likely hood of generation of dust, SO₂ NO₂ emission. This can be attributed to leveling activity and vehicular movement. The transport vehicles using petrol or diesel will be properly maintained to minimize smoke in the exhaust. Since, there is likelihood of fugitive dust from the construction activity, water sprinkling will be done.
- Any vehicle not meeting the vehicular pollution standards will not be allowed within the construction activity.
- Water will be sprayed by high-pressure water hoses during dust generating construction activities e.g. excavation, crushing, concrete mixing, material handling etc. to suppress dust; and
- Vehicles delivering loose and fine materials like sand and fine aggregates will be covered by tarpaulin to reduce spills on roads.
- The height from which excavated materials are dropped shall be controlled to a minimum practical height to limit fugitive dust generation from unloading.
- Loading/unloading and storage areas will be paved to reduce dust emissions. The proposed corridor and all roads (internal and external) to be used by the project authorities should be made 'pucca' (Sprinkled with water) to mitigate the dust generation along the roads.
- Personnel Protection Equipment (PPE) like dust fitters & nose masks should be provided to construction labors, while carrying out operations that may entail potential for dust inhalation.
- A greenbelt should also be developed in and around the boundary of the project site for protecting ambient air quality status.
- Idle running of vehicles should be minimized during transport and handling activities.
- Exhausts of other equipment used for construction (e.g. generators), if any shall be positioned at a sufficient height to ensure dispersal of exhaust emissions and meet the standards set by KSPCB.
- Regulate vehicle speed to a maximum limit of 30 km/hr within the

premises.

- Hazardous materials such as lubricating oil, compressed gases, paints and varnishes required during construction phase will be stored separately as per the safety regulations of the Department of Factories and Boilers at isolated places.
- Ensured provision for necessary basic needs and infrastructure facilities such as housing, water supply, sanitary facilities etc. to construction workers, especially domestic fuel so as to prevent cutting of trees in the surrounding vicinity for fire wood.

4.4.1.8. Mitigation of Impacts on Noise Environment

- The noise pollution will be checked and maintained by installing sound barricades around crushing plants and by taking up regular maintenance of heavy earth moving vehicles including the development of greenbelt around the major construction sites. Selection of equipment with less noise generation will be used.
- On site workers near the noise generating equipment will be provided with noise protection devices like earmuffs/earplugs.
- Acoustic enclosures will be provided for the pumps operating Jack well and also to the D.G Sets.

4.4.2. Mitigation of Impacts on Biological Environment

- In order to avoid the pressure on forests for their fuel/fodder requirements of the community in the labor camps , LPG for the labour force will be provided to reduce the illegal tree felling around the project area.
- Proper watering of mud roads shall be undertaken to avoid the wilting of plants on either side of the roads.
- Installation of HDPE pipes around the Bankapura Peacock Conservation Reserve will be avoided during the breeding season of peacocks and these works will be undertaken in due consultation with the Wildlife Division, Forest Department and Animal Husbandry Department, Haveri District Forest Department
- Mitigation of Impact on Aquatic Life - Stones/boulders excavated are to piled - up at safe locations in order to prevent their entry into river course.
- For the construction of the canal and the Lift - irrigation facilities, generally excavators, JC Bs, dumpers, tippers, concrete mixers, diesel, gen-sets etc. are required. Hence, appropriate measures are taken to minimize generation of constructional wastes. High intensity explosives should be avoided during the construction phase.
- Fish culture in the riverine sector is to be ensured with active support/ participation of the Department of Fisheries and fishermen community too.
- There will not be any negative impact on the aquatic life in general and

fish in particular on account of the commissioning of the Shiggaon Lift Irrigation Project across the Varada river in the Haveri district with the implementation of the suggestions made.

- Plantation of dust absorbing trees and shrubs near the dust generating areas such as *Azadirachta indica*, *Anthocephalus cadamba*, *Polyalthia longifolia*, etc,
- Plantation of soil binding plants e.g. grass will be carried out to avoid soil erosion.
- Plantation of noise attenuating species to reduce noise pollution both during the construction as well as in the operation stage.
- Development of green belt with carefully selected plant species is of prime importance due to their capacity to reduce noise and air pollution impacts by attenuation/assimilation and for providing food and habitat for local macro and micro fauna. This not only overcomes the problem but also enhances the beauty of area that will attract bird and insect species and by this way ecology of the area will maintain to great extent.
- For developing the greenbelt in and around proposed project site care need to be taken to plant the evergreen species. The planting of evergreen species may have certain advantages that may reduce the environmental pollution.
- Survival rate of the planted trees will be closely monitored and the trees which could not survive will be counted. Equal number of trees will be replaced and their survival will also be closely monitored.
- Criteria for selection of species for greenbelt - It should have thick canopy cover, they should be perennial and evergreen, they should have high sink potential for pollutants and they should be efficient in absorbing pollutants without significantly affecting their growth.
- The list of selected evergreen plants species for development of green belt is given in Table 4.2.

Table 4.2. Proposed Plant Species for Green Belt Development

| Sl. No. | Botanical Name | Family Name | Common Name |
|--------------|---------------------------------|------------------------|-------------------|
| Trees | | | |
| 4 | <i>Ailanthus excelsa</i> | <i>Simaroubaceae</i> | Doddamara/Bende |
| 5 | <i>Albizia odoratissima</i> | <i>Mimosaceae</i> | Bilvara |
| 6 | <i>Alstonia scholaris</i> | <i>Apocynaceae</i> | Nandi Batlu |
| 7 | <i>Anacardium occidentale</i> | <i>Aanacardiaceae</i> | Gerumara |
| 8 | <i>Artocarpus heterophyllus</i> | <i>Moraceae</i> | Hebbblasu |
| 9 | <i>Artocarpus integrifolia</i> | <i>Moraceae</i> | Halasu/Jack fruit |
| 11 | <i>Azadirachta indica</i> | <i>Meliaceae</i> | Neem |
| 12 | <i>Bauhinia malabarica</i> | <i>Fabaceae</i> | Basavanapada |
| 13 | <i>Butea frondosa</i> | <i>Fabaceae</i> | Muthuga/palasha |
| 14 | <i>Calophyllum tomentosum</i> | <i>Clustaceae</i> | Surahonne |
| 15 | <i>Casia fistula</i> | <i>Caesalpiniaceae</i> | Kakke |

| Sl. No. | Botanical Name | Family Name | Common Name |
|---------------|----------------------------------|-------------------------|--------------------|
| 16 | <i>Casia siamea</i> | <i>Caesalpiniaceae</i> | Seeme Thangadi |
| 17 | <i>Casuarina equisetifolia</i> | <i>Casurinaceae</i> | Galimara |
| 18 | <i>Dalbergia sissoo</i> | <i>Fabaceae</i> | Sheesham |
| 19 | <i>Dealbergia latifolia</i> | <i>Fabaceae</i> | Beete |
| 20 | <i>Delonix regia</i> | <i>Caesalpiniaceae</i> | Gulmohar |
| 21 | <i>Embica officinalis</i> | <i>Euphorbiaceae</i> | Nelli |
| 22 | <i>Erithrina indica</i> | <i>Fabaceae</i> | Erithrina/haluvana |
| 23 | <i>Ficus religiosa</i> | <i>Moraceae</i> | Arali |
| 24 | <i>Garcinia indica</i> | <i>Clusiaceae</i> | Punarpuli |
| 25 | <i>Glyricidia maculata</i> | <i>Leguminosae</i> | Gobbarada Mara |
| 26 | <i>Grevillea robusta</i> | <i>Proteaceae</i> | Silver |
| 27 | <i>Lagerstromia florsreginae</i> | <i>Lythraceae</i> | Holedasavala |
| 28 | <i>Leucaena leucocephala</i> | <i>Lythraceae</i> | Subabul |
| 29 | <i>Mallotus philippinesis</i> | <i>Euphorbiaceae</i> | Kumkuma |
| 30 | <i>Mangifera indica</i> | <i>Anacardiaceae</i> | Maave |
| 31 | <i>Melia azadirachta</i> | <i>Meliaceae</i> | Hebbevu |
| 32 | <i>Peltoforum pterocarpum</i> | <i>Fabaceae</i> | Peltofarum |
| 33 | <i>Pterocarpus marsupium</i> | <i>Legumineaceae</i> | Honne |
| 34 | <i>Pterocarpus santalinus</i> | <i>Legumineaceae</i> | Raktha Honne |
| 35 | <i>Polyalthia longifolia</i> | <i>Annonaceae</i> | Ashoka |
| 36 | <i>Pongamia pinnata</i> | <i>Fabaceae</i> | Honge |
| 37 | <i>Psidium guajava</i> | <i>Myrtaceae</i> | Seebe |
| 38 | <i>Samania saman</i> | <i>Mimosaceae</i> | Rain tree |
| 39 | <i>Sapindus trifoliatus</i> | <i>Sapindaceae</i> | Antuvala |
| 40 | <i>Spathodia companulata</i> | <i>Bignoniaceae</i> | Uchekayi |
| 41 | <i>Swietenia mahagoni</i> | <i>Scrophulariaceae</i> | Mahagoni |
| 42 | <i>Syzyium cumini</i> | <i>Myrtaceae</i> | Nerale |
| 43 | <i>Tabebuia rosea</i> | <i>Bignoniaceae</i> | Tabebuia |
| 44 | <i>Tamarindus indica</i> | <i>Bignoniaceae</i> | Hunase |
| 45 | <i>Tectona grandis</i> | <i>Verbenaceae</i> | Tega |
| 46 | <i>Terminalia bellerica</i> | <i>Combretaceae</i> | Alalekai Mara |
| 47 | <i>Terminalia chebula</i> | <i>Combretaceae</i> | Thaare Mara |
| Shrubs | | | |
| 1 | <i>Abutilon indicum</i> | <i>Malvaceae</i> | Tutti |
| 2 | <i>Calotropis gigantea</i> | <i>Asclepiadaceae</i> | Ekka |
| 3 | <i>Clerodendrum viscosum</i> | <i>Verbenaceae</i> | Ibbane |
| 4 | <i>Hibiscus- rosa sinensis</i> | <i>Malvaceae</i> | Daasavaala |
| 5 | <i>Hisbiscus cannabinus</i> | <i>Malvaceae</i> | Daasavaala |
| 6 | <i>Ixora chinensis</i> | <i>Caesalpiniaceae</i> | Kempulagida |
| 7 | <i>Jatropha curcas</i> | <i>Euphorbiaceae</i> | Sopina kai |
| 8 | <i>Jatropha gossypifolia</i> | <i>Euphorbiaceae</i> | Sopina kai |

| Sl. No. | Botanical Name | Family Name | Common Name |
|---------|-----------------------------------|----------------------|-------------|
| 9 | <i>Ricinus communis</i> | <i>Euphorbiaceae</i> | Harale |
| 10 | <i>Tabernaemontana citrifolia</i> | <i>Apocynaceae</i> | Milk wood |
| 11 | <i>Zyzyphus oenoplia</i> | <i>Rhamnaceae</i> | Challe |

- To avoid the impact on aquatic life, it is proposed to install suitable screens at the (i) diversion point of the river water into the canal leading to (ii) in-take point for onward lead/distribution. Screens of large -sized mesh -say over and above 2.0 inches at (i) diversion point and at (ii) main in-take point, screens of mesh-size of 0.5 inches to prevent entry of large and medium carps and catfish.

4.4.3. Mitigation of Impacts on Socio - Economic Environment

- Land losers will be benefitted as per NRRP, 2007 norms.
- The project proponents are required to provide all the infrastructure facilities to its work force such as health care, free fuel and water supply in order to reduce dependency on local infrastructure and confrontation with the society. Also good sanitation facility to avoid water borne diseases. Proper facilities for domestic water supply and sanitation services will be made available to the construction workers at the site.
- It is recommended that the local communities will be engaged in an on-going dialogue during construction period, with an objective to build and maintain a good relationship with the project proponent and contracting companies.
- The movement of heavy equipment will be done with proper precaution to prevent accidents on the approach road. Movement of vehicles with 30 km/hr will be imposed on village roads which will reduce risks of accidents or injuries.
- Occupational risks/hazards will be minimized at the project site through implementing safety measures and providing safety gadgets like helmets, safety (gas) mask/safety dress, shoes etc. for the labour force depending upon their nature of activity in the site.
- Safety training will be provided to all construction workers on operation of equipments. Security will also be extended during non-working hours to ensure there is no uncontrolled access to the machinery and equipment.
- The contractors will be vigilant to detect workers showing symptoms of communicable diseases. All illness and incidents will be reported and recorded.
- The health checkups (diagnostic) will be done for all regular employees involved in the construction activities of the project at scheduled intervals (i.e quarterly) and to maintain corresponding health records.
- First Aid Room with adequate First Aid Kits as approved from Doctors along with medical facilities like Spirometry, Pulse-Oxymetry, lung test etc., will be provided.

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- KNNL will have an interaction with PHCs (Public Health Centers) in the command area, such that the communicable diseases and other water borne diseases will be avoided through their guidance and support.