CONTRACTOR'S ENVIRONMENTAL AND SOCIAL ASSESSMENT REPORT (C-ESA)

KANKARBAGH SEWERAGE NETWORK PROJECT

VA TECH WABAGH

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Safeguard Personnel Detail

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Abbreviations

BMTPC	Building Materials and Technology Promotion Council
BSPCB	Bihar State Pollution Control Board
BUIDCo	Bihar Urban Infrastructure Development Corporation Ltd.
CGWB	Central Ground Water Board
CPCB	Central Pollution Control Board
C-ESA	Contractor Specific Environment & Social Impact Assessment
C&D	Construction & Demolition
CPHEEO	Central Public Health and Environmental Engineering Organization
DBOT	Design Build Operate & Transfer
DPR	Detailed Project Report
EC	Environmental Clearance
EHS	Environmental, Health & Safety
EIA	Environmental Impact Assessment
EPF	Employees' Provident Funds
E&S	Environmental and Social
ESI	Employees' State Insurance
ESMF	Environment & Social Management Framework
ESIA	Environmental & social Impact Assessment
ESMP	Environmental and Social Management Plan
ESDD	Environment and Social Due Diligence
GRM	Grievance Redress Mechanism
HAM	Hybrid Annuity Model
IFC PS	International Finance Corporations Performance Standards
LARR	Land Acquisition, Rehabilitation and Resettlement
MoEF&CC	Ministry of Environment, Forests and Climate Change
MLD	Million Liter per Day
NAAQS	National Ambient Air Quality Standards
NOC	No Objection Certificate
O&M	Operation & Maintenance
OHS	Occupational Health and Safety
PAPs	Project Affected Person
PMC	Patna Municipal Corporation
SPS	Sewage Pumping Station
STP	Sewage Treatment Plant
WB	World Bank
WHO	World Health Organization
ULB	Urban Local Body

Executive Summary

1. Background

'Namami Gange', is a Govt of India's Flagship Program with twin objectives of "Eeffective abatement of pollution, Conservation and Rejuvenation of National River Ganga.

Under this Program, A major initiative has been taken to develop an adequate sewage treatment infrastructure in Patna to meet the set twin objective of Effective abatement of Pollution, Conservation & Rejuvenation of River Ganga. Bihar Urban Infrastructure Development Corporation Ltd. (BUIDCO - A company owned by Government of Bihar to Implement and Accelerate urban infrastructure projects in the state) is the implanting agency of this project.

The sewerage system in Patna was established way back in 1936. Earlier the city had four sewage treatment plants located at Saidpur (45 MLD), Beur (35 MLD), Pahari (25 MLD) and KarmaliChak (4 MLD). The quantum of sewage reaching the plants was lower than installed capacity because of poor sewage network coverage. Inhabitants living in area without sewer network had to rely on either decentralized collection system in form of inhouse septic tanks or on unhygienic open defecation practice which was ultimately finding way to river Ganga, Punpun & Sone. So, there was an urgent need of new & modern sewerage infrastructure in Patna.

In recent past the PATNA city has grown at a rapid pace. To map the entire city properly for laying out a modern sewage infrastructure system, the Patna Municipal area was divided into six sewerage zones namely - Digha Zone, Beur Zone, Saidpur Zone, Pahari Zone, Kankarbagh Zone and KarmaliChak Zone.

For Kankarbagh Zone - The Sewage Infrastructure Development Project is being implemented with the financial assistance from World Bank & this project has been awarded to VA TECH WABAG Limited ("WABAG"). Sewage Treatment Plant (STP) of 100MLD capacity, 2 Sewage Pumping Station & a underground sewer network of 150.21km has been planned under this project. This project is being implemented in two parts.

- Construction of STP under Hybrid Annuity Model (HAM).
- Network construction with SPS under DBOT Model.

All Projects under NGRBP/Namami Gange are governed by Environmental and Social Management Framework (ESMF) developed to facilitate the management of environmental and social issues during planning and implementation phase. After the award of contract as per Environment and Social Management Framework (ESMF 2020), the selected DBOT contractor has to update the ESAMP based upon the detailed design of the Project along with preparation of a site specific ESAMP. This is the Contractor's Environmental and Social Assessment (C-ESA) study for the DBOT part of the proposed project, i.e construction of 150km sewerage network and two Sewage Pumping Station in Kankarbagh zone of Patna Municipal Corporation.

In process of preparing C-ESA, environmental and social assessment of proposed component has been conducted as per ESMF (2020) guideline, World Bank Group's Environmental, Health & Safety (EHS) General Guidelines (2007) and Guidelines for Water and Sanitation (2007) and used as the basis for identification of impacts and recommending mitigation measures.

2. Brief Study of Allocated Land

Project Components	Location	Area Required	Area Handed over	Land Ownership	NOC Status
SPS-A (90MLD) Coordinates: 25.593762;85.155099	In front of old water tank CA-32, Housing Board Colony, East Indira Nagar, Patna, Bihar-800020	36mX27.6m	35m X 21m	Bihar State Housing Board Patna	Obtained (NOC attached in Anne-3)
SPS-B (110MLD) Coordinates: 25.584802;85.169591	Service road, East Lakshmi Nagar, Ramkrishna Nagar, Khemnichak,Patna, Bihar-800027	37mX29.5m	35M X 25m	BUIDCo	Obtained (NOC attached in Anne-3)

3. Project Description

1. Kankarbagh zone (Zone IV) is newly carved out of existing Beur and Pahari zones. This zone consists of wards numbers 29, 30 (partly – 50%), 31 to 35, 44 to 46 & 55 with 886.50 Hectares of area of total PMC area. Total population for this zone per census 2011 data is 2,13,389.
2. The contract value of this DBOT package for Kankarbagh Sewerage Project is **Rs. 353.30 Cr** [Rs.293 Cr (capex) + Rs. 26.04 Cr (O&M for 15 yrs.) + Rs 34.26 Cr (Power During O&M)].
3. There are marginal changes from DPR stage to final design by contractor with due approval by BUIDCo for execution under Kankarbagh Zone.

DPR Component	Tender Document	Approved for Execution
Sewerage network 150km (including trunk sewer and the lateral network)	Sewerage network-150.163km (Including trunk sewer and the lateral network) with Rising main-5.020km, Manhole-5219 nos and House connection pit-18808nos	Sewerage network-150.21km (Including trunk sewer and the lateral network 122.976km open cut and 27.234km Trenchless) with Rising main-5.515km Manhole-6384 nos and House Connection Pit-1817nos
Kankarbagh SPS-A (90 MLD) At Yogipur/Ganga Bhawan	Kankarbagh SPS-A (90 MLD)	Kankarbagh SPS-A (90 MLD) In front of old water tank CA-32, Housing Board Colony, East Indira Nagar, Patna, Bihar-800020 Coordinates: 85.155108;25.593734
Kankarbagh SPS-B (110 MLD) Near Khemini chak and Ford hospital	Kankarbagh SPS-B (110 MLD)	Kankarbagh SPS-B (110 MLD) Service road, East Lakshmi Nagar, Ramkrishna Nagar, Khemnichak, Patna, Bihar-800027 Coordinates: 85.169622; 25.584792
Ward Coverage-29, 30 (partly – 50%), 31 to 35, 44 & 45	29, 30 (partly – 50%), 31, 35, & 44	29, 30 (partly – 50%), 31, 35, & 44

4. The major component of works include:

   ✓ Total sewer network of 150.21km is proposed for this zone. Out of which 122.976km will be

laid down by open trench method while 27.234km is proposed for trenchless work mainly in congested, high traffic and crossing areas.

- ✓ Total length of rising main is 5.515km. As per discussion open trench method will be used for laying of new rising main with DI(K9) pipe of dia 1200mm. The depth of rising main will be 2.5m from the ground level. About 1.2km of rising main will run parallel to the elevated Patna Metro line from Rajendra nagar to NH.
- ✓ The project proposes to lay sewer pipelines within the Right of Way (RoW) center/along the existing roads by using open trenching methodology. Approximately 95% of the excavated material will be used in backfilling of trenches. Remaining 5% is proposed to be utilized at SPS for site leveling.
- ✓ Manholes -Construction of 6384 circulars precast RCC manholes having size of 0.9m dia to 1.82m dia for various depth vary from 1.60 m to 8m as per the requirement.
- ✓ House Service Chamber-1817 house service chambers having size of 600mm x 450 mm & 900mm deep shall be connected to the outfall of the individual household.

5. **Minimum diameter of sewer network is proposed as:**
   - 500mm and above (RCC NP3 pipes)
   - 200mm-400mm (DwC PE Pipe)

6. **Laying of Pipelines below sub-soil water Table**

   The ground water table in Patna varies from 6m -8m on an average below the ground level. The ground water table rises to around 4m during the monsoon. In the low-lying areas and the areas close to the Ganga, the ground water table is in the range of 3m - 4m below the ground level. The maximum depth of the sewer line is in most areas limited to a maximum depth of 8.0m for Kankarbagh, to avoid / eliminate the need for additional pumping station and in effect, the additional expenditure in Operation and maintenance costs.

7. Operation & Maintenance (O&M) of the Structures for 15 years.
8. Environmental Monitoring and Management Measures.
9. In Kankarbagh zone pipe laying work, two crossings are proposed one NH crossing and another near STP approach road i.e. on Patna Gaya Road State Highway. For these crossings, trenchless work is proposed.

4. Legal and Other Requirements

The key applicable legal requirements to the environmental and social aspects of the investments implemented in the project are as follows:

- ✓ Environmental Protection Act, 1986 (an umbrella Act) to protect and improve the overall environment.
- ✓ Environmental and Social Management Framework for Namami Gange Programme.

The Operational Policies and the guidelines of the World Bank applicable to the project are as follows:

- ✓ Environmental Assessment (OP 4.01) – OP. 4.01 is an Umbrella Policy applicable for all infrastructure projects under Namami Gange Programme.
- ✓ The World Bank's Environmental, Health, and Safety (EHS) Guidelines for Water and Sanitation is also applicable for the proposed project. This will provide guidance on EHS issues occurs during the construction, operation and maintenance phases; of the sewage collection through a system of pipes, pumps, and other associated infrastructure (sewerage) to a centralized storage and/ortreatment system.

The applicable compliance with the regulatory requirements to the project are as follows:

- ✓ The project does not require any environmental clearance or forest clearance. At the same time, the project requires to obtain required consents and permissions from competent authorities.
- ✓ Permission for use of water for construction purposes from irrigation department/CGWA (for Surface or Ground Water) respectively. **NOC is under process**
- ✓ Labour license is required to be obtained before construction-**Labour license is obtained.**
- ✓ Interstate Migrant license will be required if labour from other state will be hired under project.

5. Project Categorization

The NGRBA program as per World Bank safeguard policies is categorized as A. However, sub-projects are categorized as high / low impact categories where high impact category project will correspond to Category A and low impact corresponds to Category B projects as per World Bank's safeguard operational policy 4.01 based on the Environmental and Social screening.

This C-ESA report is limited to the scope of network and SPS construction. Construction activities will cause temporary environmental impacts but does not envisage any displacement of squatters and encroachers due to laying of the sewer network. Project also does not require purchase of any private land for SPS. This project has an overall positive impact by tapping the sewer network and preventing its flow into the river body.

A detailed assessment on environmental and social impacts of the project is presented in **Chapter 5** of the C-ESA Report. As the scope of study is limited to network and SPS construction, so categorization of project is not detailed is this report. As far as the scope of work assigned under C-ESA study reflected that the project falls in "Low Impact" category as per Environmental and Social Management of Framework for NGRBA.

6. Baseline Analysis

As the scope of work under this assignment is limited to construction of SPS and Network, the baseline studies was carried out with site visit of the study area, environmental and social (E&S) sensitive receptors were identified through both site visit and review of secondary data. Data of environmental monitoring conducted at project site by contractor is used as baseline data. Area Of Influence for environmental and social studies is limited to 1 km from the SPS site. It is observed from the review of secondary data and validation through site visit, sensitive receptors in 1km area are mainly internal roads, hospitals, temples, parks, schools and Colleges falling under SPS-A area of influence. In SPS-B, National highway and State Highway is also falling with hospital, schools temples and parks. New laying of pipelines will be a localized activity on roads and lanes. The proposed pipeline work expected to cover 25 m per day by a single group of labour. So, the work is temporary for a particular place.

Patna is the capital of Bihar. It is the second largest city in eastern India after Kolkata. It is a densely populated and fast growing city. It comprises of 72 municipal wards. The Patna Municipal Corporation

(PMC) covers an area of 100 sq. km with population of 16.83 lacs as per 2011 census. The city is located on southern bank of river Ganga. The city has a very long river line surrounded on three sides by rivers – Ganga, Sone, and Punpun. The area does not depict any undulations in terrain. The city has an average elevation of 53 meters. The climate is influenced by tropical type. Maximum rainfall occurs during the monsoon in July and August. The city forms part of Indo-Gangetic alluvial plains and has fertile soil. The soil permits fast percolation of rain water, since that the ground water table in the region vary from 2-5 m bgl (below ground level) during post monsoon and 5-10 m during pre-monsoon. The detail of surface and ground water profile, air quality, noise, solid waste management, flora and fauna are described under this chapter.

Kankarbagh Zone is one of the highly populated and one of the core areas of the city. Population of this area have been projected to 277,227 for year 2020, 428820 for year 2035 and 663,310 for year 2050 respectively for final design for different design years.

Meteorology

The monsoon season spans from July to October and the highest levels of precipitation are experienced in the month of October (197 mm). Maximum temperatures are experienced from April to July (>35 °C) and minimum temperatures are experienced from November to February (15-18 °C). The predominant wind direction is observed to be from south-west to north-east direction with higher wind speeds (5 – 10 m/s) are experienced from the west-north-west and west direction of the study area.

Physical Resources

The 24-hour ambient air quality monitoring data in the study area were observed to be well within NAAQS standard and WHO guideline values except PM2.5 and PM10 levels exceeded the limits provided by the WHO guidelines standard values at all locations (SPS/network) monitored. The average ambient noise levels obtained for all the locations for day time were observed to be falling under the CPCB Day time Noise Level Standard of Commercial areas.

The study area falls under the high dense built fabric. The topography is flat plains as the study area is part of Indo-Gangetic flood plains with gangetic alluvium type soil. The predominant slope observed is from south-west to north-east. The River Ganga is the nearest surface waterbody (aerial distance of approx. 1.02 km) and is located towards north of the study area. As per the Central Ground Water Board (CGWB), Patna Sadar falls under "critical" zone while Patna City falls under "safe" zone for ground water development. Although the project site falls under Patna City, it is in close proximity (approx. 1.08 km) to the boundary of Patna Sadar (critical zone). The ground water monitoring analysis showed all parameters are within permissible limits as per the BIS 10500 standards.

Natural Hazards

As per the Building Materials and Technology Promotion Council (BMTPC) Hazard maps, the study area is located in the Zone IV i.e. High Damage Risk Zone (MSK VIII) for Earthquake and the High Damage Risk Zone for cyclones. The study area is also located in an area vulnerable to floods.

Flora and Fauna

Patna district has deciduous type of forest. The district has 3202 km² of Geographical area comprising 13 km² of Moderately Dense Forest, 3 km² open forest and absence of Very Dense Forest. Thus, the forest cover of the district is 0.50% of total Geographic Area. (Source: State Forest Report – 2009). The phytosociological study of the core zone (terrestrial habitat) beyond the riparian habitat comprises of manmade ecosystem. Trees plantation in form of landscaping was noticed due to nearby residential area, government offices, hospitals, university, parks and market places.

No wild mammals are reported in the study area, due to anthropogenic activity and urbanized habitat. Domestic mammals are reported in the study area.

During site visit following birds are recorded in study area like Common crow, Myna, Eagle, Sparrow, Babbler, Pigeon, Cattle Egrets, Red Vented bulbul etc.

Economic Development

The major land cover in the study area is settlements (61%) followed by agriculture fallow land (38%). Patna is the 21st fastest growing city in the world, and the fifth fastest growing city in India, and is expected to grow at an average annual rate of 3.72%.

The study area lies within the 'Middle Gangetic Plain' agro-climatic zone of the country as classified by the Planning Commission of India. The major crops grown in the study area are paddy, wheat, gram, and seasonal vegetables.

Social and Cultural Resources

There is no important cultural and heritage resource notified by Archeological Survey of India around the project influence area. None of the project area involves forest land, or is located close to any ecologically sensitive areas. No issues related to indigenous people or involuntary resettlement was noticed.

As per 2011 census, total population of Patna urban is 25, 14,590 of which 1,683,200 lives within the municipality boundary. Total male population in Patna is 13, 32,487 which is approximately 53 % of total urban population. Sex ratio in Patna district as per Census 2011 is 887 whereas child sex ratio is 883. Child populations (0-6) in urban region were 3, 29,592 of which males and females were 1, 75,005 and 1, 54,587. Average literacy rate in Patna district as per census 2011 is 82.40 % of which males and females are 87.71 % and 81.33 % literates respectively. In actual number 1,810,338 people are literate in urban region of which males and females are 1,008,475 and 801,863 respectively. The total workers population of Patna Urban Agglomeration Area was 25.2% of its total population in 2001. The male worker population was 3.8 lakhs (41.4%) and that of females it was 0.45 lakhs (5.8%). This is less than the percentage of workers population in the Bihar state which was 33% in 2001. This indicates that 74.8% of the population is dependent. It also indicates a high percentage of part time and supplemental jobs, common among those below the poverty line. Among workers, 77% are in the other workers category which includes offices/institutional workers and business.

Total no. of Slums in Patna city & its outgrowth numbers 13,696 in which population of 77,034 resides. This is around 4.57% of total population of Patna city & its outgrowth which is 1,684,297.

7. Stakeholder Consultation

Stakeholder Consultations were carried out while preparing C-ESA. Executive Engineer, Project Engineer (MACE) of Kankarbagh Project and Technical team & EHS officer of contractor were consulted to discuss the different aspects of environmental and social issues. Communities were consulted at both the SPS and network to know their views as location is close to settlements. Nearby settlements were consulted to make them aware of the proposed construction activity and its benefit as civil work is planned to start now post monsoon. Residents of nearby area has welcomed the project and also discuss about the waterlogging issue during monsoon period in Kankarbagh zone. They have also shared the problem faced during Patna waterlogging held in year 2019.

The primary objective of stakeholder consultation was to understand the acceptance of the project, obtain impressions of the stakeholders about the project and discuss issues envisaged by the local community which may be encountered due to the project. The other objectives of the consultations included understanding of the existing local socio-economic status and local sensitive receptors.

Based on the site visits and consultations with the local people, the proposed project is expected to benefit the people of Kankarbagh Zone. As the wastewater that currently flows untreated into the drain and finally goes to the river will now be captured and treated.

8. Analysis of Alternatives

As the study is limited to the network part of the project so the section on analysis of alternatives is not detailed in this report. In Kankarbagh zone, one major drain i.e Yogipur drain of length 4.39 km and 2-3 small drains, carry the waste water/sewage and sullage which ultimately discharges into Punpun river. Previously, there was no separate STP for Kankarbagh zone. It was part of the Beur and Pahari zone therefore; the sewage flow from this zone was designed to route to the STPs of Beur and Pahari zone for treatment. This area is developing into an uptown area with expanding and soaring residential apartments. So, there is requirement for separate sewerage infrastructure for this zone to meet the demand of growing population in this area.

9. Environment & Social Impact Assessment

Assessment of Anticipated Impacts

Although there would not be any permanent negative or adverse environmental or social impacts, but will have temporary impacts on water quality, air quality (impact on health), traffic blockages, safety hazards for pedestrians, possible damages to private property, possible interruption in commercial activity, and accidental breakage of other public infrastructure such as water pipes, electric cables, telephone lines. These can be mitigated with proper implementation of safeguard measures.

The major outcomes of the assessment are given below:

- Proposed land for construction of Pumping Stations is Govt. land and free from any encroachment. NOC for the same is received and the land is handed over to contractor.
- As the project is proposed in urban settings, Sensitive receptors are mainly schools, hospitals/nursing homes, parks, temples , sports complex and Highways (NH&SH) etc.
- The proposed project for establishing various project components (i.e., Pumping Stations, Staff quarters etc.) is neither located in an eco-sensitive area nor any adjoining eco-sensitive/forest area.
- The impact assessment also reiterates that the project does not involve any loss of livelihood and displacement of squatter and encroachers.
- The project will not have any impact on the tribal population.
- There is no major water body located nearby the proposed project location. Drain is passing by SPS-B location.
- No cultural heritage sites will be affected by the project development.

The proposed component of study has minimal temporary impacts and fall under the 'Low Impact' category. The anticipated impacts and corresponding mitigation measures are discussed in Phases namely: Influence area and General impacts. General impacts are further categorized in two phases, i.e., Construction Phase and Operation Phase. Based on the magnitude and duration of the Project activities, the nature, duration and extent of impact are assessed.

Positive Impact

The Kankarbagh Sewerage project is being developed under a Ganga conservation mission named "Namami Gange". It is estimated that at present the total wastewater generated in Patna is approximately 210 MLD. However, only 20% of the city area has a physical coverage of an underground sewer network. Further, the Kankarbagh Zone is one of the highly populated and core areas of the city with no dedicated sewage treatment mechanism. The sewage was presently being treated through other STP's in the nearby zones. This project will thus enable lowering of treatment loads in the other connected STP's, ensure adequate treatment and eventually lower pollution loads in the River Ganga. Further, availability of a dedicated Sewerage system will ensure the channels are not flooded during monsoon thus preventing waterlogging and associated impacts. This Sewerage scheme is also been designed in a way to promote and incorporate principles of resource efficiency and waste utilization. The sludge generated from the treatment process will be used to generate biogas which will be used for electricity and heating requirements in the STP operations. The treated sewage will also be reused for plant operations and may also be provided for other purposes.

The citizens of the zone will be the major beneficiaries of the underground sewerage system, as they will be provided with hygienic environment. The project would also generate employment opportunities for locals during construction and operation phases of the project.

General Impact

Possible Environmental and Social Impacts during Construction and Operation Phases are identified and possible mitigations during these phases have been suggested.

Impacts during the project construction and operation phase and the mitigation measures to be adopted for reducing those impact

Impacts	Mitigation Measures
Construction phase	
Air emission impacts: Air emission like dust generation, Particulate matter, Gasespollutants like SOx, NOx, SO2 and CO from construction, vehicle emission, drilling activities.	✓ Minimum 3 m height barricading with sheets/polysheet will be provided at both SPS site to protect nearby residential areas and temple from construction dust pollution. ✓ Water sprinkling will be done over the stockpiles, at working areas especially during dry and windy periods atfrequency twice a day to minimize dust generation. ✓ PUC certificates of construction vehicle and fitness certificate of construction equipment will be monitored to check over the air pollution. ✓ Material transportation will be done in the covered truck to avoid dust emission. ✓ Air monitoring of construction site will be conducted on quarterly basis except monsoon season from NABL accredited lab. Reports are enclosed (**Annexure- 2**).
Contamination of water resources: disposal of construction wastes in nearby water body	✓ Proper barricading will be done at construction site. Labor will be oriented in Tool Box Talk to restrict any kind of disposal in nearby drain especially at SPS-B. ✓ After utilization of construction wastes, left out materials will be

	disposed to designated land identified by BUIDCo. As of now construction wastes are underutilization at labour camp and SPS site. Designated land will be allocated in a month time as ensured by EE, DK Project. ✓ Proper stockpiling of excavated soil. ✓ Stockpiled areas to be bordered by berms. ✓ Stockpiles of excavated soil will be done in high areas to avoid flow in storm water run-off channels and erosion. Areas will be protected by either polysheets or bordered by berms
Impacts due to domestic waste: domestic waste will be generated from labour camps, site office and store office during construction and operation	✓ All the wastes generated on the premises will be collected in blue/red/green bins and provided it to municipality door to door collection vehicle on daily basis. ✓ Labour camp is under construction and the guidelines of camp siting is followed and enclosed in **Annex-6**. ✓ Proper sanitation facility is developed there. ✓ Provision of toilet facility will be done at site offices also.
Impacts of Construction and Demolition waste: During construction phase different category of C&D waste will be generated from excavation, material procurement, construction work etc.	✓ Most of the C & D waste will be reused in different activity like restoration, deep filling, low lying areas and raising of STP site etc. ✓ During site visit, it was observed that left over wastes after backfilling of trenches in pipelaying is utilized at SPS site and labour camp area. As of now all wastes are reused. ✓ The identification of designated land for waste disposal is in process. The remaining wastes will be disposed there if left out after its reuse.
Impact due to wastes generation at SPS site: Wastes that will be screened out at SPS site during operation phase of the Project if not disposed properly at designated place can cause contamination of land and water.	✓ Provision for storage of wastes generated during O&M phase in SPS premises is made to avoid its seepage especially during rainy season leading to contamination (storage area will be paved or trolley will be used). ✓ Disposal of wastes will be done frequently to avoid any odor nuisance.
Impact due to Noise generation: Noise will be generated from construction activities, using DG set, vehicle movement, drilling activities etc.	✓ Vehicles & construction Machinery including DG set will be equipped with mufflers/ acoustic enclosure recommended by the vehicle manufacturer to reduce the noise. (Fitness certificate of equipment and machineries will be kept in record). ✓ Stack height of DG set will be installed as per CTE NOC. ✓ Noise barriers/sheets all-around construction sites will be placed in both SPS location due to proximity of sensitive receptors. ✓ During pipelaying work near schools/hospitals, noise barrier will be placed to reduce the noise pollution. ✓ Protective equipment (PPE) like ear muffs and plugs for construction workers will be provided if engaged in noise causing activities. ✓ Daily Monitoring of noise levels through handheld meter will be measured during noise causing activity at site. ✓ Noise monitoring of construction site will be conducted on quarterly basis except monsoon season from NABL accredited lab.

Traffic issues during material transport, pipe laying,	✓ Alternate traffic route will be prepared for narrow lane if not possible to give access in consultation with concerned traffic police authorities/local police authority. ✓ In congested and densely populated/high traffic area, night work will be preferred with prior permission. Work will be done in small stretch. Backfilling will be completed by morning using excavated soil to avoid any nuisance. ✓ In this project, trenchless is proposed for VIP roads/high traffic area. ✓ Material transportation will be preferred in night for congested/traffic area. ✓ Contractor has submitted the Traffic Management Plan in EHS document which is enclosed in **Annexure-8.**
Accidents/ damages due to erosion/ sliding of vertical sides of excavated trenches while places the pipes	✓ The ground water table in Patna varies from 6m -8m on an average below the ground level. The ground water table rises to around 4m during the monsoon. In the low-lying areas, the ground water table is in the range of 3m - 4m below the ground level. ✓ The laying of pipe lines below sub-soil ground water will be carried out with adequate measures to prevent caving of surrounding earth / soil. Provision for shoring has been contemplated (Timber shoring has been considered to be done for laying of sewers lines for depths upto 4.5m and Sheet piling for laying of sewer pipes below 4.5m in the estimates) and the technical requirement so that the sidewalls of earth are protected. ✓ Before going for such operation, necessary PPEs and required precaution will be ensured as mentioned in Contractor's plan for Safety precaution during excavation (Refer **Annex-7**). Site supervisor will be watchful in case of any emergency and the work will be monitored by EHS officer.\ ✓ Exposed surface will be resurfaced and stabilized by making the sloping sides of trench to the angle of repose at which the soil will remain safely at rest. ✓ Excavated soil (spoils) and other materials will be kept at least 2 feet (0.6 meters) from trench edges. ✓ Location of underground utilities will be identified and known before digging. ✓ Other sources that might affect trench stability will be identified i.e any drain flowing near to proposed alignment. ✓ Test for atmospheric hazards such as low oxygen, hazardous fumes and toxic gases will be ensured to be measured when greater than 4 feet deep pipelaying is proposed. ✓ Contractor's EHS Plan consisting of Safety Precaution during excavation is attached in **Annexure-7.**
Health and Safety impacts including site safety	✓ ESHS plan will be referred and followed under project. ✓ Contact details of the police or security company and ambulance services will be displayed at SPS site. (Important and emergency contact no is displayed at labour camp). ✓ In network, important contact details and contact number of site supervisor will be pasted on barricader. ✓ Proper agreement with "UDAYAN" Hospital, Boring Canal Road has been done for this project. (**Annexure-4)** ✓ Quarterly health checkup for labors is scheduled.

	✓ PPE's will be ensured at site for labors. ✓ Fences/temporary enclosures will be put around construction sites (even inactive ones, if hazards, like open pits, remain) with enclosures to be properly marked with caution signs. ✓ Smaller on and off switches at SPS units will be installed with protection from rain water to minimize electrical short circuit. ✓ Contractor's EHS Plan consisting of Permit to Work is enclosed in **Annexure-10.**
Accidents, dealing withchemicals, hazardous materials during excavation	✓ Regular inspection and maintenance of the sewers and safety considerations in handling the materials will be done. ✓ Related PPE's and safety measures will be ensured at site for labors handling these materials. ✓ Labor will be oriented on job risk before going for any risky activities. Risky job will be supervised. ✓ Contractor's Emergency Preparedness and Response Plan is enclosed in **Annexure-9.**
Labour safety and facilities,labour camps	✓ The contractor will be preferring engagement of local workers wherever possible. ✓ For the labors hired from different town, proper labor camp facilities is under development following the Labour camp guidelines and management procedure mentioned in contractor's EHS plan. ✓ Labour insurance policy will be valid till engagement of labours. ✓ If labours from other states are engaged then Inter-state Migratory certificate will be taken up. ✓ PPE's will be ensured at site for labours. ✓ Hospital tie up has been done with UDAYAN hospital. ✓ Contractor's plan for Camp facilities is enclosed in **Annexure-6.**
Temporary flooding due to excavation during monsoons	✓ Excavated soil material will be stored on the higher lying areas of the site and not in any storm water run-off channels.
Impact of gender-based violence, sexual harassment/ abuse-harassment on womenworkers.	✓ Sewerage construction activities are complex and tedious job and engagement of female labour for such work in Bihar is uncommon. Sometimes labour hired from other state accompanied by their families then Gender Based Violence (GBV) risk may be arising. If case of any such issue, the matter will be shorted out through Grievance Redressal Mechanism (GRM) established for NMCG projects. ✓ Code of Conduct provided by WB on GBV will be explained to all labourers and same should be signed by them as well. ✓ BUIDCo has ICC committee which will take care of such issues at 2nd tier of GRM. ✓ GBV related posters will be displayed at site to orient labour and official staffs. ✓ TBT will also be used as orientation of workers on their code of conduct. ✓ Awareness programme on Non-discrimination, harassment of co-workers/women and those belonging to SC and STs and other minority social groups will be organized from time to time for the

	laborer's engaged in this Project. ✓ Reporting on GBV will be ensured in prescribed format on quarterly basis.
Labour influx related challenges for the host community.	✓Labors will be sensitized on local social and cultural practices. ✓Labours will be aware on national labour and womenharassment laws and its penal implications. ✓ Worker codes of conduct with respect to engagement with local residents will be spreaded time to time for the labourers engaged in the project. ✓Labour influx detail will be recorded in WB prescribed format and submitted in Quarterly ESMP compliance report.
Impacts on street vendors, squatter and encroachers located in network laying.	✓ The street vendors will be shifted across the road in the same vicinity which will help them in "not losing" their regular customers as well as the benefit of their location, and thus, this shifting will not have any adverse impact on their daily income. ✓ Advance notice to residents and shop-owners will be circulated prior to work initiation in particular areas to overcome any inconvenience during the construction activity along with completion of construction activity in given time line.
Potential access related challenges for local communities.	✓ Alternate traffic routing plan will be developed for pipe laying in congested and densely populated areas where access is not possible in consultation with ULBand concerned traffic police authorities. ✓ Laying of pipeline will be done in small stretches and temporary restoration i.e backfilling of trenches is ensured by end of the day. ✓ Permanent restoration is planned within 10 days of pipe laying after hydraulic testing. ✓ Construction activity will be limited to confined space with hard barricading. ✓ A wooding/steel plank will be arranged to give access to the households if required. ✓ A wooding/steel plank will be provided during pipelaying work near hospital so that emergency vehicles and patients will have easy access to hospital. ✓ Advance public notices with pamphlet distribution is in practice under project in pipelaying areas. ✓ Clean up of debris and clearance of site will be ensured immediately upon completion of construction activities. ✓ After completion of construction activities in particular ward, contractor is suggested to take certificate from respective ward member for satisfactory work as a Social Audit for the project.
Damage and disruption of utilities or damage to private structures during constructionwork.	✓ Assessment has already done based on the final design and drawing, none of the private structure disruption are involved. ✓ However, if any utilities/structure is damaged/disrupted during construction, contractor will ensure the restoration of the same. The expenditure on such restoration will be borne out of the provisional sum provided within the contract.
Operation and Maintenance	

Impact on Air	✓ Green belt will be developed surrounding the SPS locations to avoid/reduce the odor. **As the land provided for SPS construction is small and the green belt development will be challenging. But during consultation with Executive Engineer, Project Engineer and Project Manager, the necessity of green belt has been discussed and all steps will be taken for green belt development surrounding the SPS. As per availability of land one or two rows of short/medium height trees will be planted after discussion with forest department.** ✓ Air monitoring will be conducted twice in a year from NABL accredited laboratory. ✓ Proper handling and regular maintenance of operating machines will be ensured at pumping stations including generators.
Water and Environment	✓ Monthly monitoring of sewer line and manholes for visible leakages/ overflows will be done during Pre and post monsoon and fortnightly. ✓ Repair operation for the damaged portion of sewer line will be done within 12 hrs of complaint. ✓ Proper handling and regular maintenance of operating machines will be done at pumping stations with regular clearing of wastes.
Noise and vibration	✓ Proper handling and regular (monthly routine checkup) maintenance of operating machines including pumps, generators, noise monitoring will be done. ✓ Noise monitoring will be conducted twice in a year from NABL accredited laboratory.
Impact on Land environment	✓ To avoid land and water contamination, disposal of solid wastes will be done at designated site. Storage of solid wastes in premises with be done with all safety precaution to avoid its seepage leading to contamination.
Health and Safety aspects	✓ During cleaning/ maintenance operation, the sewer line will be adequately vented to ensure that no toxic or hazardous gases are present in the line. ✓ Proper training/orientation of the labors will be ensured. ✓ Adequate PPEs will be ensured during sewer cleaning, waste collection, transportation and disposal. ✓ Such activities will be supervised. ✓ As per contract agreement safety measures of each unit will be detailed in O&M manual.

10. Environmental and Social Management Plan

Contractor's environmental and social management plan (C-ESMP) has been developed to provide mitigation measures to reduce all negative impacts to acceptable levels. Location and setting of the proposed infrastructure were considered to further reduce impacts.

Approved C-ESMP will be used as handy document by Executive Engineer/Assistant Engineer of BUIDCo site Office and Project Manager/Site Supervisor/EHS officer of VA Tech WABAGH for implementation of mitigation measures during construction and O&M phase. Copy of this will be available to BUIDCo and Contractor's site office.

The C-ESMP included mitigation measures which is proposed for the construction phase such as

- ✓ Implementation of traffic management plan in coordination with local traffic police to minimize traffic impacts.
- ✓ Awareness campaigns and consultations to inform residents and businesses of potential disturbances.
- ✓ Provision of walkways and other suitable measures for crossing trenches to ensure access is not impeded (attention during work near hospitals/schools).
- ✓ Use of noise-dampening measures in areas with sensitive receptors such as hospitals, schools, places of worships and other silence-zones.
- ✓ Use of dust-suppression methods such as watering and/or covering of stockpiles.
- ✓ Finding alternate uses of excavated materials to reduce the disposed quantity.

As for the O&M phase, all facilities will need to be repaired from time to time, but environmental and social impacts will be much less than those of the construction period as the work will be infrequent, affecting small areas only.

The total cost for implementing measures outlined in Environmental Management Plan and Environmental Monitoring Programme during construction and operation phase in ESMP -80,04,840/- and ESMP Monitoring 13,55,500/- and unidentified impacts 10,00,000/-.

Hence total cost of Environmental Management (ESMP) is 80,04,840 + 13,55,500 + 10,00,000 = **1,03,60,340/- (One Crore Three Lakh Sixty Thousand Three Hundred Forty only)**

Institutional Arrangement

The DBOT Contractor has the prime responsibility to implement the ESMP during all phases of the project. The ESMP will be applicable to all Contractors and Sub- Contractors including labour contractors and their workers working in the project during all phases. "EHS officer" at project level from contractor side will ensure the compliance of the ESMP which will also be monitored by VA Tech WABAGH Corporate level, QHSE Head and EHS Manager (**VA Tech WABAGH has a certified Integrated Management System (IMS) as per ISO 9001:2015, ISO 14001: 2015, and ISO 45001:2018 international standards. They are having EHS management system developed at the corporate level and is extended to all projects in India**). Engineers of BUIDCo have secondary responsibility for implementation of ESMP and will coordinate the day-to-day work and monitor the ESMP compliance activities with the support from the headquarter.

Management Actions

Based on the project and associated activities, and E&S impacts identified for the project (which includes environmental, occupational health and safety, community health and safety and social), management measures have been recommended covering all phases of the project. An E&S monitoring plan for construction phase and operation & maintenance phase of the project has also been developed. Refer **Section 6.3** for detailed set of actions recommended for management of all identified adverse impacts.

Grievance Redress Mechanism

The ESMP provides the structure and process to be followed by the project for redressing project related grievance through a Grievance Redress Mechanism (GRM) developed for NMCG projects at BUIDCo level. The GRM is a platform to provide the affected communities a credible and effective channel of communication and allow them to communicate their grievances/concerns which they believe to be caused by the project activities. A Grievance Redress Committee (GRC) is established at the Project level comprising of Project Manager, EHS officer, Executive Engineer of that Projects and E&S Officer from BUIDCo. The GRM provides a procedure for receipt and recording of grievances,

review and investigation of grievances by the GRC, grievance resolution, grievance closure, and redressal of anonymous grievances. The GRM has been publicized among the community during public consultation. Contact details of the Concerned officer will be made available through displays at the Project site.

11. Conclusion

The proposed project will enable lowering of treatment loads and also increase the physical coverage of an underground sewer network. The Kankarbagh Zone is one of the highly populated and core areas of the city with no dedicated sewage treatment mechanism. The project will thus ensure adequate treatment and eventually lower pollution loads in the River Ganga, Punpun and Sone. This will also ensure the channels are not flooded during monsoon thus preventing waterlogging and associated impacts. The public of this zone would find great relief from unhealthy and unhygienic environment.

1 Introduction

1.1 Background of the Project

Urban Development and Housing Department (UDHD), Govt. of Bihar (GoB) has been entrusted for implementation of works for Development/Improvement of Infrastructure facilities like Sewerage System, Water Supply, Solid Waste Management, Transport System and Basic Services to the Urban Poor and creation of other amenities under various Central Government funded, Externally Aided and other State Govt. programs/schemes.

Bihar Urban Infrastructure Development Corporation Ltd. (BUIDCO) is a Govt of Bihar Company formed in 2009 with an objective to expedite activities related to infrastructure development for all Urban Local Bodies and accelerate the urban infrastructure project to meet the current & future need of rapid urbanization in Bihar.

According to Patna City Development Plan (CDP) report (2006) & City Sanitation Plan (2013), only 20% urban area was covered with underground sewerage system and the rest depended on septic tanks or direct disposal into open storm water drains with further disposal into the river Ganga or river Punpun, thereby resulting in excessive pollution

The Ganga clean up policy of "NamamiGange" programme launched by GoI in year 2014 recommends that no untreated municipal sewage and industrial effluents should be allowed to enter the river, Ganga. The old sewerage infrastructure of the city consisted four Sewage Treatment Plants (STPs) of 45 MLD, 35 MLD, 25 MLD and 4 MLD capacities respectively at Saidpur (1936-37), Beur (1968-69), Pahari (1993-94) and KarmaliChak (1993-94). These STPs were underutilized and treating altogether 61MLD only against the installed capacity of 109 MLD. Patna Cities coverage area increased with the rapid urbanization but no new sewage network was added. As sewage network was confined to limited area & was very old as well, there was urgent need for its repair & upgradation. Also, a new sewerage network was required to be laid in the uncovered area along with efficient sewage treatment and disposal system to ensure the health and sanitation needs of the citizens of the Patna city.

A comprehensive SEWAGE TREATMENT ROADMAP for Patna Municipal Area with a vision of "ZEROoo Sewage discharge to drain / river" has been readied by BUIDCO under India's flagship programme of "NAMAMI GANGE" with the financial assistance form WORLD BANK. Under this roadmap the PATNA City has been divided into six zone & each zones planning has been done keeping its current requirement & projected future demand. The Patna City's zonal summary is as below

S. NO	STP LOCATION	ZONE	STP CAPACITY	PROJECT STATUS
1	DIGHA	I	100 MLD	UNDER PROGRESS
2	BEUR	II	43 MLD	COMPLETED
3	SAIDPUR	III	60 MLD	COMPLETED
4	KANKARBAGH	IV	50 MLD	UNDER PROGRESS
5	PAHARI	IV SOUTH & V	60 MLD	COMPLETED
6	KARMALICHAK	VI	37 MLD	COMPLETED

Presently, STP with underground sewer network and associated infrastructure has been partially developed for BEUR, SAIDPUR, PAHARI & KARMALICHAK. Previously, KANKARBAGH Zone was not

having separate STP. The STP was constructed during Ganga Action Plan -II in 1994 at Pahari Village area under Pahari Sewerage Zone. The technology was based on Aerobic Lagoon type with 25 MLD treatment capacity. However, the system was not fully operational as they were treating only 10 MLD of sewage against designed capacity. The prevailing Sewerage system was inadequate and was at the point of breakdown. The city was an open combined system to carry both the dry weather flow and storm water and ultimately terminates into receiving river Ganga. It left enormous detrimental effect on overall City Sanitation especially during the monsoons. Therefore, to provide better living conditions, health and personal hygiene of the people by increasing access of more people to safe sewage disposal and reduce frequency of occurrence of water and wastewater related diseases and mortality rate it was urgently needed to upgrade the existing Sewerage infrastructure of the area. So, separate STP with 50 MLD capacity is proposed for Kankarbagh Zone in Pahari STP campus along with sewer network of 150km and 2 number of Sewage Pumping Station (SPS).

VA TECH WABAG Limited ("WABAG") has been awarded the contract by the Bihar Urban Infrastructure Development Company (BUIDCo), Government of Bihar which is responsible for implementation of Namami Gange Programme in State, for developing the Sewage Treatment Plant (STP) and its underground sewer network for the Kankarbagh zone of Patna, Bihar. This project is being implemented in two parts i.e., construction of STP is under Hybrid Annuity Model (HAM) and network construction with SPS is under DBOT contract. This report is dealing with DBOT part of the contract i.e., network and SPS only.

1.2 Objective and Scope of the Study

As per Environment and Social Management Framework (ESMF), in DBOT contract, after the award of work, the selected contractor may need to update the ESAMP based upon the detailed design of the Project and shall prepare a site specific ESAMP. This is the Contractor's Environmental and Social Assessment (C-ESA) study for the DBOT portion of proposed Project. The primary objective of the assignment is to ensure that the linked infrastructure of proposed STP project complies with the safeguards for environmental and social compliance while carrying out the construction and pre-commission operations and maintenance work.

The objectives of the study are as following –

- Conduct an environmental and social gap assessment of the existing infrastructures under the proposed project.
- Environmental and Social assessment of the new components/location change if any after final design and approval.
- To present an updated overview of the E&S Management plan that is being implemented and will accordingly be adjusted to continue in the upcoming Project phases.
- To ensure systematic and effective execution of the updated environmental and social (E&S) commitments (as reflected in the revised Management plan) relevant to the construction phase of the Project and future operations.

This study is limited to the construction of 150km Sewerage Network and 2 number of Sewage Pumping Station in Kankarbagh Zone, at Patna Municipal Corporation. This C-ESA has been prepared considering the latest variation with the ESA/DPR as per approved design (BEP of the proposed

infrastructures).

1.3 Approach and Methodology

The C-ESA study was carried out based on desk review of the ESDDR/ESIA report prepared during DPR stage, contract documents, variations in project from DPR to actually approved components/ design/locations, field assessments, environmental monitoring and public consultations with the community who are likely to be benefited from the project, the potential project affected persons and relevant Government Institutions.

1.3.1 Reconnaissance of Project Area

A reconnaissance visit to the proposed Sewage Pumping Station and Network (especially rising main, crossings & congested area) was conducted during month of September/October 2022 along with WABAGH team.

The purpose of the reconnaissance was to:

- Understand the fabric of the project area.
- Observe current activities that are carried out in the project area.
- To know the boundary of network system in this project. As Kumhrar is the area in Patna where remains of the ancient city of Patliputra were excavated by ASI.
- Identify the presence of encroachers or squatters on the lands designated for the project.

Discussions were also conducted with the Project Head and the EHS Head to understand the project components, status of the project activities, availability of project specific studies/ documents and the area of pipelaying work in Kankarbagh Zone.

1.3.2 Information Review

The following items were reviewed for preparation of this Report:

- Project Environmental and Social Due Diligence report.
- Environmental and Social Impact Assessment report.
- Project design and description of project flow.
- Finalized map of project components (SPS and sewer network).
- Construction approach and methodology.
- Project-specific EHS Plan.

In addition to the above-mentioned items, secondary literature review was carried out in order to better understand the project area. These included archaeological sites, hospitals, religious places (temples/ mosques/ churches etc.), schools/ colleges, water bodies, parks etc.

1.3.3 Mapping of Sensitive Receptors

As the study is limited to Sewerage Network only so, the project influence area of 1km radius from the center of SPS was defined as project study area. The environmental and social (E&S) receptors sensitive to project development were identified and spatially represented by creating data. Secondary data for

mapping activities was sourced from recognized, publicly available databases. The outputs of the mapping exercise were used as input for planning the baseline primary survey.

1.3.4 Baseline Primary Surveys

The baseline primary surveys conducted in September/October 2022 involved:

- Verification of data layers mapped using secondary data
- Baseline environmental quality monitoring
- Focus group discussion with project stakeholders
- Visit to relevant government department offices to confirm or collect data

1.3.5 Legal Requirements and IFC-PS

IFC's has provided a provisional categorization tool for projects. The tool assigns an E&S category based on risks inherent to the particular sector, as well as on the likelihood of a development taking place and on what can be reasonably ascertained about the environmental and social characterization of the Project's likely geographical setting.

As part of the review of environmental and social risks, impacts and magnitude for the proposed component assigned for study, it is envisaged that the impacts on are few in number, site- specific, largely reversible, and readily addressed through mitigation measures. The national regulations on environment, health, safety and social that are applicable to the project during pre-construction, construction, operation & maintenance (O&M) phases, as well as keyregulations that do not apply to the project were identified. The compliance requirements of each regulation by the Company (such as obtaining approvals, submitting monitoring reports, and storage of materials in a particular manner etc.) were further identified.

1.3.6 Environmental & Social Impact Assessment

The impact assessment involved the prediction and evaluation of impacts from the proposed project in different phases i.e., construction and operation phases of the Project and included consideration of mitigation measures towards the same. Based on the Environmental & Social sensitive receptors present in the study area and activities during different phases of the project (pre-construction, construction, operation, decommissioning), impacts have been identified. The results of baseline primary surveys were used as input to identify impacts. Impact assessment also involved risk assessment covering hazard identification, consequence analysis and risk reduction measures and recommendations.

1.3.7 Environmental and Social Management Plan

Based on the impacts identified for the project and associated activities, Environmental & Social Management Plan has been developed for the assigned work. ESMP includes suggested mitigation measure, roles and responsibilities for implementation.

1.4 Organization of the Report

The ESIA Report is organized into the following Chapters:

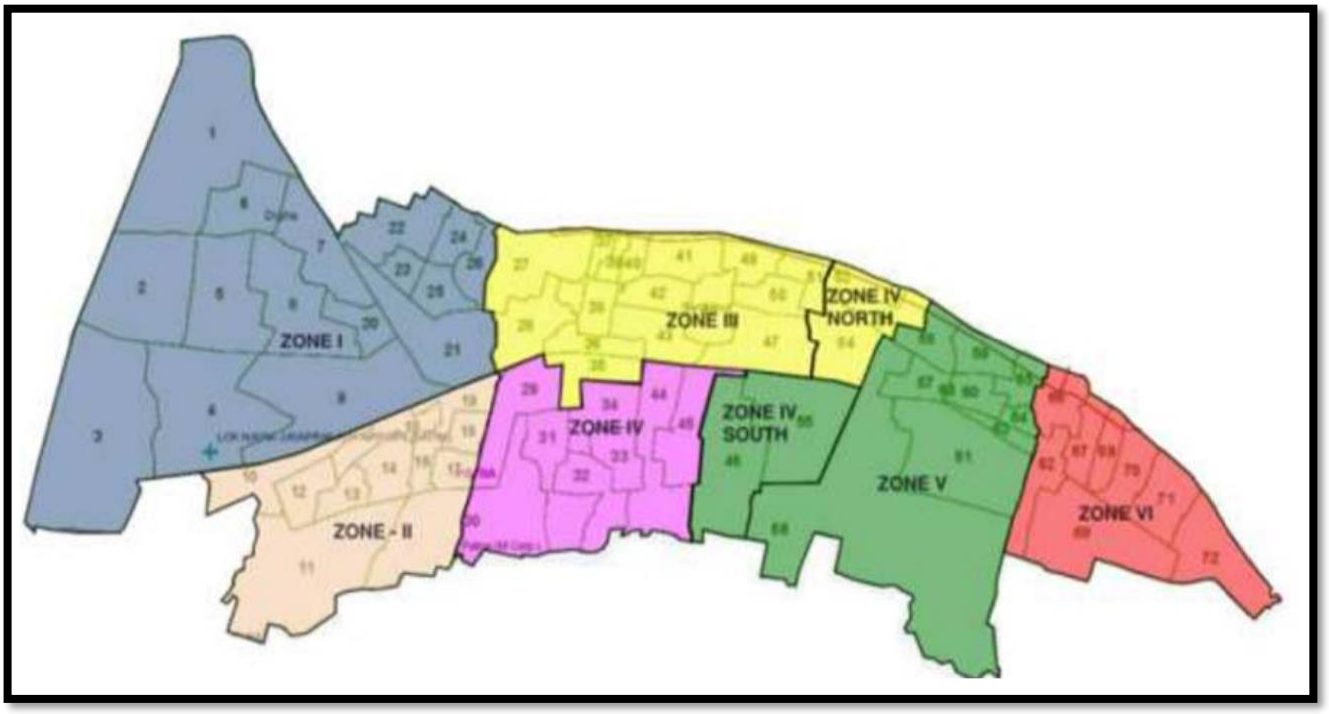
- **Executive Summary** provides a brief summary of the entire Contractor Specific environmental & Social Assessment Report(C-ESA).
- **Chapter 1** provides a brief background about the project, specifying the need to undertake the C-ESA study, reference framework for the assignment and approach adopted for undertaking the C-ESA.
- **Chapter 2** gives details about the project location, various components and process flows of the project.
- **Chapter 3** outlines the application of Indian legal requirements on environment, health and safety and social aspects of the project. It also establishes applicability of the World Bank E&S Framework requirements with compliance status.
- **Chapter 4** presents findings of the baseline studies conducted in the project influence area and secondary information collected to understand the existing environmental and social conditions. A summary of the stakeholder consultations and the approach adopted are also provided.
- **Chapter 5** presents Environmental & Social impacts identified across the project lifecycle.
- **Chapter 6** presents the set of mitigation and management measures to be taken during project implementation to avoid, reduce and mitigate for adverse environmental & social impacts, monitoring and implementation arrangement with EMP budget.

The report is supported by **10 Annexures** that are referenced in the respective chapters.

2 Project Description

2.1 Project Location

Patna is the capital of Bihar and is the second largest urban center in eastern India, after Kolkata. It is Located at $25^0$20'North Latitude and $85^0$03'East Longitude. It is one of the oldest inhabited places in India. The city is growing and expanding at a fast pace in terms of population, economics, business, and education. Patna Municipal Corporation is divided into 72 wards and extends over an area of approximately 100 km^2. The city is well-connected with other major cities of India via roads, rails and air. The city is surrounded by three rivers - the Ganga on the northern side, the Punpun on the southern side and the Sone on the western side. The Patna Municipal Corporation has divided the city into six sewerage zones namely, (1) Zone I – Digha (2) Zone II – Beur (3) Zone III and Zone IV North – Saidpur (4) Zone IV – Kankarbagh (5) Zone IV South and Zone V – Pahari (6) Zone VI – Karmalichak.



Patna city is already covered with existing or ongoing sewerage network and a comprehensive sewerage system is proposed for Kankarbagh Zone is as follows.

Kankarbagh Zone

Kankarbagh is one of the largest colonies of Asia established in 1916. The word Kankarbagh means garden of kankar (stone chips). It is an adjacent residential area in Patna. Area under this zone is around 900 acres. The zone is marked by Bhagalpur-Patna Road and railway line on west, Bhootnath Road on east, Eastern Railway main line on north and Badshahi nala on south. Kankarbagh Circle covers 11 Wards of Patna Municipal Corporation (ward number 29-35, 44-46 and 55) but under this project only ward no.-29,30 (partially),31,35 and 44 are covered with 150km of sewer network. Some of famous landmarks at this zone are Panch Shiv Mandir, TV Tower in Bhootnath Road and Kumhrar. Kumrahar is the remains of the ancient city of Pataliputra, located 5 km of east from Patna Junction railway station, on Kankarbagh Main Road. The main area covered under this circle is New By-Pass

Road area, Kankarbagh road area, Chiraiyatad railways bridge area, Gandhi setu road area and Saidpur area. There are several Multi-Speciality Hospitals, bank and schools spread throughout the area. This zone is divided into sector wise and there are several children parks. Some popular parks are - Kumhrar Park, Shivaji Park and Lohia Nagar Park etc. There is a sports complex also in this colony, known as Patliputra Sports Complex.

Previously there was no separate STP for this zone and was the part of the Beur and Pahari zone. Therefore, the sewage flow from this zone was designed to route to the STPs of Beur and Pahari zone for treatment.

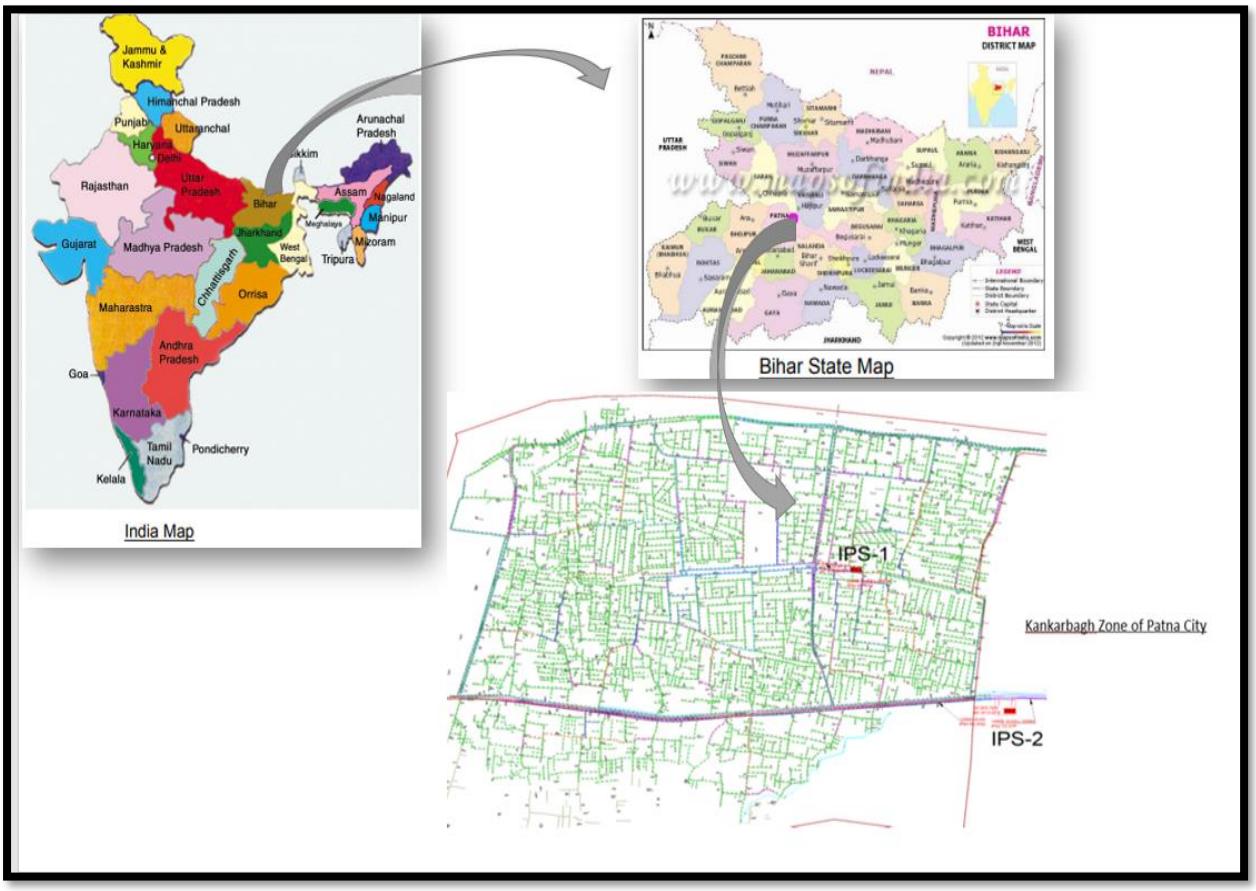


Figure 1: Kankarbagh Zone,Patna City, Bihar

2.2 Project Component

The Proposed Sewerage system comprises-(i) Construction of one new STP of 50mld capacity for Kankarbagh Zone at Pahari STP Campus. (ii) Two new SPS (90 MLD SPS-A & 110 MLD SPS-B) to collect wastewater from the entire catchment area and pump the wastewater into to gravity sewer line through rising main to feed the new STP (iii) Laying of 150 km sewer network. The STP facilities along with sewage networks in Kankarbagh zone of Patna will reduce pollution load of receiving river. This report deals with Network part only consisting of 2 SPS and 150.21km network.

Sl	Parameters	Kankarbagh
1	EL	48-53 m above Mean Sea Level
2	No. of Wards	29, 30 (50%) 31, 32,33,34,35,44 and 45
3	Area considered	9.81 sq. km
4	Total length of network	150 km
5	No. of Sewage Pumping station	2
6	Location of SPS -A	Near Patliputra Stadium
7	Location of SPS -B	Near Khemini Chak & Ford Hospital

The Major components of works include: - (i) Earthworks for Gravity Sewers and Rising Mains (ii) DWC and RCC pipes for Gravity Sewers (iii) Precast RCC Manholes of 0.9 m dia to 1.82 m dia for various depths (iv) Ductile Iron Pipe for Rising Mains (v) Inlet Well, Screen Channel, Wet Well for the Pumping Stations (vi) Submersible Pumps for Pumping Station (vii) Associated Electrical items like Panels, Transformers & DG for the Pumping Station.

The schematic diagram of the proposed project is given in **Figure 2**

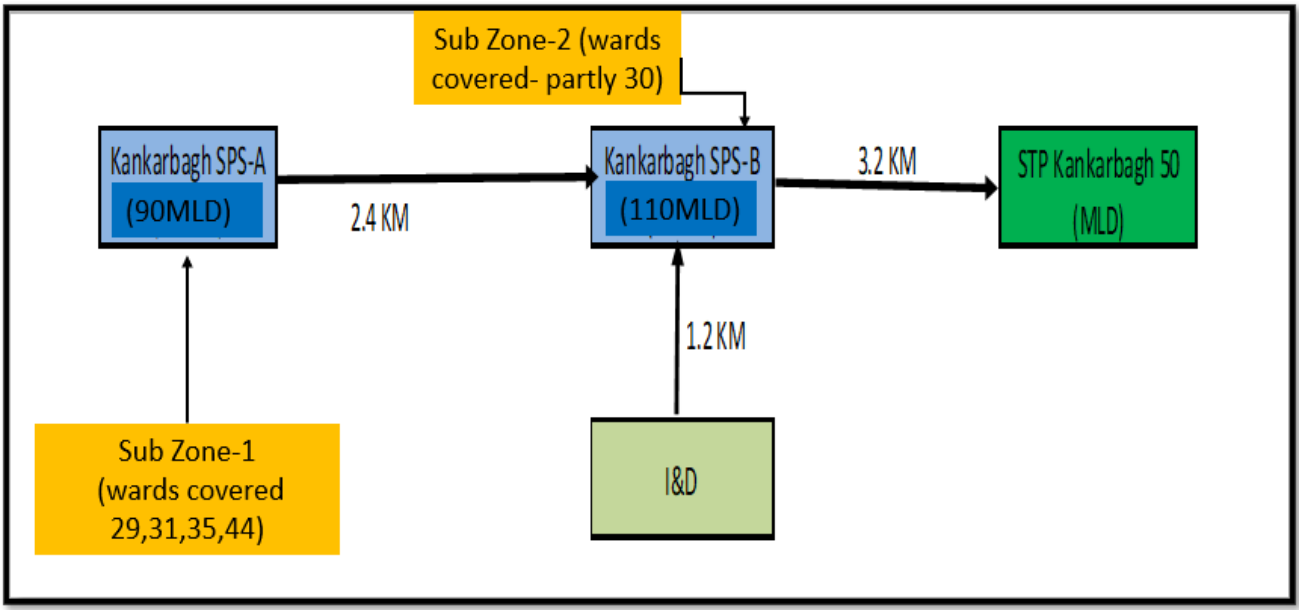
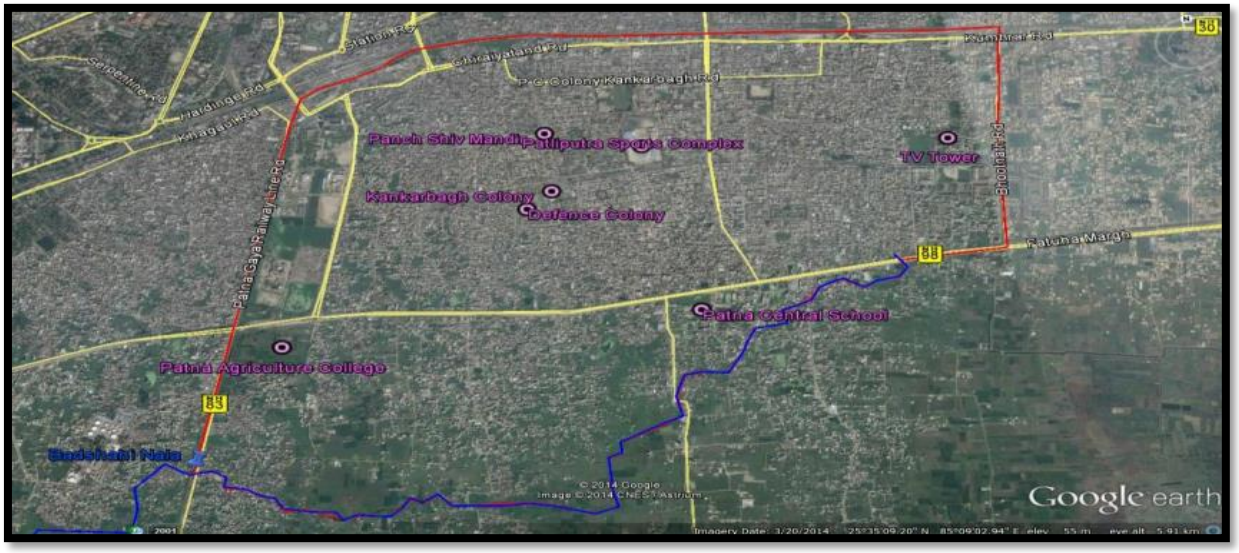


Figure 2: Schematic Diagram of Sewage Water Flow for the Proposed Project

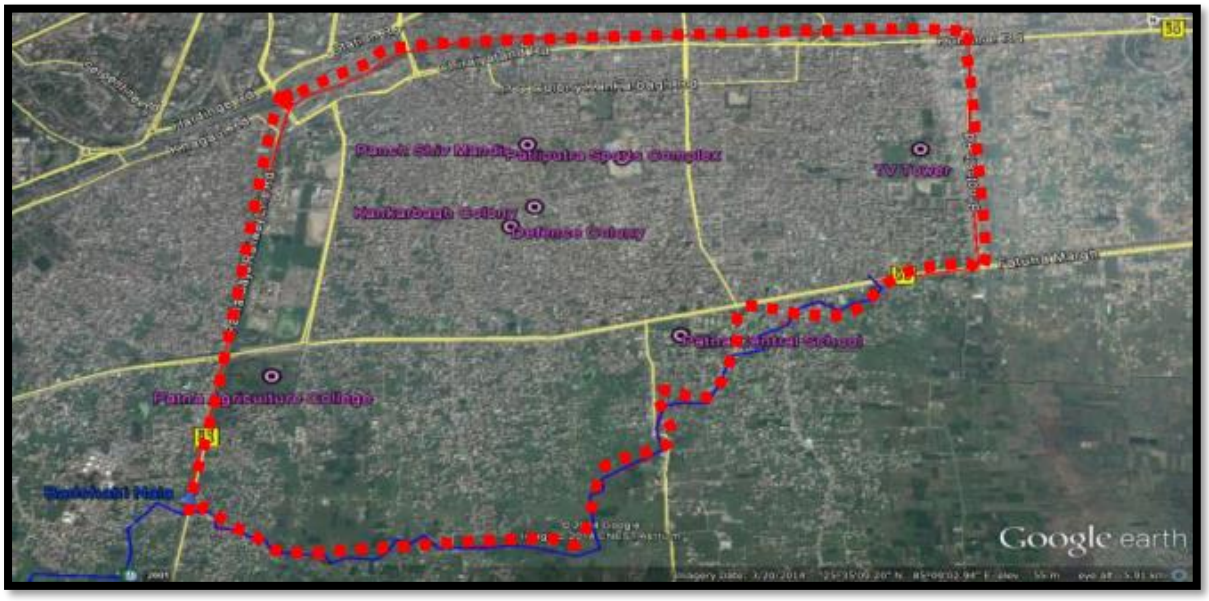
2.2.1 Network Zoning

Kankarbagh is located on the southern part of the Patna City. This zone is bounded on the north by Kankarbagh main road, on the West by the Gaya Line road, on the East by the M G road and 90ft road and Badsahi pan in the South. Kankarbagh zone (Zone IV) is newly carved out of existing Beur and Pahari zones. This zone consists of wards numbers 29, 30 (partly – 50%), 31 to 35, 44 to 46 & 55, with 886.50 Hectares of area of total PMC area. Total population for this zone per census 2011 data is 2,13,389.



According to proposed Sewerage zonation, the ward number 29, 30, 31, 32, 33, 34, 35, 44 and 45 lie in this zone but under proposed project only ward no.-29, 30 (partly), 31, 35 and 44 is to be covered. This zone has historical importance as the remains of the ancient city of Pataliputra has been excavated 5 km east of Patna Junction railway station, on Kankarbagh Main Road. But this historically important site is not covered under this project. The major landmarks at Kankarbagh are Panch Shiv Mandir, TV Tower in Bhootnath Road and Patliputra Sports Complex etc. Today, this area is developing into an uptown area with expanding and soaring residential apartments.

The figure given below is showing the outline of catchment area under this zone.



Kankarbagh being densely populated area within Patna city needs a special attention during design and construction. Kankarbagh Zone consist of Kankarbagh colony, Tilak Nagar, New Chitragupt Nagar, Rajendra Nagar, Lohiya Nagar, Karbigahiya, Chiriyatadpur, Indranagar Bank colony, Ram Krishna Nagar, Bhupati Nagar, Amardeep Nagar, Ashok Nagar, Khemni chak, Yogipur Gaon. To design sewerage system properly with efficient collection network & considering existing natural topography (Surface topography favoring gravity flow), Kankarbagh Zone has been further subdivided into two sub zones.

1. Sub Zone 1: The main/ trunk network has been designed in view of that it would cater all major areas. One major line is proposed covering PC Colony, Pateker Nagar, LIC colony coming from northern side of zone to SPS A by PC colony Kankarbagh road. Another main line is proposed towards Ramrekha Path to Hanuman Nagar to cater east Indira Nagar, Hanuman Nagar, Bankman colony etc. and sewage water discharged to SPS A at proposed near Patliptra stadium. For eastern part of Zone, a main line staring from Janakpur bus stop to SPS A has been proposed via Postal Park Road, Buddha Marg Road to cater Mithapur, Budha Marg, Chiriyatand, Khas mahal, sports complex etc. which are major influential area of Kankarbagh Zone. Accumulated waste water further pumped from SPS A to SPS B near Kheminichak through a Pumping main.

2. Sub Zone 2: A trunk main has been proposed for other zone of kankarbagh, covering major area like Ramkrisna nagar, Madhuban colony Jaganpura etc. Sewage from trunk main will be discharged into SPS 2 which will further move to STP via Rising main.

Figure 2 presents the zoning map for Kankarbagh Zone

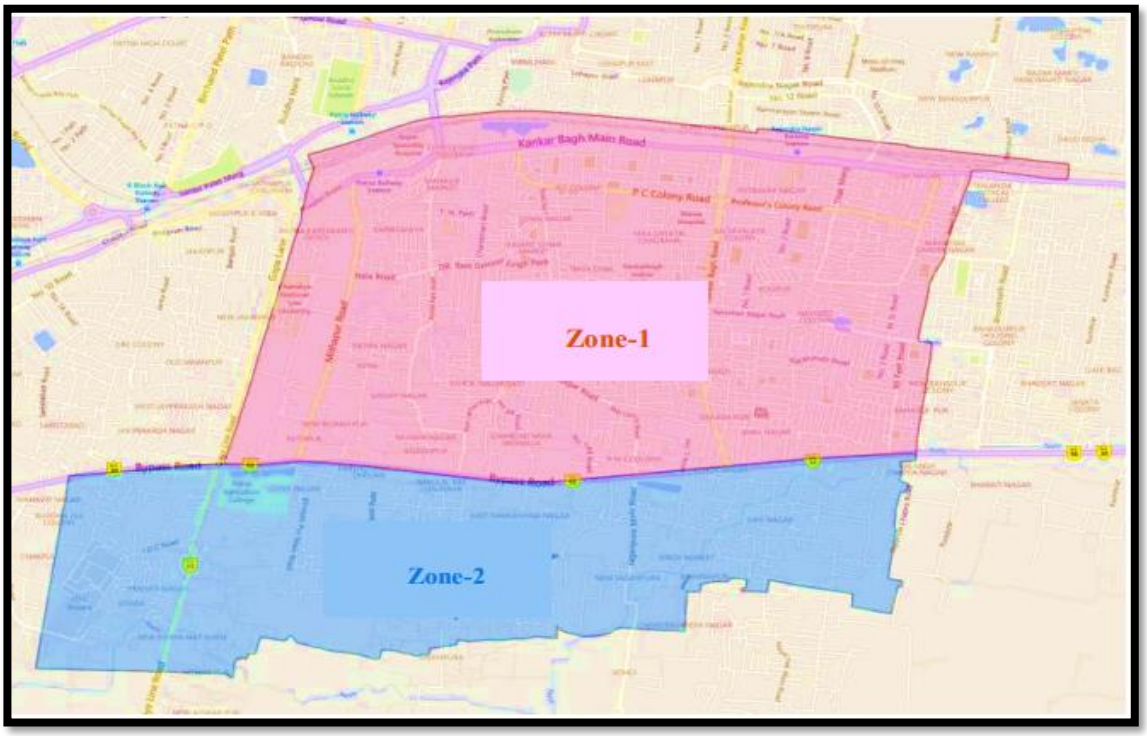


Figure 3: Zoning Map of Kankarbagh Zone

2.2.2 Sewerage Network

10. Kankarbagh zone (Zone IV) is newly carved out of existing Beur and Pahari zones. This zone consists of wards numbers 29, 30 (partly – 50%), 31 to 35, 44 to 45 & 55, with 886.50 Hectares of area of total PMC area. Total population for this zone per census 2011 data is 2,13,389.

11. There are marginal changes in the project from DPR stage to final design submitted by contractor. These changes have been duly approved by BUIDCo.

DPR Component	Tender Document	Approved for Execution
Sewerage network 150km (including trunk sewer and the lateral network)	Sewerage network-150.163km (Including trunk sewer and the lateral network) with Rising main-5.020km, Manhole-5219 nos and House connection pit-18808nos	Sewerage network-150.21km (Including trunk sewer and the lateral network 122.976km open cut and 27.234km Trenchless) with Rising main-5.515km Manhole-6384 nos and House Connection Pit-1817nos
Kankarbagh SPS-A (90 MLD) At Yogipur/Ganga Bhawan	Kankarbagh SPS-A (90 MLD)	Kankarbagh SPS-A (90 MLD) In front of old water tank CA-32, Housing Board Colony, East Indira Nagar, Patna, Bihar-800020 Coordinates: 85.155108;25.593734
Kankarbagh SPS-B (110 MLD) Near Khemini chak and Ford hospital	Kankarbagh SPS-B (110 MLD)	Kankarbagh SPS-B (110 MLD) Service road, East Lakshmi Nagar, Ramkrishna Nagar, Khemnichak, Patna, Bihar-800027 Coordinates: 85.169622; 25.584792
Ward Coverage-29, 30 (partly – 50%), 31 to 35, 44 & 45	29, 30 (partly – 50%), 31, 35, & 44	29, 30 (partly – 50%), 31, 35, & 44

12. The major component of works include:

- ✓ Total sewer network of 150.21km is proposed for this zone. Out of which 122.976km will be laid down by open trench method while 27.234km is proposed for trenchless work mainly in congested, high traffic and crossing areas.
- ✓ Total length of rising main is 5.515km. As per discussion Open-trench method will be used for laying of rising main with DI(K9) pipe of dia 1200mm. The depth of rising main will be 2.5m from the ground level. About 1.2km of rising main will run parallel to the elevated Patna Metro line from Rajendra nagar to NH.
- ✓ The project proposes to lay sewer pipelines within the Right of Way (RoW) center/along the existing roads by using open trenching methodology. Approximately 95% of the excavated material will be used in backfilling of trenches. Remaining 5% is proposed to be utilized at SPS for site leveling.
- ✓ Manholes -Construction of 6384 circulars precast RCC manholes having size of 0.9m dia to 1.82m dia for various depth vary from 1.60 m to 8m as per the requirement.
- ✓ House Service Chamber-1817 house service chambers having size of 600mm x 450 mm & 900mm deep shall be connected to the outfall of the individual household.

13. **Minimum diameter of sewer network is proposed as:**

    - 500mm and above (RCC NP3 pipes)
    - 200mm-400mm (DwC PE Pipe)

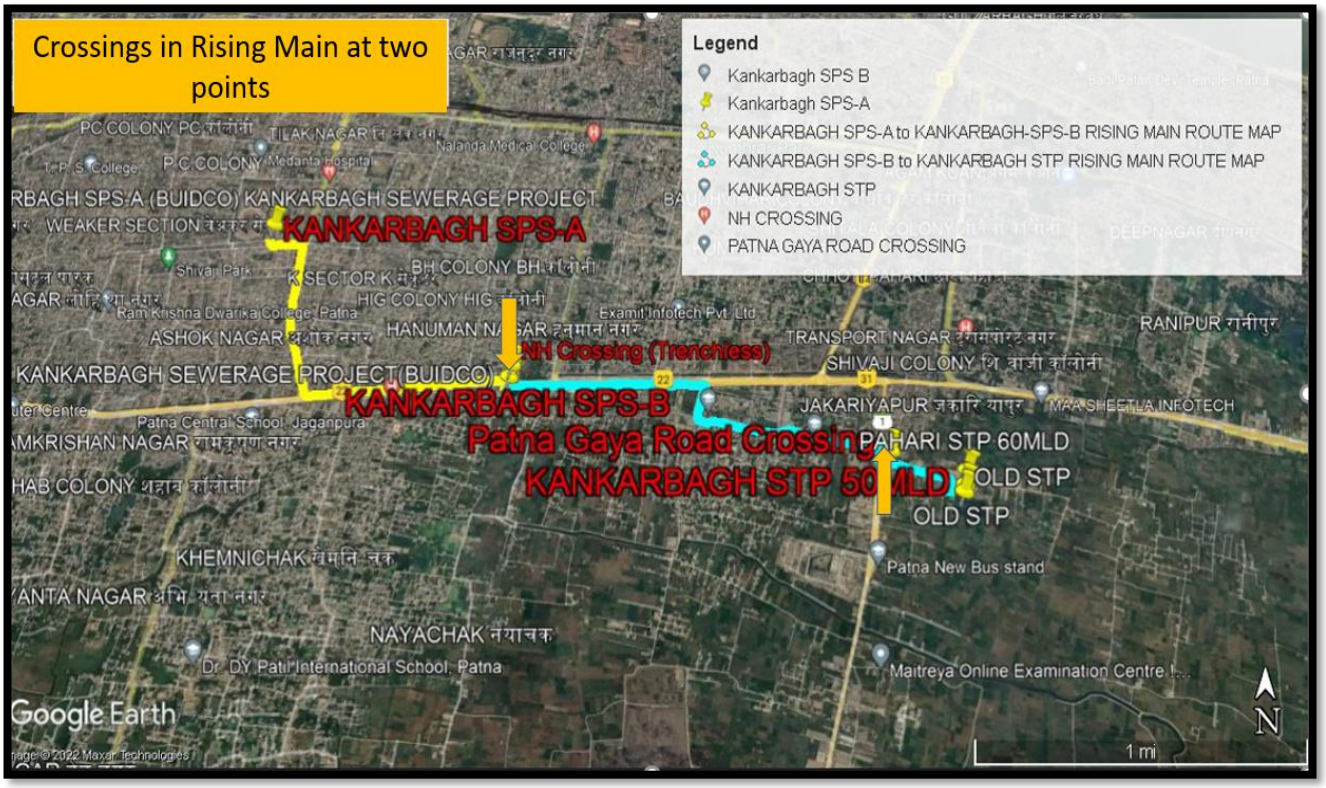
14. **Laying of Pipelines below sub-soil water Table**

    The ground water table in Patna varies from 6m -8m on an average below the ground level. The ground water table rises to around 4m during the monsoon. In the low-lying areas and the areas close to the Ganga, the ground water table is in the range of 3m - 4m below the ground level. The maximum depth of the sewer line is in most areas limited to a maximum depth of 8.0m for Kankarbagh, to avoid / eliminate the need for additional pumping station and in effect, the additional expenditure in Operation and maintenance costs.

15. Operation & Maintenance (O&M) of the Structures for 15 years.

16. Environmental Monitoring and Management Measures.

17. Under Kankarbagh zone pipe laying work is proposed at two crossings. One is National Highway crossing and another is on approach road to STP (i.e. Patna Gaya Road State Highway). For these crossings, trenchless work is proposed and NOC is under process.



18. Details of pipe laying in Kankarbagh Zone:

Details of Pipe laying -Kankarbagh Zone

Size of Pipe	Type of pipe	Length in m	Method Of Laying
200 mm dia	DWC Class SN8	115463	OPEN TRENCH
250mm dia	DWC Class SN9	3817	OPEN TRENCH
300mm dia	DWC Class SN10	2664	OPEN TRENCH
400mm dia	DWC Class SN11	823	OPEN TRENCH
500mm dia	RCC NP3 Spigot & Socket pipe	194	OPEN TRENCH
600mm dia	RCC NP3 Spigot & Socket pipe	15	OPEN TRENCH
200 mm dia	PN6 PE 100 HDPE pipe	11541	Trenchless Technology
250 mm dia	PN6 PE 100 HDPE pipe	1592	Trenchless Technology
300 mm dia	PN6 PE 100 HDPE pipe	1471	Trenchless Technology
400 mm dia	PN6 PE 100 HDPE pipe	2305	Trenchless Technology
500 mm dia	PN6 PE 100 HDPE pipe	2383	Trenchless Technology
600 mm dia	PN6 PE 100 HDPE pipe	2280	Trenchless Technology
700 mm dia	PN6 PE 100 HDPE pipe	3018	Trenchless Technology
800 mm dia	PN6 PE 100 HDPE pipe	1112	Trenchless Technology
900 mm dia	PN6 PE 100 HDPE pipe	877	Trenchless Technology
1000 mm dia	RCC Jacking pipe SS Collar	257	Trenchless Technology
1100 mm dia	RCC Jacking pipe SS Collar	38	Trenchless Technology
1400 mm dia	RCC Jacking pipe SS Collar	360	Trenchless Technology
Total		**150210**	

19. The sewerage Network in Kankarbagh Zone

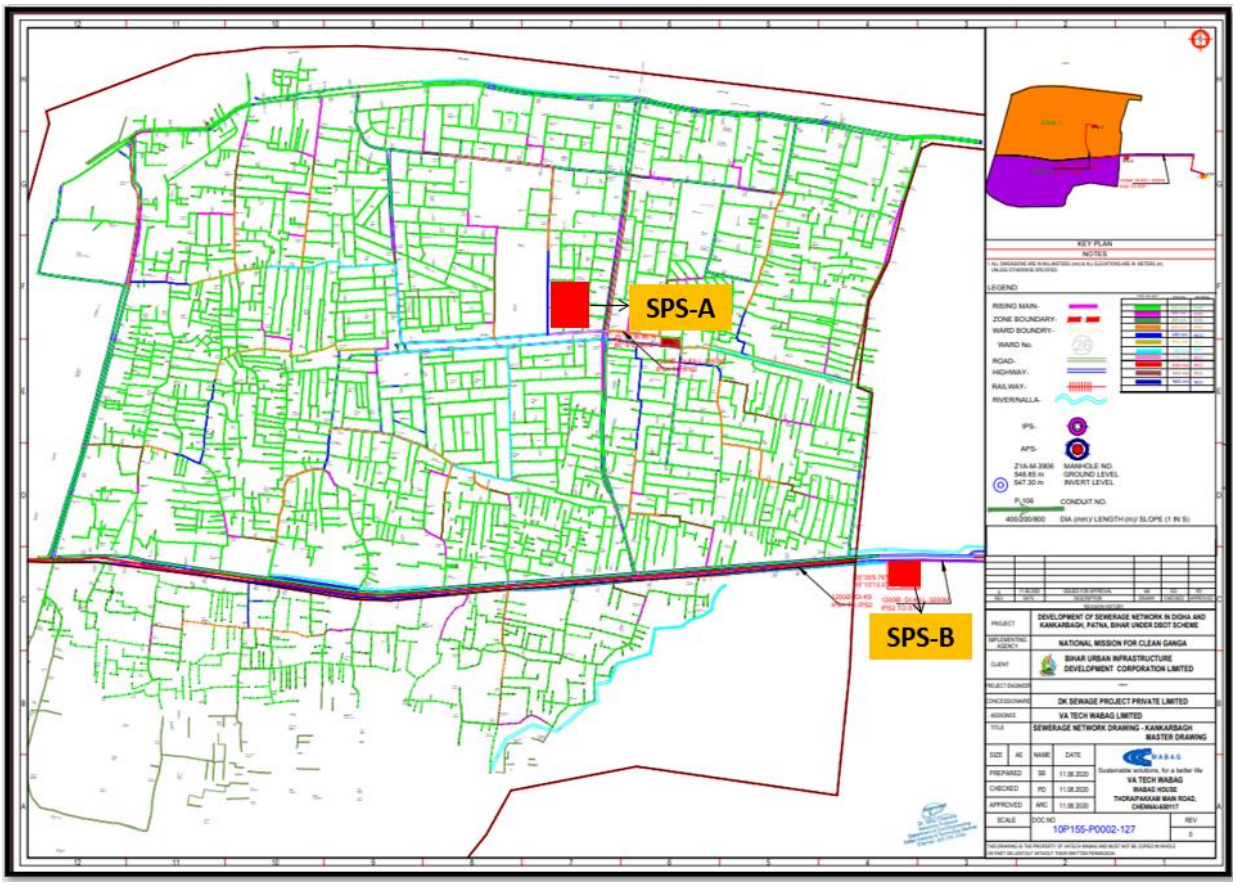
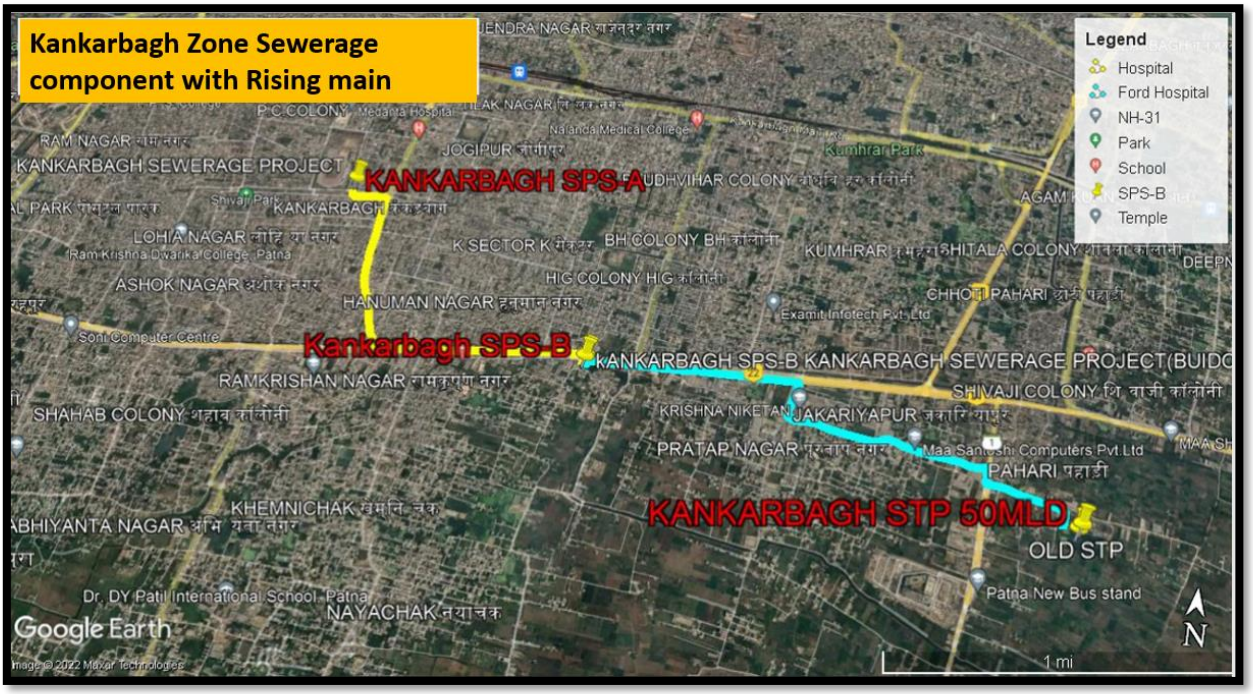


Figure 4: Sewer Network of Kankarbagh Zone

2.2.3 Sewage Pumping Station

1. The location of both SPS-A and SPS-B is given below in google map.



2. Design Considerations for Sewage Pumping Station

SPS-A and SPS-B of Kankarbagh Zone shall include construction works for the following:

For SPS-A, pumping system as per CPHEEO for the peak flow discharge of 90 MLD capacity. The sewage from SPS-A will flow into SPS-B.

- ✓ For SPS-B, pumping system as per CPHEEO for the peak flow discharge of 110 MLD capacity. The sewage from SPS-B will be flow directly to 50 MLD STP at Pahari area.
- ✓ Inlet chamber of SPS-A and SPS-B shall include mechanical coarse bar screens along with manual bypass screens.
- ✓ CI flush bottom, rising spindle type wall mounted Sluice Gate at the upstream & downstream side of the screens, for maintenance purpose .
- ✓ Electrical system consists of receiving HT Power from client, step down to LT System, DG back for emergency, LT Panel and distribution board for feeding power to the Sewage Pumping station load like submersible pumps etc. Complete illumination, earthing and lightening protection for overall SPS area.
- ✓ Instrumentation system consists of PLC RTU panel as automation system for controlling drives, field instruments etc. Field Instruments like Level Transmitter, Level Gauge, Flow Transmitter, Level Switch located Inlet chamber, well etc.

3. Mechanical Equipment at SPS will include following major items:

   (i) Pumps -Submersible Pumps & Dewatering Pumps (ii) Screens with Conveyor (iii) Sluice or Open channel Gates (iv) Material Handling Equipment

4. Major Electrical Items: (i) DP Pole structure with Metering Panel (ii)HT Switchboard (iii) Distribution Transformer (iv)Diesel Generator Set (v) LT Panels and Distribution Boards (vi) HT, LT and Control Cables (vii) Illumination System (viii)Earthing and Lightening protection System

5. Major Instrumentation Items: (i)PLC RTU Panel with HMI Graphics(ii) UPS System(iii) Instrument Cable (iv)Level Transmitter(v) Level Gauge (vi) Flow Transmitter (vii) Level Switch

6. Fire Protection & Safety Equipment: The fire protection systems for the plant will be provided to meet the basic building fire protection services. Fire protection system will be designed as per TAC guidelines. Smoke and Heat detectors will be provided in control room with fire alarm panel having appropriate battery back-up. Portable fire extinguishers will be provided in all control rooms, offices and any other area where fire might break out. Extinguishers will be of the Dry Powder Type / CO2 type depending on the location and possible hazard e.g., electrical, chemical and oil fires. Extinguishers will be colour coded and clearly marked with their type and the class of fire for which they are suitable and comply with the relevant standards.

2.2.4 Design Period

The design period of various component is as follows:

Component	Design Period(yrs)	Base Year (INTERMEDIATE)	Design Year (ULTIMATE)	Remarks
Sewerage Network	30	2020	2050	Cost of civil works is economical for full design period.
Sewage Pumping Station (Civil work)	30	2020	2050	
Sewage Pumping Station (Electromechanical)	15	2020	2035	Considering the Expected life of electrical and mechanical components.
Rising main	30	2020	2050	In case of low velocities, dual rising mains to be examined

2.3 Project Phasing and Schedule

The Project Schedule is given below

Sl No.	Project component	Scheduled completion	Estimated date of Completion
1.	Engineering	18-Feb-22	31-Dec-22
2.	Ordering	20-Dec-22	30-Apr-23
3.	Supply	17-Feb-23	30-Dec-23
4.	Civil Works	12-Sept-23	31-Jan-24
5.	Erection Work	7-Dec-23	30-Apr-24
6.	Commissioning	1-Jun-24	30-Aug-24

2.4 Project Cost

The total cost for DBOT contract of Kankarbagh Zone Sewerage Project is Rs. 353.3 Cr [Total capital cost of Rs. 293 crores + 15 years O&M cost of Rs.26.04 Cr + 15yrs Energy cost of Rs. 34.26 Cr].

2.5 Operation and Maintenance for SPS and Sewer lines

As per contract agreement Schedule 16 for Operation & Maintenance Services for Kankarbagh Sewerage Network Facilities, the Concessionaire shall ensure the Operation and Maintenance of the Sewerage Network, pumping stations and other allied works in compliance to the guidelines contained

in the Manual on "Sewerage & Sewage Treatment", latest edition as published by the Central Public Health Environmental Engineering Organization (CPHEEO), Ministry of Urban Development, Government of India, New Delhi and the prescription laid down hereunder.

Operate the Sewerage System, for a period of 15 years from the date of commissioning as specified below:

1. The Concessionaire shall prepare a detailed program (referred to as O&M Manual) covering the operation and maintenance of the Sewerage Network as a whole at the time of the commissioning of the project.
2. The Concessionaire shall operate and maintain the Sewage Pumping Station (SPS), Lift Stations and Sewer networks under the Contract complete including the road works (liability of restored portions of roads is limited to 3 years only, however the Concessionaire will not be held responsible for road restoration required on account of drainage done by other agencies/ utilities), landscaping, civil/structural, mechanical components, instrumentation system, Electrical System, all utility and ancillary buildings, SPS premises area, lift station, for the period upto End of Concession from the date of successful completion of "Tests after Completion of the Works".
3. The Concessionaire shall make his own arrangements at his own cost for staff required for operation and maintenance of networks and other assets, lubricants, diesel, spares, tools and tackles, sewer cleaning vehicles and other equipment maintenance of all types such as routine, breakdown, periodic and repair maintenance, replacement of damaged/ unserviceable sewers, maintenance of house service connections after building lane s, screenings collection, desilted material collection, transportation and disposal,co-ordination with Bihar State Pollution Control Board (BPCB), Bihar Power Corporation Ltd. (BPCL) authorities and any other activity required for the operation and maintenance of the constructed Works in full compliance with all applicable rules, regulations, laws, codes, effluent quality requirements and any other limitations. The Concessionaire will conduct fortnightly checks of the Sewerage Network Facility including lateral network, manholes, etc. The Concessionaire will also maintain a customer grievance redressal center and ensure that O&M services meet the standards of services.
4. The Concessionaire ensures that there is a steady and uninterrupted flow of waste water/sewage to STPs.
5. Identify and inform the BUIDCO about the illegal connections on the Sewerage Network within seven days of its being detected.
6. The Concessionaire shall submit a weekly report to the Employer detailing the Operation and Maintenance indicating the labour hours expended, Electrical Power Consumed and other Consumables consumed and also problems faced and rectified.
7. The Concessionaire shall submit detailed schedule/manual of all O& M activities with references of equipment manufacturers' maintenance schedules/manuals to the Employer for review and approval.
8. The Concessionaire shall submit Guidelines and Instructions manual for the maintenance staff of all levels for all the tools, plants and equipment and Operating Sewerage Network to maintain the service levels within the standards prescribed within the contract.

9. The Concessionaire shall carry out all O&M activities as per the approved Operation and Maintenance Manuals.

10. If any consumer connection needs extension of sewer line during Network O&M period, from an existing line, the same will be designed and estimated by the Concessionaire using prevailing schedule of rates and market rates. Such costs will also include 50% towards supervision charges. The owner will collect the same and pays to the Concessionaire for executing the same after the connection is formally approved. However, BUIDCO will retain connection fee/ charges.

11. During the Operation and Maintenance period, the Concessionaire shall ensure that the sewage detention time in wet well not exceeds 30 minutes and there is no backflow of sewage. The Concessionaire is responsible for maintaining back up power arrangements at their cost to ensure that the O&M services are not affected due to failure of power supply from the Public Utility Company.

12. The Concessionaire's responsibility shall also include the safety and security of the Works during the course of Operation and Maintenance.

13. During Operation and Maintenance period, the Concessionaire shall appoint a Concessionaire and Electrical/Mechanical Technician. In addition, the Concessionaire shall appoint suitable number of Concessionaires, drivers, cleaners, fitters, electricians, helpers, gardeners, office peons, security guards, laborers as required for the operation and maintenance of complete proposed sewerage system for three shifts and adequate other staff / supporting personnel during general Shift. Security of man-power, built structures, equipment and other system components.

14. The Concessionaire shall prepare and follow a Maintenance plan, detailing the maintenance activities scheduled for each of the component of the Sewerage Network on a periodic approved by Project Engineer and / or the BUIDCO. This should include the requirements for preventive maintenance.

3 Legal and Other Requirements

The Environment & Social legal requirements applicable to the project at the national, state, and local level covering various components through the lifecycle of the project have been identified in the **Section 3.1**. Similarly, the World Bank Environment & Social operational policy applicable to project is identified in **Section 3.2**.

3.1 E&S Legal Requirements for Sewerage Infrastructure Facility

The environmental regulations in India are drafted to address protection of environment and natural resources that form the input to any project or activity as well as for management and handling of pollutants released from a project or activity. The key applicable legal requirements for environmental and social aspects attracted by the project under investments and implementation are as follows:

- Policy and Regulatory Framework of Government of India (GoI).
- Environmental Policy and Regulations of the Bihar State Governments.
- Legislations applicable to construction activities.
- Environment and Social Management Framework of Namami Gange Programme.

The Government of India has laid out various policy guidelines, acts and regulations pertaining to sustenance, protection of environment and its various components. The Environment (Protection) Act, 1986 is umbrella Act for the protection of environment. As per this Act, the responsibility to administer the legislation has been jointly entrusted to the Ministry of Environment & Forests and Climate Change (MoEF&CC) and the Central Pollution Control Board (CPCB) / State Pollution Control Boards (SPCBs).

As per the EIA Notification, dated 14th September' 2006 and its amendments thereafter, stipulatedby the Ministry of Environment, Forest and Climate Change (MoEF&CC); the proposed project does not attract any environmental clearance. However, the project shall require to obtain Consents from competent authorities such as the BSPCB, for 'Consent to Establish' by submitting a common application (as per Schedule-I), under the Water (Prevention and Control of Pollution) Act, 1974, the Air (Prevention and Control of Pollution) Act, 1981 and The Hazardous Wastes (Management and Handling) Rules, 1989, as amended in January 6, 2000 and May 21, 2003. **CTE NOC is received for establishment of STP under Kankarbagh Sewerage Project.**

The key environmental and social laws and regulations relevant to the projects under the NGRBP with the compliance status are tabulated below. The key environmental regulations can also be accessed at www.moef.nic.in/rules-and-regulations.

3.1.1 Applicable Environmental Regulations

Regulation	Brief	Action Required	Compliance Status
1.Environmen (Protection) Act, 1986	The Act has been framed as an umbrella Act which provides for both protection and improvement of environment. A number of Rules, Notifications and Authorities are formulated under this Act for prevention of pollution, and protection of environmentally sensitive locations.	**Construction and O&M Phase:** Submit an environmental audit report for the financial year ending the 31st March in Form V to the BSPCB under each of the Consent Orders granted to the Project and/or its components as per time mentioned under NOC.	This report is limited to Network part. The project is envisaged to generate dusts, fumes, gaseous emissions, noise pollution during both construction and operation of the project. Thus, as per regulatory requirement, these potential pollution sources shall require to be maintained within emissions and discharge norms set out by BSPCB and accordingly report is required to be submitted.
2. Water (Prevention and Control of Pollution) Act,1974	The Act provides for the prevention and control of water pollution, and for the maintaining or restoring of wholesomeness of water in the country	**Construction Phase:** • Obtain a Consent to Establish from BSPCB for carrying out construction activities • Obtain a Consent to Operate from BSPCB for establishing and operating a batching plant. • Monitor ambient air levels at regular intervals to ascertain operations are within permissible limits. **O&M Phase:** Obtain a Consent to Operate from Bihar State Pollution Control Board for operation of the Sewage Treatment Plant	This report is limited to Network part. PUC certificate of vehicle engaged at construction site is available in site record. 
3. Air (Prevention and Control of Pollution) Act,1981	The Act provides for prevention, control, and abatement of air pollution from an establishment and primarily addresses outputs of development activities.		
4.Environmental Protection Second Amendment Rules 2002 (DGS et) & 2004	The Rule provides regulations to control noise limits and emission limits for a Diesel Generator.	**Construction Phase:** • Diesel generator set should be provided with acoustic enclosure. • Diesel generator stack height should meet the specifications in the Consentorder.	Compliance will be ensured at site.

5.The Noise Pollution (Regulation and Control) Rules 2000	It provides for regulations to control ambient noise levels in public places from sources such as industries/ construction works/ community events,etc.	**Construction Phase:** • Adopt measures to control and mitigate noise levels from construction equipment and activities. • Monitor ambient noise levels at regular intervals to ascertain operations are within permissible limits. **O&M Phase:** • Monitor ambient noise levels on a periodic basis (at least once a year) to ascertain operations within permissible limits.	Fitness certificate of equipment is to be checked regularly for validity. Noise monitoring at construction sites to be ensured as per environmental monitoring plan. **(Contractor is conducting ambient noise monitoring on quarterly basis from NABL lab and report is attached in Quarterly ESMP compliance report).**  
6. The Hazardous Waste (Management Handling and Transboundary Movement) Rules, 2016	Hazardous Waste Management Rules are notified to ensure safe handling, generation, processing, treatment, package, storage, transportation, use reprocessing, collection, conversion, and offering for sale, destruction, and disposal of Hazardous Waste.	**Construction and O&M Phase:** • Obtain an Authorization from the BSPCB for handling and management of hazardous waste mainly generated in the switchyard and from DG sets (ifany)for backup power. • Comply with conditions of the authorization. • Store hazardous waste (waste oil, oil & grease laden cotton, empty paint tins, spent filter, spent media etc.) on impermeable surfaces protected fromenvironment Dispose hazardous waste to an authorized Transfer, Storage and Disposal Facility.	Ensure to store used oil from DG sets in HDPE drums in isolated covered facility/paved area with proper signage. Conditions of CTE will be followed and will be handed over to government approved recyclers. Road tar (hazardous substance) will be generated during road cutting operation in laying of sewer lane. This bitumen is used for back filling. BSPCB guideline will be followed. In O&M period, as per approved manual, related activities will be carried out.
7.Construction and Demolition Waste Management Rules, 2016	The Rules apply to every waste resulting from construction, re-modelling, repair, and demolition of any civil structure ofindividual or organization or authority who generates construction and demolitionwaste such as building materials, debris, and rubble.	**Construction phase:** • Submit a Waste Management Plan with approvals from the local authority before starting construction or demolition. • Collection, segregation of concrete, soil and others and storage of construction and demolition wastegenerated, as directed or notified by the concerned local authority.	After use in backfilling work, left over waste is underutilization at SPS for filling and leveling of site. Designated land is yet to be identified for disposal of wastes generated from construction sites.

8. Solid Waste Management Rules, 2016	The Rules were framed with an objective to segregate, collect, dispose, process, and treat municipal solid waste generated from a various areas including cities, townships, and private and government establishments. The Rules classifies various types of waste generators and outlines their duties.	• Segregate the waste into three (3) streams, bio-degradable, non-biodegradable and domestic hazardouswastes in suitable bins and handover segregated wastes to authorized waste pickers or waste collectors as per the direction or notification by the local authorities. • Do not throw, burn or burry the solid waste generated, on streets, in open public spaces outside the premises or in the drain or water bodies. • Pay user fee for solid waste management, as specified in the bye- laws of the local bodies. Do not burn any horticulture waste.	Wastes generated from site offices and camp site is handed over to door-to-door collection ULB vehicles which is finally disposed at Municipal Corporation Disposal site. The proposed project is envisaged to generate different categories of non-hazardous wastes such as packaging waste, metal scrap, solid wastes mainly plastics, cardboards, miscellaneous grits at SPS during construction and operational phase. As per regulatory requirement these wastes have to be segregated and stored as per three specified streams and disposed through approved vendors of Bihar State Pollution Control Board.
9. E-Waste (Management) Rules, 2016	The primary objective of the Rules is to ensure channelization of E-waste generated in the country for environmentally sound recycling which is largely controlled by the un-organizedsector who are adopting crude practices that results into higher pollution and less recovery, thereby causing wastages of precious resources and damage to environment. The Rules apply to every manufacturer, producer, consumer, bulk consumer, collection centres, dealers, e-retailer, refurbisher, dismantler and recycler involved in manufacture, sale, transfer, purchase, collection, storage and processing of e-waste or	**Construction and O&M phase:** • Ensure e-waste generated is channelized to authorized collection centers or registered dismantler or recycler or; returned to pick-up or take back services provided by producers. Maintain records of e-wastegenerated in Form 2.	Such type of waste will be hardly generated during construction phase. During O&M, it can be possible if replacement of electronics will be required. If so, these wastes will be collected and stored separately and its management will be done as per conditions of CTE norms.

	electrical and electronic equipment listed in Schedule I, including their components, consumables,parts, and spares which make the product operational		
10. The Batteries (Management &Handling)Rules, 2001	The Rules were notified with the primary objective of channelizing the used lead acid batteries for environmentally sound recycling. These provisions of the Rules apply to every manufacturer, importer, re- conditioner, and assembler of such batteries to ensure that used batteries are collected back and sent to registered recyclers. Responsibilities are also fixed on other stakeholders such as dealers, recyclers, bulk-consumers, and auctioneers to maintain records and file annual returns	**O&M Phase:** Deposit used batteries with the dealer, manufacturer, importer, assembler, registered recycler, and re-conditioner or at the designated collection centers.	
11. Public Liability Insurance Act 1991	The main objective of the Public Liability Insurance Act 1991 is to provide for damages to victims of an accident which occurs as a result of handling any hazardous substance. The Act applies to all owners associated with the production or handling of any hazardous chemicals.	**O&M Phase:** • Obtain insurance policy against the liability for handling hazardous substance specified in the Act andsubmit copy of the same to BSPCB. • In addition to the premium, every owner shall pay the insurer for being credited to the Relief fund. ○ Copy of the same shall be submitted to SPCB. • Renewal before expiry of validityperiod.	Study is limited to SPS and network.

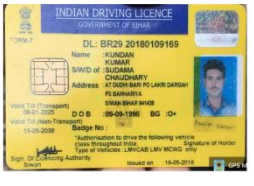
12.The Bihar Ground Water (Regulation andControl of Development and Management) Act, 2006 13.Central Ground Water Authority Guidelines to regulate and control Ground Water Extraction in India dated 1 June, 2019	An Act to promote water conservation, and tree cover and regulate the exploitation and use of ground and surfacewater for protection and conservation of water sources, land and environment and matters.	**Construction Phase:** • Approval from Authority for digging borewell for water withdrawal during construction. • Obtain permission from Local Authority for cutting of trees. • Ensure protection of trees and their branches while developing their infrastructure or carrying on their activities. **O&M Phase:** Approval from Authority for digging borewellfor water withdrawal during O&M.	Application is already put up for taking permission from CGWB for digging borewell for water withdrawal duringconstruction and O&M work. Presently, water from municipal tanker is used for construction work.
14.Ancient Monuments and Archaeological Sites and Remains Act, 1958	Conservation of cultural and historical remains found in India notified under ASI Act -1958	**Construction Phase:** No such area is observed during site visit near project location and pipe line.	If any observed in due course of work, necessary permission will be required from Art & Culture department, GoB.

3.1.2 Applicable Social Framework Regulations

Regulation/Policies	Brief	Action Required	Compliance Status
Applicable State Policies			
Bihar Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement rules 2014 (BLARR Rules 2016)	Land required for the project shall be acquired as per the provisions of the rules.	Applicable if land will be acquired.	
Bihar Raiyati LandLease Policy (2014)	Government can acquire the land on lease through this policy. This is time saving approach.	Applicable if land will be acquired	

3.1.3 Applicable Occupational, Health & Safety Regulations

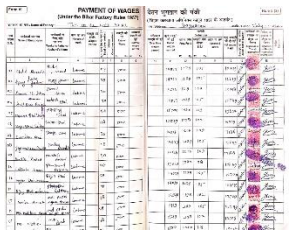
Regulation	Brief	Action Required	Compliance Status
1 Building and Other Construction Workers (Regulation ofEmployment and Conditions ofService) Act,1996	An Act to regulate the employment and conditions of service of building and other construction workers. The Act stipulates health, safety, and welfare measures and for other matters connected therewith applicable to the construction workers	**Construction phase:** • Registration with Labor Department (for recording maximum number of workers to be present at site during construction). • Engagement of Contractor registered with the Labour Department. • Ensure that Contractor employs measures on worker health and safety during construction.	More than ten construction workers will be engaged during construction phase of the project; thus, this regulation will be applicable. Labor license is in place & valid till 24.08.23. 

2. The FactoriesAct, 1948 and Bihar Factories Rules, 1950	The main objective of the Act is to ensure adequate safety measures and at the same time also to promote health and welfare of the workers employed in factories as well as to prevent haphazard growth of factories. The Act is applicable to any factory using power & employing 10 or more workers. The Act along with Rules (state specific) outlines requirements to ensure occupational safety, health, and welfareof workers at work place	**O&M phase:** Applicability of factories license withrespect to the operations of the STP should be confirmed with the local office of the Factories Inspectorate. Iffound applicable, the following key actions would require to be undertaken: • contractor should apply to the obtain license to work in a factory (Form No. 4) from Factories Inspectorate (DISH). • Obtain an approved factory layout/ plan from Factories Inspectorate (DISH). • Conduct structural stability ofbuilding by competent and authorized Civil/Structural Engineers. • Obtain Fire NOC from Chief FireOfficer. • Conduct health check-up of employees and/or non-employee workers. • Establish Occupational Health Centre based on number ofworkers. • File Annual Factory Returns for the calendar year every yearbefore 31 January of the next year. • Adhere to Bihar Factories Rules (BFR), 1950 on labour safety andwelfare.	The proposed project's major activity would entail pumping of sewage and ten or more workers will be employed within the premise of the facility, for the work to be carried on with the aid of power. Thus, the provision of the Factories Act, 1948 and Bihar Factories Rules, 1950 will be applicable for the proposed project activity.
3. Central Motor Vehicles Act 1988	An Act that regulates all aspects of road transport vehicles. It also seeks to consolidate and amend the law relating to motor vehicles. The Act provides in detail the legislative provisions regarding licensing of drivers/conductors, registration of motorvehicles, control of motor vehicles through permits, special provisions relating to state transport undertakings, traffic regulation, insurance, liability, offences and penalties, etc.	**Construction phase:** • Construction equipment and transport vehicles (owned or hired) should possess valid driver's license; registration, permit for transportation, fitnesscertificate and insurance. **O&M phase:** • Vehicles used (owned or hired) should possess valid driver's license; registration, permit for transportation, fitness certificate and insurance.	Record on site.  

4.Central Electricity Authority (Measures relating To Safety and Electric Supply) Regulations, 2010	The regulation consolidates the laws relating to generation, transmission, distribution, trading and use of electricity and generally for taking measures conducive to development of electricity industry, promoting competition therein, protecting interest of consumers andsupply of electricity to all areas, rationalization of electricity tariff, ensuring transparent policies regarding subsidies, promotion of efficient and environmentally benign policies.	**Construction phase and O&Mphase:** • Employ safety measures specifiedin the Regulation for all electrical work. • All earthling systems to be testedfor resistance during the dry season once every year. • Periodic inspection of LT/HT installation - at least once in five years. • Approval from Electrical Inspector for operation of generating unit >10 kW. • Fire buckets filled with clean dry sand, ready for immediate use for extinguishing fires, in addition to fire extinguishers suitable for dealing with electric fires to be kept at site.	The proposed project activity would involve installation and operation of medium to high voltage electrical installations (transformers, pumps, etc.) at SPS, thus, relevant regulatory requirement arises. Fire buckets filled with clean dry sand and fire extinguisher must be available at site. 

3.1.4 Applicable Employee and Labour Welfare Regulations

Regulation	Brief	Action Required	Compliance Status
1. Child and Adolescent Labor(Prohibition and Regulation) Act, 1986 and Amendment Act 2016	An Act to prohibit the engagement of children in certain employments and to regulate the conditions of work of childrenand adolescents in certain other employments.	**Construction and O&M phase:** • Ensure that child labor is notengaged for any activity.	Pipe laying work was stopped due to monsoon during site visit. Civil work is not started on SPS site. Labour record detail indicated that no child labour was hired at site.
2. Minimum Wages Act, 1948	An Act to provide for fixing minimum rates of wages in certain employments to ensure level of income for a worker which will provide a basic standard of living including good health, dignity, comfort, education and provide for any contingency	**Construction phase and O&M phase:** • Ensure payment of wages to workers (employed, on contract,through a contractor) as per minimum wages notified.	The proposed project's major activity is pumping of sewage and within premise of the facility ten or more workers will be working, on any day and in any part of which is being carried on with the aid of power. This qualifies as a manufacturing process (under Factories Act). The proposed project activity will engage contractual workers during the construction phase as well as during the operations and maintenance (O&M) phase of the project. Thus, the regulatory provision

			under Minimum Wages Act, 1948 will be applicable for the proposed project related activity. Wage register is maintained at site 
3. The Equal Remuneration Act,1976	An Act to provide for the payment of equal remuneration to men and women workers and for the prevention of discrimination, onthe ground of sex, against women in the matter of employment and for matters connected therewith.	**Construction phase and O&M phase:** • Pay equal remuneration to employees of all genders performing same work or work of a similar nature. • Employer will not make any discrimination while making recruitment for the same work orwork of a similar nature, except where such work is prohibited or restricted by or under any law for the time being in force.	Complied. Record at site.
4. Employees' State Insurance Act (ESI),1948	An Act to provide for certain benefits to employees in case of sickness, maternity and injury during employment and to makeprovision for certain other matters in relation thereto. The ESI is a self- financing social security and health insurance schemefor Indian workers.	**Construction phase and O&M phase:** • Ensure deduction and payment ofESI for workers (employed, on contract, through a contractor).	
5. The Employees' Provident Funds (EPF) and Miscellaneous Provisions Act, 1952 amended up to 1996	The EPF is a social security mechanism to ensure employees better future on retirement and of dependents during death.It seeks to provide for institution of provident funds, pension funds and deposit linked insurance funds for employees in factories and other establishments.	**Construction phase and O&M phase:** • Ensure deduction and payment ofprovident fund for workers (employed, on contract, through acontractor).	Compliance under process.

6.Employee CompensationAct 1923 and Amendment Act 2009	This Act aims at providing financial protection in form of insurance/medical benefits to workmen and theirdependents in case of accidental injury by means of payment of compensation by theemployers.	**Construction phase:** • Ensure that Contractor obtains insurance for construction workers. **O&M phase:** • Obtain insurance for workers(employed, on contract, through a contractor).	Employees Compensation policy is valid under project upto 23.09.22. The renewal is under process. 
7. The Paymentof GratuityAct, 1972	An Act to provide for a scheme for the payment of gratuity (type of retirementbenefit) to employees engaged in factories, mines, oilfields, plantations, ports,railway companies, shops, or other establishments.	**O&M phase:** • Payment of gratuity to employees as per requirements under the Act.	
8.The Maternity Benefits Act, 1961	An Act to regulate the employment ofwomen in certain establishments for certain periods before and after child-birth and to provide for maternity benefit and certain other benefits.	**O&M phase:** Ensure provision of leaves as specified in the Act.	
9. The Payment ofBonus Act, 1965	The Payment of Bonus Act, 1965 provides forthe payment of bonus to persons employed in certain establishments, employing 20 or more persons, on the basis of profits or on the basis of production or productivity and matters connected there with.	**O&M phase:** Payment of bonus for an accounting year as per provisions ofthe Act.	
10. The Contract Labour (Regulation and Abolition) Act, 1970	An Act to regulate the employment ofcontract labour in certain establishments and to provide for its abolition in certaincircumstances and for matters connected therewith	**Construction phase and O&M phase:** Engagement of Contractor registered with the Labour Department.	The proposed project activity will engage contractual workers during the construction phase as well as during the operations and maintenance (O &M) phase of the project. Thus, under this act registration for license is necessary before employing workers for any project related

			activity.
11. The Industrial Disputes Act, 1947	An Act to make provision for the investigation and settlement of industrial disputes, and for certain other purposes. The objective of the Act is to secure industrial peace and harmony by providing mechanismand procedure for the investigation and settlement of industrial disputes byconciliation, arbitration and adjudication which is provided under the statute.	**O&M phase:** Provisions of the Act are to be followed during laying-off of workers.	
12. The PrivateSecurity Agencies(Regulation) Act, 2005	An Act to provide for the regulation ofprivate security agencies in India.	**Construction phase and O&M phase:** Ensure security agencies hired areregistered under the PSARA Act.	
13.The SexualHarassment of Women at Workplace (Prevention, Prohibition andRedressal) Act, 2013	An Act to provide protection against sexual harassment of women at workplace and for the prevention and redressal of complaints of sexual harassment and for matters connected therewith or incidental thereto.	**Construction phase and O&M phase:** • Constitute an Internal Complaints Committee. • Develop a procedure for recording and resolving complaints related to sexual harassment. • Conduct enquiry on receipt of complaint as per the procedure. • Submission of Monthly Report in prescribed format (provided by NMCG) detailing on the number of cases filed and their disposal to BUIDCo/SMCG.	Pipe laying work was stopped due to monsoon as per directives of GoB. There is no planning for hiring female labour as per discussion with contractor. In case, female labor will hired in future and any GBV related issues arise, the same will be resolved through channel of GRM and BUIDCo ICC committee will handle it at 2nd tier.

3.2. World Bank Environment and Social Safeguard Policies

3.2.1 Application of World Bank E&S Safeguard Policies

The applicability of World Bank Environmental & Social Safeguard Policies to the project has been assessed based on the review of the project information and baseline studies.

WB Operational Policies	How the World Bank Operational Policies is Applicable	Statement on Applicability
Environmental Assessment (OP4.01)	Laying of Networks under DK Sewerage Projects fall under the Category A as per OP4.01. Therefore, they will automatically trigger EA safeguards. The activities include, construction of new SPS and laying of network by open excavation and/or micro tunnelling, collection, transportation and treatment of sludge/slurry to be generated from project activities during construction and during operation of the facilities.	Applicable
Natural habitats (OP4.04)	Applicable to protect natural habitats including forest and wild life impacted due to project. No forest land diversion and tree felling is envisaged under the proposed project activities. None of project location and activities is also located near to any National Park / Sanctuary / Eco sensitive zones and nor fall within 10 Km. radius of such protected areas.	Not Applicable.
Pest Management (OP4.09)	It is expected not to require major pest management measures.	Not Applicable
Physical Cultural Resources (OP4.11)	This policy may be triggered by Projects under this in those areas where cultural property, historical, religious and unique natural value-this includes remains left by previous human inhabitants and unique environment features may be affected during widening and strengthening work of the sub-projects.	Not Applicable In Kankarbagh zone remains of ancient city of Patliputra was excavated by ASI in Kumhrar area,5km away from Patna junction but network laying is not proposed in that area.
Involuntary Settlement (OP4.12)	Applicable in case of Private Land Acquisition to minimize / avoid resettlement wherever feasible. No land acquisition and/or resettlement is envisaged under the proposed project activities. SPS construction and laying of sewer lane will not lead to loss of livelihoods, loss of land and buildings etc.	Not Applicable
Forests (OP4.36)	There are no forest areas within Patna which may be affected by the project construction works. As such the WB OP 4.36 will not be triggered.	Not Applicable
Indigenous Peoples (OP4.10)	The policy is not triggered as the geographical areas in consideration are not likely to have indigenous people as defined by the Bank policy.	Not Applicable
Safety of Dams (OP4.37)	The policy is not triggered as it will not involve the construction or maintenance of dams as defined by the Bank policy.	Not Applicable

Consultation and Disclosure (OP17.5)	Under this policy, the borrower needs to consult with the project affected people and beneficiaries about environmental and social concerns related to the project. Therefore, OP 17.5 will be triggered.	Applicable

3.2.2 World Bank Group's EHS Guidelines

The IFC Performance Standards 3 refers to World Bank Group's EHS Guidelines. The following Guidelines will be applicable to the Sewerage facility:

a) General EHS Guidelines (April 2007)
b) EHS Guidelines for Water and Sanitation (December 2007)

3.3. Project Categorization

This study is limited to Network part of the project where construction of Sewage Pumping Station and pipe laying work is proposed. The nature and magnitude of potential Environmental & Social risks and impacts generated during construction and O&M phase are expected to be few in number, generally site specific, short term, largely reversible and can be mitigated through proper implementation of Environmental and Social Management Plan. Land allocated for construction of SPS is encroachment free Govt. land and NOC is received for the same.

Kankarbagh zone of Patna are not located near any eco-sensitive area. Kumhrar area of Kankarbagh zone is the place where remains of ancient city of Patliputra were excavated by ASI but pipelaying work is not proposed in that area.Further the proposed project is not involving any land acquisition or displacement of any category of people including tribals. Two pumping stations is proposed to be constructed on Govt. land which will also have minimal environmental impact on the adjoining settlements in terms of dust and noise during construction. However, compliance with Air Act 1981 and Noise Rules, EP Act 1986 will be mandatory for contractors. The laying of sewer lines will not produce any significant amount of waste particularly since it will be laid under minimum 2m-3 m width roads. The roads will be reinstated to its original conditions after lying of sewer line. Traffic disruptions will be avoided through appropriate diversions. There will be no significant adverse impacts in terms of flooding, gas emission, waste discharge, health risks etc. Hence Environmental Clearances and abidance to social laws and Regulations are not relevant in the context of the Proposed Sewerage project in Kankarbagh zone,Patna. Detail environmental and social features of the SPS site is presented in Section 4 Baseline environmental and social status. Based on the scope of work assigned under C-ESA study and assessment of overall social and environmental impacts, the project can be categorized in "Low" impact project. A detailed assessment on environmental and social impacts of the project is presented in **Chapter 5.**

4 Baseline Environmental and Social Status

4.1 Approach for Baseline Studies

As the scope of work under this assignment is limited to construction of SPS and Network, the baseline studies was carried out with site visit of the study area. Environmental and social (E&S) sensitive receptors were identified through both site visit and review of secondary data. Data of environmental monitoring conducted at project site by contractor is used as baseline data. This section describes the environmental and social baseline condition prevailing in the study area.

4.1.1 Project Influence Area

The Area of Influence (AOI) of the Project comprises of the Project Site and the surrounding area, where influence of the Project activities is anticipated. The AOI with respect to the environmental and social resources was considered based on the following reach of impacts:

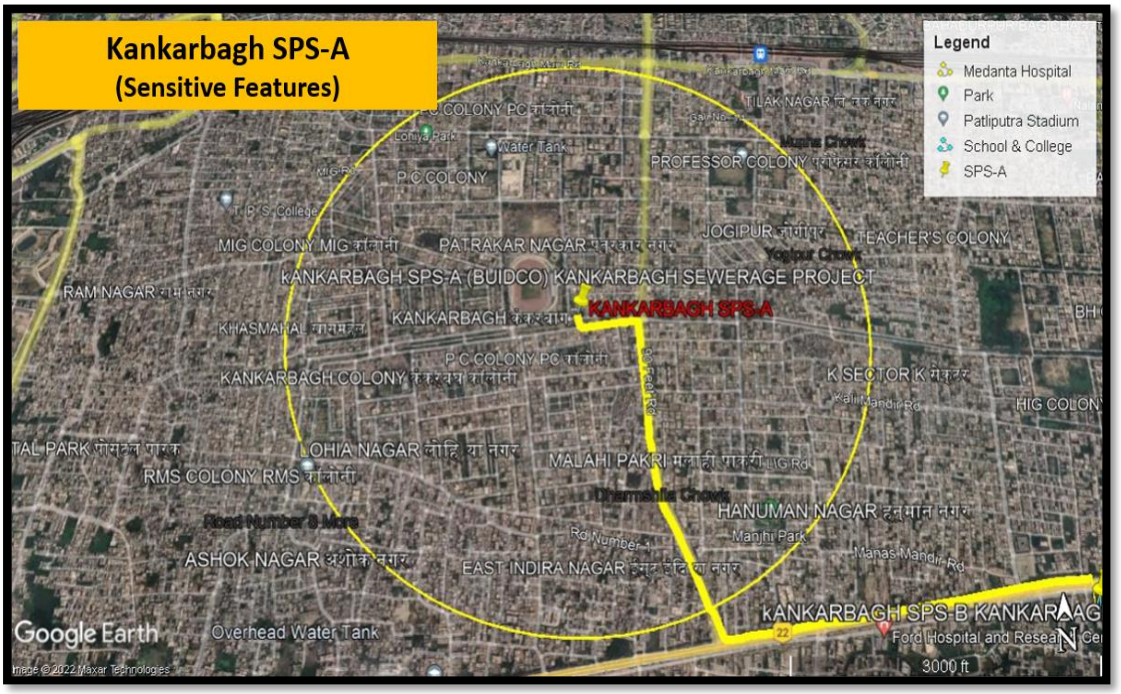
- ✓ Air Quality: Gaseous pollutants (e.g. NOx and SO2) and fine particulate matter (PM10 and PM2.5)– typically up to 1 km from projects site during construction and operational phase.
- ✓ Noise: Noise impact area (defined as the area over which an increase in environmental noise levels due to the project can be detected) –typically 500 m from project site.
- ✓ Water: Groundwater can be contaminated through leaching of pollutants from the project site depending on the geology (soil cover) of the area.
- ✓ Flora and Fauna (Terrestrial and Aquatic): The project area is a part of urban environmental setting. There are no natural forests in the entire study area. If any significant impact is identified near the project site, the area of influence will not exceed 1 km.
- ✓ Socio-economic: This is based on the understanding that most of the interactions from the project will be limited to project site i.e., SPS.
- ✓ Based on the above the AOI for environmental and social studies is limited to 1 km from the Project site. New laying of pipelines will be a localized activity on 3m width roads and lanes. The proposed pipeline work expected to cover 25 m per day by a single group of labour. So the work is temporary for a particular place.

4.1.2 Identifying Environmental and Social Sensitive Receptors

The sensitive receptors in the study area were identified by site visit and undertaking a mappingexercise. These include:

- Settlements
- Water bodies/drain
- Archaeological sites
- Tribal/Scheduled Areas
- Highway/airports/railway station
- National Parks/Wildlife Sanctuaries
- Reserved/Protected Forest
- Ecological Sensitive Areas
- Ground water development status
- Socio-economic analysis
- Cropping pattern
- Meteorology

The map showing sensitive receptors in 1km radius of proposed location of SPS is given below:



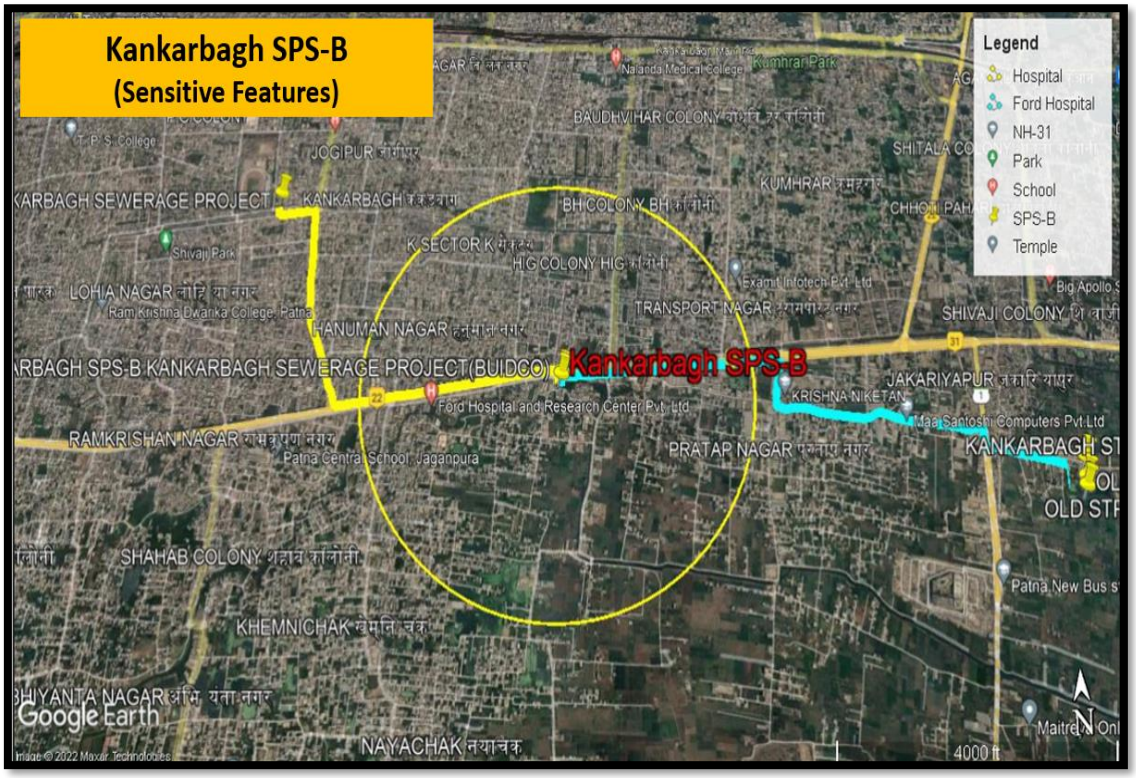


Figure 5: Sensitive Receptors in Project Influence Area

4.1.3 Site Visit

A field visit was conducted to the study area for understanding the site context, validating the sensitive receptors identified through the desktop review, reviewing the baseline environmental monitoring already conducted and holding stakeholder consultations. A brief description of the activities carried out is presented below:

a) Opening meeting with contractor representatives – Discussions were conducted with representatives of WABAGH team to understand the project timelines, project operations, components siting, material handling and process flows, waste management practices etc.

b) Verification of data layers – The sensitive receptors in the study area mapped during the desk-based exercise were verified on site through visual inspection during transect walks. During the site visit, local E&S sensitive receptors were also identified in addition to those identified through desktop review.

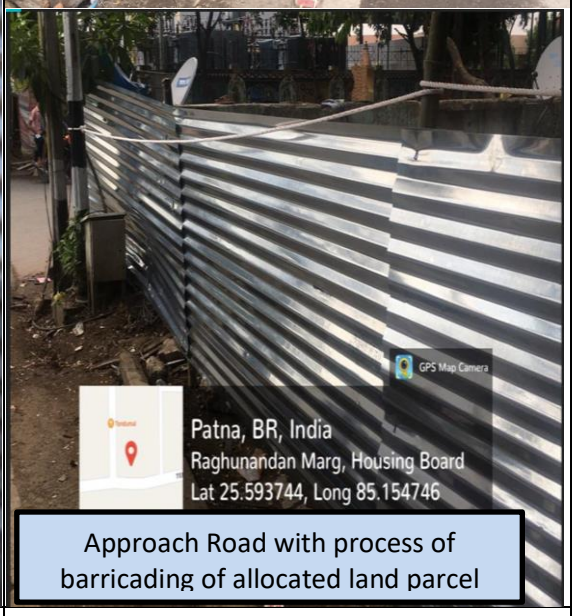
c) Stakeholder Consultations – The site visit was carried out to interact with project stakeholders including local authorities, ward members and neighboring communities of SPS sites/pipelaying areas. Community was appraised on the development of the SPS and its benefits in management of pollution in the river. Responded the queries of the nearby community on odor issues at SPS-B.

4.1.4 Environmental and Social profile of project sites

Environmental and Social features of the proposed project sites are detailed below in **Table-1**

S.No	Component	Social features	Environmental features
1.	**SPS-A** (Sewage Pumping Station) 1. In front of old Water Tanke CA-32, Housing Board Colony, East Indira Nagar, Patna, Bihar-800020, 2.Capacity-90MLD 3.Total land available-21mX35m	1.Parcel of land is Govt. land which belongs to BUIDCo. 2.NOC is received and land is handed over to contractor. (NOC is attached in **Annexure-3)** 3.Land is free from any encroachment. 4.Site is being barricaded to avoid external entry once construction picks up post monsoon.	1.The proposed land is vacant land of BUIDCo. 2. Proposed land is behind Patliputra Stadium. 3. Approach road is paved and main road called Tempo Stand Road . 4.Settlement and shops are nearby to the proposed site. 5. Site campus is having small temple and an old Peepal tree. As per discussion with WABAGH team layout of SPS site does not require its removal. 6.Land parcel is demarkated and barricading with tin sheet is under process, can be seen in site photo. 7. Currently left over soil from pipe laying is used at site for site leveling work. 8. The impact on sensitive receptors near the component has been assessed and it is observed that it will not be impacted by the project. 9. Important sensitive receptors under 1km influence area :- Patliputra stadium,Gayatri Mandir,Sai Temple,Panshiv Temple,Medanta hospital famous one,few small hospitals and nursing homes, several parks developed in residential areas,schools and college.

Site photographs with approach road

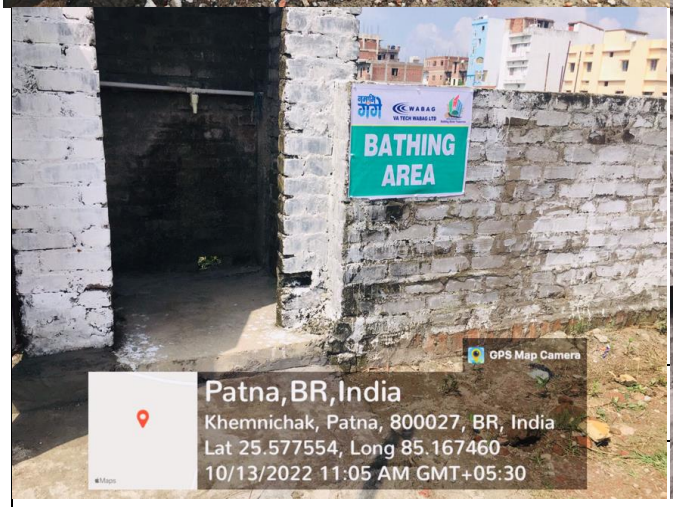


2.	**SPS-B** (Sewage Pumping Station) 1. Service Road, East Lakshmi Nagar, Ramkrishna Nagar, Patna, Bihar-800027 2.Capacity-110MLD 3.Total land available-36mx25m	1.Parcel of land is Govt. land & belongs to Housing Board. 2.NOC is received and land is handed over to contractor. (NOC is enclosed in Annex-3) 3.Land is free from any encroachment. 4.Consultations with local resident and nearby shop were done and they didn't have any problem as of now.	1. Nala is flowing near to the proposed location. 2. No tree cutting is proposed at location. 3. Settlement is close to proposed location. 4.There is a temple nearby to proposed location, but out of the final layout design. 5.One public toilet is coming in layout for which WABAGH team informed that it will be shifted to another corner of the land 6.The impact on sensitive receptors near the component has been assessed and it is observed that it will not be impacted by the project. 7. Approach road is paved road. 8. . Important sensitive receptors in 1km influence area :- NH 31,Ford hospital,few small hospitals and nursing homes, several parks developed in residential areas,schools .

Site photographs with approach road

3.	**Labour Camp** 1. Under process of establishment at Nandlal Chapra Area near bypass. 2.It can accomodate 120-150 labours	1.Boundary is sharing one house. 2.GVB related poster and signages are displayed and more will be done once entire camp will be fully established. 3.Labour will be trained on GVB related Code of Conduct. 4.Assembly area is developed at labour camp.	1.Proposed location is low lying area and the left-over soil after backfilling in pipe laying work is utilized here for site preparation. 2. Rooms will be constructed with proper ventilation, toilet facilities, separate kitchen area, common area and 3.Material stocking areas will be demarcated with green net. There is proper approach road to labour camp. 4. Assembly area is also developed here. Installation of firefighting equipment was also observed at labour camp site. 5.Labour camp will be developed as per guideline mentioned in EHS plan and enclosed in Annex-6.

Site photographs with approach road

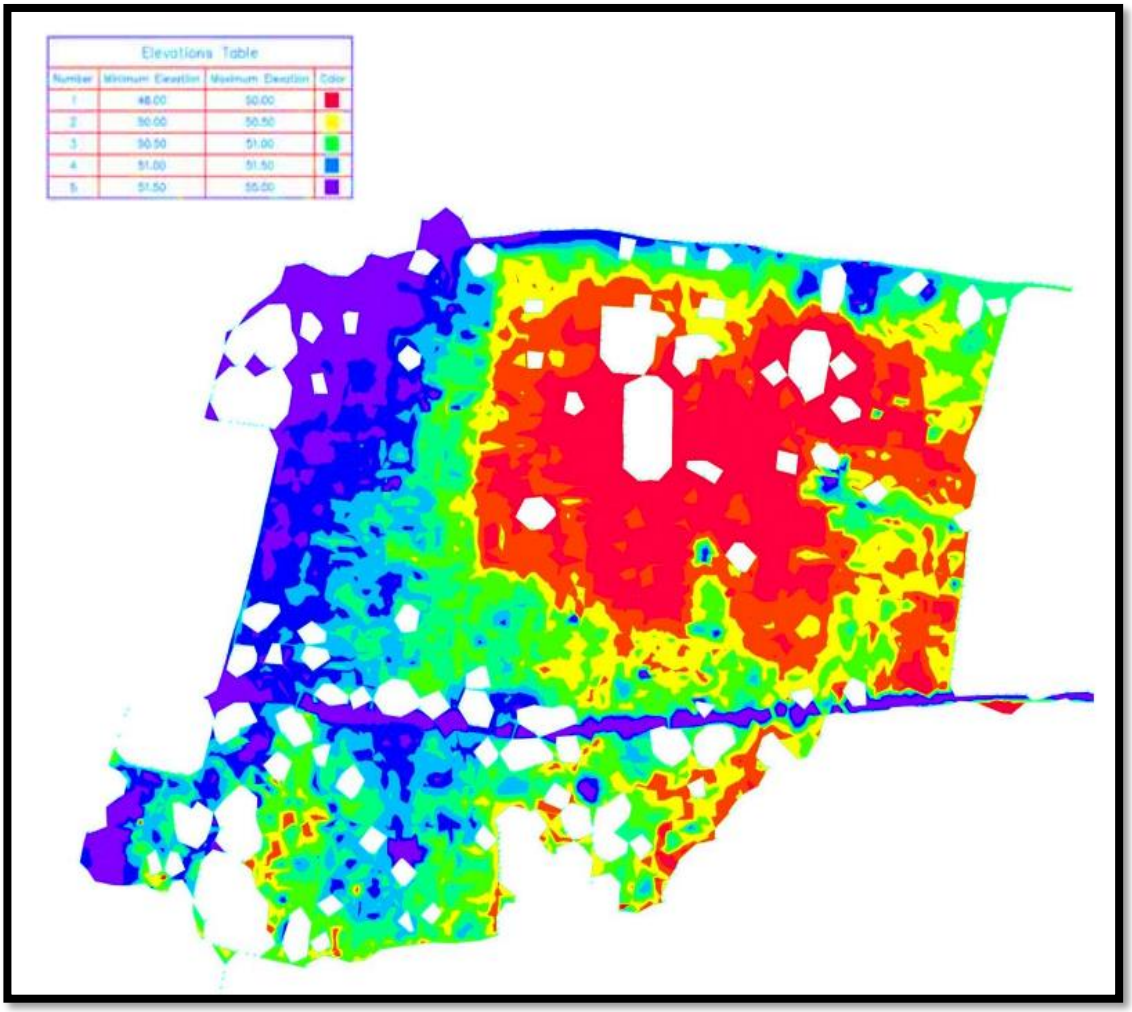


4.Solid Waste Disposal Site:- Solid waste disposal site is not identified till date.Presently all left over soil after backfilling is used for site preparation at SPS site and land filling at labour camp site.During Consultation with Executive Engineer and Project Engineer,it was confirmed that the designated land for solid waste disposal will be identified within a month time.

4.2 Baseline Environment

4.2.1 Topography

Patna is located on the southern bank of river Ganga. The town is situated at an altitude of 53 m above mean sea level. Patna is unique in having four large rivers in its vicinity - Ghaghara, Gandak, Punpun and Sone. This urban area is entirely flat, except the 8km width narrow strip of somewhat high land along the southern bank of the river Ganga. Patna does not contain any hilly region. The Kankarbagh Zone have a distinct drainage pattern and it is sloping towards Yogipur drain above bypass and towards Badsahi Nala below Bypass road (NH 98). The site contours generated under hydraulic study is presented below.



4.2.2 Geology

Patna city is a part of the Indo Gangetic alluvium. The district forming a part of the flood plains of the Ganga has a monotonously flat relief. The region is underlain by alluvial sediments of quaternary age. The quaternary sediments are deposited unconformable on the Archaean basement.

4.2.3 Rainfall

The annual mean rainfall across the study area over 30 years (1984 to 2013) shows variations and ranges between 1,084 – 1,127 mm from north-east to south-west direction.

The **Figure 6** presents the variation in mean rainfall for 30 years over twelve months of the year. The monsoon season spans from July to October and the highest levels of precipitation are experienced in the month of October (197 mm).

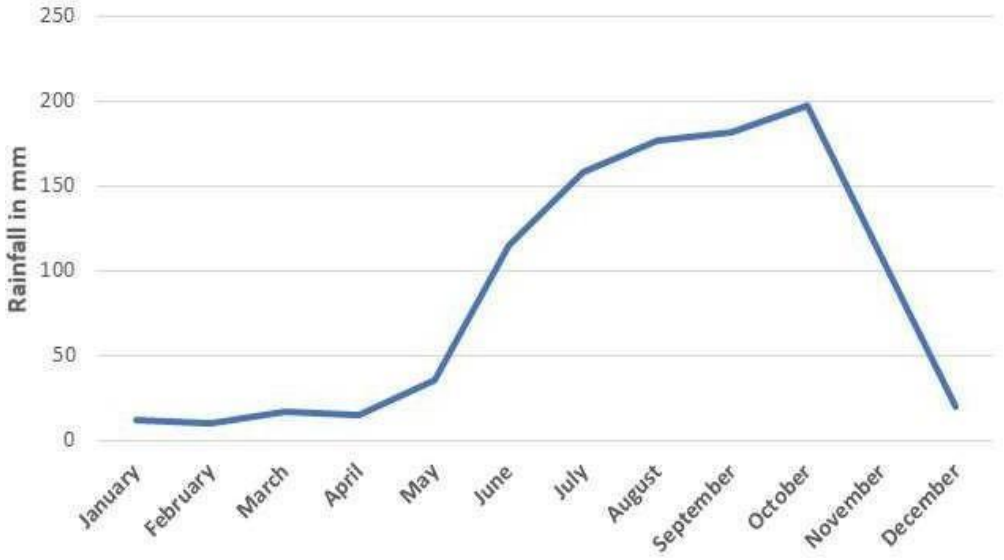


Figure 6: Variation in Rainfall in Project area

4.2.4 Temperature

The annual mean temperature across the study area is studied for 30 years. **Figure 7** presents the variations of temperature maximum, minimum and mean across twelve months of the year. Maximum temperatures are experienced from April to July (>35 °C) and minimum temperatures are experienced from November to February (15-18 °C).

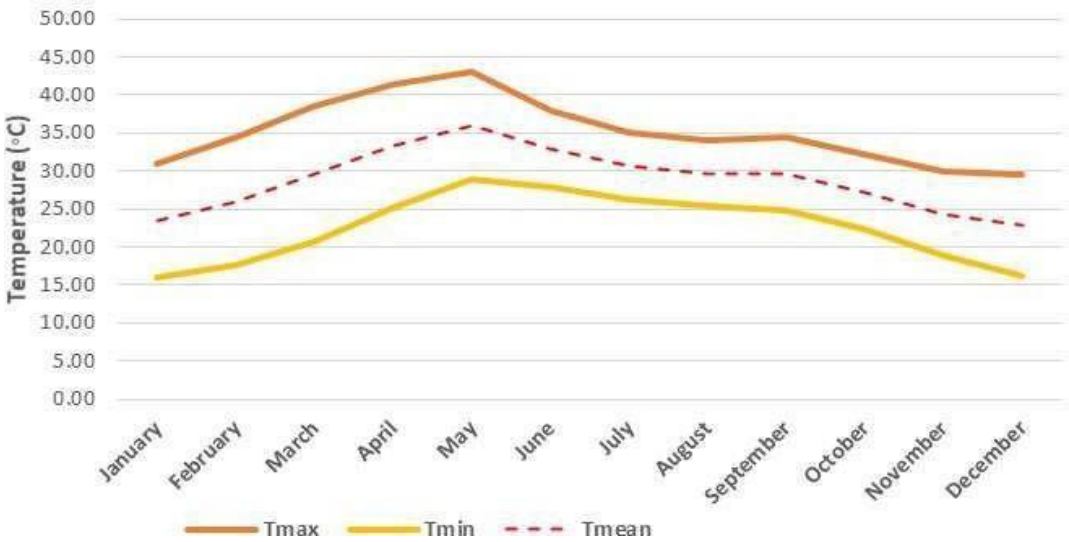


Figure 7: Temperature Variation in Project Area

4.2.5 Wind Speed

The predominant wind direction is observed to be from south-west to north-east direction. Refer **Figure 8** for the annual wind rose at Patna indicating the direction of wind flow in terms of number of hours per year. Higher wind speeds (5 – 10 m/s) are experienced from the west-north-west and west direction of the study area.

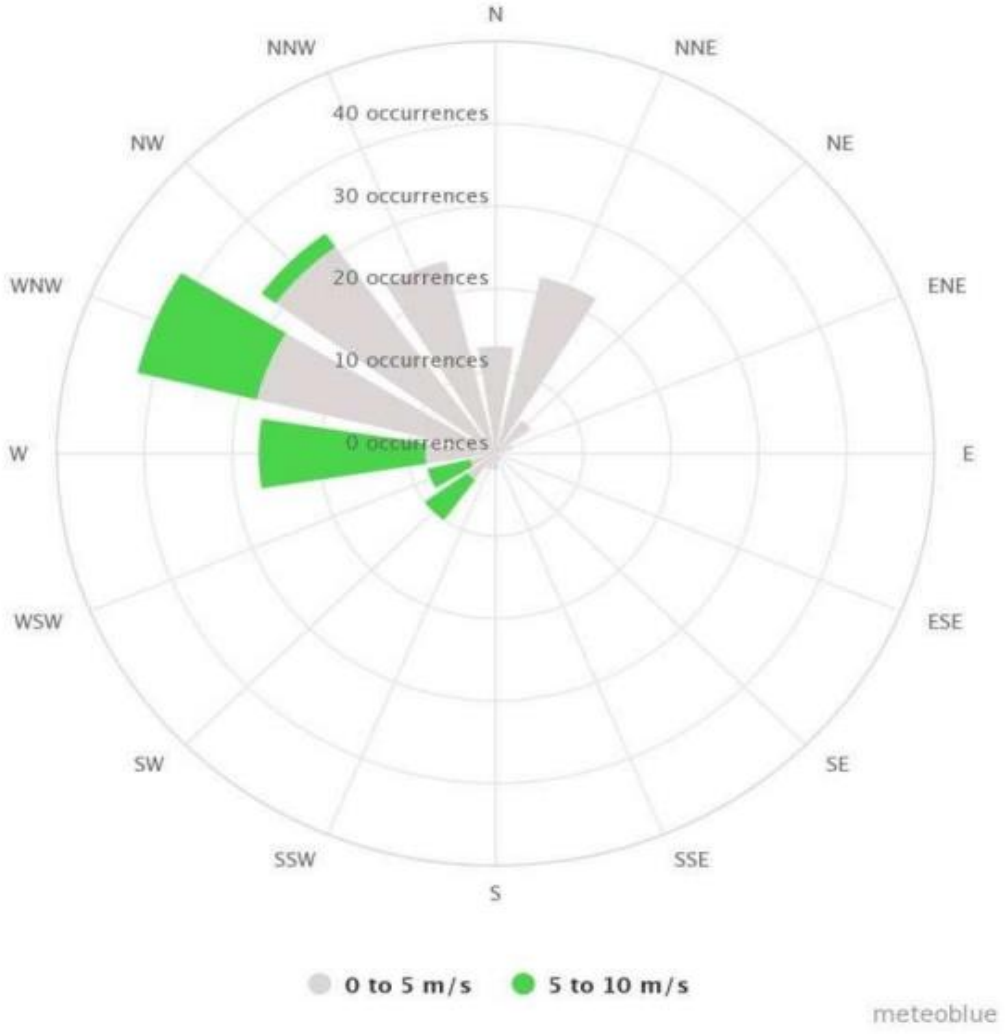


Figure 8: Wind Rose Diagram Patna
(Source: ESIA Validation for Kankarbagh STP)

4.3 Physical Resources

4.3.1 Air Environment

In this report the ambient air quality data has been taken from the air quality test report of WABAGH, conducted in due course of project implementation. The test is being conducted by NABL accredited lab. Samples are collected for 24 hours and this data is considered as baseline data for SPS and network site.

Table 2: Ambient Air Quality Monitoring Result

Parameters	CPCB	WHO	Result		
	Standard (24 hours)	Guideline	SPS-A	SPS-B	Network CC-72 Colony
PM_{10} µg/m³	100	50	88.65	91.48	83.65
$PM_{2.5}$ µg/m³	60	25	56.37	58.16	55.86
SO_2 µg/m³	80	20	19.17	18.35	17.85
NO_x µg/m³	80	40	26.27	24.78	23.54

Analysis of Monitoring Results

The pollutant concentrations in the ambient air in the study area were compared with National Ambient Air Quality Standards (NAAQS) of CPCB and WHO guideline values provided in the World Bank Group's General EHS Guidelines. The results of Ambient Air Quality monitoring reveal that the concentrations of all the parameters were found well within the prescribed limit of CPCB, while the $PM_{2.5}$ and PM_{10} levels exceeded the limits at all locations as per standard provided by the WHO guidelines. Detailed Air Monitoring Lab reports are attached as **Annexure-2**.

4.3.2 Ambient Noise Level

In this report the ambient noise quality data has been taken from the noise quality test report of WABAGH, conducted in due course of project implementation. The test is being carried out by NABL accredited lab. This data is considered as baseline data for pumping and network site

Table 3: Noise Level Monitoring Results

Monitoring location	Highest Noise Level, Lmax (Day)	Lowest Noise Level, Lmin (Day)	Equivalent Noise Level, Leq (Day)
	dB (A)	dB (A)	dB (A)
SPS-A	58.4	52.8	56.44
SPS-B	62.8	55.7	60.56
Network-CC 72 colony	55.8	52.6	54.48

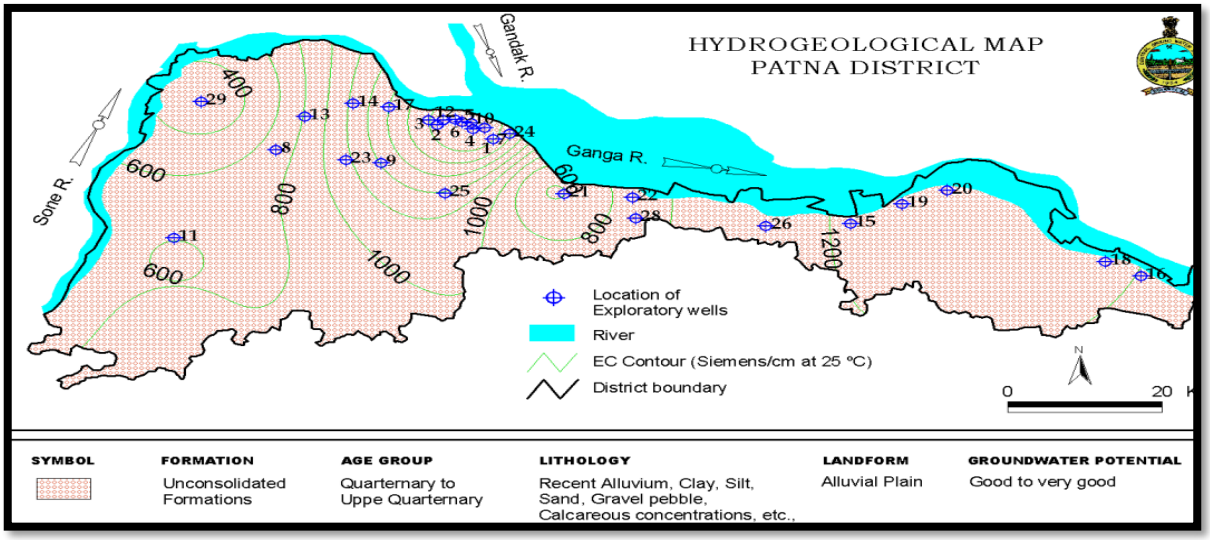
Analysis of Monitoring Results

The ambient noise levels monitored at site were compared with CPCB standards for ambient noise for Day time (for residential, commercial, industrial, and silent zones) and found to fall under commercial category. Results are within the prescribed limit.

4.3.3 Soils

The district forms a part of the Ganga basin and is characterized by a monotonously flat relief with elevation In general, the western part of the district is sloping due north and north-east, with elevation of the land surface varying from 68 m in the south to 48 m in the north, and from 67 m in the west to 45 m in the east. A notable geomorphic feature is the strong natural levee formation or upland all along the southern bank of the Ganga which acts as a natural barrier thereby causing many of the streams flowing from south to run parallel to the course of Ganga before finally joining it further east of the district boundary.

Soils are predominantly sandy loam with clay loam at places with low to medium nutrient status. It is generally alkaline with pH value ranging from 6.3 to 8.2. Traditionally soils in an area are classified on the basis of mode of deposition. Soils are divided into three groups viz. (i) Recent alluvium (ii) Tal and (iii) Older alluvium. The soils of the district have developed on alluvial deposits transported from relatively younger geological formations where physical weathering is predominant and the soils developed in them are generally coarser in texture. Below is hydrogeological map of Patna district.



Based on the soil investigation work carried out at SPS site in month of Dec,2020 stated that the sub soil strata from natural ground level consist of clay of low to medium plasticity. Chemical analysis of soil is given in **Table 4.**

Table 4: Soil Quality data around the project area

Parameter	Unit	Result
pH	-	8.85 (1:5) 26^{0}C
Texture	-	Silt loam
Sand	%	22-30
Silt	%	40-45
Clay	%	23-25
Bulk density	g/cc	1.23-1.28

WHC	%	42-45
OM	%	1.1-1.2
N	Mg/kg	270-350
P	Mg/kg	10-13
K	Mg/kg	130-160

(Source: EIA Pahari Sewerage System)

4.3.4 Surface Water

The water network in the study area is nala and yogipur nala is important in Kankarbagh Zone. There is no immediate surface water body within the study area and hence no baseline environmental monitoring for surface water quality was conducted. The river Ganga is the nearest surface waterbody (aerial distance of approx. 1.02 km) and is located towards north of the study area. Quality report of Yogipur drain is taken from DPR.

Table 5: Water Quality Analysis of Yogipur drain

Parameter	Unit	Yogipur Nala Lowest Noise Level, Lmin (Day)	
		Up stream	Down stream
pH		7	7
TSS	Mg/l	149	149
TDS	Mg/l	680	680
VSS	Mg/l	95	95
COD	Mg/l	115	115
BOD	Mg/l	48	48
Chloride	Mg/l	62	62
TKN	Mg/l	17	17
PO_4	Mg/l	2	2
$SO_{4^{-2}}$	Mg/l	20	20
S^{-2}	Mg/l	2	2
Total Coliform	MPN/100ml	7897	7897
Faecal Coliform	MPN/100ml	1871	1871
Flow (12hrs)	M^3		2562

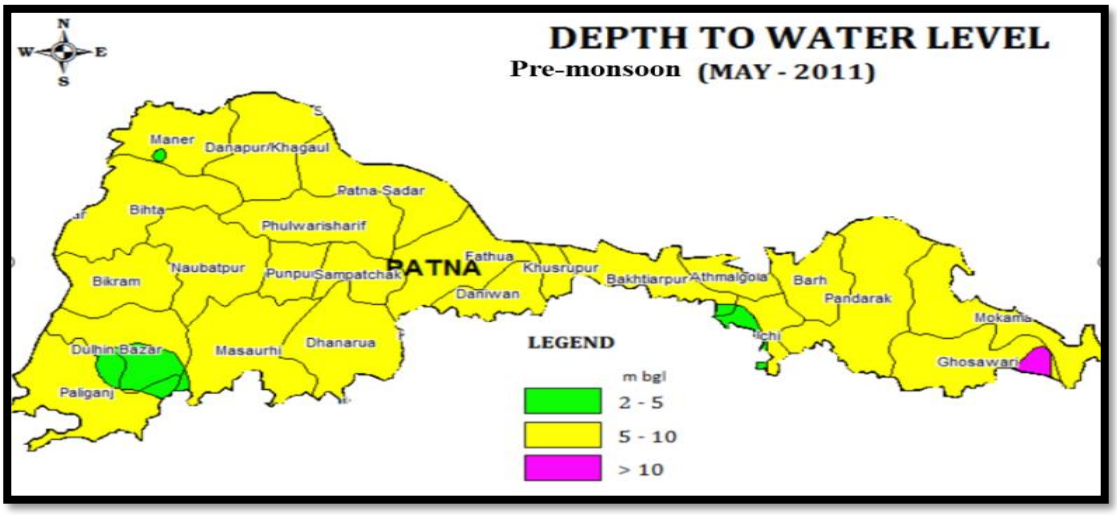
4.3.5 Ground Water Scenario

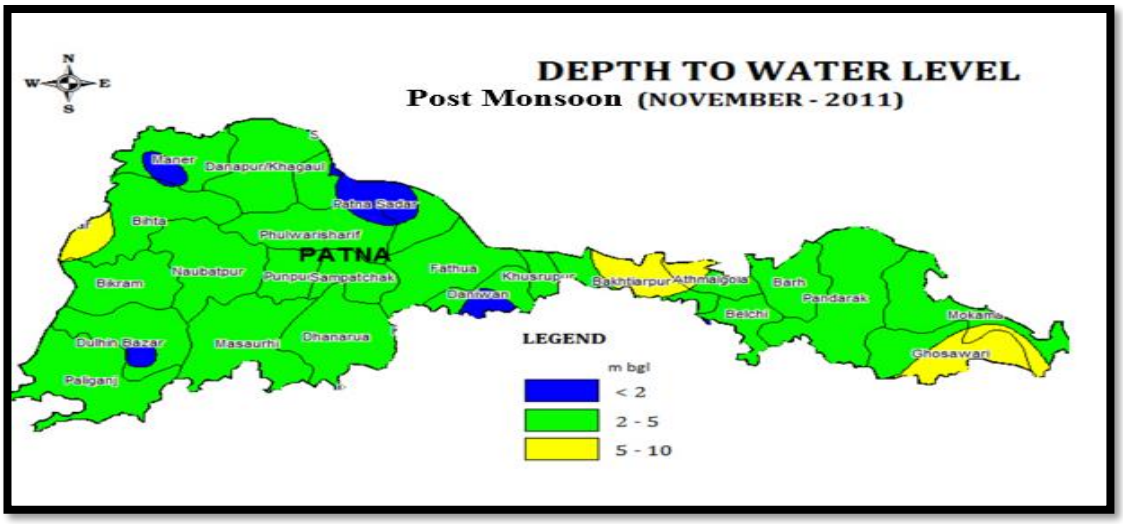
CGWB has established a network of observation wells under National Hydrograph Network (HNS) programme to ascertain fluctuation and quality of groundwater in the district. There are 11 HNS monitoring locations which are being monitored every year regularly during January, May, August and November. In addition, a total of 7 piezometers are being monitored in Patna Urban area to account for the behavior of the deeper aquifers which are under intensive development for urban water supply of Patna.

During pre-monsoon season, the minimum and maximum water levels were observed as 3.64 and 10.09 m bgl respectively. About 20 % of the wells have the water level in the range of 2 – 5 m bgl. In majority of the wells (70 %), the water levels remain in the range of 5 – 10 m bgl. The spatial distribution of water levels during this season reveals that the south-west and central parts of the district are observed with a depth range from 2 to 5 m bgl while in the eastern part the depth to water level are > 10 m bgl .

The water level measurement during post-monsoon season ranges from 1.40 to as deep as 7.12 m bgl. There are each 45.45 % of wells observed in depth range of 0 – 2 and 2 – 5 m bgl whereas about 18.18

% of wells observed in 5 – 10 m bgl depth range. Spatial distribution of water level shows that maximum area is covered with the range of 2 to 5 m bgl. In the southern, central & eastern part of the area water level is > 10 m bgl. **All the blocks of the district are under safe category**. Below map is showing Ground Water Table in Patna district.





Soil Investigation report carried out on 12/12/2020 under project stated that the water table was encountered at the depth of 3.5m from the natural ground level.

Groundwater Quality

Groundwater quality data has been taken from the water quality test report of WABAGH, conducted in due course of project implementation. The test is being carried out by NABL accredited lab. The recent report is attached in **Annexure-2.**

Table 6: Ground Water Quality Monitoring Result

Parameter	IS 10500:2012		Result
	Acceptable Limit	Permissible Limit	Labour Camp
Colour (Hazen)	5	15	0.98
Taste	Agreeable	Agreeable	Accepted
Odour	Agreeable	Agreeable	Acceptable

Conductivity (ms/cm)	-	-	689
Turbidity (NTU)	1	5	1.1
pH at 25 °C	6.5-8.5	No relaxation	7.35
Total dissolved solids (mg/L)	500	2000	380
Total alkalinity as $CaCO_3$	200	600	410.8
Total Hardness as $CaCO_3$ (mg/L)	200	600	356
Calcium as Ca (mg/L)	75	200	65.87
Magnesium as Mg (mg/L)	30	100	55.87
Chloride as Cl- (mg/L)	250	1000	36.59
Sulphate as SO_4 (mg/L)	200	400	14.23
Nitrate as N (mg/l)	45	No relaxation	1.15
Iron as Fe (mg/L)	0.30	No relaxation	0.23
Manganese as Mn (mg/L)	0.1	0.3	BDL
Fluoride as F (mg/L)	1	1.5	0.028
Copper as Cu (mg/L)	0.05	1.5	BDL
Residual Chlorine (mg/L)	0.2 – 1	-	nil
Arsenic as As (mg/L)	0.01	0.05	0.007
Cadmium as Cd (mg/L)	0.003	No relaxation	BDL
Total Chromium as Cr (mg/L)	0.05	No relaxation	BDL
Selenium as Se (mg/L)	0.01	No relaxation	BDL
Mercury as Hg (mg/L)	0.001	No relaxation	Nil
Nickel as Ni (mg/L)	0.02	-	BDL
Boron as B (mg/L)	0.5	-	BDL
Coli form count/100 ml	Nil	-	16
E.Coliform Count // 100	Nil	-	Absent

Analysis of Monitoring Results

The parameters analyzed in the ground water sample were compared with IS 10500:2012 drinking water standards and found to be well within permissible limit.

4.3.6 Drainage

The state of water quality is the result of complex natural and man-made conditions and the consequent interactions between in both time and space. Consequently, abstracting the essence of water quality conditions is often very difficult. Monitoring and assessment of the environmental state of surface and ground water defines a network of the water bodies of various nature, e.g. rivers, springs, brooks, streams, river systems, ponds, lakes, reservoirs, estuaries, coastal area, or open marine water and the geographical area it covers. Total length of pucca covered drains is about 460 km, which is coming to about 16.18% coverage of storm water drainage network. The drainage system of Patna town was laid about 200 years back and drains are in bad condition. The system comprises hierarchy of natural and man-made drains that ultimately discharge surface run off and sewage to River Ganga and Punpun. Natural nalas are the main carriers of the storm water.

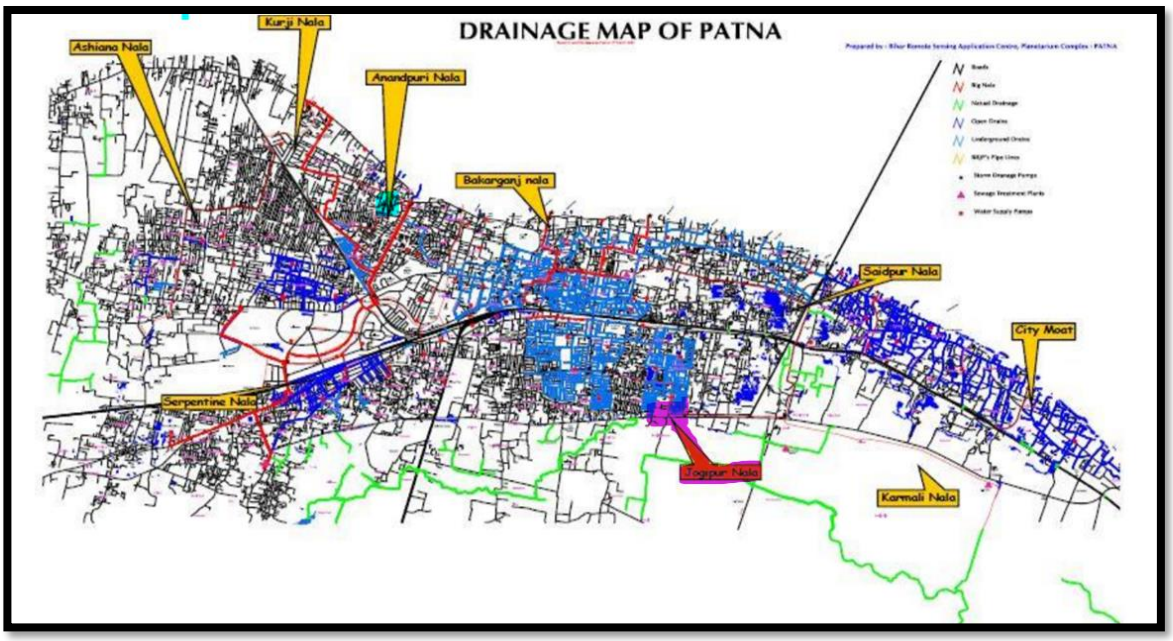


Figure 9: Drainage Map of Patna

Patna has saucer type topography and has many depressions and low-lying pockets such as Kankarbagh, Rajendra Nagar etc. having ground levels below the HFL. In order to drain out the surface runoff during monsoon and drain out the dry water flow from low lying pockets, 35 nos. of drainage pumping station once operated. Drainage outfalls at the river bank side causes flow back of water when river level rises. Water logging is a common problem. This problem has increased gradually along with progress of rapid urbanization. The Catchment areas of water bodies have been gradually filled up, modifying the natural slope of the land and thus disturbing the existing drainage system heavily. Natural drains are highly silted up and are suffering from being inhabited by squatter settlements. Surface Drains are being choked by wastes particularly by plastic materials. Jogipur / Yogipur nala is the main nala which runs throughout the project area of Kankarbagh zone. In Kankarbagh zone,Lohia nagar housing colony is served by 670HP pumping station and discharge is in River Punpun through Pahari Pumping station and Badshahi drain outfall. Area west of Chiraiyatad and Karbigahia and unplanned development beyond housing board colony in Kankarbagh, Bahadurpur In addition, Hanuman Nagar has no drainage system.

4.4 Natural Hazards

Seismology – The study area lies in Zone IV i.e. High Damage Risk Zone (MSK VIII) according to the Building Materials and Technology Promotion Council (BMTPC) Earthquake Hazard Map. The region has not experienced any major earthquake in the last decade.

Cyclones – The study area lies in the Very High Damage Risk Zone B (50 m/s) according to the BMTPC Wind and Cyclone Hazard Map. The project location experiences cyclones periodically, latest being in May 2020.

Floods – The study area is located in an area vulnerable to floods according to the BMTPC Flood Hazard Map.

4.5 Ecological Resources

Patna district has deciduous type of forest. The district has 3202 km² of Geographical area comprising 13 km² of Moderately Dense Forest, 3 km² open forest and absence of Very Dense Forest. Thus, the forest cover of the district is 0.50% of total Geographic Area. (Source: State Forest Report – 2009). As the proposed activity is in urban settings, there are no Reserved/Protected Forests present in study area. There are no national parks, wildlife sanctuaries and Ramsar sites around the project site. Furthermore, there are no ASI sites located within the project influence area. There are no Important Bird Areas (IBA) located in the study area.

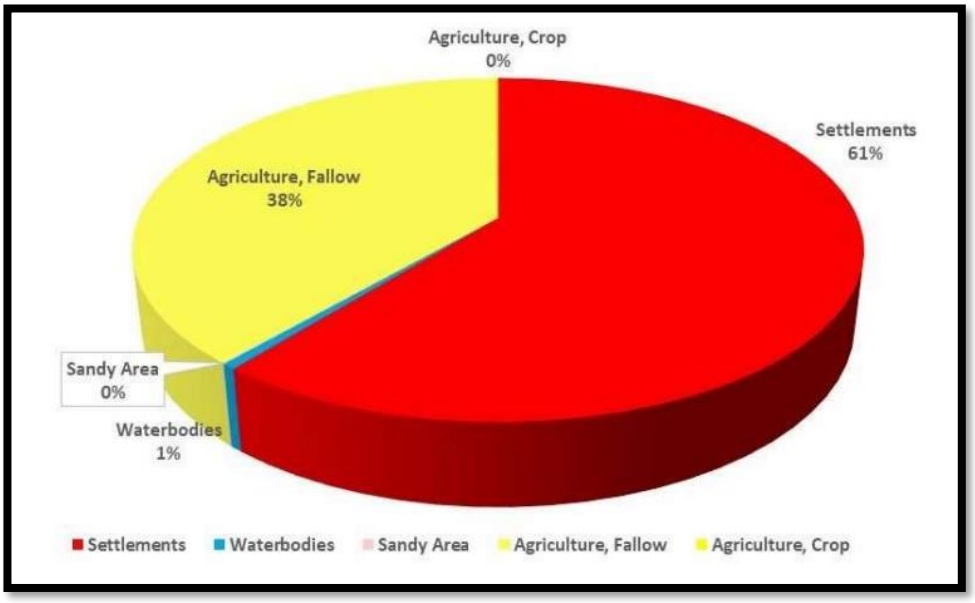
Trees plantation in form of landscaping was noticed during visit, due to nearby residential area, government offices, hospitals, university, parks and market places. The species of trees reported are mainly planted, except few species which are naturally growing. These trees are fruit, flower and seed bearing and attract avifauna, small mammals and reptiles. Nesting was commonly reported.

The most common flora found within the region include Peepal (*Ficus religiosa*), Sal (*Shorea robusta*), Kendu (*Diospyros melonoxylon*), Salai (*Bosewellia serrata*), Bahera (*Terminalia bellirica*), Mahua (*Maduca Indica*). The other species of flora found are *Holarrhena antidysenterica*, *Ziziphus xylopyrus, Flemingia Chappar, Butea superba*, *Butea parviflora*. The common fauna in the area mainly includes Crow, Myna, Eagle, Sparrow, Babbler, Pigeon, Cattle Egrets, Red Vented bulbul etc.In mammals, the local wild mammals like Indian mongoose and five stripped squirrel are reported. Domesticated mammals like goat, sheep, dog, cow, ox, donkey etc are reported. Reptiles like Rat Snakes (Ptyas mucosus), Common Kraits (Bungarus caerulens), Indian cobra (Naja Naja) etc. has been reported. House Geiko and Garden Lizard are directly sighted during visit.

4.6 Economic Development

Land use and Land cover analysis of project area indicates that the major land cover in the study area is settlements (61%) followed by agriculture fallow land (38%). LULC analysis is given below.

(*Source: ESIA validation Kankarbagh STP)*



Patna has long been a major agricultural hub and center of trade. Its most active exports are grain, sugarcane, sesame, and medium-grained Patna rice. There are several sugar mills in and around Patna. It is an important business and luxury brand centre of eastern India.

The economy of Patna has seen sustained economic growth since 2005. As of 2015, GDP per capita of Patna was ₹1,06,000 and its GDP growth rate is 7.29 per cent. The rate of urbanization was as high as 43.1 percent in Patna. This growth has been due to the increased businesses in the Fast-Moving Consumer Goods (FMCG) industry, agriculture related industries and service sector. Eight (8) industrial clusters are under development in the City under the Chief Minister Micro and Small Industries Cluster Development Scheme, one of which includes an apparel park in the City.

The areas towards the south–west and south-east are densely fabricated with residential and commercial establishments and the areas towards the north, north-east and north-west of the study area has River Ganga and its flood plain.

Patna is the 21st fastest growing city in the world, and the fifth fastest growing city in India, and is expected to grow at an average annual rate of 3.72%. *(Source: Economy | District Patna, Government of Bihar | India)*

4.7 Social and Cultural Resources

Patna city is governed by Municipal Corporation which comes under Patna Metropolitan Region. The urban local bodies in the state of Bihar are governed by the Bihar Municipality Act 2007. The act specifies the governance framework, spatial jurisdiction and the functional domain of the urban local bodies. The functional domain was expanded in 2007 as per the 12th schedule of the 74th CAA.
The Patna city is located in Bihar state of India.

Demographic Data

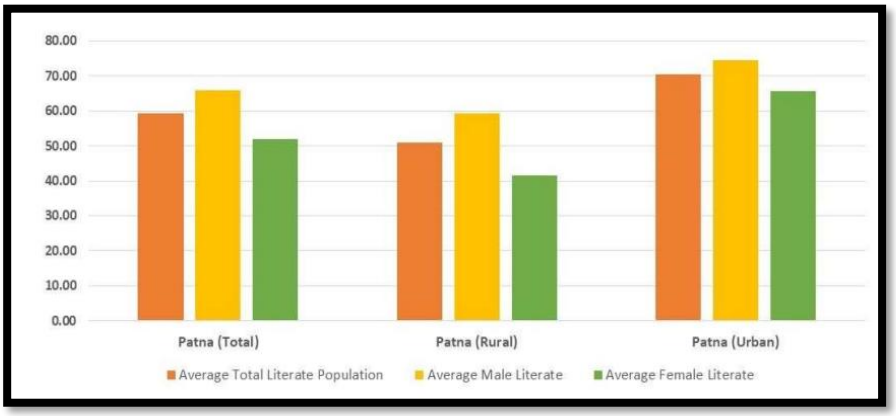
From Bihar's total area 96163 km² Patna district occupies an area of 3,202 km². Total Urban Population of Bihar is 1, 17, 58, 016.00 in which males' population are 62, 04,307 and females are 55, 53,709. Out of the total Patna population for 2011 census, 43.07 percent lives in urban regions of district. As per 2011 census, total population of Patna urban is 25, 14,590 of which 1,683,200 lives within the municipality boundary. Total male population in Patna is 13, 32,487 which is approximately 53 % of total urban population. Sex ratio in Patna district as per Census 2011 is 887 whereas child sex ratio is 883. Child populations (0-6) in urban region were 3, 29,592 of which males and females were 1, 75,005 and 1, 54,587. This child population figure of Patna district is 13.11 % of total urban population.

Hinduism is majority religion in Patna city with 86.39 % followers. Islam is second most popular religion in city of Patna with approximately 12.27 % following it. In Patna city, Christinity is followed by 0.51 %, Jainism by 0.09 %, Sikhism by 0.23 % and Buddhism by 0.23 %. Around 0.01 % stated 'Other Religion', approximately 0.49 % stated 'No Particular Religion.

Total no. of Slums in Patna city & its Out Growth numbers 13,696 in which population of 77,034 resides. This is around 4.57% of total population of Patna city & its outgrowth which is 1,684,297.
(*Source: Census 2011*)

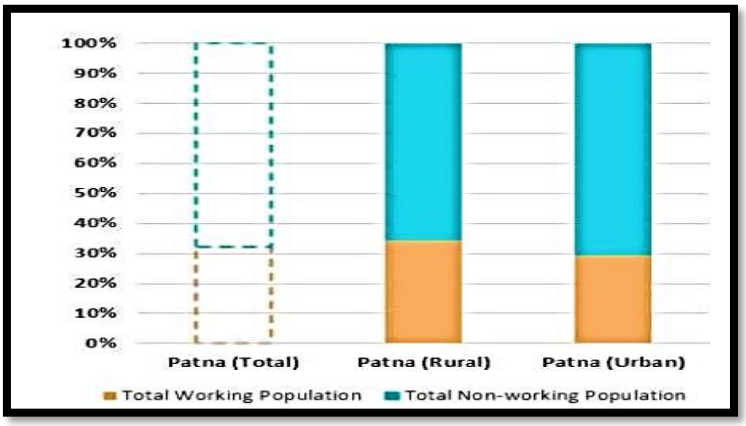
Literacy Rate

Average literacy rate in Bihar is 76.86% which males and females are 82.56% and 61.95%. In Patna district as per census 2011 literacy rate is 80.98 % of which males and females are 85.75 % and 75.59 % literates respectively. In actual number 1769307 people are literate in urban region of which males and females are 992574 and 776733 respectively. Average literacy rate of Patna city is 83.37 percent of which male and female literacy was 87.35 and 78.89 percent. Literacy rate in project area is given below.(*Source: Census 2011*)

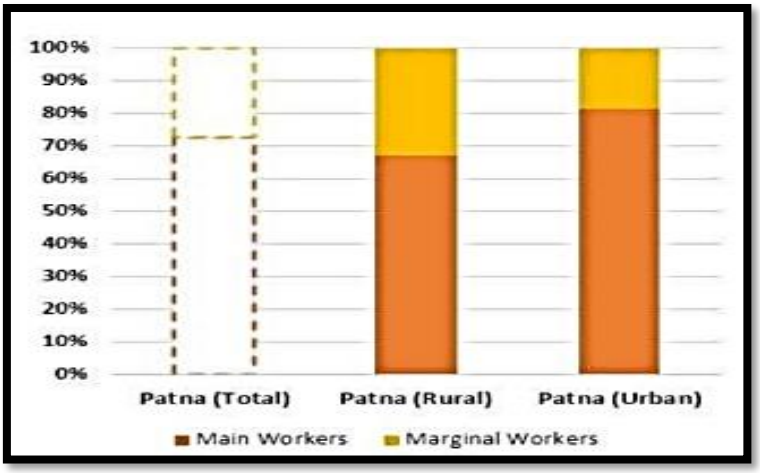


Occupational Pattern

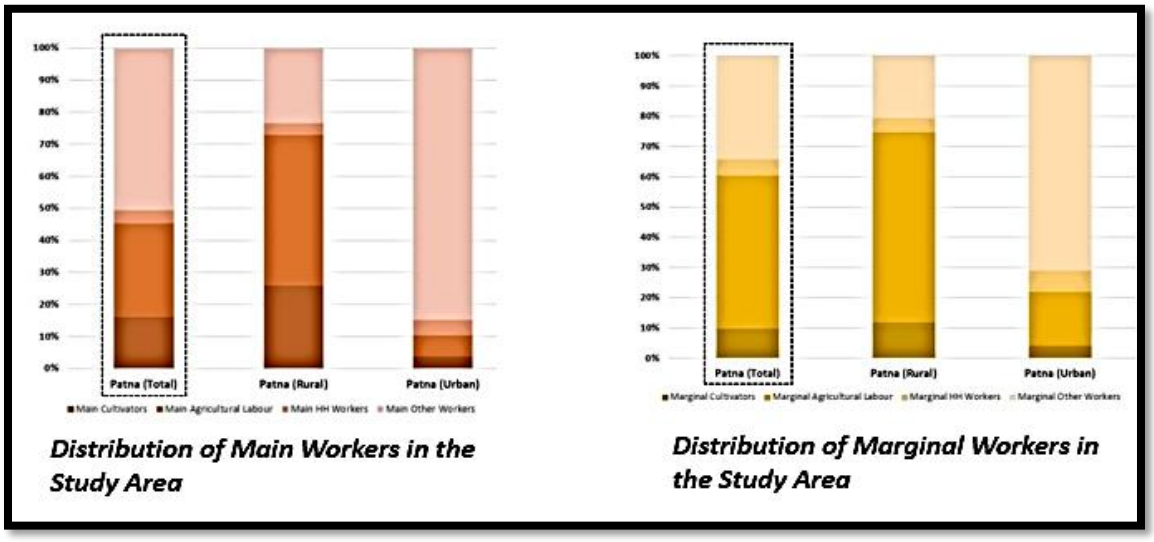
The proportion of working and non-working population in Patna District has been presented below. The proportion of non-working population in Patna District (67.77%) is more than that of working population (32.23%).



Amongst the working population, the proportion of main and marginal workers is represented below. The proportion of main workers is higher than that of marginal working population.



The distribution of working population among main and marginal workers across key sectors has been presented below. Amongst the main workers, the proportions of other workers (50.50%) dominate the work force in Patna (Urban) while agricultural labourers (29.15%) dominate in Patna (Rural). A similar pattern is observed in marginal workforce as well.



Social Infrastructure

Good and adequate social infrastructure is the key to achieve progressive communities. Patna being headquarter of Patna District caters to the education and health need of the entire district. PMC does not run any school or education institution. The Education Department of the State Government does so with control over administrative and financial aspects. New infrastructure of international standards is being built up in Patna to meet the growing citizen's need and expectations. The following new infrastructure project is under progress -

AIRPORT - 1300 Cr allocated to Patna Airport for expansion work and by 2023 it will be converted into world class airport and 1000 cr allocated for construction of Bihta airport which will be ready by 2023.Patna will become first city which will have two airports in one city for commercial use.

IT PARK - 2.58 acres of land has been allotted by Bihar Government for establishment of IT Park. Patna has almost all prestigious central universities like IIT, NIT, AIIMS, NIFT, NIELTS, STPI

MEDICAL INFRASTRUCTURE - Patna has also improved a lot in healthcare sector in past few years. Govt Hospitals infrastructure is being upgraded to make them offer best services like PMCH, IGIMS & NMCH. Also, Pvt hospitals have established world class hospitals in Patna like Paras, Vedanta.

ROAD INFRASTRUCTURE - Patna's 60% road has been converted in to 6/8 lane. Patna has around 40–45 flyovers. And many are under construction. Electric and CNG buses are running in Patna for city ride under supervision of BSRCTC.

METRO - Patna City will have a Metro for the ease of commuting. It will run on two corridors. East - West Corridor will cover area of Danapur, Mithapur and Kheminichak. North – south Corridor will cover area of Patna railway station to new ISBT.It will have a elevated track of 23.30km and underground track of 16.30km.

CULTURAL & RECREATIONAL INFRASTRUCTURE - Patna is now known as a city of PARKS. Numerous Park has been developed across Patna. ECO PARK , BUDDHA SMRITI PARK are famous park. ASHOKA CONVENTION Centre has been developed, which matches worlds best Convention Centre with a seating capacity of 5000. Patna riverfront development project on RIVER GANGA is over & it has become nice place to hang out with family & friends. Patna Marine Drive on the bank of GANGA River will take you to the Mumbai's famous MARINE DRIVE.

4.8 Stakeholder Consultation

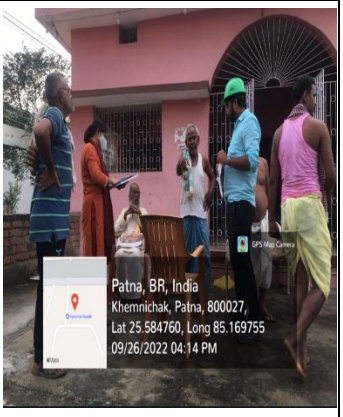
The primary objective of stakeholder consultation was to understand the acceptance and obtain impressions of the stakeholders about the project and discuss issues envisaged by the local community that may be encountered due to the project. The other objectives of the consultations included understanding of the existing local socio-economic status, social fabric, and local sensitive receptors.

In the proposed project public consultations were held with the community stakeholders, along with the WABAGH technical team and EHS officer during site visit in month of September/October 2022. Consultation with BUIDCo Executive Engineer for this project & Project Manager WABAGH was conducted to discuss the finding of observations during site visit.

The details of the consultation and issues discussed have been summarized in the table below with attendance sheets

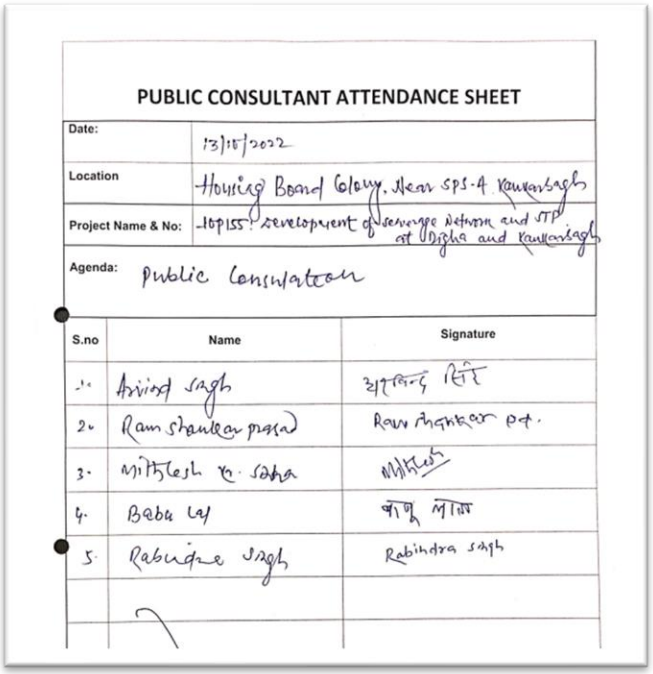
Table 7: Stakeholder Consultation Details

S No.	Date /Location of Consultation	Person Met	Brief of discussion	Photos
1.	Sewage Pumping Station (SPS-A) Near Patliputra Stadium, Housing Board land. 13.10.22	Household and nearby shops	1.Civil work is not started at sites and site preparation work is under progress. Nearby residents were consulted and informed about the project and its benefit to community. At the same time temporary inconvenience, they have to face was discussed. WABAGH team informed that measures will be taken up to minimise the inconvenience. They expressed their cooperation for the project. 2. They were also explained about the network layout. Installation of underground pipes network and connection to each household will be carried out thus solving any problems related to open drains, overflowing of nallas and waterlogging during monsoon. People welcomed the project as Kankarbagh has issue of water logging but their concern was for odour issue in O&M phase. 3.Nearby shops were also informed about the pipelaying work. WABAGH team has explained that pipelaying will be done in small stretch within scheduled timeframe to minimise	 

			the inconvenience to customer coming to their shops. 4.Hospitals and Nursing homes are found in this area. WABAGH team and EHS officer is suggested to keep wooden/steel plank ready during pipelaying work so that emergency vehicle and patients approach to hospital should not be affected. 5.Even, site engineer of pipelaying work was suggested to keep wooden/steel plank ready during work near hospitals/schools/temples or other religious places. 6.Patliputra Sports complex was closed during visit. No consultation was made. There will be no impact due to construction activities. During pipelaying, proper mitigation will be taken up to minimize the inconvenience.	
2.	Sewage Pumping Station (SPS-B) BUIDCo land. 26.09.22	Near by temple and Household	1.Temple Pujari ji and other persons of nearby house hold were consulted at temple in SPS-B proposed location.They were informed about the project and construction activities.Their major concern was related to temple premises for which WABAGH team informed that as per layout plan ,no damages will be made to temple.Only public toilet will be removed. 2.They are not having any issue with the proposed construction. 3.WABAGH team were recommended for regular consultations in this area especially during pipelaying work.	 

3.	BUIDCo Official 08.10.22	BUIDCo Executive Engineer, Project Engineer DK Sewerage project and Project Manager WABAGH	1.Discussion on designated land for debris disposal-During site visit it was observed that the designated disposal site is not yet finalized for this project.Major work is not undertaken in this project. Left out wastes of pipelaying work is utilized at SPS site for site preparation work. Executive Engineer has assured to look into the identification of debris disposal site in consultation with PMC and this will be closed within a month. 2.Green belt development in SPS-During public consultation concern for odor nuisance during O&M phase at SPS site was raised. So as a mitigation measures green belt area surrounding the SPS site was discussed.Contractor informed that the land handed over is already very small in size. Design is just approved. Green belt provision will be defenitely done but exact area is difficult to mention at this stage. 3.Public Toilet removal at SPS-B-Discussion were made on the public toilet coming in layout plan for which it was informed that it will be shifted to other side. 4.Kumhrar area -It was informed that kankarbagh zone consisting of remains of ancient city of Patliputra,excavated by ASI .So working in regulatory zone requires permission from competent authority. But it was informed that pipelaying is not proposed in that area.	 

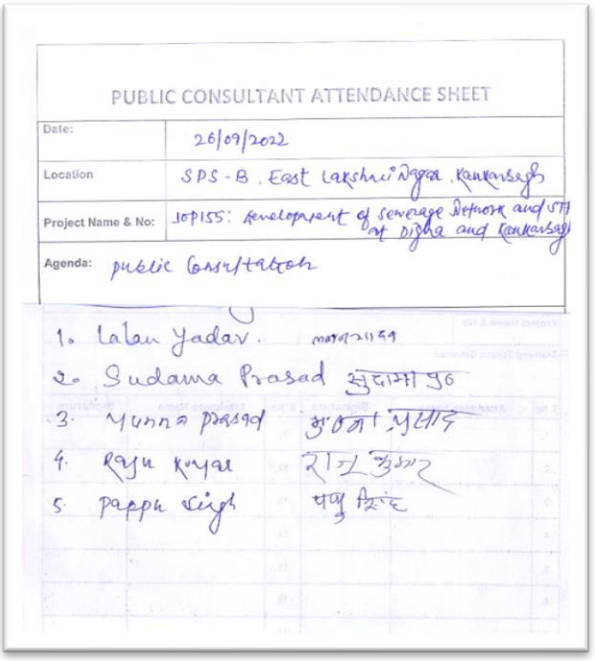
Attendance Sheet



PUBLIC CONSULTANT ATTENDANCE SHEET

Date:	13/10/2022
Location	Housing Board Colony, Near SPS-4 Kankarbagh
Project Name & No:	10P155: Development of sewerage Network and STP at Digha and Kankarbagh
Agenda:	Public Consultation

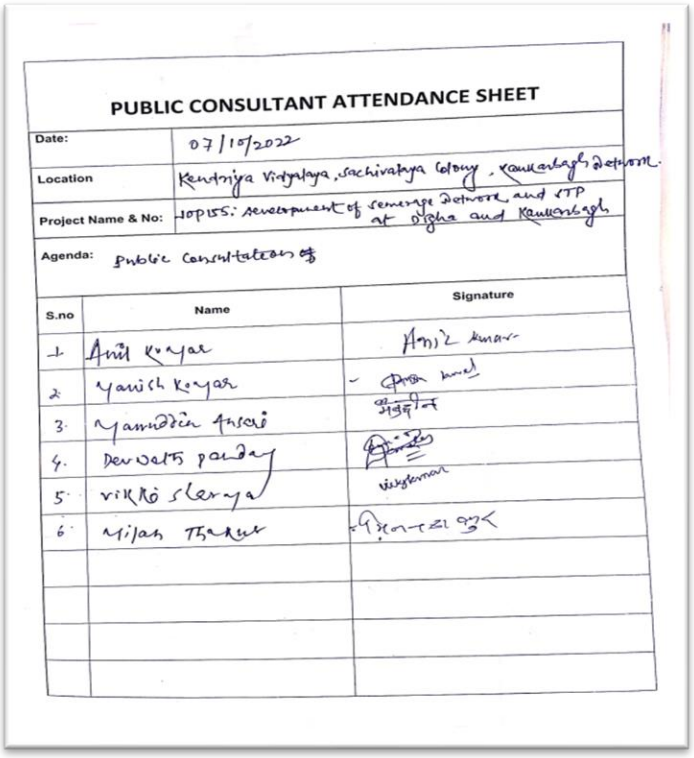
S.no	Name	Signature
1.	Arvind Singh	अरविन्द सिंह
2.	Ram Shankar prasad	Ram Shankar pd.
3.	Mithilesh K. Saha	Mithilesh
4.	Babu Lal	बाबू लाल
5.	Rabindra Singh	Rabindra Singh



PUBLIC CONSULTANT ATTENDANCE SHEET

Date:	20/09/2022
Location	SPS-B, East Lakshmi Nagar, Kankarbagh
Project Name & No:	10P155: Development of sewerage Network and STP at Digha and Kankarbagh
Agenda:	public Consultation

1. Lalu Yadav.
2. Sudama Prasad सुदामा प्र०
3. Munna prasad मुन्ना प्रसाद
4. Raju Kayar राजू कायर
5. Pappu Singh पप्पू सिंह



PUBLIC CONSULTANT ATTENDANCE SHEET

Date:	07/10/2022
Location	Kendriya Vidyalaya, Sachivalaya Colony, Kankarbagh, Patna.
Project Name & No:	10P155: Development of sewerage Network and STP at Digha and Kankarbagh
Agenda:	Public Consultation of

S.no	Name	Signature
1	Anil Kayar	Anil Kumar
2	Yanish Kayar	
3	Nyamuddin Ansari	
4.	Devdatt pandey	
5	vikki sherya	
6	Nilam Thakur	

5 Environmental and Social Impact Identification and Assessment

5.1 Methodology of Impact Assessment

This section identifies and assesses the potential impacts to the physical, biological and socioeconomic environment that can be expected from the proposed project components i.e., two number of SPS and 150.21km of Network. The impacts due to the Project activities have been identified and assessed. Impacts are identified and predicted based on the analysis of the information collected from the Project site (environmental and social features of the project component) and baseline information. The identification of likely impacts during construction and operation phases has been carried out based on understanding of activities and their consequent impacts on various environmental and socio-economic resources or receptors.

5.1.1 Impact Identification

For identification of Environmental & Social impacts, the following resources were referred:

- Applicable local, State, National environmental and social legal regulations
- Environmental & Social Management Framework (2020)
- World Bank Group's Environmental, Health & Safety Guidelines (WB-EHS) – General (2007), and Water and Sanitation (2007)

5.1.2 Impact Classification

The adverse impacts of project activities on environmental and social receptors in the study area have been classified based on the following attributes:

- Nature of impact – Reversible/can mitigate or Irreversible impact
- Duration of activity – Long or short term
- Extent of impact – Regional or Local impact
- Order of impact –Direct or Indirect impact

Using the above attributes, the adverse impacts have been classified as 'Low', 'Moderate' or 'High' to enable prioritization of mitigation measures as shown below.

EXTENT / NATURE	Short Term (Duration of activity ≤ 6 months)			Long Term (Duration of activity > 6 months)	
	Regional	Local		Regional	Local
Irreversible	High	Medium		Very High	High
Reversible	Medium	Low		High	Medium

The site context will determine likelihood of the impact, where this is found negligible, the impact is scaled down. The impact classification may be lowered or elevated basis the site context.

The assessment largely focusses on identifying **Direct Impacts** caused due to the project activities for

planning preventive and mitigation measures. Addressing direct impacts would inherently break the chain of indirect impacts. Indirect impacts where critical have been identified.

5.2 Positive Impacts

The Kankarbagh Sewerage project is being developed under a Ganga conservation mission named "Namami Gange". It is estimated that at present the total wastewater generated in Patna is approximately 210 MLD. However, only 20% of the city area has a physical coverage of an underground sewer network. Further, the Kankarbagh Zone is one of the highly populated and core areas of the city with no dedicated sewage treatment mechanism. The sewage was presently being treated through other STP's in the nearby zones. This project will thus enable lowering of treatment loads in the other connected STP's, ensure adequate treatment and eventually lower pollution loads in the River Ganga & Punpun. Further, availability of a dedicated Sewerage system will ensure the channels are not flooded during monsoon thus preventing waterlogging and associated impacts. This Sewerage scheme is also been designed in a way to promote and incorporate principles of resource efficiency and waste utilization. The sludge generated from the treatment process will be used to generate biogas which will be used for electricity and heating requirements in the STP operations. The treated wastewater will also be used for plant operations and may also be provided for other purposes which will reduce the freshwater usage.

The citizens of the zone will be the major beneficiaries of the underground sewerage system, as they will be provided with hygienic environment. The project would also generate employment opportunities for locals during construction and operation phases of the project.

5.3 Areas of No Significant Impact

5.3.1 Physical Cultural Resources

During the site assessment, no scheduled historical, archaeological, paleontological, or architectural sites were observed. Hence **no impacts on physical cultural resources** are anticipated from the project.

5.3.2 Scheduled/Tribal Areas

There are no Scheduled/Tribal Areas documented or notified in the study area. Hence, **there will be no impact on tribal areas due to the project.**

5.3.3 Protected Areas/ Forests

The study area does not comprise of any Reserved/Protected Forests, National parks, Wildlife sanctuaries and Ramsar sites. Hence **no impacts on protected areas/forest are anticipated from the project**.

5.4 Project Activities

5.4.1 Construction Phase

The construction phase of the project component will include the following key activities:

- Site Preparation (clearance of existing vegetation, fencing to avoid intrusion)
- Earthwork (earth moving and filling, land grading, levelling, and compaction)
- Operation of heavy vehicles/ machinery/ equipment
- Use of diesel generator sets and diesel-powered vehicles
- Labour camps and site office/control room
- Storage of construction material
- Transportation of raw material and construction spoil
- Storage of scrap, hazardous waste, and construction debris
- Maintenance of equipment/machinery

5.4.2 Operation and Maintenance Phase

The operation phase at project component will include the following key activities:

- Operation and maintenance of SPS and its component
- Sewer cleaning in case of any blockage identified
- Proper disposal of wastes screened out at SPS
- Material storage
- Staff quarters
- Maintenance of vegetation (de-weeding, maintenance of greenbelt/buffer)

The potential impacts have been identified through a systematic process whereby the activities (both planned and unplanned) linked with the Project have been considered with respect to their potential to interact with environmental and social resources or receptors.

The interaction matrix enables a methodical identification of the potential interactions each Project activity may have on the range of resources/ receptors within the Area of Influence i.e. the study area for the Project.

Impact Identification Matrix for Linked Facilities o Kankarbagh Network

Project Activities	Potential Impacts																						
	Environmental Resources											Ecological Resource			Social-Economic Resources								
	Visual Aesthetics & Odour Nuisance	Land Use	Soil Quality	Air Quality	Ambient Noise	Topography & Drainage	Surface water	Surface water quality	Ground water resource	Ground water quality	Traffic (road)	Terrestrial Flora & Fauna	Aquatic Flora (Inland & Marine)	Aquatic Fauna (Inland & Marine)	Job & economic opportunity	Livelihood Loss	Social & Cultural Structures	Physical Displacement	Land Use (Economic Displacement)	Access Disruption	Cultural Resources	Community Health & Safety	Occupational health & safety
I. Construction Phase (SPS)																							
Mobilization and Operation of earthmoving equipment				■	■						■				■					■			■
Land preparation (cleaning and grading)			■				■								■								
Land excavation			■				■								■								
De-watering of excavated area			■				■								■								
On-site handling and storage of excavated material	■		■	■		■	■								■								
On-site handling and storage of construction waste including concrete residue	■		■	■		■	■								■								■
Off-site disposal of construction waste including concrete residue	■	■	■	■			■								■								
Installation of SPS structures					■										■								■
Installation of electro-mechanical equipment															■								■
Operation of DG sets (standby)				■	■	■	■								■								
Use of water for construction activities							■		■						■								
Wastewater generated			■	■		■	■								■							■	■

during construction activities																							
Vehicular Movement *(*RMC Trucks, raw material unloading vehicles, waste disposal trucks etc.*)*																							
II *(a). Activities at Linked Sewage Infrastructures*																							
Mobilization and operation of earthmoving equipment for sewer pipeline work																							
Laying of New sewer pipelines																							
On-Site storage and handling of excavated materials																							
Off-Site disposal of left out excavated soils/wastes																							

= Represents "no" interactions is reasonably expected

= Represents interactions reasonably possible but none of the outcome will lead to significant impact impacts

As per above Impact Identification Matrix for the activities undertaken under proposed component have an interaction with following environmental resources:

- ✓ Visual Aesthetics & Odour Nuisance
- ✓ Soil Quality
- ✓ Ambient Air quality
- ✓ Ambient Noise
- ✓ Drainage
- ✓ Surface Water
- ✓ Ground Water
- ✓ Road Traffic
- ✓ Community Health and Safety
- ✓ Occupational Health and Safety

Detailed impacts linked to above mention have been assessed and respective mitigation measures

have been analyzed in further section.

5.5 Impacts during Construction Phase

5.5.1 Viewscape Impacts

SPS-B is near to settlement so there will be impact on community viewscape. SPS-A is little bit away from habitation but next to Patliputra Sports Complex, so there will be impact on community viewscape. During construction phase, there will be an increase in the movement of vehicles, thus affecting the calm and serene view from the locality at SPS site but the overall impact is low for this phase. There are no archaeologically important places in close vicinity of the project area.

Nature	Extent	Duration	Impact	Remarks
Irreversible	Local	Long term	**Medium**	*The SPS is being constructed in a land within residential colony. Further, there are no archaeologically important places in the study area. Hence, the viewscape impacts are lowered from 'High' to 'Medium'*.

5.5.2 Impact on land

There is no major impact on land environment is anticipated from the component assigned for study under proposed project.

- ✓ Local land and soil may get affected during construction work as it would involve land clearing.
- ✓ Removal of vegetation and land clearing is associated with soil erosion. But this is not required at SPS sites .SPS-A is not required any vegetation removal, whereas SPS-B is having grasses only can be seen in site visit photo. Hence, no major impact anticipated.
- ✓ No quarries are envisaged in the project, hence no major impact anticipated.
- ✓ Excessive debris, trash or construction remnants (e.g., dirt piles) may create problems related to drainage, unhygienic conditions and poor aesthetics.
- ✓ Uncontrolled disposal of municipal solid waste generation at SPS may impact the land environment.
- ✓ Since the project does not involve any private land acquisition hence, there will not be any impacts on titleholder's land or structures.

Nature	Extent	Duration	Impact	Remarks
Reversible	Local	Short term	**Low**	*Although the construction shall span across the rainy season, an embankment is to be built around the project site under good management practice. Thus, ensuring that soil is retained within the site area.*

5.5.3 Ambient Air Quality

The main sources of air pollution during construction will potentially be fugitive dust emissions, and exhausts from transportation vehicles and construction equipment.

The proposed activities are expected to increase the air pollution before EMP implementation:

- ✓ The soil in the site area is alluvium soil and is unlikely to contribute much to the particulate matter emissions. Thus, it is expected that fugitive dust emission generation from the various pre-construction activities of site clearance and levelling and various construction activities such as excavation and earthworks, haul roads, stockpiles of excavation spoil etc. will be minimal.
- ✓ The transportation of raw materials to the site will lead to increase in vehicular emissions due to movement of trucks carrying construction material and mobilization of construction.
- ✓ The use of diesel generator sets, and construction equipment will increase the concentration of pollutants (SPM, SO_2, NOx, CO) in the project area and immediate vicinity due to burning of fuel.
- ✓ Laying of sewer lines is mainly within the residential area, hence temporary impact on air quality where excavating and D.G sets operate to run digging machinery and to break the paved path would result in increase in fugitive dust.
- ✓ Anticipated impact scenarios mentioned above will be short−term and will exist during construction activities only. As a result, they pose medium risk and they are reversible in nature. The potential impact on air quality is assessed to be Minor.

Nature	Extent	Duration	Impact	Remarks
Reversible	Local	Short term	**Medium**	*During construction phase before implementation of EMP and close proximity to settlements, different activities trigger the impact from 'Low' to'Medium'.*

5.5.4 Noise Pollution

The operation of construction equipment and other construction activities such as movement of materials/vehicles will increase the noise levels in the vicinity during the construction phase.

The proposed construction activities are expected to increase the noise levels mainly due to

- ✓ Plying of transport/construction vehicles, pumping machines, use of portable generators, mechanical machinery such as cranes, riveting machines, hammering etc.
- ✓ There will be an increase in noise levels in areas situated close to the road due to movement of trucks and construction activities. Temporary impacts may especially be felt at educational facilities like schools/colleges, hospitals, cultural/religious centers including all religious institutions in the pipelaying areas.
- ✓ The increase in noise levels may thus be a major concern at SPS-B, since it is located close to habitation (not beyond 0.5 km) and hospitals/nursing homes are nearby.
- ✓ Increase of noise level at night may produce disturbances, causing sleeplessness in people in the vicinity of the site in case construction activity is extended into the night hours.
- ✓ Since the activities are for shorter duration hence the magnitude of impact is Moderate in nature.

Nature	Extent	Duration	Impact	Remarks
Reversible	Local	Short term	**Medium**	*Due to close proximity to settlement, plying of transport vehicles and use of heavy machineries will cause the impact elevated from 'Low' to 'Medium'*

5.5.5 Surface Water Pollution

The natural water bodies/drainage channels of the project area are likely to be affected in the following ways:

- ✓ Construction activities will be conducted throughout the town even near the drains flowing to nallas and water bodies has generated significant amount of silt materials. Mobilization of settled silt materials, runoff from stockpiled materials, and chemical contamination from fuels and lubricants during construction works can contaminate nearby water body.
- ✓ In pipe laying work, situation of temporary flooding may arise due to excavation during monsoons or blockage of surface drains.
- ✓ Construction wastes are likely to be discharged to the nearby surface drains and would hence temporarily increase the pollution load of the drains/nallas. Care is to be taken at SPS-B as drain is flowing near the allocated land parcel.
- ✓ Soil erosion may be caused by the exposure of loosen soil to rain and wind during site clearance, earth moving, and excavation activity that may result in sedimentation of surface drainage networks.
- ✓ These potential impacts are temporary and short-term duration and can be mitigated through proper implementation of EMP.

Nature	Extent	Duration	Impact	Remarks
Reversible	Local	Short term	**Low**	*No adverse impact on surface water quality is envisaged as no discharge into surface water is proposed during construction phase of SPS/network*

5.5.6 Ground water

There will be no groundwater extraction during construction phase for proposed component assigned for study. As of now requirement of water for construction activities are sourced through water tankers. Hence there will no impact on ground water resource. Although the project area falls in the "safe" zone for ground water development.

Soil investigation report of project area observes the water table at 3.5m in month of Dec,2020. During excavation, there is a potential for groundwater contamination particularly if pits / cuts are left unfilled / uncovered for a long time. The activities causing soil pollution can leach into the ground and thus indirectly impact the ground water quality.

The maximum depth of the sewer line is in most areas limited to a maximum depth of 8.0m for the zone. Accidents/ damages due to erosion/ sliding of vertical sides of excavated trenches may take place while placing the pipes. The laying of pipe lines below sub-soil ground water shall be carried out with adequate measures to prevent caving of surrounding earth / soil.

Nature	Extent	Duration	Impact
Reversible	Local	Short Term	**Low**

5.5.7 Loss of Flora and Fauna

No natural forest area has been observed in the study area. There are no notified ecological sensitive locations, migratory paths, sanctuaries, etc. within the study area. As detailed out there are no endangered floral species in the study area. The proposed project component assigned for study does not envisage any destruction or displacement of any endemic floral or faunal species; hence the impact will be insignificant. The project area being in an urban setting and small in size, not likely to affect the movement and life pattern of the species. No vegetation removal is proposed at SPS site.

Nature	Extent	Duration	Impact
Reversible	Local	Short Term	**Low**

5.5.8 Social and Livelihood Impact

All the activities to be carried out during construction and operation phases will require skilled and unskilled labourers, hence creating temporary as well as permanent employment for local people. As the proposed project is located within the city limit with lot of employment opportunities, it is likely to have positive socio-cultural economic impact.

The proposed project will entail temporary access disruption during excavation work for the removal of debris and piling up of mud earth along the roadside for laying of new sewer pipelines along congested locations. Using large construction machinery such as cranes etc and vehicular movement for transportation of construction materials for carrying out construction materials etc. will likely cause access disruption.

The proposed project will entail access disruption during the laying of new gravity sewer lines as observed during site visit due to the 80% of the alignment is transverse through the market and residential areas. In the other areas where road width is 9m or above the street vendors will be shifted across the road in the same vicinity which will help them in "not loosing" their regular customers as well as the benefit of their location, and thus, this shifting will not have any adverse impact on their daily income. The laying of the sewer pipelines will involve an open−cut method mostly in the center of road at the depth of 8m maximum. To provide access to the community and shopkeepers wooden/steel planks will be provide at site and a pipe laying work will be done in small stretch to ensure the backfilling with temporary restoration by the end of the day.

These impacts are short term and can be mitigated with proper implementation of ESMP.

Nature	Extent	Duration	Impact
Reversible	Local	Short Term	**low**

5.5.9 Occupational Health and Safety

Construction workers are likely to have injuries and hazards as the construction works unavoidably expose workers to occupational health and safety risks. The workers are also likely to be exposed to risk of accidents and injuries resulting from accidental falls and injuries from hand tools and construction equipment. The project OHS hazards may impact the workers and cause some disturbances in work progress. By providing PPEs, TBT , Mock Drills and training on safety practices with preparation of SOPs for work to permit, working at deep trenches, work in confined space and its proper implementation and monitoring may reduce the risk to a minimum.

Nature	Extent	Duration	Impact	*Remarks*
Reversible	Local	Short term	**Medium**	*Workers will have direct exposure continuously during construction, hence impact classification elevated to 'Medium' from 'Low'*

5.5.10 Community Health and Safety

Hazards posed to the public, specifically in high-pedestrian areas may include traffic accidents and vehicle collision with pedestrians. Sewers works and deep excavations along the roads and narrow streets, and hauling of equipment and vehicles have potential to create safety risks to the community. Rising main of 1.2 km is sharing the construction work with Patna Metro in same area. Deep excavations without any proper protection will endanger the close by buildings. Potential impact is negative but short-term and reversible by mitigation measures.

During peak construction phase, a portion of the labour requirement will be met from nearby locality. A few migrant labour will also be engaged through labour contractors for whom labour camps will be established. The migrant labours could have cultural differences with the resident population, resulting in potential conflicts on issues related to the environment, safety and privacy issues of the women in the surrounding locality, spread of various communicable diseases, nuisance caused by them due to improper sanitation facilities etc. The impacts related to community, if not appropriately managed, could lead to agitation.

Nature	Extent	Duration	Impact	*Remarks*
Reversible	Local	Short term	**Medium**	*The impacts related to community, if not appropriately managed, could lead to agitation. Hence impact classification elevated to 'Medium' from 'Low'*

5.5.11 Gender Based Violence

In Bihar, chance of engaging local female labour is very remote. Therefore, zero cases are reported so far w.r.t. GBV during construction. However, even if one female labour is engaged, GBV risk may be there. Sometimes the migrant labours can impact the safety and privacy issues of the women in the surrounding locality will trigger the GBV risk. GRM will take care of this aspect. Sexual Exploitation & Abuse and Sexual Harassment are manifestations of GBV to mitigate these risks. There is an Internal Complaint Committee (ICC) formed in BUIDCo for the Prevention, Prohibition and Redressal of Sexual Harassment of Women at Workplace under PoSH Act India. BUIDCo ICC comprises of two female members and one male member from BUIDCo and one external female member. Any GBV related issues can be referred to BUIDCo ICC though GRM.

Nature	Extent	Duration	Impact	*Remarks*
Reversible	Local	Short term	**Medium**	*The impacts related to community, if not appropriately managed, could lead to agitation. Hence impact classification elevated to 'Medium' from 'Low'*

5.5.12 Labour Influx

The construction of civil works for which, the required labour force, associated goods and services cannot be fully supplied locally for a number of reasons such as worker unavailability and lack of technical skills and capacity. In such cases, the labour force (total or partial) would be brought in from outside the project area from nearby municipal towns and villages and sometimes outside the state. The rapid migration of labour to the project area may affect the project area negatively in the terms of additional burden on public infrastructure such as local social and health services, utilities such as water and electricity, housing and social dynamics and thus impact on local communities. Other related issues could be increased risk of spread of communicable diseases, and increased rates of illicit behaviour and crime. The conflict can also arise with shop owners and business entities during pipe laying work due to access disruption, in case no proper mitigation measure is put in place. This can take place especially during the excavation and pipelaying work. The construction of the SPS will be within closed premises.

Some of the adverse environmental impacts are illegal waste disposal sites, inappropriate Waste water discharges, camp related noise, access roads and land use issues. Such adverse impacts may get amplified by local-level low capacity to manage and absorb the incoming labour force, and specifically when civil works are carried out in or near vulnerable communities and in other high-risk situations.

As this impact is restricted to the construction phase, measures such as proper orientation to workers on gender and cultural sensitivity and prior information dissemination before construction starts can mitigate the impact.

Nature	Extent	Duration	Impact	*Remarks*
Reversible	Local	Short term	**Medium**	*The impacts related to community, if not appropriately managed, could lead to agitation. Hence impact classification elevated to 'Medium' from 'Low'*

5.5.13 Impact on Traffic

Due to the excavation work which will take place on the main roads of the city and 80% of area is residential and market, there will be a disturbance in the traffic movement. People may suffer some inconvenience during the morning and evening peak hours. Traffic disruption can be expected in busy areas such as market place due to transportation of material of construction. Also, many of the roads in residential areas and market areas are very narrow some ranging from 7 -9 ft. wide. Any excavation along the roads in these areas will inhibit traffic movement. Temporary inconveniences caused by construction will be reduced if the project is implemented in a timely manner.

Nature	Extent	Duration	Impact	Remarks
Reversible	Local	Short term	**Medium**	*It may be higher at many locations in absence of proper mitigation. Hence impact classification elevated to 'Medium' from 'Low'*

5.5.14 Impact on Existing Utility Services

The road opening activities may damage the underground water pipelines, telephone cables or electricity poles in the vicinity of the site for the proposed Projects. This will lead to hinderance in telephone lines, water supply interruptions, disruption in electricity supply and will involve expensive repair costs. For sewerage works in the entire city, flooding could be an issue during the monsoons. This issue may further aggravate due to blocked drains and poor solid waste management in the town. As per Govt. order new construction in pipelaying work is stopped in monsoon season.

Nature	Extent	Duration	Impact	*Remarks*
Reversible	Local	Short term	**Medium**	*If wastes are not properly stored and disposed may cause flooding issue and unhygienic situation in city. Hence impactclassification elevated to 'Medium' from 'Low'*

5.6 Impacts During Operation and Maintenance Phase

5.6.1 Water Environment

Water resources in the project area would be the most positively benefited by the sanitation project since sewage will now be routed to the STP. Therefore, proper operation and maintenance mechanism must be followed for efficient working of the system. During maintenance work periodically flushing to remove accumulated sediments and other impurities accumulated in pipe need to be carried out. The environmental implication of pipe flushing is discharge of flushing water which may have high suspended solids and other contaminants. These can harm surface water. The uncontrolled discharge of domestic water into aquatic system can result in increase in microbial load, chemical contamination, oxygen depletion, turbidity and eutrophication.The probably environmental impacts related to water during operation stage may include unpredictable events such as:

- ✓ Temporary flooding of adjacent areas due to accidental leakages/bursts and also due to blockages and backlogging of lines.
- ✓ Water pollution and possibility of mixing with water supply line due to leakages/ overflows from the sewer lines.
- ✓ Potential sources of impact for ground water contamination are minor oil and grease spillage, during maintenance of construction machinery, repair of pumps and compressors during operational phase.

The overall environmental impact for all the above mentioned aspects are reversible in nature and local that will continue throughout the lifecycle of the project and can be mitigated by adopting industry best practices.

Nature	Extent	Duration	Impact
Reversible	Local	Long term	**Medium**

5.6.2 Noise Pollution

Improper handling and irregular maintenance of operating machines including pumps, generators, air diffusers, etc may lead to increased noise pollution during operation activity. Workers shall be directly prone to the exposure to excessive noise levels from operating machinery such as air compressors and pumping systems and motors. Increase in noise may also be experiencedin the treatment systems where flow of water and bubbling exists.This can be mitigated by implementation of mitigation measures.

Nature	Extent	Duration	Impact	*Remarks*
Reversible	Local	Long term	**Low**	*Proper mitigation measures will be taken up to reduce the noise pollution. Hence impactclassification is lower down to 'low' from 'medium'*

5.6.3 Air Pollution and Odours

SPS will not have any major type of unit operations releasing the gaseous emissions, but there may be

some chances of some odours which may not be pleasant to the nose. Nuisance odour generated from pumping plants impairs ambient air quality and represents a growing social and public health issue that is increasingly a cause for public discomfort and complaints. The same concern was raised during public consultation. It can be mitigated with the green plantation surrounding of the proposed sites along with regular removal of screened out wastes with proper disposal to designated place.

The vehicular movement will be limited in the O&M phase. The project is not expected to increase traffic volumes or change other existing conditions to such a degree as to increase air pollutants emissions. In absence of proper waste management, long term impacts of odour can be anticipated.

Nature	Extent	Duration	Impact
Reversible	Local	Long term	**Medium**

5.6.4 Impacts due to Leakages and Overflows

The leakages and flow in the sewer networking system can result in soil, ground water and surface water pollution. As it is mentioned in construction phase-Ground water impacts that water table in monsoon season in Kankarbagh zone is observed as 3m-4m. This would result in mixing of sewer water with ground water due to water seepages. Overflow condition in the sewer network occurs, when there is excess volume of waste water generated or there is blockade in sewer lane. It also happens when there is aheavy rain. The overflow in sewer line will happen when there is excess amount of wastewater generated, heavy rains, power loss, STP components malfunctioning, or blockages.

The overall environmental impact for all the above-mentioned aspects is reversible in nature and local that will continue throughout the lifecycle of the Project and can be mitigated.

Nature	Extent	Duration	Impact
Reversible	Local	Long term	**Medium**

5.6.5 Solid waste disposal

The solid waste generated at pumping station, screening chamber, cleaning of drainage and sewer collection system etc would be menace to the locals. If not collected and quickly removed it would choke the storm water network, and also can be potent disease vector. These impacts are local and can be mitigated.

Nature	Extent	Duration	Impact
Reversible	Local	Long term	**Medium**

5.6.6 Hazardous chemical handling and exposure

In operation and maintenance of sewage pumping station major hazardous chemicals are not required to be handled so impact envisaged is low. But use of oil and lubricants is associated with pump operation should be handled carefully.

Nature	Extent	Duration	Impact
Reversible	Local	Long term	**Low**

5.6.7 Chance of accidents & injuries

The occupational health and safety impacts resulting from the O&M phase will primarily include accidents and injuries, exposure to hazardous chemicals and pathogens, occupational noise and exposure to natural and man-made emergencies.

The employee working in the SPS operation and maintenance work would be subjected to injuries and health hazard if precaution at work place is not taken. In the SPS locations there are work areas which are under ground or at elevation, slippery walkways, electrical circuits.

The workers, staff and operators of waste collection can be exposed to the many pathogens contained in sewage. Workers may also be exposed to endotoxins, which are produced within a microorganism from sewage pipeline. This could affect the health of workers, if PPE and precaution are not properly taken. Work may also involve entry into confined spaces, including manholes, sewers, pipelines, and pump stations. Getting trapped at confined space may also result in asphyxiation resulting from increased carbon dioxide levels. When the labourer will be involved in such activity, they must be trained and equipped with proper PPEs. The various emergencies will have an impact to workers' health and could potentially impact the neighbouring community as well but can be managed by adopting proper mitigation measures.

Nature	Extent	Duration	Impact
Reversible	Local	Long term	**Medium**

5.6.8 Community Impacts

The impacts on community may include:

- The security personnel appointed for protection of the plant could pose risks to the community due to misbehavior.
- During operation phase, inflow of persons is expected. This will result in establishment of supporting facilities and attract labour for employment. New persons coming in could have cultural differences with the resident population, potential conflicts may arise on issues related to the environment, safety, and privacy issues of the women in the surrounding villages.

The overall impacts related to community, if not appropriately managed, could lead to agitation. However, it is expected that the impact will be restricted to immediate vicinity of the project area and can be addressed through implementation of mitigation measures and management of human resources.

Nature	Extent	Duration	Impact
Reversible	Local	Long term	**Medium**

5.7 Summary of E&S Impacts

Nature of Impact/ Activity	Impacted EHS Component	Impact Classification
Project Development/ Planning Impacts		
1. Views cape impacts due to proximity of settlements tothe project area	Local Community	**Medium**
2.Land Use Change due to setting up of SPS	Local community	**Low**
Pre- Construction & Construction Phase Impacts		
3. Impact on land due to various construction activities	Soil quality	**Low**
4. Increase in fugitive dust emissions causing air pollution from site clearance, excavation, raw material transportation, storage of excavation spoil, use of fuel wood in labour camps	Ambient air quality, community health, worker health	**Medium**
5. Increase in concentrations of PM_{10}, $PM_{2.5}$, SO_2 from burning of fuel in construction equipment, transportation vehicles and cooking in labour camps		**Medium**
6. Increase in ambient noise levels due to operation of construction equipment.	Worker health	**Medium**
7. Obstruction of flows in open nalla and deterioration of surface water quality due to soil erosion and dumping of construction waste	Surface water quality, local community	**Low**
8. Loss of flora and Fauna due to setting up of plant unit	Flora and Fauna	**Low**
9. Soil contamination due to improper management of construction waste, spills and leaks, absence of sanitation provisions in labour camp.	Soil quality, Ground water, Local community	**Low**
10. Ground water pollution due to leaching of materials and waste into the soil	Ground water Local community	**Low**
11. Accidents/ damages due to erosion/ sliding of vertical sides of excavated trenches while places the pipes	Worker	**Medium**
12.Exposure to physical, chemical hazards, exposure to noise, working with construction equipment, fugitive dust, emergencies at site	Construction worker	**Medium**
13.Exposute to migrant workers, air, noise pollution, project security personnel, obstruction to community activities and accident caused in the nearby community due to construction activities	Local community	**Medium**
14.Traffic congestion due to network in congested area	Local community	**Medium**

15.Interruption in existing utility during pipelaying work	Localcommunity	**Medium**
Operation and Maintenance Phase		
16. Air pollution through air emissions and odour generation from the operation of the sewage pumping station	Ambient air quality Local community	**Medium**
17. Leakages and overflows resulting contamination of soil, freshwater bodies, and groundwater	Surface water quality Groundwater quality Soil contamination Local community	**Medium**
18. Unscientific management and disposal of screened out wastes	Soil quality Groundwater quality Local community	**Medium**
19.Exposure to chance of accidents and injuries in sewer cleaning and work at confined space	Workers at work	**Medium**
20. Community Impacts resulting from use of untreated wastewater, exposure to odor, resource depletion, influx of immigrant population, misbehavior of security,	Local community	**Medium**

6 Environmental and Social Management Plan

6.1 Methodology of Developing ESMP

Based on the project activities during pre-construction, construction and O&M stages of the project, environmental, occupational health and safety, and community health and safety impacts have been identified in the previous Chapter.

For identification of management measures, the following resources were referred:

- World Bank Group (WBG) General EHS guidelines
- EHS Guidelines for Water and Sanitation (2007)

The hierarchy adopted for planning management measures is elimination, substitution, engineering control, administrative control, and personal protective equipment.

The environmental and social management plan ensures to suggest appropriate mitigation measure against the issues/ concerns identified during the environmental and social assessment study. In general, BUIDCO, Bihar (with assistance from DBOT Contractor) is the responsible entity for ensuring the mitigation measures as suggested in the ESAMP. Further, this ESMP provides project and site-specific mitigation measures to minimize damage to the local environment and disruption to local communities**.**The roles and responsibilities of the involved institutes are described below.

6.2 Institutional Arrangement for Implementation of ESMP

6.2.1 Implementation of ESMP

The DBOT Contractor has the prime responsibility to implement the ESMP during all phases of the project. The ESMP will be applicable to all Contractors and Sub- Contractors including labour contractors and their workers working in the project during all phases. "EHS officer" at project level from contractor side will ensure the compliance of the ESMP which will also be monitored by VA Tech WABAGH Corporate level, QHSE Head and EHS Manager (**VA Tech WABAGH has a certified Integrated Management System (IMS) as per ISO 9001:2015, ISO 14001: 2015, and ISO 45001:2018 international standards. They are having EHS management system developed at the corporate level and is extended to all projects in India***)*.VA Tech WABAGH OHSE Policy is enclosed in **Annexure-5.**

Engineers of BUIDCo field office have secondary responsibility for implementation of ESMP and will coordinate the day-to-day work and monitor the ESMP compliance activities with the support from the headquarter.

6.2.2 Reporting and Monitoring

Contractor will submit the Monthly ESMP compliance report to BUIDCo and SPMG. Quarterly ESMP compliance report submitted by contractor will be shared with NMCG and World Bank. Periodic monitoring for the ESMP compliance will be ensured by E&S personnel of BUIDCo and SMCG.

6.3 ESMP for proposed component under sewerage project

6.3.1 During Pre-Construction, Construction and O&M Phase

The contractor specific ESMP with mitigation measures and implementation budget for subproject development/ planning, pre-construction, construction and O&M phase impact is presented in **Table 8**. The legal requirements to be adhered during planning, pre-construction and construction phases ofthe project are provided in **Section 3.1** of this report.

Most of the mitigation measures require the Construction Contractors to adopt good site practice, which should be part of their normal procedures & SOP. So, there is unlikely any major cost escalation to be associated with compliance. Regardless of this, any costs of mitigation by the construction contractors are included in the budgets for the civil works and do not need to be estimated separately.

The environmental and social management plan ensures to suggest appropriate mitigation measure against the issues/ concerns identified during the environmental and social assessment study.

6.3.2 Social Impact Assessment/Mitigationmeasures

(i) Livelihood impact: Sewer constructions will invariably lead to road closures which will adversely affect shops on those streets. The first priority is for the contractor to take the necessary measures to ensure that pedestrians always have access to shops, vendors etc. For mobile vendors, this may include adjusting the location of the cart etc. to a similar location in the immediate vicinity of the original location for the duration of the project. Projects should also proceed on schedule so as to minimize disruption. Additionally, clean-up of debris and clearance of blockages should commence immediately after project completion so as to remove any potential obstacles that might prevent customers from accessing businesses or other disruptions.

(ii) In the event that the contractor, despite best efforts, is unable to avoid blockages of the roads and/or disruption of local businesses, some assistance is necessary. The ESMF currently mandates assistances only in the case of permanent livelihood loss or displacement and provides no provisions for temporary livelihood loss. Additionally, no regulation, policy, guideline etc. exists which can provide precedent or guidance in this instance ESMF clearly states that mobile/ambulatory hawkers: fruit cart vendors etc. who can easily relocate fall into this category. These vendors are most eligible for a temporary relocation just outside the construction area, and will thus not be eligible for compensation as is the case for this proposed project.

(iii) However, if during the construction of the project any party faces livelihood loss due to the proposed project, then that party should be compensated according to the entitlement matrix given in the ESMF report. As of now no such issue is observed in this contract during site visit.

(iv) Sewer lines will pass through various residential colonies of sewerage zone. Moreover, there would be no loss of community assets during the construction as noticed during field survey and consultation with the local people.

(v) Land acquisition: - Both sewage pumping station is proposed on Govt. land and NOC is received.
(vi) There is no risk to the social and cultural resources of the zone under this project. During working at sensitive times such as religious and cultural festivals, special care must be taken.

Table8: ESMP for Pre-Construction, Construction and O&M Phase

Environment & Social Prospective	Duration /Level of Risk	Mitigation Measures	Cost (Rs.)	Responsibility	
				Implementation	Monitoring and Supervision
Design Phase					
Land Acquisition for SPS	Short term/Low	a) Two SPS is proposed at Govt. land, which is encroachment free and NOC is received for the same. b) Sewer constructions will invariably lead to road closures, which will adversely affect shops on those streets. The first priority is to take the necessary measures to ensure that pedestrians always have access to shops, vendors etc. Work will be done in small stretch in such street so as to minimize the road closure period if not possible to give access hence lower down the livelihood impact of shopkeepers. c) For mobile vendors, this may include adjusting the location of the cart, etc. to a similar location in the immediate vicinity of the original location for the duration of the Project. d) Projects should also proceed on schedule so as to minimize disruption. e) Additionally, clean-up of debris and clearance of blockages will commence immediately after completion of work so as to remove any potential obstacles that might prevent customers from accessing businesses or other disruptions. f) Proper barricading with signages will be ready for pipe laying work along with traffic diversion plan for congested area if not possible to give access in narrow lane.	Two SPS is proposed at Govt. land, which is encroachment free and NOC is received for the same.	Contractor	BUIDCo/SMCG/NMCG
DBOT Contractor has reviewed and verified the project component, land availability and data made available in DPR. Accordingly design & drawing of the proposed project is prepared with its vetting.					

Construction Phase					
View scape impacts due to proximity of settlements to the project area	Short term/Low	a) Both proposed SPS location in Kankarbagh zone is within residential areas, so construction of SPS will impact the views cape. (Especially at SPS-B which is an open land). During construction work, care for site management is important at both SPS location due to proximity of habitation. b) During public consultation, the local community will be informed about schedule of construction activity and related inconvenience as 80% of pipe laying work is proposed in residential and market areas. c) Location of dump yards and traffic parking will be not be in direct view of the settlements. d) All the construction activities will be restricted within the designated site with proper provision of storage facility for construction materials. e) Construction and municipal solid waste temporarily stored at the site will be transported to the designated disposal facility at regular intervals. f) Sections excavated for construction activity will be barricaded with tin sheets. g) Sections excavated for pipeline route will be properly barricaded with movable barrier to avoid any risk to passer-by. h) Stacking of sections of pipeline to be done away from settlements with provision of wedges to ensure that rolling or movement of pipeline do not pose risks to nearby. i) On completion of pipe laying work, all temporary structures, surplus materials and wastes will be completely removed from the site and disposed to a designated place.	Part of contract	Contractor	BUIDCo/SMCG/NMCG

Surface water pollution due to soil erosion, release/runoff of construction wastewater and dumping of debris	Short term/Medium	a) All the digging and lying of sewer lane will be planned as per the schedule of monsoon. sewer work or diversion of sewer land will not be done during monsoon season to prevent local flooding. **During site visit it is observed that pipe laying work is stopped in monsoon time. After monsoon, proper inspection of trench will be carried out before initiating the work.** b) Left-over excavated spoil after backfilling is under use at SPS site for site levelling and preparation. Designated site for disposal will be obtained in a month time. e) Precaution is required at SPS-B where nalla is flowing nearby. Labours will be oriented to not dispose the construction wastes in nalla. f) Provision of channels or sand bag barriers will be made available to site especially on rainy days in initial phase of construction to direct storm water to silt removal facilities. g) Protection of stockpiles will be made by plastic sheeting to ensure that they are suitably secured against the wind. h) Stockpiled areas will be bordered by berms. i) Stockpiles will be done in high areas to avoid flow in storm water run-off channels and erosion.	Part of contract	Contractor	BUIDCo/SMCG/NMCG

1. Increase in fugitive dust emissions causing air pollution from site clearance, excavation, raw material and transportation, storage of excavation spoil, use of fuel wood in labour camps 2. Increase in concentrations of PM10, PM2.5, SO2 and NOx from burning of fuel in construction equipment and transportation vehicles and cooking in labour camps.	Short term/Medium	a) While digging for sewer lane and sewer piping, dust prevention measures like water sprinkling, shade cloth will be installed to attenuate dust. (Water sprinkling will be ensured twice a day specially in dry and windy period) b) Portable hard barricading at least 3 m height will be provided at sewerage network laying areas in the major roads of the town. c) At the stocking yard, loading and unloading area will be temporarily fenced with green shade cloth in labour camp and SPS site to prevent air pollution in nearby areas. Height will be minimised from which fill materials are unloaded during site backfilling as far as possible. Wherever possible, this should be below the height of the barricading around the Project site boundary. d) GI sheet about 3m height/Shade Cloth with help of Scaffolds 3 meters high as per availability will be installed all along the SPS construction site to prevent the surrounding areas from dust nuisance. (**During site visit, GI sheet was installed at SPS-A construction site but more arrangement will be done to prevent the surrounding residential colony/ apartment/houses/hospitals/schools from dust**). e) All the D.G Sets will be installed with appropriate stack height for proper dispersion of gaseous complying with the BSPCB norms. It will be ensured that the oil used should be lead free and use of low sulphur diesel. f) The vehicles carrying construction materials will be properly covered to prevent dust falling from vehicles during plying. g) All the vehicles used for transport of construction material and used for construction activities will have Valid PUC certificate. Periodical maintenance / inspection will be carried out on Vehicles/ Equipment/ Machineries as per schedule in order to ensure proper working conditions and to render exhaust emissions, inoffensive. (**Record is available at site)** h) Quarterly ambient Air Quality monitoring except monsoon season, at the active construction site will be carried out with the help of NABL approve laboratory, downwind of the project site (**Record is available at site)** i) No waste will be burnt on or around the Project site.	Dust suppression cost for 150 Km network Rs. 27,93,000 /- and Top cover for dumper truck involved in transportation work: Rs. 60,750/- (Cost given in ESDDR is considered here)	Contractor	BUIDCo/SMCG/NMCG

Increase in ambient noise levels due to operation of construction equipment and vehicles	Short term/Medium	a) Periodic preventive maintenance of construction equipment for optimum engine performance will be practiced. b) D.G set including vehicle and construction machinery will be provided with acoustic enclosures and thickly padded to prevent vibration. c) Day time work will be allowed (10 A.M to 6.00 P.M) in area near sensitive receptors if not congested/high traffic. If work needs to be undertaken outside these hours, it will be limited to activities that do not lead to exceedance of the noise criteria at nearby sensitive receptors e) Installation of mufflers will be ensured on engine exhausts and compressor components. f) Operation hours will be limited for hammer, Jackhammer to break the RCC road within the colony by using mobile source operating through settlements. g) Care will be taken that no employee be exposed to a noise level greater than 85 dB(A) for duration of more than 8 hours per day without hearing protection. No worker will be exposed to a peak sound pressure level of more than 140 dB(A) without using ear protective measures. h) Health Check-up on quarterly basis is scheduled on site where BP, Sugar, Eye check-up, Weight and oxygen level will be examined. i) Signages no honking is ensured to the construction site and driver will be oriented on that especially during work near to sensitive receptors. j) In TBT, Drivers and workers will be trained on noise management. k) Noise barriers will be installed on-site requirement basis (Noise barriers will be provided in inhabited areas, particularly near sensitive zones like hospitals, schools etc. l)Monitoring of noise levels through handheld meter will be conducted at all construction sites near to sensitive receptors especially hospitals and schools. n) Ambient Noise monitoring of construction site is already scheduled and all reports are available at site and enclosed in quarterly ESMP compliance report submitted by contractor. This monitoring is conducted by NABL accredited lab.	Usage of sound barriers or sheet costing is Rs. 11,77,140 /- taken from ESDDR for this component.	Contractor	BUIDCo/SMCG/NMCG

Impact on land-Soil contamination due to improper sanitation, spills of hazardous waste and other waste and improper management of wastewater	Short term/Medium	a) To prevent soil, land pollution, all loading and unloading area, storage of hazardous chemicals, identified area used for storage of wastes will be paved. b) To prevent land pollution due to road tar (hazardous substance) which is generated during road cutting operation for laying sewer line is used for backfilling and the left-over soil is under use at SPS site. Identification of designated place for disposal is under process and will be done within a month time. c) Disposal of hazardous waste will be done as per CTE condition. d) Construction labour camp is under preparation and guideline given in EHS will be followed (Anne-6). Workers will be provided with toilets with septic tank and soak pit facility and separate bathing areas in labour camp. e) Domestic waste from site offices/labor camp will be stored in different colour bins and handed over to door-to-door collection ULB vehicle. During site visit handing over of domestic waste to door-to-door collection ULB vehicle is observed at office. f) Care will be taken to store fuel and oil (if required) at a place away from any drainage channel/nalla preferably to be stored in drums mounted on a concrete paved platform with slop draining to small spills collection pit. g) In Contractor EHS plan following mitigation measures are given- • *Mitigation for spillage control is given as follows-This will be prevented by ensuring provision of secondary containment for storage of chemicals, drip trays to avoid soil contamination during fuel transfer and maintenance activities and proper maintenance of vehicle / equipment.* • *Mitigation plan for waste management is given as follows-Wastes that have the potential to cause harm to human health and the environment will be segregated and stored at the designated locations at site. Waste material such as plastic, paper, cardboard etc., will be segregated and stored for disposal at the designated areas. Waste disposal log will be maintained indicating the type & quantity of wastes disposed, including the mode of disposal*	Part of contract	Contractor	BUIDCo/SMCG/NMCG

Exposure to migrant workers, air and noise pollution, project security personnel, obstruction to community activities and accidents caused in the nearby community due to construction activities	Short term/Medium	a) Average deployment of labour is 120-150, and labour licence is valid. b) Hospital tie up is done with UDAYAN HOSPITAL, Boring road,Patna. c)There is no planning for engaging female labours at site. d) Labour camp is at Nandalal Chapra area and is under construction. Contractor will follow the guideline for labour camp siting as detailed in their EHS Plan (Provision of adequate facilities to the workers and labourers such as properly constructed and well-ventilated labour camps, clean and hygienic sanitation facilities, cooking areas etc. to minimize the health-related impacts).(**Contractor's Camp Facilities enclosed in Annexure-6.** e) Before entering into the site all the labour's identity card (Adhar card/voter id/driving licenses etc.) , issued from competent authority will be checked and documented at site office level as per information shared by EHS officer. It will be ensured that no child labour is hired under project. f) Worker's centric GRM and a committee at project site as First tier of redressal of grievances to be constituted to manage the workers grievances as per BUIDCo Grievance Redressal Mechanism. g) Orientation training on safety requirements, Code of Conduct, and other working conditions will be provided. h) Awareness will be created about local tradition and culture among outside migrant and encouraging respect for same. i) Awareness programme will be conducted about sexually transmitted diseases among the migrant workers, labourers . j) Proper disposal of wastes generated from the camp and construction activity will be followed to maintain the general hygiene in the area. k) Contractor has submitted the EHS plan "Environment Social Health and Safety Management Plan" document no.-10P155-Q0014-5101.	Labour Camp cost (*considered from different component cost given in ESDDR report*) is Rs 10,21,950/- for labour. NOC is required for Tube well from CGWB. Cost for tube well will be borne by contractor as part of contract.	Contractor	BUIDCo/SMCG/NMCG

Resource consumption such as water and fuel causing depletion	Short term/Low	a) Procurement of sand, aggregates and soil will be done from authorized quarries and borrow areas. b) Preventive maintenance of construction equipment will be followed to ensure proper engine performance and optimum level of fuel consumption. c) Optimization of running hours of the equipment and machinery will be done through proper planning of the activities to be carried out. d) Air nozzles on hose pipes will be used for water spraying during curing and plugging of leaking pipe will be taken care in case of any leakages. e) Tanker water is in use for construction work, it will be ensured to close the taps while not in use to save water consumption. f) Monitoring will be done for usage of water and ensure optimization of usage for various activities. g) Workers will also be oriented on the aspects of resource conservation. Special focus will be given on wood burning for cooking or in winter period.	Part of contract	Contractor	BUIDCo/SMCG/NMCG
Biodiversity conservation (Flora and Fauna)	Long term/Low	a) Top soil of the excavated area will be stored and used for green belt development b) Care will be taken to avoid any disturbance to flora and fauna of the area. Peppal tree in SPS-A campus is saved while finalizing the layout. c) In the case of SPSs construction, sewerage network laying laydown, debris disposal, camp areas do not have any significant flora and fauna. f) All the activities will be restricted to the premises only to avoid and reduce the impact on biodiversity.	Part of contract	Contractor	BUIDCo/SMCG/NMCG

Environment and Social Health and Safety (ESHS) Community Health and Safety	Short term/Medium	The Contractor has prepared a "Environment Social Health and Safety Management Plan" document no.-10P155-Q0014-5101, prior to commencing the civil work and is submitted to BUIDCo. This plan includes method statements for working methods and safety arrangements. Measures will be implemented to reduce the likelihood and consequence of the following hazards: falling from height, entanglement with machinery, tripping over permanent obstacles or temporary obstructions; slipping on greasy oily walkways, falling objects, contact with dangerous substances, electric shock, variable weather conditions, lifting excessive weights. This plan also includes traffic management plan. Proposed mitigation measures will be implemented at site: **A. Occupational health and Safety** a) A Permit to Enter system will be established to ensure that only authorised persons gain entry to the site. Daily toolbox talk (TBT) with workforce is conducted by EHS officer at each of the on-going construction sites before starting the work to aware the workforce about the kind of job and associated risk with preventive measures. b) Weekly Trainings on different aspects of the environment, social, health and safety will be organised including H&S risks and mitigation measures (including indirect workers) at site. c) During first time engagement, each of the labourers whether skilled and un-skilled, oriented/inducted through training on Occupational health and safety. d) All workers, suppliers and subcontractors will be oriented and make familiar with requirements and specifications of this ESMP. e) Each of the labourers will be provided with PPEs engaged in the sites. There use will be ensured during implementation activities. f) Reporting of incidents and accidents including near miss will be done by EHS personnel and maintained at site. g) Primary healthcare on site- At every workplace, a readily available first-aid unit including an adequate supply of sterilized dressing materials and	Rs 27,42,000 /- (Cost is taken from ESDDR report)	Contractor	BUIDCo/SMCG/NMCG

		appliances will be provided as per the Factory Rules. Suitable transport will be provided to facilitate taking injured and ill persons to the nearest or contracted hospital- UDYANAl. First aid kits will be maintained on every construction site with availability of emergency contact number with supervisor. (Refer Annexure-12) h) Tie-up with the local hospital (UDYANA Hospital, Boring Road) has already been done for causal and emergency purposes (Letter enclosed.). i) Quarterly Health check-up camp is scheduled at under project. j) Contractor's Emergency Preparedness and Response Plan is attached in **Annexure-9.** B. **Community Health and Safet**y a) Advance information to community before starting of the work through public consultation will be done to reduce the impact on community during construction. b) GI sheet of about 3 m height around construction site (SPSs) will be provided to prevent ingress of persons into the construction site and also to protect the public from exposure to hazards associated with the construction activities c) Portable hard barricading at least 3 m height will be provided at sewerage network laying areas in the major roads of the town to avoid incidents and accidents impact on community. d) Work on the Sensitive location sites will be done with local consultation and to avoiding peak and working hours. e) Wooden and steel planks will be provided at narrow lanes of the town to avoid the public disruption during sewer network laying activities. Steel plank will be made available during pipelaying work near hospital/nursing homes/school to not disturb the access. f) Erect warning signs/ tapes and temporary barriers and/or danger tape, marking flags, lights and flagmen around the exposed construction works will be ensured for warning the public and traffic flow of the inherent dangers. g) Proper signage will be ensured to be displayed at all construction site.			

		h) Road safety awareness will be created among the residents living along the transportation route. **C. Construction sites, Labour Camp and labour management** a) Labour safety laws, rules and regulation mitigation measures will be followed as per act. b) The emergency contact details will be displayed at construction site. c)Handling of equipment and materials will be supervised and adequately instructed. d) Adequate safety precautions such as helmets, safety shoes, gloves, dust masks, gumboots, etc. will be provided to workers and inventory is to be maintained at site. e) Screening, surveillance and treatment of workers will be made through the provision of medical facilities. f) Health awareness and education initiatives will be taken among workers. g) Collection of stagnant water will be avoided in labour camp areas to avoid water borne diseases. h) Labourers from other place residing at labour camp will be oriented on rule and regulations for interaction with nearby community/shops. i) Work permit system will be strictly followed, inspection of the high-risk work areas requiring permit and closure of the permit will be followed. j) Contractor's EHS Plan- Permit to Work is enclosed in **Annexure-10.**			

Stakeholder Engagement	Short term/Low	a) Continuous engagement/ communication with the local communities is in practice and public consultation record is available at site. b) Prior information on starting of the work of the particular site, local communities will be informed through door to door campaign and with distribution of pamphlet. c) Through Grievance redress mechanism regular feedback and work satisfaction report will be taken up after resolving the grievances. d) Community awareness program will be organized to provide information about GRM and its access on regular basis. e) Regular consultations with the local authorities and communities regarding the management of construction is observed at site with the available documents and feedback from the nearby community	Lumpsum cost RS. 2,10,000/- taken from ESDDR under training and awareness	Contractor	BUIDCo/SMCG/NMCG
Traffic congestion	Temporary/Low	a) 80% of pipelaying areas in Kankarbagh zone is residential and market. b) Advance information will be shared in congested residential area /sensitive places during consultation for disclosure/traffic diversion if required. Pamphlet is also prepared by contractor to be distributed before start of the work. c) Alternate traffic routing if required to be adopted, will be done in consultation with concerned traffic police authorities and accordingly plan is to be sketched out and share with nearby community. d) Warning ribbons, poly sheets and other unsafe measures will be provided in the narrow lanes and the road restoration will be done immediately same day after sewer network laying. e) All the barricades will be with warning lights to avoid incident/accident f)Traffic management plan is prepared by contractor and is enclosed in EHS plan.(**Refer Annexure-8)** g) Most of Traffic congested area is taken up in trenchless work. During course of work if requirement feels, traffic route diversion plan will be developed accordingly. h) Care will be taken to minimize congestion and negative impacts at schools and hospitals. Safe access through steel /wooden planks will be maintained to these places during construction.	Part of contract	Contractor	BUIDCo/SMCG/NMCG

Accidents/ damages due to erosion/ sliding of vertical sides of excavated trenches while places the pipes	Short term/Low	a) Before going for pipelaying at higher depth, necessary PPEs and required precaution will be ensured. b) Trenches 1.2 meters or deeper will be shored or sloped back to the angle of repose. Any excavation in unstable ground requires shoring or sloping. Excavation will be maintained by Shoring trench sides by placing sheeting, timber shores, trench jacks, bracing, piles, or other materials c)Exposed surface will be resurfaced and stabilized by making the sloping sides of trench to the angle of repose at which the soil remains safely at rest. d)Excavated soil (spoils) and other materials will be kept at least 1.5m from trench edges. e) Location of underground utilities will be identified and known before digging. f) Other sources will be identified that might affect trench stability especially nearby drain. g) Test for atmospheric hazards such as low oxygen, hazardous fumes and toxic gases ensured will be measured when > 4 feet deep pipelaying is proposed. h) Each excavation will be inspected daily by the supervisor responsible, or more often if conditions change rapidly. If there is evidence of cave in solvency or slides, all work in the excavation will be cease until the necessary precautions have been taken to safeguard employees i)Contractor has developed a checklist for excavation work enclosed in EHS Plan Annexure. That will be filled up and certified before starting of work. j) Identification of high-risk work areas requiring permit to work system and it will be ensured that the work starts only after getting a work permit. k) Refer **Annexure-7** for Contractor's safety precaution plan for excavation.	Part of contract	Contractor	BUIDCo/SMCG/NMCG

Temporary loss of livelihood	Short term/Low	a) There will be temporary impact on permanent shops/ kiosks which may have the issues of accessibility during network laying. However, this issue will be resolved by -Laying network will be in the centre of road avoiding any access issue -Wherever network is to be laid on one side of the road, it will be laid in small stretches and providing steel or wooden planks over the excavated area and the temporary restoration will be ensured by end of the day. b) The street vendors (on carts or sitting on roads) wherever needed, will be shifted to the other side of road without affecting their livelihood. Sewer laying work in the market areas will be done either on market off day or in night time with prior permission. c) Temporary crossing/ bridges if required will be provided tofacilitate normal life and business	Not required	Contractor	BUIDCo/SMCG/NMCG
Operation and Maintenance Phase					
Air Environment and Odour	Short term/ low	a) Green belt development surrounding the SPS site is required to avoid/reduce the air contamination/purification of the odor if any generated. This would act as caution wall between the SPS and nearby community. Provision will be made at both SPS site. b) Ambient Air Monitoring will be conducted on scheduled time.	Part of contract	Contractor	BUIDCo/SMCG/NMCG

Water Environment	Long term/ medium	a) Monthly monitoring of sewer line and manholes for visible leakages/ overflows will be done during Pre and post monsoon and fortnightly monitoring will be done during monsoon seasons. b) Repair operation for the damaged portion of sewer line will be done within 12 hrs of complaint. c) De-siltation of blocked sewers/ manholes with sewage pumping machines will be done every pre monsoon period or as and when required and collected debris will be disposed of to designated place. d) The agency will maintain log book and record of all the grey area were frequent overflow/ sewer leakage happens which results in time saving and smooth functioning of the STP and Sewage system. e) The wastes collected at SPS site will be collected in a trolley or paved area to avoid leaching and further contamination.	Part of contract	Contractor	BUIDCo/SMCG/NMCG
Noise and vibration	long term/ Low	a) Proper handling and regular (monthly routine checkup) maintenance of operating machines including pumps, generators, air diffusers, noise monitoring, will be done. b) The wall along the SPS Boundary with buffer zone will act as noise and smell attenuation. c) All noise generating units i.e DG sets will be acoustically enclosed. d) Use of rubber padding underneath high noise and vibration generating machines will be done. e) Personnel working onsite in high noise generating areas will use ear plugs /ear muffs	Part of contract	Contractor	BUIDCo/SMCG/NMCG

Solid waste disposal	Long term/ medium	a) Solid waste (domestic waste) generated from the office premises will be disposed daily. b) At the SPS locations all the plastic and other waste screened out will be collected daily and disposed at designated place. c) Wastes/debris generated during maintenance of sewer line will be disposed to designated place.	Part of contract	Contractor	BUIDCo/SMCG/NMCG
Hazardous chemical handling and exposure	Long term/Medium	a) The waste oil generated from the D.G sets will be stored in close container and be handed over to Government approved recyclers as per CTO norms. b) The D.G sets oil storage will be away from electric circuit, on paved floor and under close premises at one corner. c) During cleaning/maintenance of sewer line, hazardous gas generation is possible so operation personnel will be trained on handling these things.	Part of contract	Contractor	BUIDCo/SMCG/NMCG

General Environment Health and Safety	Long term/ Medium	a) Boundary wall will be constructed at all the proposed infrastructure sites. b) During cleaning/ maintenance operation, the sewer line will be adequately vented to ensure that no toxic or hazardous gases are present in the line. c) Gases present in the sewer line will be analysed for hazardous/toxic gases before commencing cleaning operation monthly or before cleaning. d) Cleaning maintenance work to be carried out as per the safety guide lines prescribed by CPHEEO and labor laws. e) No manual scavenging will be involved in the cleaning process. f) Worker codes of conduct with respect to engagement with local residents, child labor, non-discrimination, harassment of co-workers including women and those belonging to SC and STs and other minority social groups will be developed. g) PPEs for maintenance workers will be make available at site. h) Safety and Emergency Preparedness plan for O&M will be followed. h) WBG EHS Guidelines on Water and Sanitation to prevent minimize, and control exposure to potentially toxic emissions, pathogens and vectors will be followed.	Part of contract	Contractor	BUIDCo/SMCG/NMCG
Total EMP Cost (in Rs)			**80,04,840/-**		

6.4 Environmental & Social Monitoring Plan

6.4.1 ESMP Monitoring

The ESMP provides prevention and mitigation measures to be undertaken to reduce the environmental and social impacts due to project activities. Monitoring parameters and mechanism of monitoring are also provided.

During construction, monthly ESMP compliance monitoring to be conducted and reporting to BUIDCo/SMCG will be ensured. Whereas Quarterly monitoring of implementation of the ESMP should be conducted with Environmental monitoring (ambient air, ambient noise, groundwater) at construction site except monsoon season. During operation and maintenance phase of the project, implementation of the ESMP should be monitored on a half yearly basis.

6.4.2 Environmental Quality Monitoring

To ascertain effectiveness of implementation of mitigation measures recommended in the ESMP and to comply with legal requirements, environmental quality monitoring would need to be conducted. The ambient air quality, ambient noise and ground water quality is required to be monitored. It is observed that during construction phase, the monitoring is being conducted at the ongoing construction site and compared with the standard of permissible limit.

Apart from Environmental monitoring others aspects required to be monitored as the conditions of CTE NOC and submission of compliance report to Bihar State Pollution Control Board, accidents/fatalities/near miss and its reporting, fire extinguisher inspection etc. Monitoring plan is given below.

Table 9: Environmental Monitoring Plan

Environmental Component	Stage	Parameters	Locations	Total No. of Samples	Frequency	Standards /Methods	Implementation Agency
Environmental Monitoring Plan							
Air quality	Construction	PM10 µg /m3, PM2.5 µg/m3, SO2, NOX, CO	2SPS +Network sites	Twenty Seven Samples	Once in every season (except monsoon)	National Ambient Air Quality Standards, CPCB	Contractor though approved monitoring agency/Lab (NABL/ MoEF&CC accredit Laboratory)
	Operation		2SPS	Twenty Samples	Twice in every year (pre & post monsoon) for first 5 years		
Noise levels	Construction	Leq dB (A) (Day and Night) Average and Peak values	2SPS +Network sites	Twenty Seven Samples	Daily through handheld noise meter And Once in everyseason (except monsoon)	National Ambient Air Quality Standards with respect to Noise Standards, CPCB	Contractor though approved monitoring agency/Lab (NABL/ MOEF&CC accredit Laboratory)
	Operation		2SPS	Twenty Samples	Twice in every year (pre & post monsoon) for first 5 years		

Environmental Component	Stage	Parameters	Locations	Total No. of Samples	Frequency	Standards /Methods	Implementation Agency
Environmental Monitoring Plan							
Water Quality (Surface and Groundwater)	Construction	Ground Water Parameter as per IS:10500 (2012) and surface water parameters (Surface Water Quality ofthe nearest drains (outfall) asper CPCB guideline for discharge of treated effluents in Inland water bodies	Ground Water-SPS & Labour camp	Twenty Seven Samples	Once in every season (except monsoon)	As per CPCB/NGT Standards for treated effluent discharge and IS:10500 (2012) for ground water	Contractor though approved monitoring agency/Lab (NABL/ MoEF&CC accredit Laboratory)
	Operation		Ground Water of SPS site (2)	Twenty Samples	Twice in a year (Pre and post monsoon) for first 5 years		
Soil	Construction	Physical Parameter: Texture, Grain Size, Gravel, Sand, Silt, Clay; Chemical Parameter: pH, Conductivity, Calcium, Magnesium, Sodium, Nitrogen, Absorption Ratio	SPS	Six Samples	Once in every year (Except monsoon)	Soil test method by Ministryof Agriculture	Contractor though approved monitoring agency/Lab (NABL and MoEF&CC accredit Laboratory)
	Operation		SPS	Ten Samples	Once in a year (except monsoon) for first 5 years		
Other Monitoring aspects (construction phase)							
Health & Safety Monitoring	Minor accidents/near miss/fatalities				Record in accident register and reporting will be in ESMP compliance report		Contractor -EHS officer
Fire Extinguisher	Validity period				Inventory to be maintained and reporting to be ensured.		Contractor -EHS officer
Monitoring points of Consent to Establish (CTE) NOC received from Bihar State Pollution Control Board							
Specific Conditions of CTE NOC							
Diesel generating sets (DG Sets), if any; as source of backup power should be provided with an integral acoustic enclosure and the maximum permissible sound pressure Level for new D.G. set shall be 75 dB(A) at 1 meter from the enclosure surface. The height of exhaust of DG sets should be as: Exhaust Stack Height formula: - (Ht of Building in meter+0.2VKVA)m; it should be installed on pucca base with anti-vibration pads;							Contractor
That, they shall ensure all possible measures to be implemented to control noise pollution and the ambient noise levels should conform to the standards prescribed under the Noise Pollution (Regulation and Control) Rules, 2000, as amended to date viz. 75 dB(A) during day time and 70 dB (A) during night time;							Contractor
That, they shall comply with the provisions (whichever applicable) of the Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016. The used oil from DG sets as hazardous waste will! be stored in HDPE drums in isolated covered facility. This used oil will be sold to authorized recyclers and record shall be maintained. Necessary carewill be taken so that spills/leaks of used oil from storage are avoided;							Contractor
That, they shall comply with the provisions (whichever applicable) of the E-Waste (Management) Rules, 2016. The e-waste generated shall be disposed off by handing over to the authorised collection centre and a record shall be maintained;							Contractor
That, they shall comply with the provisions (whichever applicable) of the Plastic Waste Management Rules, 2016. They will make effort to discourage the use of plastics so that minimum generation of plastics wastes to be taken place;							Contractor

Environmental Component	Stage	Parameters	Locations	Total No. of Samples	Frequency	Standards /Methods	Implementation Agency
Environmental Monitoring Plan							
That, in case of construction activities, they shall comply with the provisions (whichever applicable) of the Construction and Demolition Waste Management Rules, 2016;							Contractor
That, the surface having unpaved and loose soil, if any, shall be adequately sprinkled with water to suppress dust;							Contractor
That, maximum efforts will be made to retain existing tree cover as well as new sapling shall be planted during coming season; and							Contractor
That, the project proponent shall submit half yearly compliance report of CTE condition.							Contractor
General Conditions of CTE NOC							
That, they shall provide adequate fire safety measures and equipment as required under the Rules and obtain necessary permission/NOC from competent authority as required;							Contractor
That, they shall obtain all mandatory clearance/ permission from all relevant agencies;							Contractor
That, the Environmental Statement as prescribed in the E (P) Rules, 1986 [see rule 14] for each financial year ending the 31a March, shall be submitted by the month of September every year;							Contractor
That, maximize recycling of water and utilization of treated sewage water in irrigation/rain water in harvesting							Contractor
That, they shall provide electromagnetic flow meter at the inlet and outlet of the STP and any pipeline to be used for re-using the treated wastewater in irrigation purposes as well as back into the system for flushing/horticulture purpose/green belt development etc. and shall maintain a record of readings of each such meter on daily basis;							Contractor
That, adequate number of ground water monitoring stations by providing piezometers around the project area shall be set up. The ground water quality shall be monitored for parameters like pH, BOD, COD, Ammonical Nitrogen, Chloride and Total Dissolved Solids.Analysis report shall be submitted to the Board on monthly basis;							Contractor
That, they shall comply with the applicable provisions/directions of the State Govt./BSPCB including the directions that no person shall manufacture, Import, store, sell or use any kindof plastic carry bags;							Contractor
That, in compliance of direction of the Hon'ble Supreme Court and vide Board's HQ ref. no.2638, dated 09.07.2019, they shall make provisions for display of data outside main unit gate about quantity and quality of water discharge and air emission along with solid waste generated within the unit premises							Contractor
That, not withstand any thing stated above, provisions of the environmental laws including policies and guidelines made there under; and he applicant unit shall abide by all the							Contractor

6.4.3 Environmental and Social Budget

The cost of environmental budget for the various environmental management measures proposed in the ESMP and the cost of the Environmental Monitoring is given in **Table -8,9 and 10**. There are several other environmental issues that have been addressed as part of good engineering practices, the costs for which have been accounted in the Engineering Cost. Various environmental aspects covered/will be covered under engineering costs are listed below:

- ✓ Proper drainage arrangements to prevent water stagnation/ flooding in SPS sites.
- ✓ Appropriate siting, and enclosing within building to reduce noise and odors nuisance to surrounding area.
- ✓ Alternate traffic re-routing.
- ✓ Ensuring storage of excavated soil material on the higher lying areas.
- ✓ Flushing and desilting of sewers at necessary locations.
- ✓ Excavation, cutting and filling operations.
- ✓ Safety hazards to workers and residents.
- ✓ Solid Waste Management.

- ✓ Site management.
- ✓ Noise monitoring of DG sets if any used during construction phase.

Table 10: Environmental Monitoring Cost

Item	Location	Season	Year	Total no. of samples	Unit cost (INR)	Total cost (INR)
Environmental Monitoring during Construction Stage						
Air Quality Monitoring (SPS,Sewer Network site)	3	3	3	27	7000	189000
Noise/Vibration (SPS,Sewer Network site)	3	3	3	27	2500	67500
Water Sample (Ground Water-SPS and Labour camp)	3	3	3	27	7000	189000
Soil (SPS)	2	1	3	6	5000	30000
Travel and Transportation of Monitoring team (Lump sum cost)						200000
Sub-Total:						**675500**
Environmental Monitoring during Operation Stage						
Air Quality Monitoring (SPS site)	2	2	5	20	7000	140000
Noise/Vibration (SPS site)	2	2	5	20	2500	50000
Water Sample (SPS sites)	2	2	5	20	7000	140000
Soil	2	1	5	10	5000	50000
Travel and Transportation of Monitoring team (Lump sum Amount)						300000
Sub-Total:						**680000**
Total for Environmental Monitoring						**13,55,500**

The total cost for implementing measures outlined in Environmental Management Plan and Environmental Monitoring Programme during construction and operation phase in ESMP -80,04,840/- and ESMP Monitoring 13,55,500/- and unidentified impacts 10,00,000/-.
Hence total cost of Environmental Management (ESMP) is 80,04,840 + 13,55,500 + 10,00,000 = **1,03,60,340/- (One Crore Three Lakh Sixty Thousand Three Hundred Forty only)**

6.5 Stakeholder Engagement and Information Disclosure

6.5.1 Context of Stakeholder Engagement

Stakeholder engagement is an ongoing process that may involve,in varying degrees, the following elements spanning the entire life of a project:

- Disclosure and Dissemination of Information
- Consultation and Participation
- Grievance Mechanism
- Ongoing Reporting to Affected Communities

The World Bank defines stakeholder as a person, group, or organization that has a direct or indirect stake in a project/organization because it can affect or be affected by the Project/organization's actions, objectives, and policies.

6.6 Grievance Redress Mechanism

GRM is considered as a tool for measuring efficiency and effectiveness of the Project as it provides important feedback on the Project management. Efforts has been made to create public awareness about this grievance mechanism and also inform the Project stakeholders including labourers about its availability for registering their grievances and feedback (**Placing display board at STP/SPS site containing name and contact detail of GRC members, movable barricader in pipe laying having contact number of site supervisor, public consultations with locals and TBT are used as sharing information on GRM).** Anonymous complaints (those related to the scope of GRC) would only be entertained if the Grievance Redressal Committee observes that it has some essence then aggrieved will be consulted in the process. No personal response will be provided for such grievances. Also, if insufficient information is provided and furtherinvestigation cannot proceed, such grievances can be closed without the possibility of resolution. However, any complaint related to the immediate safety of residents/labor will be taken care of.

The proposed Project has grievance redress mechanism (GRM) which will not hinder the legal process of grievance resolution route that the aggrieved may wish to adopt. This GRM will be adopted as mentioned below:

6.6.1 Institutional Arrangement for Grievance Redressal

National Mission for Clean Ganga (NMCG) under the Ministry of Water Resources, River Development & Ganga Rejuvenation has set an objective to ensure effective abatement of pollution and conservation of the river Ganga by adopting a river basin approach for comprehensive planning and management. Under the flagship Program of Namami Gange, several sewerage projects have been taken up along the banks of river Ganga in Bihar. Under these projects, Grievance Redressal Mechanism (GRM) is proposed to establish. In 14th Implementation Mission meeting at NMCG Office Delhi, a detail discussion was held and a common approach to solve the grievances was finalized which is detailed below: -

- ✓ On receipt of complaints and suggestions from different stakeholders & citizens, a plan of action is devised accordingly.
- ✓ Time-bound reply to the complainant after doing a root causes analysis (RCA) of the incoming complaint as per rules & regulations of the Government and project scope.
- ✓ Co-ordination with Implementing Agencies (BUIDCo), SPMG and the Government Department -UD&HD for effective redressal of the complaints.
- ✓ In compliance to above, the following actions have been taken up by BUIDCo, an Implementing Agency for the Namami Gange Projects: -
    - A Control room is set up in the BUIDCo office with toll free-umber (18003456130).
    - Toll- free number is displayed on BUIDCo website and on project site.
    - This control room works from 10.00 am to 06:00 pm.
    - Staff are deputed to register the complaints, segregate it project-wise and refer to concerned Executive Engineer by next day.
    - The same control room is working as Grievance Redressal Cell which is under IT cell.

In BUIDCO Grievance Redressal Mechanism is working in three-tier system to resolve the issues effectively on time.

A. First-tier- At each project site,

- ✓ At each project site, project-specific Grievance Redressal Committee is working comprise of Executive Engineer of the project, Asst. Engineer of the project, Env/Social expert BUIDCo, Project Manager (contractor), Supervisor Contractor and Health & Safety Officer (contractor).
- ✓ Along with toll-free number, detail of Grievance Redressal Committee is also displayed on the site.
- ✓ This committee is taking up the referred issues of GRC and directly received complain in scheduled Monday meetings at each site and try to resolve it in 15days.If fails to resolve, the issue is forwarded to the second tier.

B. Second-tier- BUIDCo HQ level

- ➢ In the second tier, the issue is taken up at Chief Engineer and MD BUIDCo level.
- ➢ Any unresolved issue of First tier is taken up in monthly scheduled review meetings in the chairmanship of MD BUIDCo. At this stage, GBV related issues if any will be attended by BUIDCo Internal Complain Committee (ICC).
- ➢ Unresolved issues of the second tier will be forwarded to SPMG for necessary action and direction.

C. Third tier- SPMG level

- ➢ At this level, issues will be taken up in review meeting of Namami Gange projects at UD&HD in thechairmanship of Secretary, UD&HD (SPMG).

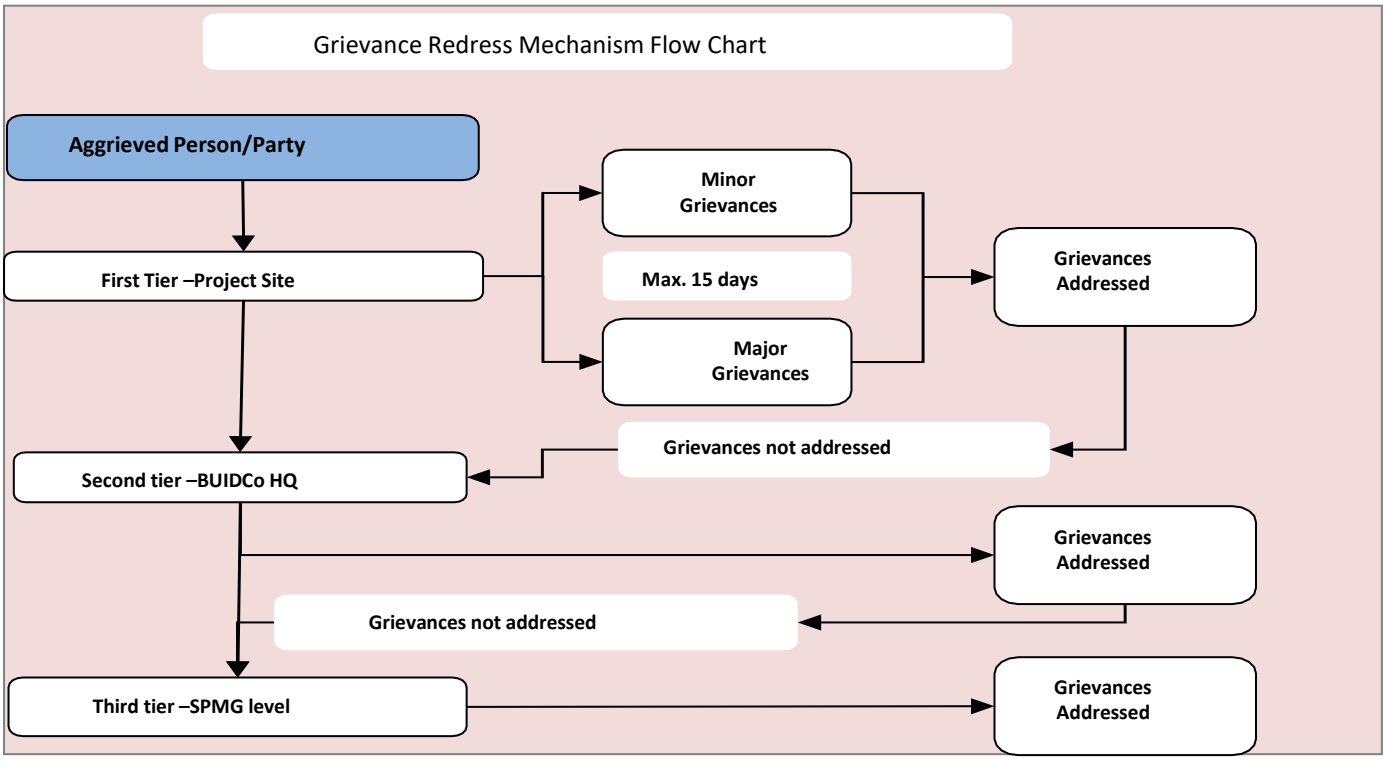


Figure 10: Grievance Redress Mechanism in BUIDCo

6.6.2 Receipt & Recording of Grievance

The aggrieved members can communicate their grievances related to the Project through the formal and informal avenues listed below.

- Oral complaints communicated through remote-access methods such as phone calls on the contact number displayed at site or can use BUIDCo toll free number or face to face to the Officer during group or individual public consultation meetings (Project site has to maintain a grievance redressal register to keep the record of grievances received at local level or forwarded complain from upper level).

- Written complaints communicated through remote-access methods such as written complaint in wooden box, email or face-to-face, wherein individuals or a group submit their grievances to the site-in-charge and BUIDCo officer (grievances received through this mode will also forwarded to first tier, Project site and recorded in site grievance register).

All grievances received through oral or written format will be recorded in World Bank prescribed format given below: -

Format for recording grievances at investment level

Sl. No.	STATE	Districts	Total Number of grievances received	Type of grievances received						# of grievances resolved	Average time taken to resolve in days	# of cases escalated	# of Cases escalated to		Total # of court cases	# of court cases resolved	Labour Issues			
				Land Acquisition related	Noise and dust / environmental	Damage to personal property	Damage to communal property	Damage to Public property	Others				SPMG	NMCG			Total	Female	Male	Facilities
																				accommodation
																				toilets
																				bathing
																				cooking
																				childcare
																				medical
																				lighting

6.6.3 Review and Investigation of Grievances

Where the grievances that are found to be within the scope of the Project, the details are reviewed. Relevant Project documents and records are to be reviewed. There may be a need for discussion with the aggrieved community members/ complainant for better understanding of the nature of the grievance and to discuss resolution options. Site visits and meetings with complainants can be conducted by the social expert of BUIDCo/SMCG (if any forwarded at such level) for redressing grievances resulting from a physical incident. Proceedings of the site visit must be documented.

The Project should take full responsibility for investigating the details of grievances coming through its grievance mechanism, at no cost to the communities.

6.6.4 Grievance Resolution

All grievances received through oral or written format will be recorded in World Bank prescribed format and the compliance status/resolving status of those grievances will be shared separately to the Social Expert of NMCG through SMCG and must be part of ESMP monthly/quarterly compliance report.

6.6.5 Gender Based Violence (GBV)

GBV is an umbrella term for any harmful act that is perpetrated against a person's will and that is based on socially ascribed gender differences. GBV includes acts that inflict physical, mental, sexual harmor suffering; threats of such acts; and coercion and other deprivations of liberty, whether occurring in public or in private life. The Project site includes both the actual locations where civil works are conducted and also the associated areas such as the locations of workers' camps, quarries, etc. These GBV risks need to be assessed throughout the Project's life by monitoring the situation, assessing the effectiveness of risk mitigation measures and adapting them.

Since a Project involves construction work that will demand a constant supply of labourers, theinflux of migrant workforce can be a potential risk for the host population. The influx of labour force can lead to the risk of Gender-Based Violence.

The interventions will be at three levels, that of SPMG, BUIDCo and the Contractor. According to guidelines of ESMF on GBV prevention, following actions will be taken up to address the risk of gender-based violence inthe Project and adjoining communities: -

- ✓ Display of GBV relating posters and signages at Projects site and office.
- ✓ Mandatory and repeated training and awareness raising for the workforce (will be incorporated in tool box talk) about refraining from unacceptable conduct toward local community members, specifically women.
- ✓ Informing workers about national laws that make sexual harassment and gender-based violence a punishable offence which is prosecuted.
- ✓ Introducing a Worker Code of Conduct as part of the employment contract and including sanctions for non-compliance (e.g., termination)
- ✓ Contractors adopting a policy to cooperate with law enforcement agencies in investigating complaints about gender-based violence.
- ✓ Additional measures will aim to reduce incentives to engage with the local community by providing workers with the opportunity to spend their time off away from the host community, where feasible with a small transport allowance, ideally allowing workers to regularly return for brief visits to their families, spouses, and friends, or to visit nearby urban centers that provide a variety of legal social opportunities. For workers who need to travel further it may be attractive to forego weekends off in exchange for longer breaks that would allow for such home leave travel.

There is a prescribed format provided for reporting GBV on monthly/quarterly basis consisting of all indicators required to be followed at site for preventing GBV and shared separately to social expert of NMCG through SMCG and must be part of monthly/quarterly ESMP compliance report. GBV reporting mechanism will be followed in this Project.

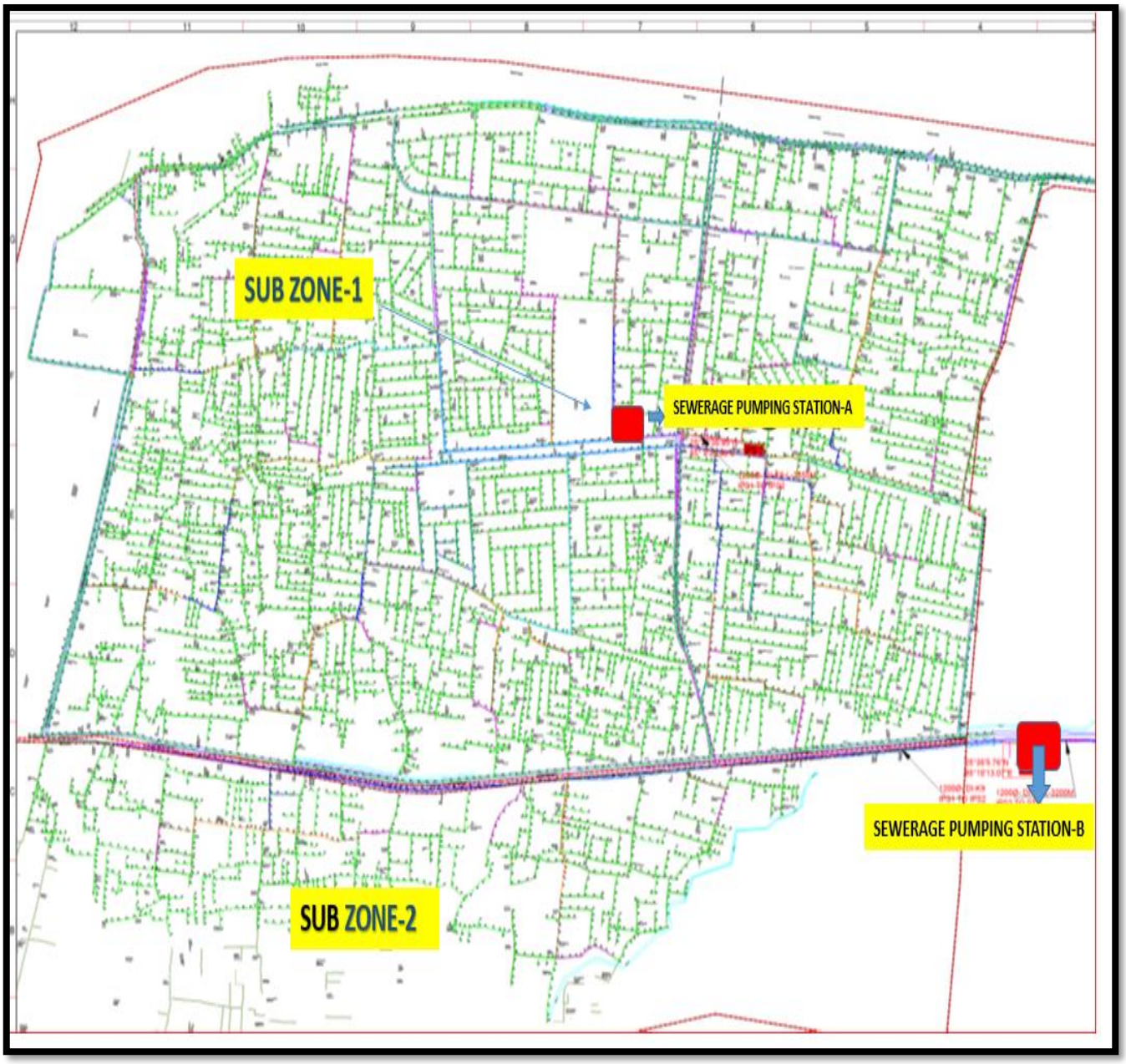
6.7 Conclusion

The scope of this report is limited to the Kankarbagh Zone Sewerage Network consisting of two SPS & 150.21km of Sewer network. Environment & Social analysis of the " Proposed Kankarbagh Zone sewerage Network " concludes that the Projects falls under Low Impact category and has overall positive benefits on the life and environment of the people. There has been no reported land acquisition or livelihood losses to be caused under this project. As per environmental and social management framework guidelines of NGRBA (ESMF for Ganga-2), Environmental and Social

Assessment, with a Generic Safeguard Management Plan was conducted for addressing possible issues & concerns arising from proposed project. Impacts of activities identified during the assessment fell under two separate categories of Construction and Operation. Although no such adverse or permanently negative environmental or social impacts were identified. There were certain temporary impacts, for which appropriate mitigation plans have been suggested. The environmental management plan suggests appropriate mitigation measure against the issues & concerns identified during the environmental and social analysis study. All the social and environmental issues were appropriately studied and have been substantiated using appropriate evidences, to ascertain the magnitude of their impacts. Even the issues of public grievances and public notice have been taken care in the report to confirm transparency during the project implementation. A well defined institutional mechanism is already in place to monitor and evaluate the progress of the project during construction, implementation and operation phases and to handle the project related grievances if any arise in due course of project life cycle.

ANNEX-01

Zoning Map of Kankarbagh.



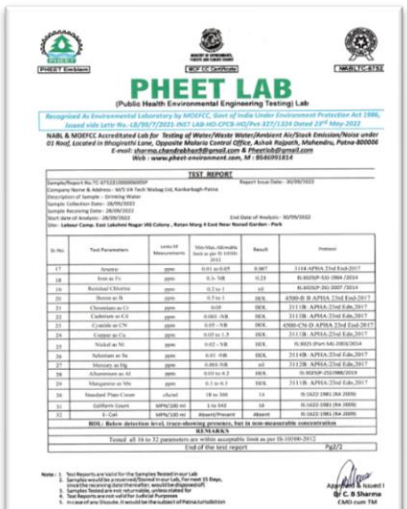
ANNEX-02

Environmental Monitoring Test Report


PHEET LAB
(Public Health Environmental Engineering Testing) Lab
TEST REPORT


PHEET LAB
(Public Health Environmental Engineering Testing) Lab
TEST REPORT
AMBIENT NOISE RESULT
Noise (Ambient Standard)


PHEET LAB
(Public Health Environmental Engineering Testing) Lab
TEST REPORT


PHEET LAB
(Public Health Environmental Engineering Testing) Lab
TEST REPORT


PHEET LAB
(Public Health Environmental Engineering Testing) Lab
TEST REPORT
AMBIENT NOISE RESULT
Noise (Ambient Standard)


PHEET LAB
(Public Health Environmental Engineering Testing) Lab
TEST REPORT


PHEET LAB
(Public Health Environmental Engineering Testing) Lab
TEST REPORT


PHEET LAB
(Public Health Environmental Engineering Testing) Lab
TEST REPORT
AMBIENT NOISE RESULT
Noise (Ambient Standard)


ENVIRO INSTRUMENTS
Patna,BR,India
Khemnichak, Patna, 800027, BR, India
Lat 25.584790, Long 85.169603
10/13/2022 12:47 PM GMT+05:30


Patna,BR,India
Khemnichak, Patna, 800027, BR, India
Lat 25.584781, Long 85.169617
10/13/2022 12:48 PM GMT+05:30


GPS Map Camera
Mali
Nigeria
Google
Patna, Bihar, India
MIG-168, Housing Board Colony, East Indira Nagar,
Kankarbagh, Patna, Bihar 800020, India
Lat 25.597123°
Long 85.156918°
28/09/22 11:15 AM GMT +05:30


ENVIRO INSTRUMENTS
Patna,BR,India
Raghunandan Marg, Housing Board
Colony, Patna, 800020, BR, India
Lat 25.593768, Long 85.155083
10/13/2022 12:05 PM GMT+05:30

ANNEX-03

Land NOC Detail

बिहार शहरी आधारभूत संरचना विकास निगम लि0
(बिहार सरकार का उपक्रम)
राजापुर पुल, पश्चिमी बोरिंग कैनाल रोड, पटना-800001.
फोन न0–91-612-2558412, email – mdbuidco@gmail.com

पत्रांक– 17. दिनांक– 18.2.21

सेवा में,

VA Tech Wabag Limited,
WABAG HOUSE,
No. 17, 200 Feet Thoraipakkam - Pallavaram Main Road,
Sunnambu Kolathur, Chennai - 600 117, Tamil Nadu.

विषयः– कंकड़बाग एस0टी0पी0 एवं सिवरेज नेटवर्क योजना अन्तर्गत एस0पी0एस0–A के लिए भूमि का अनापत्ति प्रमाण पत्र के संबंध में।

प्रसंगः– सचिव, बिहार राज्य आवास बोर्ड का पत्रांक– 1071, दिनांक– 18.02.2021

महाशय,

उपरोक्त विषयक प्रासंगिक के संबंध में कहना है कि मलाही पकड़ी चौराहा के पश्चिम–उत्तर, पथ संख्या–4 के उत्तर में स्टेडियम के पूरब स्थित ओभरहेड वाटर टैंक कैम्पस स्थित भूखण्ड में से 21 मीटर X 35 मीटर का उपयोग कंकड़बाग एस0टी0पी0 सिवरेज नेटवर्क योजना के एस0पी0एस0–A के लिए अनापत्ति प्रमाण पत्र प्रासंगिक पत्र द्वारा प्राप्त हुआ है।

अतः उक्त भूमि पर यथाशीघ्र एस0पी0एस0–A का कार्य प्रारंभ किया जाय।

विश्वासभाजन
18.2.21
कार्यपालक अभियंता,
दीघा कंकड़बाग सिवरेज नेटवक परियोजना,
बुडको, पटना।

बिहार शहरी आधारभूत संरचना विकास निगम लि0
(बिहार सरकार का उपक्रम)
राजापुर पुल, पश्चिमी बोरिंग कैनाल रोड, पटना-800001
फोन +10-91-612-2558412, email – mdbuidco@gmail.com

Letter No. :-बुडको / पी० अ० / यो०-141 / 19 – 190 Date:- 12·10·2020

DK Sewerage Projects Private Limited
WABAG HOUSE,
No. 17, 200 Feet Thoraipakkam - Pallavaram Main Road,
SunnambuKolathur,
Chennai - 600 117.

Subject: **Handover the site for development of Sewerage Pumping Station 'B' at Kankarbagh Zone, Patna, Bihar**

Reference: The Concession Agreement signed on 30th December 2019 executed between BUIDCO, NMCG and the Concessionaire (the "**Concession Agreement**")

Dear Sir,

We hereby grant to the Concessionaire, the license over the Sites including the exclusive right to occupy and use the Sites to construct, renovate and/or operate and maintain the Facilities along with all necessary rights of way and access road(s) to the Sites, free of all Encumbrances and encroachments, and this license shall also include each of the rights set out under Concession Agreement.

The license granted by BUIDCO shall be valid till the expiry of the Term or till the termination of the Concession Agreement, whichever is earlier, subject to the exercise of any substitution rights by the Lenders, in accordance with the terms of the Concession Agreement and the Substitution Agreement.

The Co-ordinates& land details of the Kankarbagh Zone Sewerage Pumping Station 'B' land is as below:

Co-Ordinates:
N = 2830985.777 E = 316209.987
N = 2830985.778 E = 316244.987

Enclosed: - A self-declaration/NOC on the ownership of the land & Maps.

Yours faithfully,

12/10/20

Executive Engineer,
Patliputra Anchal,
BUIDCo, Patna

Accepted, agreed and acknowledged by:

12.

Rajeev Ranjan Mishra

For **DK Sewerage Projects Private Limited**

ANNEX-04

Hospital Tie-up

UDAYAN HOSPITAL

(NABH ACCREDITED)

An ISO 9001-2015 Certified

(A Multi Speciality Hospital & Trauma Centre)

(A unit of Indira Gopal Institute of Medical Services Pvt. Ltd.)

West Boring Canal Road, Near Rajapur Pul, Patna-800 001

Ph.: 0612-2557550, 2557551

In Service to Save Life

To

Date :- 28/06/2022

Site Project Manager,

VA TECH WABAG LIMITED

Digha Sewerage Work , Patna , City Bihar

Subject :- you're Request for Tie-up with our Hospital Udayan Hospital (A Unit of I.G.I.M.S. Pvt. Ltd.) for Normal & Emergency cases for only one year.

Dear sir,

Greetings

We are happy to provide your our consent for Tie-up with us, as per above mentioned subject.in.ref. with your request letter No. Ref.WABAG/10P55N/061/22-23 date 28/06/2022. We accept your proposal for the same.

Final confirmation through our end depends on your approval/confirmation against our hospital tariff with all other cost & rate of rooms, investigations , procedures, etc., and that will be intimated to you shortly.

Thanking You

For

DIRECTOR

Indira Gopal Institute of Medical Services Pvt. Ltd. A Unit of

UDAYAN HOSPITAL West Boring Canal Road Patna - 1

ANNEX-05

VA Tech Wabag OHSE Policy

ENVIRONMENT SOCIAL HEALTH AND SAFETY POLICY

WABAG
sustainable solutions. for a better life.

VA TECH WABAG LTD. is a leading Pure Play Water Technology Multinational offers portfolio in the areas of Municipal and Industrial Water & Wastewater Treatment, besides offering a full-fledged state-of-the-art engineering services in line with global standards both in terms of quality and delivery.

VA TECH WABAG LTD. will undertake every reasonable effort to elimate the hazards that cause incidents and injuries and aim to control or reduce wastage of natural resources, energy, materials, and chemicals.

We shall strive to continually improve our Environment, Social, Health and safety performance in the activities, products and services by implementing and maintaining ESHS management systems and by

- Ensuring compliance with applicable legal and other requirements and their evaluation of compliance obligations
- Avoidance of incidents through prevention and ESHS awareness
- Promotion of activities that could minimise environmental pollution
- Optimising the utilisation of natural resources like Water, Energy, Materials and reducing the waste generation
- Promotion of measures aimed at enhancing the physical and emotional health of the people who work with or for our company
- Creating awareness amongst our employees and stake holders by proactive Communication, Training, Consultation and Felicitation
- Ensuring commitment and achieving excellence in the area of Environment, Social, Sustainability, Health and Safety
- Increasing green cover in and around the operational sites

RAJIV MITTAL

Rajiv Mittal
(Managing Director & Group CEO)

Date: 31st May 2021

Tel: +91 44 6123 2323 | Email: wabag@wabag.in | Web: www.wabag.com

ANNEX-06

Contractor's EHS plan for camp facilities

10.0 Occupational Health and Hygiene

- VA Tech Wabag shall be responsible for the providing health, hygiene and welfare facilities to thepersonnel.
  - Medical examinations for Height, Trench and confined space workers
  - Welfare of labor camps by ensuring hygienic living quarters.
  - Provide the highest quality of sanitary facilities to the labor camp
  - Conducting regular medical checkup for the contractor workers
- Good housekeeping will be maintained throughout the period of any work, both at work site andaround any temporary building/store.
- The working area will be cleaned on a regular basis to ensure good housekeeping.
- Escape and other access ways will be kept clear, safety equipment kept accessible and surplus/scrap material will be removed daily.

10.1 Workers Welfare Measures and Social Responsibilities

Potable water, Toilets, Latrines, Washing Facilities, and Wastewater Disposal

- Throughout the period of construction VA Tech Wabag will provide, maintain, and cleanse suitable and sufficient toilets, latrines and washing facilities for use by its employees and workmen
- After completion of the works, the temporary toilets, latrines, washing facilities, septic tanks, and soak pits shall be removed, all ground disinfected and the surface restored to its original condition.
- Welfare facilities such as access to drinking water within easy reach, sheds for rest / lunch breaks, toilets in sufficient numbers in well-lit at easily accessible locations shall be made available at all times for male and female employees and workers.
- Workers will not be permitted to eat food at workplaces other than the designated shed / cabins to prevent attracting vermin and ingestion of contaminated food.
- On site updated First aid kit, trained first aiders, emergency response vehicle will be provided.
- The facilities will be kept clean and well maintained.

10.2 Camp Facilities

If a labor camp is provided, all the necessary services and compliance to local regulations will be maintained. These include the mandatory legal requirements mentioned in the BOCW Act. Basic facilities include:

- The inspection of camp will be done to ensure proper hygiene and housekeeping.
- Proper lighting will be provided in all camp areas
- Grass cutting will be done to ensure pest problems
- Proper sanitary facilities will be provided along with running water.

- Safe drinking water will be made available.
- Pest control will be carried out at a pre-decided frequency.
- Timely spraying of insecticide will be done to prevent spread of communicable diseases in thesite.
- Emergency contact details will be displayed.

Pest control

- VA Tech shall take the necessary precautions to protect Wabag's & Employer's Personnel employed on the Site from insect and pest nuisance, and to reduce their danger to health and shall comply with all the regulations of the local health authorities, including use of appropriateinsecticide.
- Timely spraying of insecticide will be done to prevent spread of communicable diseases in thesite.
- Pest control services will be called regularly to ensure that the site is free of rodents and poisonous reptiles.

ANNEX -07

Contractor's EHS plan for safety precaution during excavation

Excavation and Public Road Works

11.7.1 Hand tool

Wherever the presence of underground pipes, cables, vessels or structures is known, or suspected, they shall be exposed by hand tool digging before mechanical excavators are used. Hand excavation isrequired within 10 feet (3 meters) of the object.

11.7.2 Machine excavation

When the locations of all utilities or structure have been established by surface markers on hand excavation, machine excavation may commence under Owner/Client clearance of the Contractor's supervisor.

11.7.3 Restoration

Following completion of the excavation, the area will be restored in accordance with the specificationsfor backfilling, compaction, paving or concreting.

11.7.4 Excavating and Trenching General

- No trench, ditch or other excavation shall be left over night without barricades and warning lights.
- Materials must be placed no closer than 1.5 meters from the edge of the excavations. Precautionsmust be taken to prevent material from falling into the excavations.
- Trenches 1.2 meters or deeper must be shored or sloped back to the angle of repose. Any excavation in unstable ground will require shoring or sloping.
- Materials used for sheeting shoring or bracing must be in good condition. Timbers must be soundfree large knots and of adequate dimensions.
- Each excavation shall be inspected daily by the superintendent responsible, or more often if conditions change rapidly. If there is evidence of cave-In solvency or slides, all work in the excavation must cease until the necessary precautions have been taken to safeguard employees.
- Where vehicles or equipment operate near excavations, the sides must be shored or braced as necessary to withstand the force exerted by the super-imposed load. Also stop logs or other substantial barricades must be installed to protect the edge of such excavations.
- Safe access must be provided to excavations by means of ladders, stairs or ramps.
- Trenches 1.2 meters (4 feet) or more in depth must have ladders spaced so that employee's lateraltravel to a ladder does not exceed 7.5meters (25feet).Such ladders must be installed in accordancewith the ladder safety requirements.

ANNEX -08

Contractor's Traffic Management Plan

11.9 Traffic management plan

11.9.1.1 Purpose

The Traffic Management Plan describes procedures and protocols for site access, traffic routing and management, and company policy with respect to vehicle and employee transportation during the Design, construction and operation maintenance & minimizing the risk of any disturbance to local andvisitor people around the project area during the construction and commissioning. TMP provides a consistent framework for assessing and controlling health and safety risks associated with road transport activities.

11.9.1.2 Scope

This Traffic Management Plan applies to project staff, any Contractor, subcontractor or supplier supporting the Company contract.
Ensure that the effective traffic management system is implemented and reviewed to reflect the requirements of the Project. The Project Manager along with Construction Manager and H&S Engineer and subcontractor personnel shall be responsible for monitoring and implementing the 'Traffic Management Plan', and all team members for the Project are responsible collectively for the effective operation of the traffic management system.

11.9.1.3 Documentation requirements

The list of documents required to be submitted to site office is as follows:

(i) RC (Registration Certificate) Book copy
(ii) Driving license
(iii) Insurance documents,
(iv) Pollution Under Control (PUC) Certificate
(v) ID proof of driver

11.9.1.4 Common road transport hazards

Common road transport hazards can result from problems with the driver, the vehicle or the externalenvironment. Some common hazards associated with land transport are detailed below. These will beconsidered during the hazard identification and risk assessment.

Human behaviour is a primary cause in most vehicle incidents. Incidents can occur because the drivermay be:

- Untrained for the type of vehicle driven.
- Unaware of risks.
- Without defensive driving skills.
- Not medically fit.
- Under the influence of medication or substance abuse.
- Suffering from stress.
- Lacking in attention.
- Fatigued.
- Lacking judgement or experience.

- Not using safety devices (e.g. seat belt).
- Lacking in knowledge of cargo.
- Impaired visibility (e.g. glare, obstructions or dirty windscreen);
-

The hazards associated with vehicles include:

- Inadequate selection criteria.
- Poor design/specification.
- Lack of specific safety features (e.g. side and rear guard protection, rear view mirrors, Horn etc).
- Inadequate maintenance (e.g. defective or worn tyres).

11.9.1.5 Risk reduction measures

Flagman

- To avoid collision between construction vehicle and traffic; Flagmen with flags will be used at the exit/entry points of working stretch. The flags for signaling will be 0.60 m x 0.60 m size, made of a good red cloth and securely fastened to a staff of approximately 1m in length.

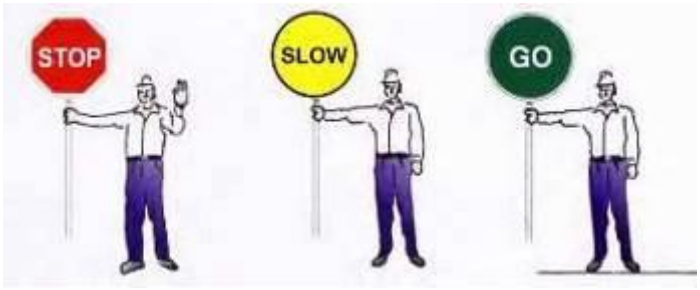


Fig 1 Flagman with signage Board

- Flag man need to maintain the flow of traffic continuous past a work zone at relatively reducedspeeds by suitably regulating the traffic. He shall stop the traffic for a short while whenever required (e.g. for entry and exit of construction equipment in to work zone).
- Flag man should be positioned in a place where he is clearly visible to approaching traffic and at a sufficient distance to enable the drivers to respond for his flagging instructions. A flag mannever leaves his post until properly relieved.
- The standard distance shall be maintained at 60 – 100 m but can be altered depending upon the approach speed and site conditions. In urban areas this distance shall be taken as 20 m to 50 m.

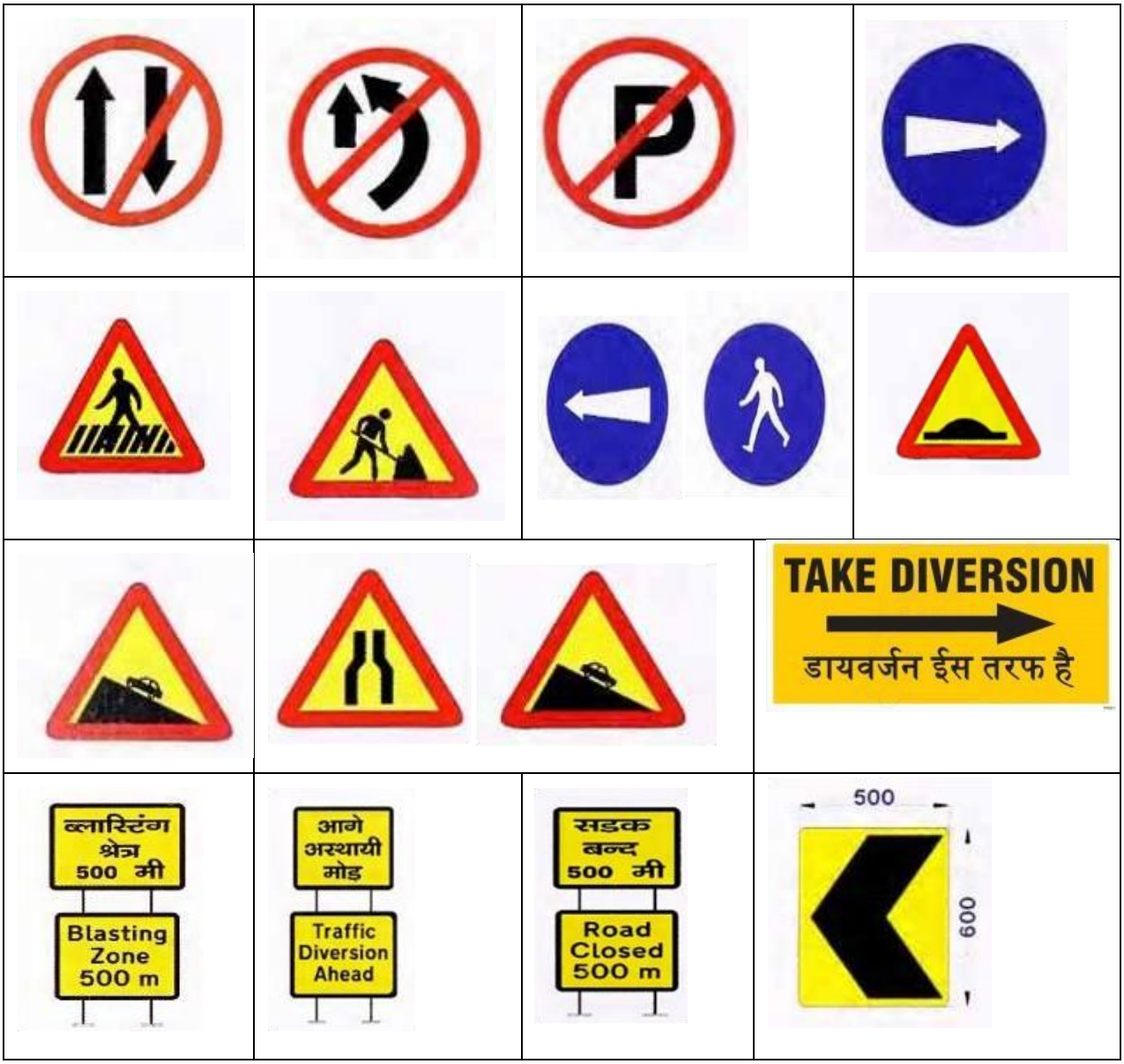
Standard signals

Standard Signals to be given by Flag man are depicted in the Fig 1. They should undergo special task training program through safety department. The construction and maintenance of signage's fall into the three major categories such as regulatory, mandatory Signage. Some other signboards will also be used to regulate the traffic, which have not been standardized. However they confirm with the general requirement of shape and colour, and their message is brief, legible and clearly

understandable, i.e., "CAUTION- Men and Machinery at work Go Slow", "CAUTION- Work in Progress Go Slow" etc.

The location, frequency and type of signboards will be governed by the kind of traffic situations arisingduring the construction. Signboards of 'men at work' and 'speed limit' will be provided at locations wherever required on a case-to-case base

Sample Signage to be used in site are as follows:



11.9.1.6 Designated Pathways for Pedestrians / Vehicle movement

Pedestrian pathways shall be demarcated and should be separated from vehicle movement area.

- Pedestrian pathways shall be identified by signage boards and retro reflection stickers to cautionthe vehicle drivers.
- Adequate illumination should be ensured in the pedestrian pathways
- Providing of concave mirrors on curves and turnings.

Speed Reducing barriers / Zigzag barriers:

- Speed limit 20 km / hr. shall be achieved by providing speed reducing barriers / Zigzag barriers, inareas where critical activities such as erection & other construction activities are planned.
- Trained signal man should be provided

11.9.1.7 Vehicle parking, reversing and Traffic marshals

- Designated parking areas for busses and construction equipment shall be arranged.
- Safety inspection for the construction equipment shall be performed at this area before beingpermitted to work place.
  - Functioning of reverse horn should be inspected on daily basis
  - No vehicle shall be reversed without signal man / banksman.
  - Wheel choke blocks / wedge blocks shall be provided for parked vehicles, to avoid idlemovement of vehicle.
  - Vehicle reversing signage's shall be provided in area, where vehicle reversing is very prominent, such as Batching plant area, dumping yard & storage area
  - Traffic marshals shall be provided in the area, where site and public vehicle interference isfound
  - Suitable traffic controlling materials such as Baton lights, Red flag, Green flag and whistle shallbe provided for the traffic marshals
  - Multi mirror arrangement shall be provided at the operator cabin for better rear view duringvehicle operation

11.9.1.8 Driver Training and Testing

Induction training

- In order to minimise risks, it is important to provide induction training, supervision by site supervisors and continuous assessment.
- All newly appointed drivers will attend a driving induction course before being allowed to drive on company business. The course should be specific to the job requirement and should include:
- Main features of the company Land Transport HSE Management System, highlighting key policies, rules and procedures.
- Local culture and attitude to driving and how this affects the driving environment.
- Vehicle and driver documentation requirements.
- Indian traffic regulations, traffic signs and markings;
- Local accident block spots (areas where frequent accidents have occurred)
- The risks of driving and common causes of incidents.
- Journey management including maximum driving and duty hours and formal rest periods.
- Defensive driving techniques.

- The effects of medication and substance abuse.
- Vehicle design, specification and condition.
- The benefits of vehicle safety features such as seat belts.
- Responsibility for care, cleanliness, inspection and maintenance of vehicles and associated equipment.
- Appropriate product or cargo knowledge.
- When, where and how to use personal protective equipment.
- Emergency procedures including product and cargo characteristics.
- Essential elements of incident reporting.
- Refresher training will be provided at regular intervals. The frequency of refresher training should be set so as to maintain optimum driver HSE performance, but will be more often than once in three years.

11.9.1.9 Roles and responsibilities

Driver

1. Drivers shall never drink alcohol and drive. Drinking alcohol and driving is strictly forbidden at all times.
2. Strict disciplinary action will be taken against any violators, violation of this procedure mayinclude termination.
3. Drivers shall never drive when feeling sleepy.
4. Drivers shall never use mobile phones when driving. If the use of a mobile phone is urgentlyneeded, it is required that the operator stop the vehicle and then make / answer a call.
5. Drivers shall never eat when operating a vehicle, it increases the chances of distraction and thus increases the chance of accidents.
6. No one is allowed to smoke when operating a vehicle. It is required not to smoke while operating a vehicle as it is a major distraction, and tobacco smoke contains high amounts of carbon monoxide, which causes dizziness and relaxation causing the operator to lose concentration, increasing the probability of an accident.
7. Driver will comply with all site and Indian traffic rules.
8. Drivers will immediately report any incident/accident involving a motor vehicle to their supervisor.
9. In the case where wildlife is involved it is required that at no time the driver is allowed to step out of the vehicle when in the situation where a wild animal is in the vicinity.

Passenger

1. Passengers when in seat of a vehicle are required to wear their seat belts at all times.
2. Passengers shall not be transported in the rear of pickups or on truck beds, if they are, thetrucks or pickups should be provided with proper seats or benches.
3. Drivers should not transport more passengers than the number of seat belts provided in thevehicle.
4. Passengers shall not ride unauthorized Company vehicles.
5. Passengers have full authority to report transport with damage seat belts.
6. Passengers may refuse to ride with a driver who refuses to wear his seat belt.

11.9.1.10 Emergency response

Emergency plans will be based on events and situations identified in land transport risk assessments and will typically include provisions for:

- Driver lost in hostile environment.
- Vehicle stolen.
- Vehicle off the road.
- Overturned vehicle.
- Vehicle fire/explosion in all likely situations (e.g. urban,)
- Collisions involving fatality including multiple fatalities.
- Loss of load or cargo.
- Trailer incidents, such as trailer detachment.
- Leaking hazardous cargo or hazardous chemical incident.
- Cargo or load fire, tyre fire.
- Pollution (water, land or air) incident.

Responses will be documented for each event where a significant risk has been assessed. Measures should include:

- Emphasizing safety aspects among drivers
- Improving driving skills and requiring licensing of drivers
- Adopting limits for trip duration and arranging driver rosters to avoid overtiredness
- Avoiding dangerous routes and times of day to reduce the risk of accidents
- Use of speed control devices (governors) on trucks, and remote monitoring of driveractions
- Regular maintenance of vehicles and use of manufacturer approved parts to minimizepotentially serious accidents caused by equipment malfunction or premature failure.

Where the project may contribute to a significant increase in traffic along existing roads, or where road transport is a significant component of a project, recommended measures include:

- Minimizing pedestrian interaction with construction vehicles
- Collaboration with local communities and responsible authorities to improve signage, visibility and overall safety of roads, particularly along stretches located near schools or other locations where children may be present. Collaborating with local communities on education about traffic and pedestrian safety. Coordination with emergency respondersto ensure that appropriate first aid is provided in the event of accidents.
- Using locally sourced materials, whenever possible, to minimize transport distances. Locating associated facilities such as worker camps close to project sites and arranging worker bus transport to minimizing external traffic.

11.9.1.11 Safe Loading and Unloading

The loading and unloading of plant and equipment on site is a high risk activity. To minimize the risk

ofan accident or injury the following should be put in place. Before loading the vehicle, consideration should be given to how the vehicle will be unloaded later, the positioning of the materials, plant or equipment etc.

The following are some of the key items needed to be considered for any loading / unloading process:

- Deliveries will be timed to avoid the busiest rush hour periods whenever practicable.
- Risk assessment and control measures to be put in place to address / reduce the risk.
- Safe access onto the vehicle body or onto the load to unload the lorry.
- The load needs to be stacked / loaded in a manner that will allow a safe means) of unloading. The receiver of the delivery needs to be aware of the resources to be in place to unload the vehicle.
- All drivers when collecting and after loading the particular machine, piece of plant or any other type of load need to ensure the load is secured and any restraints that are required to be in place are in place even where the vehicle is moving a short distance.
- When an enclosed delivery vehicle arrives at the site the driver must exercise due caution and care when the driver is opening any curtains etc as parts of the load may have moved or been dislodged during transport.
- When arriving on the site, all delivery drivers are to report to the site security guard or report to the Site Office
- Ensure that any load on your vehicle is well secured also that your vehicle is not overloaded or loaded in such a way as to affect the handling of the vehicle.
- When providing vehicles for use on site, ask for information of site hazards and instruct drivers accordingly, e.g. excavations open, overhead cables, blasting operations, etc.
- Ensure drivers are provided with any necessary safety equipment Ensure before reversing that there are no obstructions or people behind the vehicle. Preferably keep a Banksman when reverse.
- Ensure that when reversing or driving towards an edge that a suitable stop has been provided to prevent the vehicle going over the edge.
- Ensure that having tipped the load, the vehicle does not travel forward until the tipper body has returned to the travelling position. This is particularly important on sites with overhead services, or uneven ground.
- The operator of any crane, pipe layer, backhoe, or any other lifting device is prohibited from bringing the boom or any part of the machine or load within the arc zone of high voltage lines.
- Adhere Government regulations for safe working distances.
- Seat belts, where supplied by Manufacturer shall be maintained and worn at all times.
- The use of seat belts by all occupants of cars, vans, Busses and goods vehicles is mandatory. Belts will be of the lap/sash configuration.
- All heavy equipment shall be equipped with an operational back up alarm.
- Drivers of load carrying vehicles have to be properly trained in load securing, and ensure at all times that loads are properly secured before starting on a movement to or in the project site.
- Adequate signage should be provided to indicate diversionary routes
- Provide appropriate public safety and traffic warning signs of activities.
- Ensure safe pedestrian access to businesses/ facilities affected by the pipeline route. Temporary protected pedestrian crossing to be installed.
- Temporary access routes should be identified in consultation with the affected Community.
- Speed limits shall be enforced for project vehicles

11.9.1.12 Excavation and sewer laying over public roads

- Informing the Public: Portable Variable Message Signs will be installed at each end of the Project & public area, prior to any changed traffic conditions due to construction activity. These will be used to inform the public where any road changes as a result of the construction works.
- While trenching care shall be taken to ensure that all underground structures and utilities are disturbed to the minimum. Trenching shall be made with sufficient slopes on sides in order to minimize collapsing of the trench.
- Worker will not be allowed down into an excavation of depth more than 2.5 until an inspection has been carried out and recorded by a competent supervisor who will complete a checklist for excavation support.
- Regular inspection of excavation supports will be carried out daily before workers enter excavation.
- The area of excavation shall be properly lighted and barricaded during the night.
- Barriers should be put in place for deep excavations in populated areas.
- Provide free passage and access to all parts of the project and at all times to authorized representatives from the Municipalities.
- Ensure work area is clearly defined and off limits to the public.
- Maintain condition of public roads to satisfactory safety levels.
- All complaints involving vehicle movements relating to construction activity will be logged and responded to as soon as practicable.
- All ongoing works – in particular exposed manholes, street-related activities, open excavations, etc – must be protected with barriers and identified with warning signs.
- Construction activity should not present an undue risk to members of the public, especially to children. Suitable fencing must be used to secure sites.
- Particularly on street-side works, adequately designed and constructed hoardings should be erected to secure the site work.
- Arrangements must be put in place to ensure that normal pedestrian and public vehicular traffic are not put at undue risk as a result of any changes made.
- Vehicular speeds must be controlled when passing through or in the vicinity of roadwork activities. Speed signs advising drivers of permitted speeds must be erected and displayed appropriately.
- Before road works or road-related activity is undertaken, traffic-control signs must be erected. These should alert the public to the works ahead and to any change of road layout or diversions. The signage work (erecting a single movable sign, constructing a base and installing, commissioning of large signs, etc) must be carefully planned.
- Operators must possess the appropriate training certification as prescribed in the Construction Regulations. The machine must be set up safely when digging: the hand parking brake must be engaged, direction levers must be in neutral, front bucket lowered, machine level, stabilizers dropped appropriately to the ground and all wheels must be off the ground.
- Where the operator's visibility is restricted appropriate auxiliary devices, which may include convex mirrors, flashing beacon and reversing alarm, must be fitted.
- VEHICLE RECOVERY: If any vehicle gets into difficulty on site, back actors, excavator booms, lifting arms, etc, should not be used to pull the vehicle free (unless this might prevent injury or

death). Only appropriate plant should be used to rescue vehicles, and it should be done from an approved towing point.

- EXCLUSIVE ZONE: As a general rule, persons should not be working within the working radius of an excavator boom. People should be kept a safe distance away from working plant and barriers should be used where possible.
- Back filling is the re-instatement and making safe of the excavation. It must be carried out immediately after the support systems are removed. Stop blocks should be used to alert drivers of vehicles (dumpers, lorries, teleporters, etc.) when they are approaching the side of the excavation.
- Enough working space will be left to make sure that the movement and operation of the plant (e.g. swinging of jibs and excavator arms) is clear of passing traffic and is not encroaching into thesafety zone.
- The trenches/ pits shall not be kept open in night times. However in case the same is essential thesame shall be properly barricaded with proper lighting arrangements & manned. Proper lighting arrangements for illuminating these signs will be made during the night hours
- Reflective paints/sheets will therefore be used for the signs/barricaded so that these are visible atall times.
- The Contractor shall at his own cost, support and protect all buildings, walls, fences or other structures and all utilities e.g. Electrical cables, Telephone Cables, Water pipelines, Sewer pipelines

  etc., and property which may, unless so protected, be damaged as a result of the execution of theworks. He shall also comply with the requirements in the specification relating to protective measures applicable to particular operations or kind of work Special care shall be taken while laying Pipelines near the trees.
- OPEN HOLES: All ground openings, manhole openings, etc, as soon as they are created, must be guarded to prevent falls. Usually the opening is surrounded with visible guard rails and toe-boardsthat are anchored and fixed securely.
- Where openings are covered, the covers (e.g. manhole covers) must be of adequate strength andsize and be firmly fixed in position. These covers may also identify what they are covering (e.g. a floor opening) so they will not be inadvertently removed. Excavated openings should be backfilledas soon as possible.
- Warning signboards must be used across the site to alert workers or others when they are approaching high-risk areas (e.g. exclusion zones, leading edges and openings). Supplementary signboards should also be used to convey safety information (e.g. deep excavation). Signs must beplaced at an appropriate location.

ANNEX-09

Contractor's Emergency Preparedness and Response Plan

14.0 Emergency Preparedness and Response

14.1.1 Emergency response plan

Emergency response plans for foreseeable emergency situations involved in project activities will be prepared to ensure that an effective and efficient response is achieved in case of any emergency.

The emergency response includes the following contingencies:

1. Fire and explosion
2. Structural collapse Chemical spill/Toxic Gas Release
3. Flood/Earthquake
4. Fall from Height/injuries
5. Bomb/Substance Threat
6. Electrocution
7. Snake bite

If any additional threats are identified, it will be incorporated into the emergency response procedure at the site level. The draft of the ERP is the Operational control procedure- OCP 015. The site specific emergency plan with the details of emergency response team and communication chart is prepared using the draft.

The following department/personnel are to be informed immediately.

(The contact numbers of the following are to displayed at prominent places in the project site)

Owner/Client:

Fire & Safety:

FirstAid/Ambulance:

Security/Control Room:

Disaster Control Room:

Project-in-Charge:

Safety Mgr.:

14.1.2 Emergency Mock Drills

Emergency Mock Drills will be conducted on potential emergency scenarios as per the schedule established in the Site Activity Plan.

14.1.3 First Aid and Life-saving Apparatus on Site

Life-saving apparatus, which is appropriate and adequate will be provided at Site. The first aid facilities will be as per the BOCW Act. Trained first aiders will be available at the site. They will be trained to actin case of an emergencies at site.

ANNEX-10

Contractor's EHS Plan-Permit to Work

11.1 Permit to work

To ensure that appropriate controls are rigidly adhered to when high-risk activities (e.g. entering confined spaces, working at heights) is being carried out, a permit- to-work system will be implemented. This ensures that works do not begin until all the safety and environmental controls are in place, and signed off.

Permit to work will be issued for following activities.

- Hot Work
- Blasting/Demolition
- Excavation
- Confined Space
- Working at night
- Electrical Work / Machinery - Lock Out Tag Out(LOTO)
- Working at height
- Other activities which project management considers as high potential

The permit is to be closed or extended after the approved time validity of the permit. For both, re-inspection of the control measures and work area is to be done before approval. The detailed procedure for reference is **OCP- 021 Permit to Work.**

ANNEX-11

Checklist of materials for First Aid Kit at construction site.

- A leaflet providing general guidance on first aid.
- Antiseptic liquid or cream/burnol ointment.
- 20 individually wrapped sterile plasters of assorted sizes. These should be suitable for the type of work and may need to include hypoallergenic ones.
- 2 individually wrapped sterile triangular bandages.
- 6 mediums individually wrapped sterile unmedicated wound dressings.
- 2 large individually wrapped sterile unmedicated wound dressings.
- 2 sterile eye pads.
- 3 pairs of disposable gloves.
- 6 safety pins.

Additional contents

- Cleansing wipes to clean skin around a wound
- Tough-cut scissors to cut bandages or through clothing.
- Adhesive tape to hold dressings or bandages in place.

Always check the expiry date of materials kept in First Aid Kit. Above kit is only for low level injury at construction site. In case of emergency, provision to rush the hospital tie up for projects is to be ensured.