
**Bihar Urban Infrastructure Development
Corporation Limited (BUIDCO)**

Form 1 A

***Proposed Inter State Bus Terminal (ISBT) at Khata no.-660,
662,100,336,313, Plot no.-1348, 1349, 1400, 1416Mauza
Pahari (Patna- Gaya Road) district Patna, State Bihar.***

Submitted By



CONSULTANT



ASCENSO ENVIRO PVT. LTD
Formerly known as Ascenso Management & Consulting Services Pvt. Ltd.
New Delhi

A QCI ACCREDITED ENVIRONMENTAL ORGANIZATION

APPENDIX II

(See paragraph 6)

FORM-1 A (only for construction projects listed under item 8 of the Schedule)

CHECK LIST OF ENVIRONMENTAL IMPACTS

(Project proponents are required to provide full information and wherever necessary attach explanatory notes with the Form and submit along with proposed environmental management plan & monitoring program)

1. LAND ENVIRONMENT

(Attach panoramic view of the project site and the vicinity)



- 1.1 Will the existing land use get significantly altered from the project that is not consistent with the surroundings? (Proposed land use must conform to the approved Master Plan / Development Plan of the area. Change of land use if any and the statutory approval from the competent authority to be submitted). Attach Maps of (i) site location, (ii) surrounding**

Proposed Inter State Bus Terminal (ISBT) at Khata no.-660, 662,100,336,313, Plot no.-1348, 1349, 1400, 1416Mauza Pahari (Patna- Gaya Road) district Patna, State Bihar.

features of the proposed site (within 500meters) and (iii) the site (indicating levels & contours) to appropriate scales. If not available attach only conceptual plans.

Landuse Pattern: Inter State bus terminal (ISBT), Patna has a plot area of 25.02 acres i.e. 1,01,252.35 sq.m. The design for bus terminal for future and urban scenario will have efficient use of space for entertainment, shopping, related activity & high bus trip of 3,000 buses and 1,50,000 footfalls per day. The long and short route buses enter the terminal through state highway-78. Planning of the terminal is done in such a way that proper circulation of vehicular as well as pedestrian traffic is kept in mind.

Proposed bus terminal would mainly be a transit bus terminal for neighboring states- Uttar Pradesh, Jharkhand buses, potential bus trips / day~3,000. The basic objective of the project is to construct multistoried building accommodating both states of art bus terminus & business commercial activities.

The total area available for the site development is 101252.35 m² (10.12 ha). The built up area is **82,809.98 m²**.

The site is going to develop as per Master Plan of Patna 2031 and according to that project comes under public utility. **Figure 1** shows the location of project on Patna master Plan 2031.

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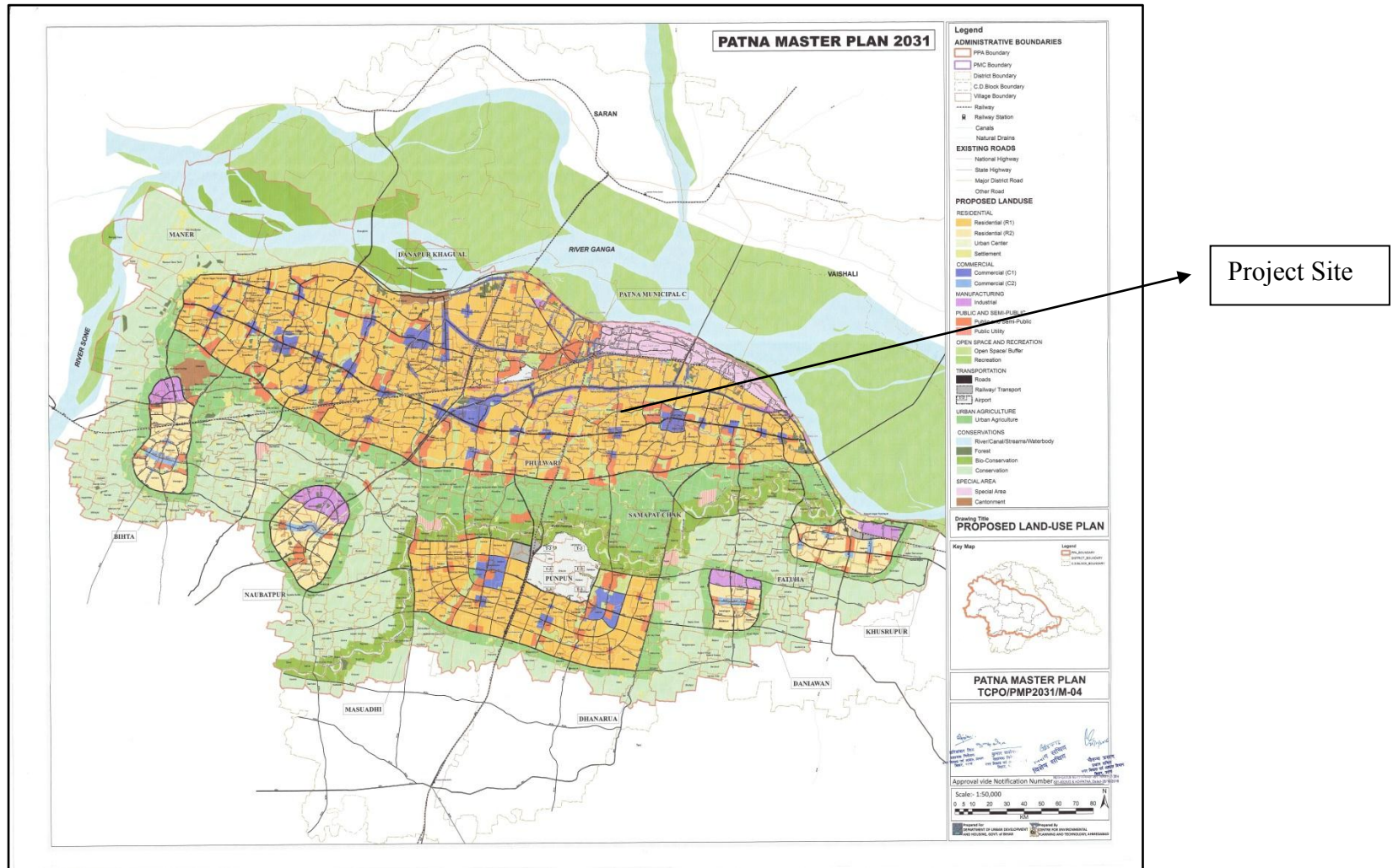


Figure1:-Patna Master Plan showing Project location

Proposed Inter State Bus Terminal (ISBT) at Khata no.-660, 662,100,336,313, Plot no.-1348, 1349, 1400, 1416Mauza Pahari (Patna- Gaya Road) district Patna, State Bihar.

Site Location:- Bihar Urban Infrastructure Development Corporation Limited (BUIDCO) has proposed to develop modern Inter State Bus Terminal (ISBT) at Khata no.-660, 662,100,336,313, Plot no.-1348, 1349, 1400, 1416, Mauza-Pahari, Dist.-Patna in order to address the high urbanization trend, rapidly growing Urban Transport related issues witnessed in Patna of State Bihar.

Geographically, the project site is located at:

- Latitude: 25°34'33.94"N
- Longitude: 85°11'14.18"E

The location map showing the project site is given in **Figure 2**.

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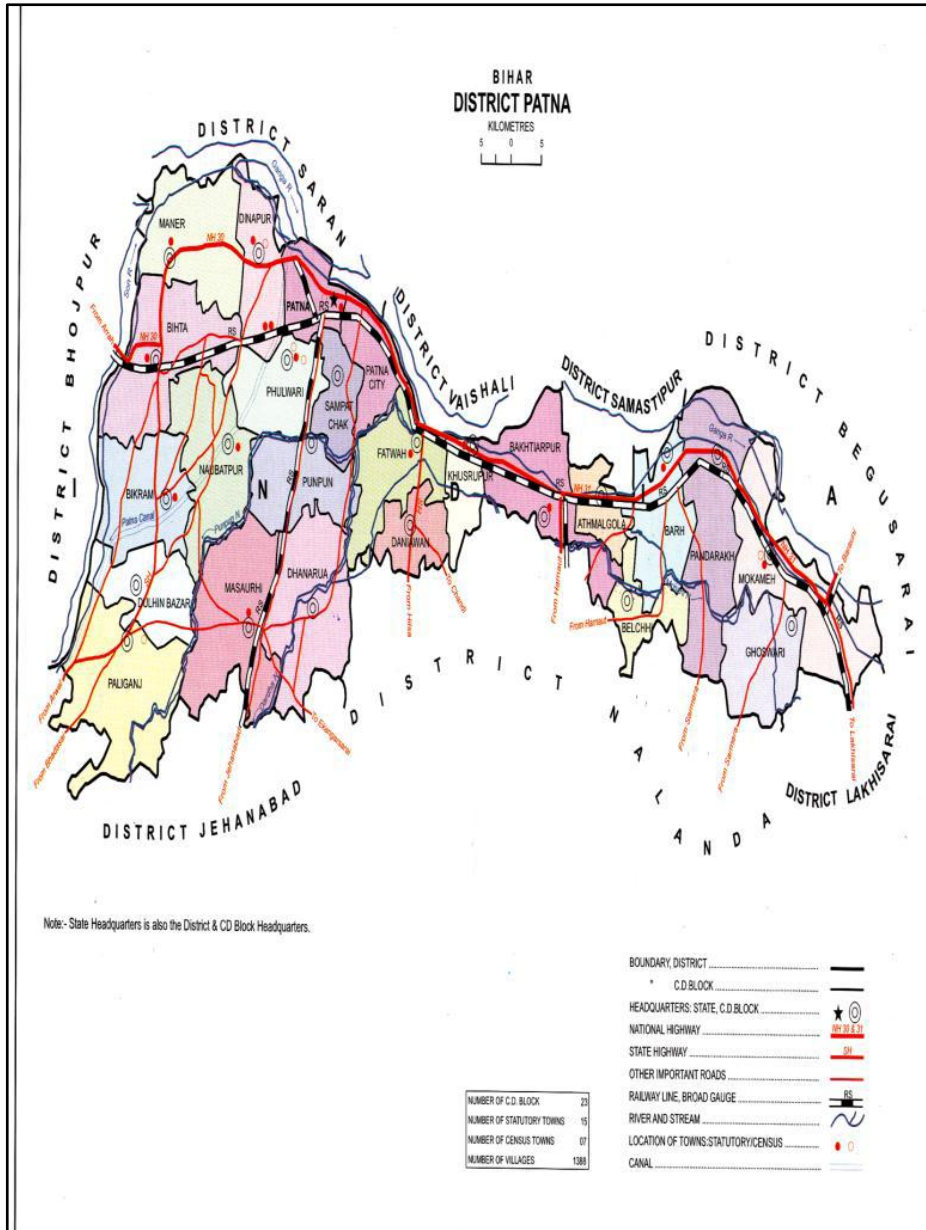


Figure-2: Location Map showing the project site

Proposed Inter State Bus Terminal (ISBT) at Khata no.-660, 662,100,336,313, Plot no.-1348, 1349, 1400, 1416Mauza Pahari (Patna- Gaya Road) district Patna, State Bihar.

Surrounding Features: The surrounding area of the project site possesses Public utilities land use pattern. Since, the surrounding area will develop as per the Bihar Master Plan 2031. The development in the project site will be consistent with the surroundings.

A Google Map showing surrounding area of project within 500 m is shown in **Figure-3**.

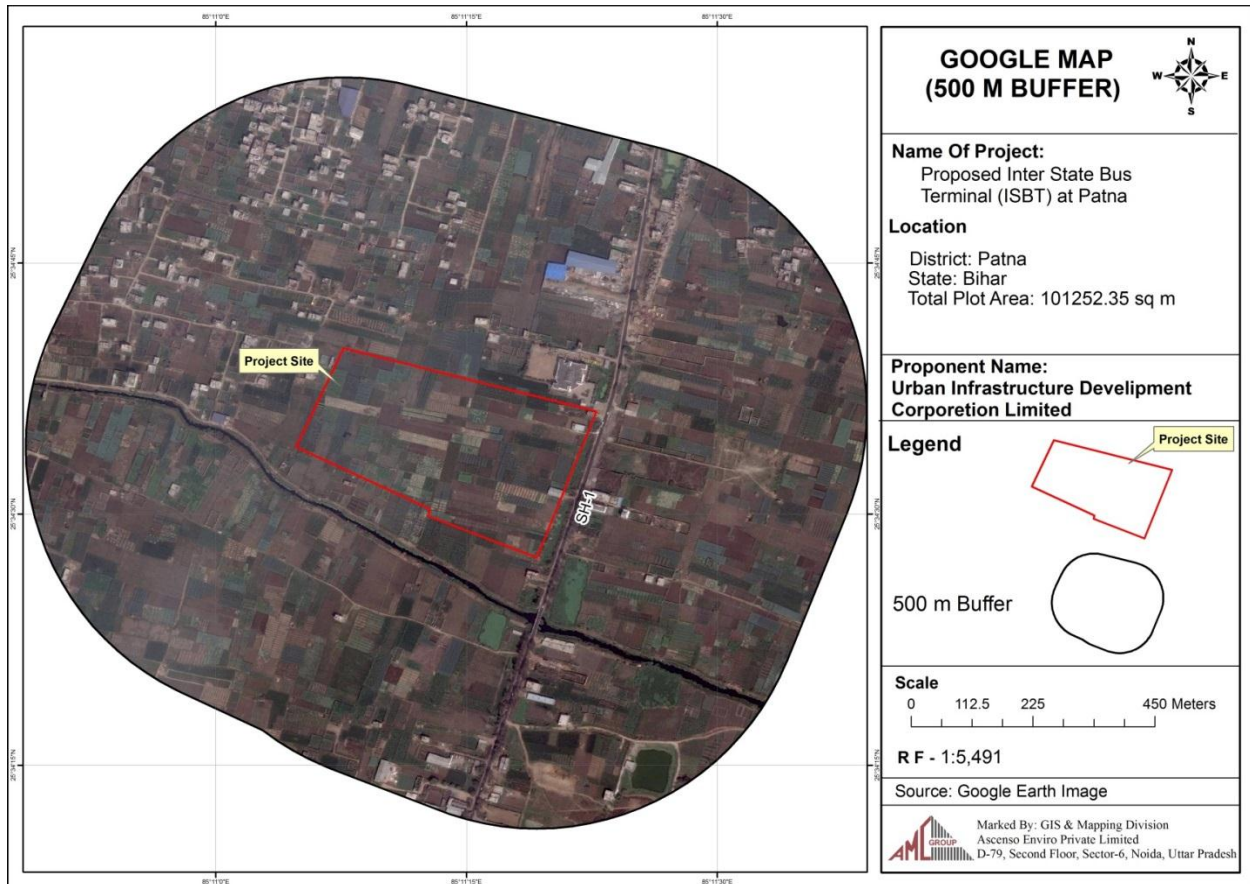


Figure-3: Google Map of 500m radius showing surroundings of the area

Proposed Inter State Bus Terminal (ISBT) at Khata no.-660, 662,100,336,313, Plot no.-1348, 1349, 1400, 1416 Mauza Pahari (Patna- Gaya Road) district Patna, State Bihar.

1.2 List out all the major project requirements in terms of the land area, built up area, water consumption, power requirement, connectivity, community facilities, parking needs etc.

Bihar Urban Infrastructure Development Corporation Limited, 2nd Floor, Khadya Bhawan, Road No. 2 Daroga Prasad Rai Path, R Block, Patna-800001 intend to construct Inter State Bus Terminal (ISBT).

Land Area: The total area available for the site development is 1,01,252.35 m².

Built up Area: The built up area is 82,809.98 m².

Water Consumption: Water requirement during the Construction phase will be met by private water tanker or treated water from CSTP. It is estimated that water demand during the construction phase may be approx. 24 KLD.

Water requirement during the operational phase will be met through Municipal supply or by ground water after taking necessary permission from the CGWB. The total water requirement for the proposed project has been estimated to be 4,442 KLD. This includes potable water requirement, flushing, landscaping, requirement for washing purposes, HVAC and DG Cooling. The total fresh water requirement is 1,639 KLD. The water requirement for Flushing, cooling and landscaping will be met through treated water from STP.

Power Requirement: The total electrical load demand has been estimated to be 6,245 KVA. The possible sources of power will be State Electricity Supply. In case of power failure, 3 DG sets of total capacity of 2000 KVA (3*2000) will be provided. The DG sets are water cooled type.

Connectivity: Nearest railway station is Patna railway station at an aerial distance of 6 km towards NNW.

Nearest Airport is Jay Prakash Narayan International Airport at an aerial distance of 9 km towards NNW.

Community Facilities: The project site is surrounded by many schools and hospitals such as:

Schools:

Anand international school: Adjacent towards WSW

Adelaide Convent school: Adjacent towards North West

Camford Public School: Adjacent towards WSW

Hospitals:-

GD Memorial homeopathic Medical College and hospital:- 2 Km approx. West

Narayani Hospital:- 2 Km approx. towards NW

Ford hospital:- 3 Km approx. towards NW

Parking Requirements: Total No. of proposed Bus bays is 194.

1.3 What are the likely impacts of the proposed activity on the existing facilities adjacent to the proposed site? (Such as open spaces, community facilities, details of the existing land use, disturbance to the local ecology).

The proposed development shall be carried out as per the Bihar building by-laws and as per planned land use, hence no negative impact is envisaged due to proposed development. Further, the construction as well as operation stage of the project will generate direct and indirect employment opportunities for a large section of society. The employment will have positive impact thereby improving the quality of life.

- The main areas of concern which will pose a significant impact are Sewerage discharge. Mitigation options that are proposed are mentioned below:

- i. A Sewage Treatment Plant (STP) of capacity 3,631 KLD is proposed and the treated water will be reused for landscaping, flushing & DG Cooling.

Further, there shall not be any change in the land use pattern due to the proposed project.

The green area will be developed as shelter belt, along with avenue plantation on both sides of road, lawns area including herbs and shrubs. The indigenous/local plants will be planted, which will increase the aesthetic value of the area. Hence, there will be no disturbance to the local ecology of the area.

1.4 Will there be any significant land disturbance resulting in erosion, subsidence & instability? (Details of soil type, slope analysis, vulnerability to subsidence, seismicity etc may be given).

The proposed activity will not affect any land disturbance resulting in erosion, subsidence and instability. The area is not susceptible to erosion.

Soil Type: 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 group's viz. (i) Recent alluvium (ii) Tal and (iii) Older alluvium.

Slope Analysis:

Patna town is located on a level strip of land on the south bank of the River Ganga that slopes to the south and east.

(Source: City Development Plan (2010-30))

Subsidence/Erosion:

Proper greening and paving of site area will not cause any soil subsidence problem.

Seismicity:

- The whole country has been divided into 5 Seismic zones as per maximum intensity of 'Modified Mercalli Scale' (MMS). The project site lies in Seismic Zone IV, called as 'High Damage Risk Zone'.

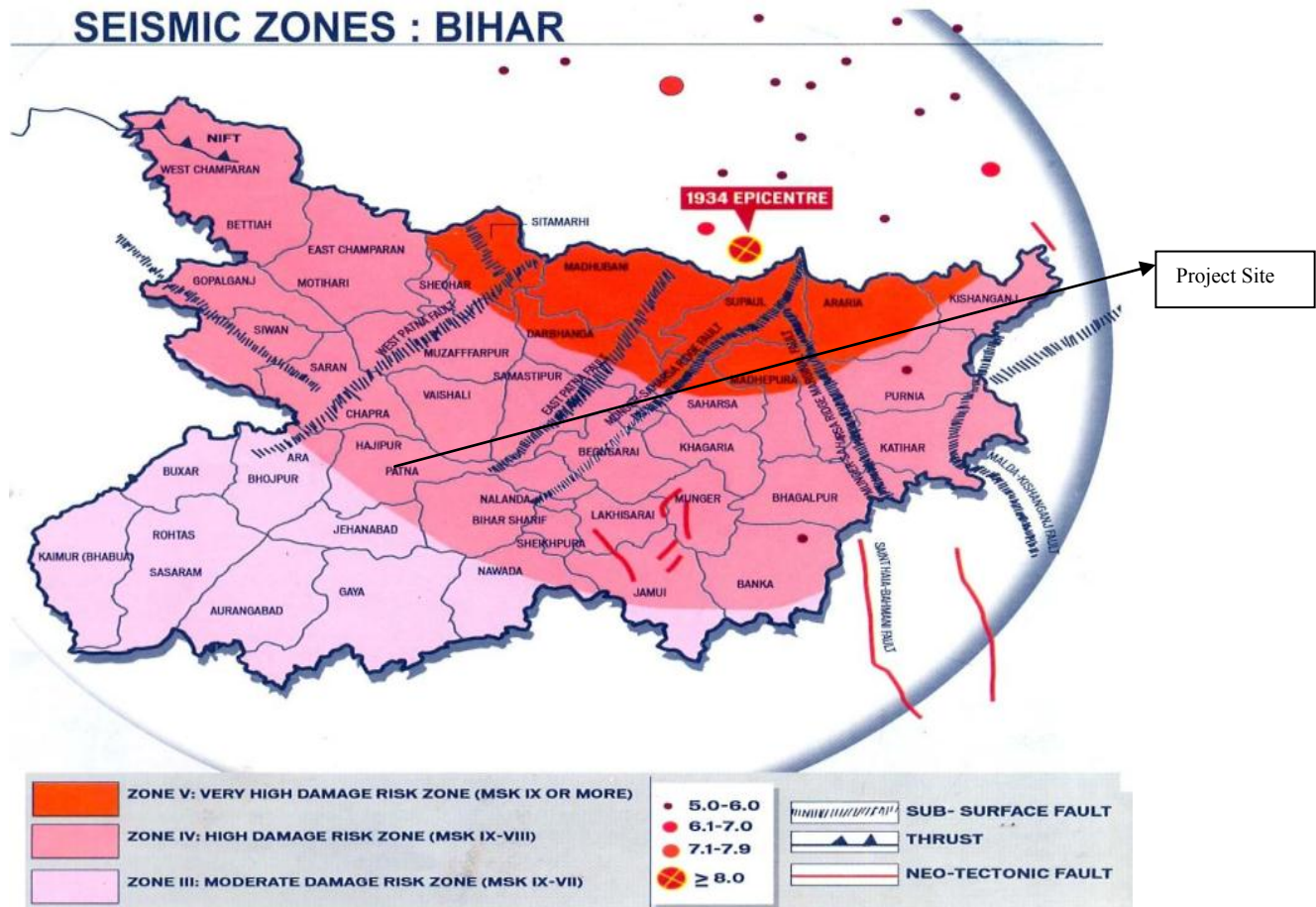


Figure-4: Map showing the Seismic Zone classification of Bihar

1.5 Will the proposal involve alteration of natural drainage systems? (Give details on a contour map showing the natural drainage near the proposed project site).

A drain is passes through near the project site in direction South approx. at the distance of 0.09 Km. The River Ganga and Gandak are at a distance of 5 Km approx. towards NNE and 10 Km approx. towards North respectively from the project site. Punpun river is also lies at distance of 5 Km towards South.

1.6 What are the quantities of earthwork involved in the construction activity-cutting, filling, reclamation etc. (Give details of the quantities of earthwork involved, transport of fill materials from outside the site etc?)

No excavation process will be carried out because there is no provision of basement in the project site.

1.7 Give details regarding water supply, waste handling etc. during the construction period.

Water Supply:

Water required during the construction period will be supplied through private water tanker. It is estimated that water demand during the construction phase may be approx. 24 KLD. Water will be used in the construction activity for cement mixing, sprinkling, dust suppression and domestic purposes of the construction workers.

Waste Generation/Handling:

Sewage: The existing sewerage collection facilities comprising of toilets and urinals shall be used by the construction workers and staff involved. No additional sewage shall be generated which has to be separately disposed of.

Construction waste: No demolition waste shall be generated. The solid waste generated during the construction phase like metal cutting. Debris, plastic material and wooden log etc. will be collected and stored in a separate covered area so as to prevent damage to property and personnel working at the project site. Further, most of the construction debris will be used for filling activities and the rest is being disposed of through authorized recyclers. The waste generated during the construction activities is limited to project site only and during construction phase only. These will be reused for backfilling and road development after manual segregation. This waste shall be utilized for construction of roads.

Major types of construction wastes are expected from the proposed Project: -

▪ **Clean Fills:**

Clean fill is uncontaminated soil, rock, sand, gravel, concrete, asphaltic concrete, cinder blocks brick, minimal amounts of wood and metal and inert (non-reactive) solids for fill, reclamation or other beneficial use. Minimal means the smallest amount possible.

▪ **Recovered Materials**

Recovered Materials are those removed for reuse (lumber, doors, windows, ceramic tile and glass) and those removed to be recycled into new products. Potentially recyclable construction and demolition wastes will include scrap metals, asphalt shingles, sheet rock, lumber, glass and electrical wire.

▪ **Regulated construction and demolition waste**

Regulated construction and demolition wastes are those not classified as clean fill and not being reused or recycled. Regulated non-hazardous construction and demolition wastes will be disposed of at a permitted landfill or transfer station.

Scrap metal painted with heavy metals will be sent to a salvage yard for recycling.

Conclusively, it can be stated that impacts may be confined to small area (mainly to project site) and for short duration. Construction waste will be reused; disposal of non-reusable waste will be done through authorized vendors/recyclables.

Solid Waste during Construction Phase

Table-1 gives an estimate of the average composition of waste generated from the onsite construction activities whereas **Table-2** lists of the various hazardous wastes expected to be generated from the project during construction.

Table-1: Waste Composition - During Construction Phase

S. No.	Constituents	Percentage Composition
1	Soil, Sand and Gravel	34.99
2	Brick and Masonry	29.95
3	Concrete	24.98
4	Metal	4.97
5	Bitumen	2.04

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S. No.	Constituents	Percentage Composition
6	Wood	2.04
7	Other	1.02
	Total	100

Source: TIFAC Report "Utilization of Waste from Construction Industry," 2001

Table-2: Types of hazardous waste to be generated during construction

S. No.	Hazardous Waste
Construction phase	
1.	Used Oil from DG Sets
2.	Centering Oil, formwork oil
3.	E-waste- Circuit boards, CRTs, Electronic parts, solder dross, weld waste
4.	Paints, pigments, dyes and primers
5.	Fuels and heating oils and other volatile/ flammable liquids such as coolants, grease etc.
6.	Tar and tar products
7.	Lead containing products
8.	Product packaging (cement bags, cartons, containers, plastic covers etc.
9.	Fluorescent lamps intact and crushed, halogen lamps, arc lamps, UV lamps, high pressure sodium lamps, neon lamps, incandescent lamps.
10.	Mercury containing lamps and tubes, mercury vapor lamps, Mercury containing devices- mercury switches, relays, regulators, thermostats, manometers and debris containing mercury.

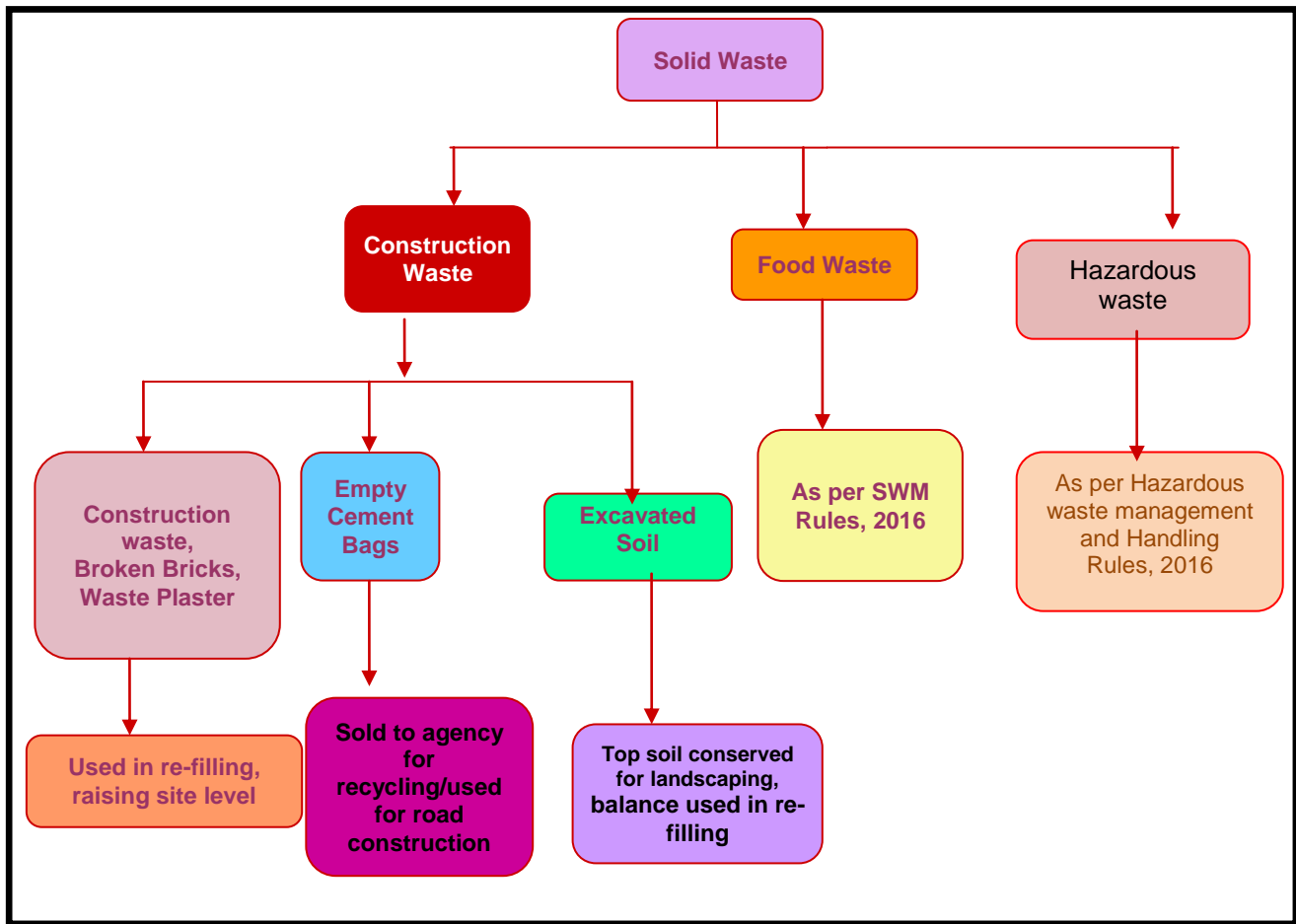


Figure-5: Solid Waste Management during Construction Phase

1.8 Will the low lying areas & wetlands get altered? (Provide details of how low lying and wetlands are getting modified from the proposed activity).

Sewage generated will be treated in the onsite STP. Hence, no low lying areas will get altered.

1.9 Whether construction debris & waste during construction cause health hazard? (Give quantities of various types of wastes generated during construction including the construction labor and the means of disposal).

- No significant health hazard is associated with the proposed construction.

- During construction period, source of fugitive dust generation is from material handling and vehicular movement. Impact due to fugitive dust emission shall be negligible as water sprinklers are being used to suppress fugitive dust emission as and when generate. However, the impacts are confined to laborers/workers particularly with regard to occupational exposure. Proper Personal Protective Equipment's have been provided to the workers working in the potential areas (e.g. masks, ear plugs etc.).
- Careful design, planning and good site management has minimized waste of materials such as concrete, mortars and cement grouts. Construction wastes are being segregated as much as possible at site itself to increase the feasibility of recycling concrete and masonry as filling material and steel pieces as saleable scrap. Litter disposal and collection points have been established around the work sites. Empty packaging materials, drums, glass, tin, paper, plastic, pet bottles, wood, and other packaging materials, etc are being disposed through recyclers. The construction spoils are being temporarily stored at designated dumpsite located inside the site premises. Later on these wastes will be used for land filling / leveling work within the site premises.

2. WATER ENVIRONMENT

- 2.1. Give the total quantity of water requirement for the proposed project with the breakup of requirements for various uses. How will the water requirement met? State the sources & quantities and furnish a water balance statement.**

Water Requirement:

During Construction Phase:

During construction phase, water will be sourced primarily through tankers arranged by the contractor. It is estimated that water demand during the construction phase may be approx. 24 KLD which will be used in domestic as well as construction purpose.

During Operation Phase:

Water requirement during the operational phase will be met through Municipal supply or by ground water after taking necessary permission from the CGWB. The total water requirement for

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the proposed project has been estimated to be 4,442 KLD. This includes potable water requirement, flushing, landscaping, requirement for washing purposes, HVAC and DG Cooling. The total fresh water requirement is 1,639 KLD. The water requirement for Flushing, cooling and landscaping will be met through treated water from STP. Details of break-up of water requirement for expansion project are given in **Table-3**.

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Table 3: Details of water requirement for expansion project

Description	Total Population / Area	Unit Water Consumption (LPCD)	Total Water Requirement (KLD)	Fresh Water Requirement (KLD)	Flushing Requirement (KLD)	Wastewater Generation (KLD)
Hotel Rooms	30	180	5.4	4.05	1.35	4.59
Passengers	1,50,000	15	2,250	1,350	900	1,980
Retail / Office population of all blocks	8,663	45	389.8	259.89	129.9	337.8
Driver Dormitory	100	135	13.5	9.5	4	11.6
Restaurant and Food Court	250	70	17.5	12.5	5	15
Multiplex	400	15	6	3.6	2.4	5.28
Landscaping	33,413.28	5.5 liters/sqm	187.11
Cleaning of Buses	3,000	300 liters/bus	900	630
Platform Floor	8306.12	8 liters/sq.m	66.4	46.5
DG Cooling	6,000 KVA	1 litres/KVA/Hr.	60			
HVAC Cooling	1,950 TR	12/ltrs/hr/ton	561.6			
Fire Fighting (one time)			4.78			
Total			4,462.1	1,639.54	1,042.695	3,030.841
		SAY	4,442	1,639	1,043	3,031

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Water balance diagram for Non-Monsoon is given in **Figure-6** and for Monsoon is given in **Figure-7**.

Total Sewage generated will be 3,031 KLD sewage. After Treatment about 2,425 KLD will be available this will be used for Flushing, Horticulture & HVAC.

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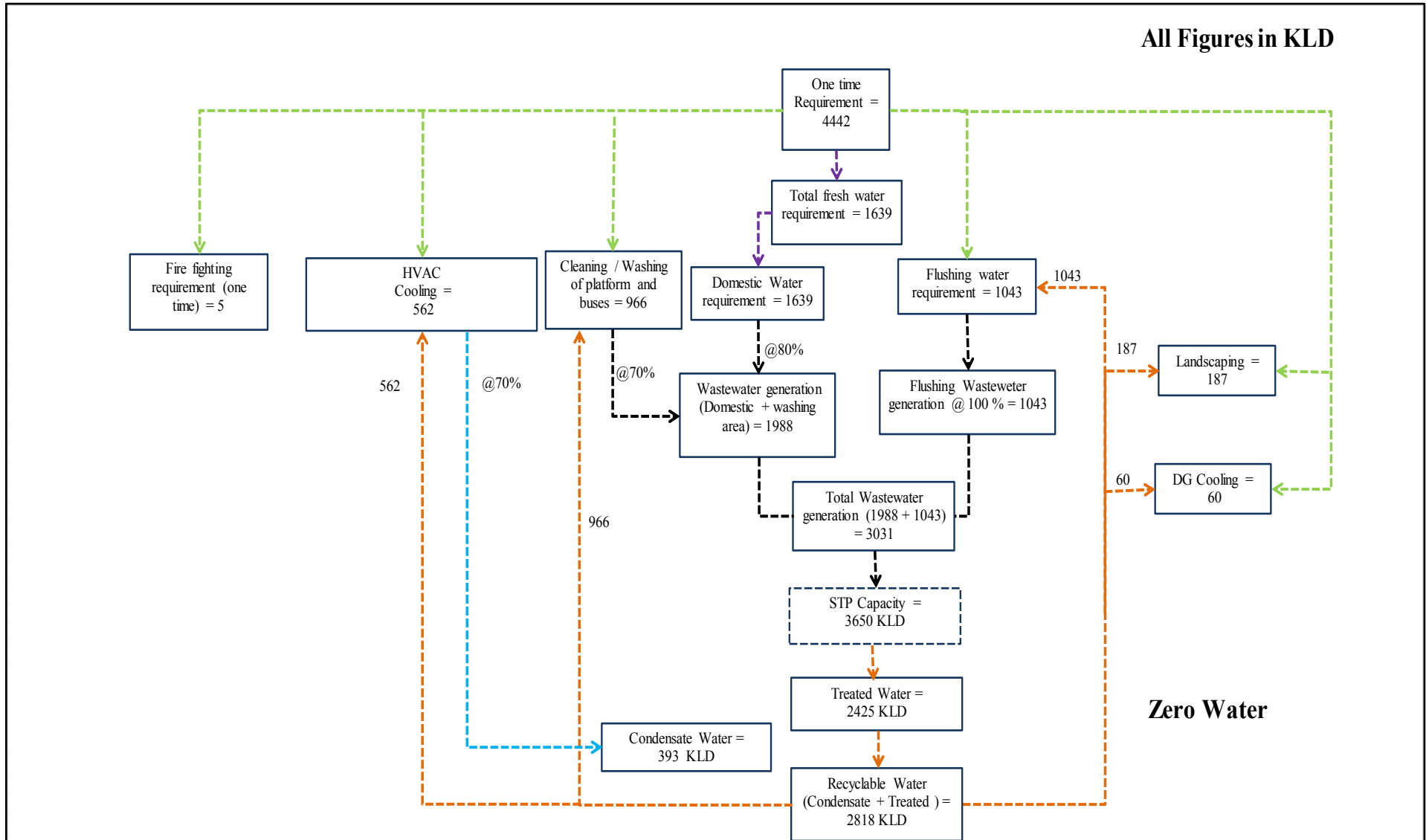


Figure-6: Water Balance Diagram for Non- Monsoon Season

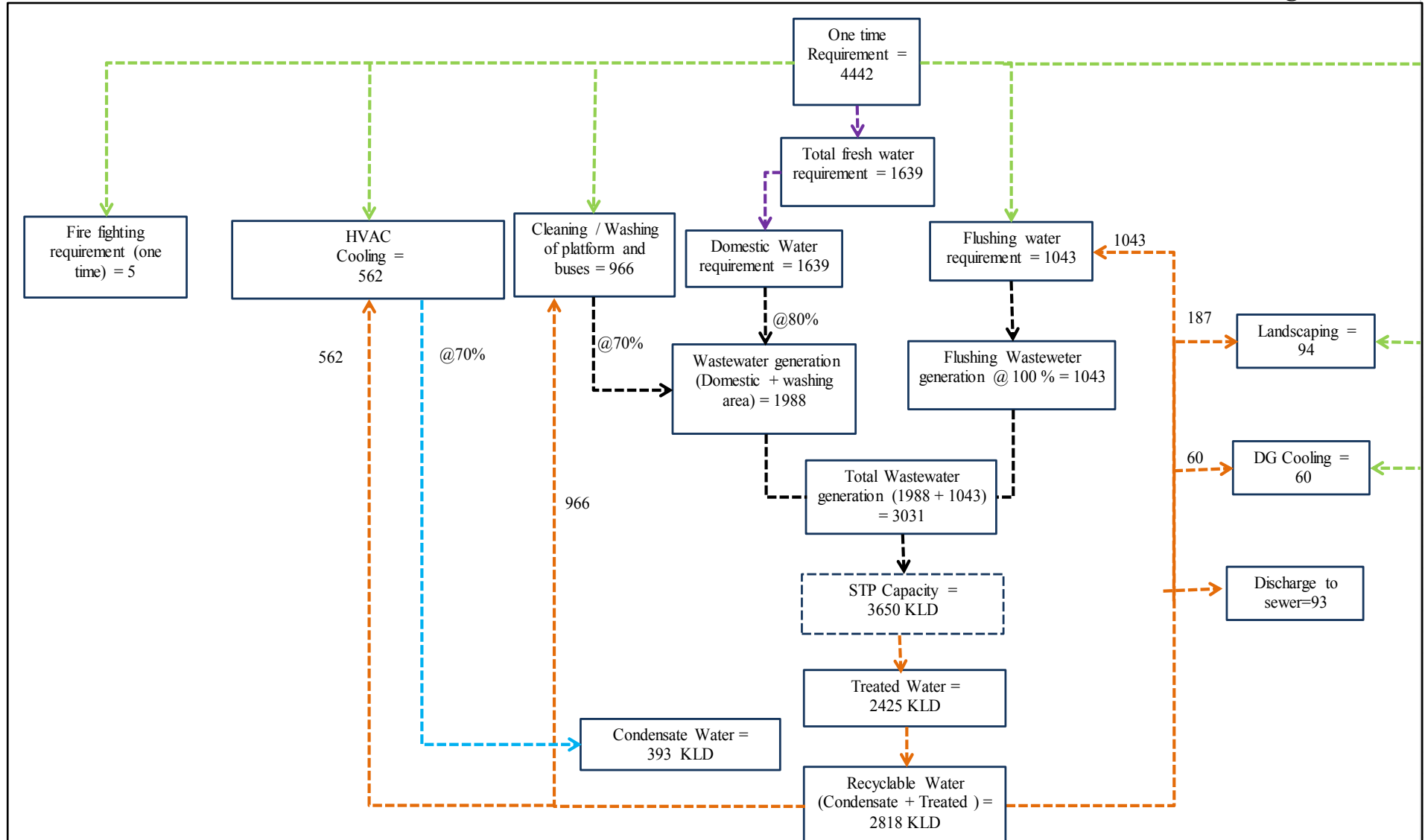


Figure-7: Water Balance Diagram for Monsoon Season

One time Requirement

Fresh Water Requirement

Wastewater Generation

Treated Water

Condensate Water

2.2. What is the capacity (dependable flow or yield) of the proposed source of water?

Water requirement of construction phase will be met from Private water supplier. While during operation phase water requirement will be met through Municipal supply or by borewell after taking permission from the CGWB.

2.3. What is the quality of water required, in case, the supply is not from a municipal source? (Provide physical, chemical, biological characteristics with class of water quality)

Water requirement of construction phase will be met from Private water tanker. During post construction water demand will be met form Municipal water supply or by ground water. Ground water abstraction will be done only after getting NOC from CGWA. During operation phase the supplied drinking water to each dwelling unit will be as per Bureau of Indian Standards (BIS) and IS: 10500-2012.

2.4. How much of the water requirement can be met from the recycling of treated wastewater? (Give the details of quantities, sources and usage)

About 2,818 KLD of total water requirement will be fulfilled from recycled water after treatment from STP and rest will be met from Municipal water supply. The details of recycled water use are given below in **Table-4**.

Table-4: Use of Recycled water

	Treated Water	Flushing	Landscaping	HVAC Cooling	Cleaning of buses and platform	DG Cooling	Discharge to sewer
Non-Monsoon Season	2818 KLD (2425 KLD from STP+393 KLD Condensate water	1043 KLD	187 KLD	562 KLD	966 KLD	60 KLD	0
Monsoon Season	2818 KLD (2425 KLD from STP+393 KLD Condensate water	1043 KLD	94 KLD	562 KLD	966 KLD	60 KLD	93 KLD

2.5. Will there be diversion of water from other users? (Please assess the impacts of the project on other existing uses and quantities of consumption).

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There will not be such diversion of water from other users as the water demand during construction phase will be met from Private water tanker. In operational phase water demand will be met form Municipal water supply or by borewell. Ground water abstraction will be done only after getting NOC from CGWA. Hence, no impact on others user observed.

2.6. What is the incremental pollution load from wastewater generated from the proposed activity? (Give details of the quantities and composition of wastewater generated from the proposed activity).

During the operational phase, 3,031 KLD waste water will be generated which will be treated in the STP.

The waste water generated will be treated in the Sewage Treatment Plant, and the capacity of Sewage Treatment Plant (STP) will be higher of waste water generated i.e. 3,631 KLD. The proposed STP shall be based on Fluidised Aerobic Bio-Reactor (FAB).

The waste water generation is given in **Table-5**. **Table-6** shows expected characteristic of untreated and treated wastewater.

Table-5: Details of Wastewater Generation from Project

Details	Water (KLD)
Water requirement for domestic purpose	1,693
Wastewater to be generated from domestic use (@ 80% of domestic water requirement)	1,311
Water requirement for Flushing Purpose	1,043
Wastewater to be generated from Flushing (@ 100% of flushing requirement)	1,043
Wastewater to be generated from Washing	966
Wastewater to be generated from Washing (@ 70% of washing water requirement)	677
Total Wastewater generated	3,031

Table-6: Characteristic of untreated and treated sewage

Parameters	Value	
	Raw sewage	Treated Sewage
pH	6.0-9.0	7.0-8.0
BOD ₃ 27°C	250-300 mg/l	Less than 20 mg/l
Suspended Solids	300-400 mg/l	Less than 5 mg/l
COD	400-600 mg/l	Less than 50 mg/l

The waste water generation will be about 3,031 KLD. After treatment in STP approx. 2,818KLD (2425 KLD from STP treatment + 393 KLD from HVAC Condensate) will be available for reuse, which will be used for flushing, horticulture, HVAC and DG Cooling.

2.7. Give details of the water requirements met from water harvesting? Furnish details of the facilities created.

(i) Rainwater Collection Potential for Reuse or Recharging

During the monsoon months, the storm water runoff could be stored and used for bus washing. The proposed rainwater harvesting system would need to be based on environmental and sustainable concepts.

Table-7: Runoff Calculation of the Area

I	Catchment Area	
	Total Roof /Terrace Area	30,871.84
	Green Area	33,413.28
	Paved Area	36,967.23
II	Intensity of Rainfall	
1	Peak rainfall during one hour of rainfall (mm)	11
	Peak rainfall intensity during one hour of rainfall (m)	0.011
III	Co-efficient and Factors Adopted	
1	Runoff Coefficient for roof and terrace	0.8
2	Runoff coefficient for landscape area, garden and park	0.2
3	Runoff coefficient for Paved Area	0.75
IV	Calculation of Rain Water Harvesting	
1	Rain Water Harvesting Potential from Roof	271.67

	top Area	
2	Rain Water Harvesting Potential from Road Area	304.97
3	Rain Water Harvesting Potential from Green Area	73.51
4	Total Run-off water project site	650.16
5	Total volume of storm (15 min retention time)	162.54

Table-8: Numbers of Pits Calculation

6	Diameter of recharge pit	4
7	Depth of recharge pit	5
8	Volume of 1 recharge pit	62.8
9	No. of Pits required	2.588
		Say 3

We are proposing 3 numbers of pits for proposed bus terminal.

2.8. What would be the impact of the land use changes occurring due to the proposed project on the runoff characteristics (quantitative as well as qualitative) of the area in the post construction phase on a long term basis? Would it aggravate the problems of flooding or water logging in any way?

- There will not be such impact as the proposed project will be developed on a land base which is for “Public utility” purpose.
- As the project site is almost plain land and the topography of the site is not anticipated to change due to the project activities, hence, no impacts are expected on the drainage profile or runoff characteristics after construction phase.
- A network of storm water drain is proposed all along the direction along the main roads and cross roads of suitable area size. All storm water drains will be covered with RC slabs so as to prevent the entry of soil and dust. Storm water collected through storm water drains and discharged into existing Storm Water Drains. Storm water drains will be constructed on all the edges of roads.
- The proposed project will have a storm water management system aiming at “Maximum uses of Storm water.”

2.9 What are the impacts of the proposal on the ground water? (Will there be tapping of ground water; give the details of ground water table, recharging capacity, and approvals obtained from competent authority, if any)

Adequate management measures are being taken to protect the water quality during construction phase. Care is being taken to avoid soil erosion. To prevent surface and ground water contamination by oil/grease, leak proof containers shall be used for storage and transportation of oil/grease. The floors of oil/grease handling area shall be kept effectively impervious. Collection and settling of storm water, prohibition of equipment wash downs, and prevention of soil loss and toxic release from the construction site will be adhered to minimize water pollution. **Figure-8** shows hydrogeology map of Patna district. **Figure 9** and **10** showing the water level in Patna in Pre monsoon and Post monsoon period.

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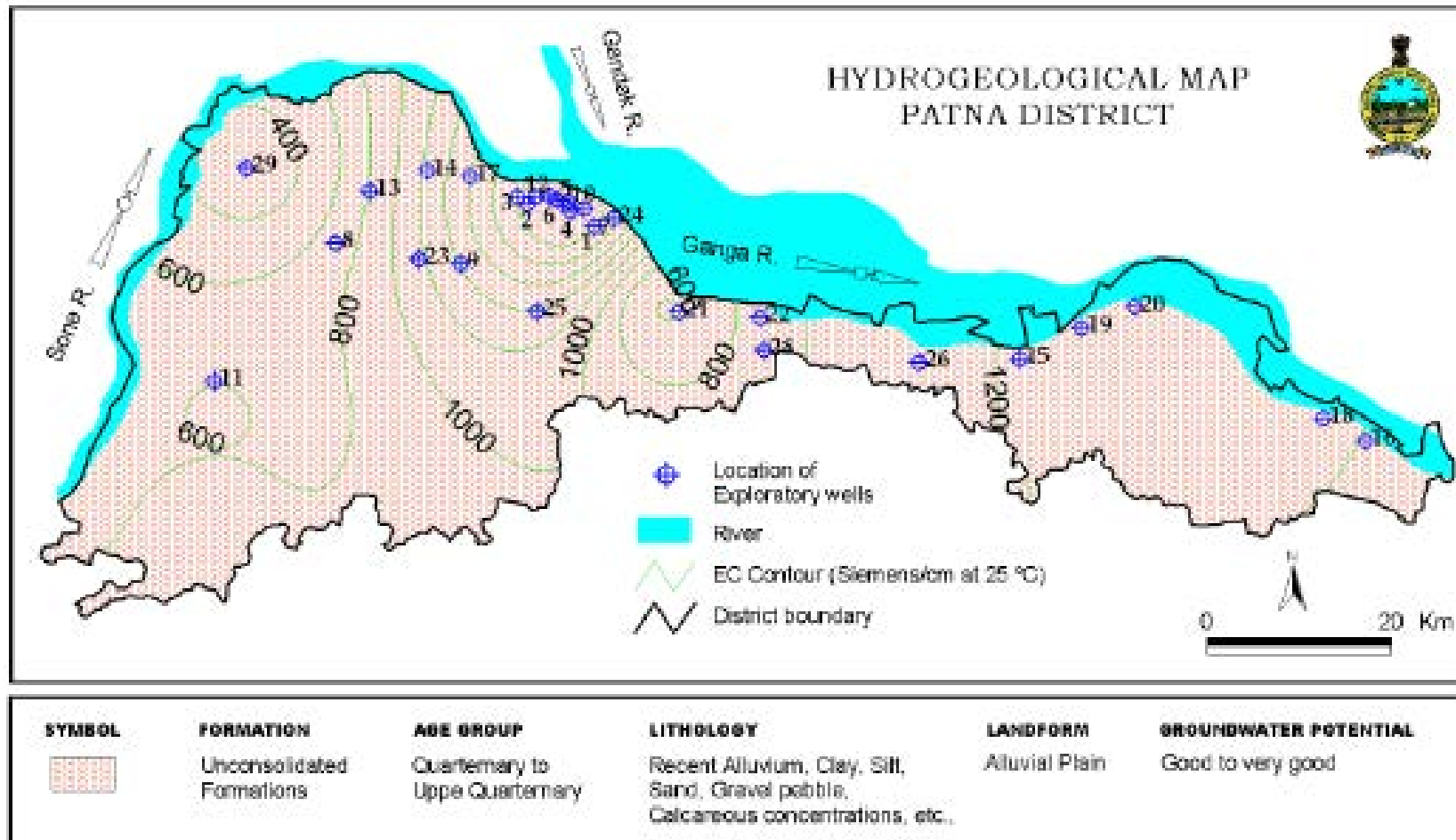
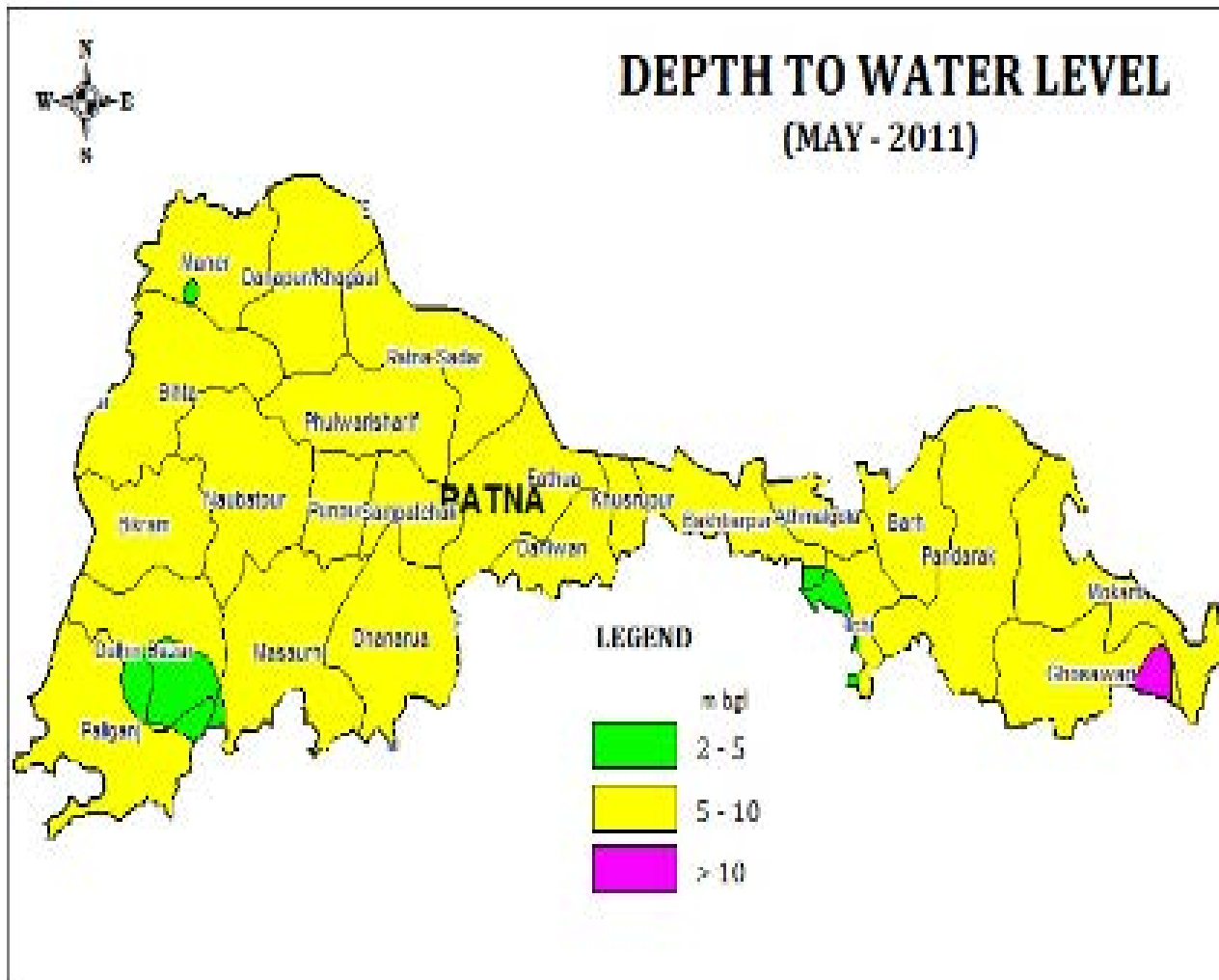


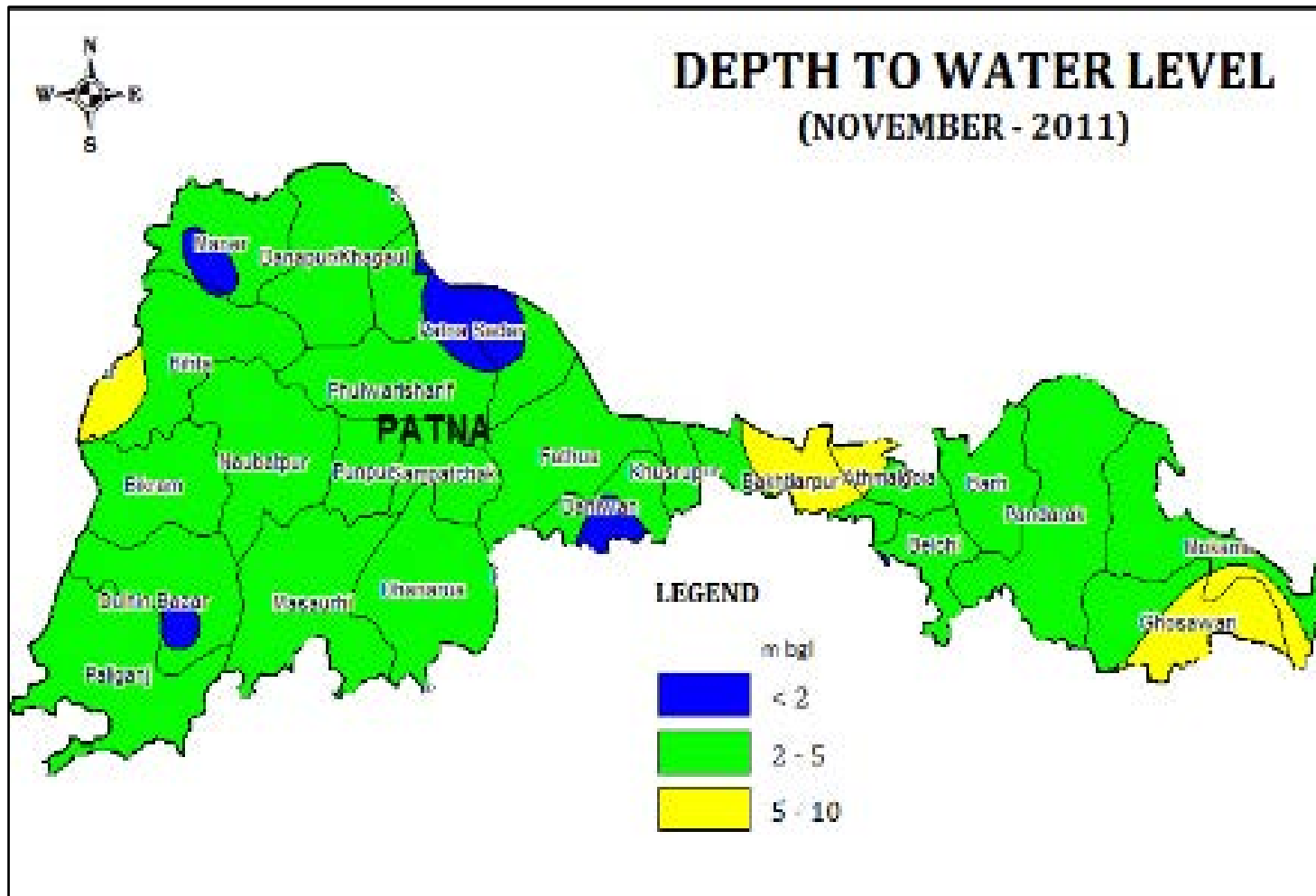
Figure 8: Hydrological map of Patna

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Source:- District Boucher of Patna, CGWB

Figure 9:-Pre- monsoon (2011) depth to water level contours in Patna district, Bihar.



Source:- District Boucher of Patna, CGWB

Figure 10: Post- monsoon (2011) depth to water level contours in Patna district, Bihar.

2.9. What precautions/measures are taken to prevent the runoff from construction activities polluting land & aquifers? (Give details of quantities and the measures taken to avoid the adverse impacts)

The construction shall be taken up on a piece of land which is enclosed from all side. As such there shall not be major impact due to the runoff from construction activities. However, a channel shall be prepared to collect the surface runoff during rains to collect at a place which shall be disposed of to existing storm water drain.

In operation phase most of the storm water produced on site will be harvested for ground water recharge. Thus proper management of this resource must be ensured so that it is free of contamination. A detailed Storm Water Management Plan will be developed which will consider the sources of storm water. The plan will incorporate best management practices which will include the following:

- ✓ Regular inspection and cleaning of storm drains.
- ✓ Installation of clarifiers or Oil/Water separators system of adequate capacity around parking areas and garages as per requirement.
- ✓ Cover waste storage areas.
- ✓ Avoid application of pesticides and herbicides before wet season.
- ✓ Conducting routine inspections to ensure cleanliness.
- ✓ Preparation of spill response plans, particularly for fuel and oil storage areas.
- ✓ Provision of silt traps in storm water drains.
- ✓ Good housekeeping in the above areas.

Precautions /Measures Taken to Prevent the Run-Off from Construction Activities

- **Domestic Wastewater from Toilets:** Additional generation of sewage is not envisaged to be treated and disposed of separately. Existing sewage line with toilet facilities shall be used by then involved construction workers and staff.
- **Site Development and Construction:** The wastewater generation during site development and construction mainly includes the storm water run-off from the construction areas,

stockpiles of construction materials and wastes, etc. mainly containing high suspended solids (SS), in case these activities are undertaken during rainy season.

2.10. How is the storm water from within the site managed? (State the provisions made to avoid flooding of the area, details of the drainage facilities provided along with a site layout indication contour levels).

Most of the storm water will be managed through water sump for the collection of roof top rain water and it will be further used for miscellaneous purposes. The storm water management plan will include practices as stated in **point 2.7**.

2.11. Will the deployment of construction laborers particularly in the peak period lead to unsanitary conditions around the project site (Justify with proper explanation).

No it shall not lead to unsanitary conditions. Additional generation of sewage is not envisaged to be treated and disposed of separately. Existing sewage line with toilet facilities shall be used by then involved construction workers and staff.

2.12. What on-site facilities are provided for the collection, treatment & safe disposal of sewage? (Give details of the quantities of wastewater generation, treatment capacities with technology & facilities for recycling and disposal).

The capacity of Sewage Treatment Plant (STP) for the treatment of wastewater generation from the project will be higher i.e. 3,631 KLD. The proposed STP shall be based on FAB technology.

FLUIDIZED AEROBIC BED REACTOR (FAB)

FAB is a waste water treatment technology which acts as a better alternative to the conventional waste water treatment plants. The conventional treatment plants are large sized, power intensive and require a lot of monitoring. Scarcity of open space geographical network of piping, high power and land cost has made conventional systems obsolete. FAB serves as a great space saving and efficient treatment option.

FAB consists of a tank filled with specially developed media. These media are made of special material of suitable density that can be fluidized using an aeration device through diffusers. A

bio-film develops on the media, which move along the effluent in the reactor. The movement within the reactor is generated by providing aeration with help of diffusers placed at the bottom of the reactor. This thin film on the media enables the bacteria to act upon the bio-degradable matter in the effluent and reduce BOD/COD content in presence of oxygen from the air used for fluidization.

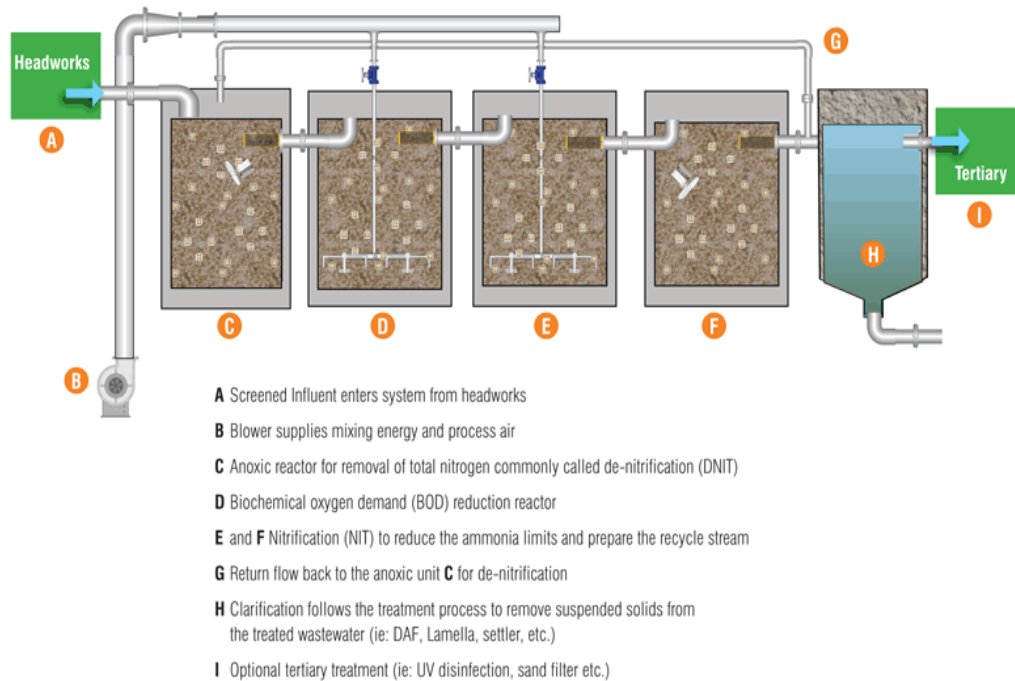


Figure-11: Schematic Diagram of FAB STP

2.13. Give details of dual plumbing system if treated waste is used for flushing of toilets or any other use.

Dual plumbing system that utilizes separate piping systems for freshwater and recycled wastewater will be adopted for the project. Treated water from the STP is estimated at 2,425 KLD. The recycled water system shall utilize this treated water and serve for non-contact uses such as flushing, horticulture, and HVAC etc.

3. VEGETATION

3.1. Is there any threat of the project to the biodiversity? (Give a description of the local ecosystem with its unique features, if any)

There is no anticipated threat to the bio-diversity of the study area from the proposed project. There are no eco-sensitive areas in the project vicinity.

3.2. Will the construction involve extensive clearing or modification of vegetation? (Provide a detailed account of the trees & vegetation affected by the project)

No, the project does not involve any clearing of existing vegetation.

3.3. What are the measures proposed to be taken to minimize the likely impacts on important site features (Give details of proposal for tree plantation, landscaping, creation of water bodies etc along with a layout plan to an appropriate scale?)

The following steps were taken to minimize the likely impacts on the surrounding environment.

- As per the Forest Conservation Act, 1980. The compensatory afforestation plan will be prepared, if required for the recovery of greenery loss due to construction activities.
- The Green Belt is proposed for clean, healthy and beautiful green environment for the people to live in and work in.
- Within the proposed project site green belt to be developed by plantation of various species of plants, shrubs to create a clean, healthy and aesthetic environment that provides a visual retreat and relaxation to the occupants of the project. A combination of evergreen trees and ornamental flowering trees and shrubs is used in the project site.
- The plantation arrangement would be based on optimal use of available land and quantum of irrigation water and treated waste water.
- The capability of plants to act as a sink for air contaminants has been addressed by a number of reviews. Various studies indicate that the surface of vegetation provides a major filtration and reaction surface to the atmosphere for removing pollutants from the atmosphere. Therefore, the green belt is essential feature of any developmental project because it acts as a pollution cleaning region, improvement of the aesthetic value of the project and a noise buffer.

- The procedure for tree felling and forest land diversion (if evolved) to be minimize or issue to addressed as per the guidelines of the Forest (Conservation) Act, 1980.

4. FAUNA

4.1. Is there likely to be any displacement of fauna- both terrestrial and aquatic or creation of barriers for their movement? Provide the details.

There will not be any type of displacement or any other effect on the local fauna due to proposed project activities.

4.2. Any direct or indirect impacts on the avifauna of the area? Provide details.

The following impacts to be observed after completion of the project.

- After green belt development, the planted trees and shrubs will provide shelters and shed especially to the birds and other domesticated animals and human being.
- Within the proposed project site, proper landscaping has been planned to provide a clean, healthy, and beautiful green environment for the people to live and work in.
- The common native variety of trees and ornamental flowering species will be planted in the green space.
- The vibration raised during construction will affect the movement of birds during day time.
- The monitoring to be done for regular checkup of the pollution raised by construction activities. That should not above the prescribed limit as per CPCB norms.

4.3. Prescribe measures such as corridors, fish ladders etc to mitigate adverse impacts on fauna.

These measures are not applicable for this project.

5. AIR ENVIRONMENT

5.1. Will the project increase atmospheric concentration of gases & result in heat islands? (Give details of background air quality levels with predicted values based on dispersion models

taking into account the increased traffic generation as a result of the proposed constructions)

Definitely increased traffic generation due to development of bus terminal is going to cause significant increase in atmospheric concentration of gases and but we ensure that it will not generate heat island formation by proper checking and proper maintenance of vehicles..

5.2. What are the impacts on generation of dust, smoke, odorous fumes or other hazardous gases? Give details in relation to all the meteorological parameters.

Construction Phase:

During construction phase there is increased generation of dust and smoke from the background levels.

There is no activity associated with generation of odorous fumes and any hazardous gases during construction phase.

The main sources of dust generation are land clearing, drilling, ground excavation, cut and fill operations (i.e., earth moving), and construction of a particular facility. A large portion of the dust emissions results from equipment traffic over temporary roads at the construction site.

Measures taken during Transport and Handling of Materials during Construction

The transport and handling of materials during construction has potential impacts on air quality in the vicinity. Thus the following mitigation measures are being adopted to minimize the impacts.

Air Emissions

- **Dust Suppression:** The most cost-effective dust suppressant applied to mitigate airborne dust is water, because of its efficiency as well as ready availability on the construction site. Water shall be applied using handheld sprays and automatic sprinkler systems. Water spray at the work site also effectively suppresses dust generated. Results have proven that for about 80% of such active area(s), the water spray suppresses airborne dust by about >90%.

Table-9: EMP for Dust Suppression

Sources/Process	Emission Potential	Scope of Control	Effectiveness
Hydraulic excavators and loaders (e.g Front loader, backhoe face shovel bulldozers) for the excavation, lifting and movement of material such as Soil, overburden.	High when dry or fine silty material are being handled, particularly during strong windy weather	Use of water sprays to moisten material being handled. Soils may be subject to a soil moisture content planning condition	Moderate
	Low when coarse or wet material are being handled during conditions of low wind speed	Minimize drop heights when unloading material. Protect from exposure to wind where possible.	
Vehicles for transport of material within the site.	High particularly when travelling over unsurfaced and dry site roads.	Minimize onsite transportation distances.	High
		Use of water sprays to moisten road surfaces during dry weather.	
		Use mechanical road sweepers during dry weather, to, limit visible dust emissions. Restrict vehicle speeds through signage/staff training.	
		Use of covered conveyors to transport material around the site.	

- **Emission Control for Construction Equipment/Vehicles:** Construction equipment and heavy transport vehicles meet emission standards like Bharat Stage - IV requirements for

vehicles. The operation and maintenance of all vehicles, equipments deployed on site by different contractors are being regulated and effectively monitored. The Pollution under Control (PUC) certification is being ensured for proper O&M of vehicles.

- **Improved Maintenance:** Recognizing that significant emission reductions can be achieved through regular equipment and vehicle maintenance, all site contractors have been asked to take necessary steps for proper maintenance of vehicle and equipments. A monetary incentive/ disincentive provision encourages contractors to comply with regular maintenance requirements. The fuel used in the equipments, and vehicles is of good quality with low “Sulphur” percentage by following the norms prevailing in project area.
- **Reduction of On-site Construction Time:** The heavy construction activities are being confined to the daytime to avoid higher impacts during the nighttime. During daytime, there is higher atmospheric dilution. Rapid on-site construction reduces the duration of traffic interference and therefore, reduces emissions from traffic delay. Off-site fabrication of various moulded structural components, obtaining proper cut size of stone, pre-fabricated concrete slabs, etc. also enhance the quality of work environment at the construction site because other factors such as traffic congestion and emissions are then not relevant.
- **Barrier around the Site:** Besides the project site is enclosed by about 2.5 m high temporary barrier during the whole construction period so that the spread of dust to the neighborhood shall be restricted.

Operation Phase:

The land use of the site is designed to have open areas covered with either soft or hard landscape and paved areas (roads and pedestrian walkways). This will mitigate dust emissions in any meteorological conditions.

5.3. Will the proposal create shortage of parking space for vehicles? Furnish details of the present level of transport infrastructure and measures proposed for improvement including the traffic management at the entry & exit to the project site.

No, the proposed project will not create shortage of parking space for the vehicle. The parking bays are calculated based on the traffic surveys and forecasts. The bus bays are 194 in number.

5.4. Provide details of the movement patterns with internal roads, bicycle tracks, pedestrian pathways, footpaths etc., with areas under each category.

Internal road and traffic movement are shown in site plan.

5.5. Will there be significant increase in traffic noise & vibrations? Give details of the sources and the measures proposed for mitigation of the above.

Sources of traffic noise & vibrations in construction phase:

Construction vehicles (Majorly Trucks & JCBs, Road rollers etc.)

The trucks carrying materials such as concrete bags, construction debris etc. is being serviced regularly and there is speed limit for all the vehicles moving within the project site. Proper maintenance of the internal roads is being carried out, encourage vehicle owners to not to blow horns. The movement of vehicles has been restricted to day time so as to reduce the disturbances in nearby areas of project site during night.

Sources of traffic noise in operation phase:

Project itself a interstate bus terminal project so there will be slight increase in noise due to load of buses per day but project will has proper take care against noise increment. Apart from buses Light motor vehicles & 2-wheelers, hired taxis and auto will be major sources of noise increment.

To mitigate the noise effects vehicle owners will be encouraged for regular checks of their vehicles. Moreover the effect of noise will be further minimized by plantation on the sides of internal roads, on the open spaces inside and around the periphery of whole project site and by minimum use of horn blow.

5.6. What will be the impact of DG sets & other equipment on noise levels & vibration in & ambient air quality around the project site? Provide details.

In case of power failure, 3 DG sets of total capacity of 6000 KVA (3*2000) will be provided as power back-up for the expansion buildings. The DG sets will be of water cooled.

Calculation of DG Stack Height:

Stack Height for D.G. set capacity more than 1010 KVA:

$H=14*Q^{0.3}$ ----- (As per CPCB norms for D.G. sets commissioned after 1.7.2003)

Where,

H= Maximum Stack Height in Meter (m)

Q= Total SO₂ emissions from D.G. sets in kg/hour

As per "The motor sprit and High speed Diesel (Regulation of supply and distribution and Prevention of Mal practices) Order,1998" the content of sulphur in HSD shall be maximum of 0.25 % after 2000.

Sulphur content in HSD =0.25%

Density of HSD= 0.85 kg/liter

D.G. Set Capacity = 6000 KVA

Fuel Consumption for combined DG set capacity of 6000 KVA = 399 *3lit/hour=1197 lit/hr

Sulphur content in fuel =0.25%

Density of HSD= 0.85 kg/liter

Sulphur Content in whole fuel=299.25%

=2.99 Li/hr

= 2.543625Kg/hr

SO₂ Emission (Q)= 5.08725 Kg/hr

Applying,

$H= 14*Q^{0.3}$

= 22.8072 ~ 22 m

We suggest a stack height of 6 m from the roof of building

Impact of D.G. sets on noise & vibration and mitigation measures to be adopted in construction and operational phase:

D.G. sets if not enclosed in acoustic enclosures will contribute to significant increase in noise levels at the project site.

However the D.G. sets used during construction and operation phase will be enclosed in an acoustic enclosure to reduce the noise. The DG sets foundation will comprise of heavy weight inertia concrete block. The generator will be mounted on Cushy Foot mounting and the concrete block will be isolated from the adjoining floor. Thus no vibration impacts are expected from the DG sets.

The D.G. sets will be checked for noise every 6 months.

The noise level of DG sets will be maximum 75dB (A) (at 1.0 m distance) & the insertion loss will be maintained at minimum 25 db as per the prescribed compliance standards of the MoEF {Noise pollution (regulation & control) (Amendment) rule 2010}.

Impact of D.G. sets on ambient air quality and mitigation measures to be adopted:

The D.G. Set emission consist of following pollutants

1. Hydrocarbon+ NO_x
2. Carbon Monoxide (CO)
3. Particulate Matter (PM)
4. Smoke

If unchecked the emissions from D.G sets will increase the concentration of above mentioned pollutants in the atmosphere. To mitigate the polluting effects of D.G. sets following mitigation measures will be taken,

- A. Use of High Speed Diesel as a fuel to run D.G. sets
- B. Provision of stack with height as prescribed by Central Pollution Control Board.

C. Emission test of D.G. stacks every 6 months to check the concentration of pollutants.

6. AESTHETICS

6.1. Will the proposed constructions in any way result in the obstruction of a view, scenic amenity or landscapes? Are these considerations taken into account by the proponents?

The site lies in well planned area designated for “public utility” purposes. Thus, no obstruction of view or scenic beauty or landscape is anticipated. Furthermore, the construction is being done in such a way that the organized open spaces and landscaped areas will render the plot aesthetically appealing.

6.2. Will there be any adverse impacts from new constructions on the existing structures? What are the considerations taken into account?

There will not be any adverse impacts from new constructions on the existing structures as the proposed development shall be carried out as per the defined Bihar building by-laws. All precautions are being taken to mitigate the impact due to water air and noise pollution during construction the construction phase and same will be followed during the operation phase.

6.3. Whether there are any local considerations of urban form & urban design influencing the design criteria? They may be explicitly spelt out.

There is no local consideration of urban form and urban design criteria. The proposed project will be constructed within the designated site as per the defined building bye laws of Bihar.

6.4. Are there any anthropological or archaeological sites or artifact nearby? State if any other significant features in the vicinity of the proposed site have been considered.

Within the project influence area, there are no significant archeological sites or artifacts nearby. Since all the activities whether during the construction or operation stage, will be carried out in the project premises hence no impact on any type of archeological monuments are envisaged.

7. SOCIO-ECONOMIC ASPECTS

7.1. Will the proposal result in any changes to the demographic structure of local population?

Provide the details.

Establishment of any project like plotted development leads to socio-economic changes. Influx of population leads to change in social & economic status of the community. During construction period local people will be engaged and hence there will be demand of 700 workers (peak labour), till construction complete.

7.2. Give details of the existing social infrastructure around the proposed project.

School:

- Anand international school: Adjacent towards WSW
- Adelaide Convent school: Adjacent towards North West
- Camford Public School: Adjacent towards WSW

7.3. Will the project cause adverse effects on local communities, disturbance to sacred sites or other cultural values? What are the safeguards proposed?

No, the proposed development will not have adverse effects on local communities. On the contrary, it is expected that there will be major positive impacts due to development of the bus terminal. Positive impacts would include improvement of ease in transport and economic condition of society indirectly.

8. BUILDING MATERIALS

8.1. May involve the use of building materials with high-embodied energy. Are the construction materials produced with energy efficient processes? (Give details of energy conservation measures in the selection of building materials and their energy efficiency).

The main construction materials being utilized in the construction of the proposed project include cement, stone aggregate, Coarse sand/fine sand, Steel, Sand Stone, Granite/Marble, Bricks, and Blocks, glass etc.

The embodied energy content of the material is given in **Table-10**.

Table-10: Embodied Energy Content of the Material

Primary Energy Requirement	Materials	Primary Energy Requirement (Gj/tonne)
Very High Energy	Aluminum	200-250
	Stainless steel	50-100
	Plastic	100+
	Copper	100+
	Steel	30-60
	Lead	25+
High Energy	Glass	12-25
	Cement	5-8
	Plasterboard	8-10
	Lime	3-5
Medium Energy	Clay bricks and tiles	2-7 1-4
	Gypsum Plaster	<0.5
	Concrete	
	Sand, aggregate	

Source: Manual on norms and standards for environment clearance of large construction projects, MoEFCC

- These construction materials will be procured from the reputed suppliers/manufacturers and thus it is expected that they are produced with energy efficient processes. Most of the quality grade building material production facilities and industries now use energy efficient processes.
- All the items to be used in the proposed project will be as per the National Building Code specification. If the building materials with high-embodied energy are locally available, it will be used in construction.

8.2. Transport and handling of materials during construction may result in pollution, noise & public nuisance. What measures are taken to minimize the impacts?

The transport and handling of materials during construction phase has potential impacts on air and noise emissions in the vicinity. To control this, various mitigation measures shall be adopted to minimize the impacts.

Air Emissions

Dust Suppression: The most cost-effective dust suppressant applied to mitigate airborne dust is water, because of its efficiency as well as ready availability on the construction site. Water is being applied using water trucks, handheld sprays and automatic sprinkler systems. Water spraying at the site also effectively suppresses dust generated. Results have proven that for about 80% of such active area(s), the water spray suppresses airborne dust by about >90%.

Emission Control for Construction Equipment/Vehicles: Construction equipment and heavy transport vehicles meet emission standards like Bharat Stage - IV requirements for vehicles. The operation and maintenance of all vehicles, equipments to be deployed on site by different contractors shall be regulated and effectively monitored. The Pollution under Control (PUC) certification are being ensured for proper O&M of vehicles.

Improved Maintenance: Recognizing that significant emission reductions can be achieved through regular equipment and vehicle maintenance, all site contractors have been asked to take necessary steps for proper maintenance of vehicle and equipments. A monetary incentive/disincentive provision encourages contractors to comply with regular maintenance requirements. The fuel to be used in the equipments and vehicles shall be of good quality with low “Sulphur” percentage by following the norms prevailing in project area.

Reduction of On-site Construction Time: The heavy construction activities are being confined to the daytime to avoid higher impacts during the nighttime. During daytime, there is higher atmospheric dilution. Rapid on-site construction reduces the duration of traffic interference and therefore, reduces emissions from traffic delay. Off-site fabrication of various moulded structural

components, obtaining proper cut size of stone, pre-fabricated concrete slabs, etc. shall also enhance the quality of work environment at the construction site because other factors such as traffic congestion and emissions are then not relevant.

Noise Emissions

- The mitigation measures concerning technological control at source (of vehicles) shall meet the minimum compliance requirements for manufacturing stage. Besides these, other measures shall be of preventive nature as follows:
- **Restriction of Time of Construction:** The heavy construction and transport activities are being restricted to daytime operation when the background noise levels are high so that impacts like sleep disturbance during the night time are avoided.
- **Provision of Noise Barrier:** No extra barrier has been provided because it is within the premises of the project site.
- **Proper Maintenance of Construction Equipment/Vehicles:** Proper operation and maintenance of heavy equipment as well as transport vehicles are being ensured for lower noise emissions.
- **Occupational & Passive Protection:** Ear plugs, ear muffs, etc. have been provided to workers handling high noise equipment or stone cutting operations shall protect them from high noise exposure.

8.3. Are recycled materials used in roads and structures? State the extent of savings achieved?

Fly ash used materials would be utilized for paving work etc, if viable. Also, the construction waste (particularly the construction debris) will be used on the project site for leveling purposes. An approximate saving of 5% to 7% is proposed to be achieved.

8.4. Give details of the methods of collection, segregation & disposal of the garbage generated during the operation phases of the project.

Solid Waste during Operation Phase

Solid waste and other waste to be generated from the proposed project will be classified as given in **Table-11**.

Table-11: Classification of Solid Wastes and other Wastes

S. No.	Types of Solid waste and other waste	Description
1.	Food Waste (garbage)*	Wastes from the kitchen including preparation, cooking and serving of food.
2.	Rubbish*	Combustible (Primary Organic): Paper, cardboard, cartons, wood, boxes, plastics, rags, cloths, beddings, leather, rubber, grass, leaves. Non-combustibles (Primary Inorganic): Metals, tin cans, metals foils, dirt, stones, bricks, ceramics, crockery, glass bottles, other metal refuses.
3.	Street Waste*	Street sweeping, dirt, leaves, catch basin dirt, animal dropping, contents of litter receptacles dead animals.
4.	Horticultural waste*	Tree trimming, leaves, waste from parks and gardens etc.
5.	General domestic waste from office and administration	Paper, General Domestic Waste etc.
6.	STP Sludge	Sludge generation after treatment of sewage in STP.

****Source: Manual on Municipal Solid Waste Management, published by Central Public Health and Environmental Engineering Organization (CPHEEO), Ministry of Urban Development, Government of India.***

- The proposed project is expected to generate certain types of wastes which would include both non-hazardous and some hazardous wastes. The non-hazardous wastes generated at the project would be municipal solid waste including paper & cardboard wastes, food wastes, plastic wastes etc. STP sludge and other solid waste would also generate.

- It is estimated that total quantity of municipal solid waste generated will be approx. 23,916.45 kg / day from the proposed project.

Collection:

The solid waste expected to be generated by the passengers or by staffs.

Segregation:

- The solid waste expected to be generated by the population in the proposed project can be broadly categorized into bio-degradable and non-biodegradable. These solid wastes will be collected separately by putting three types of separate bins at the source of generation. For the biodegradable waste green bins will be provided, for the recyclable waste blue bins and for the non-recyclable waste dark grey bins will be provided.

Disposal:

- Organic waste will be stored temporarily at the site and it will be disposed at the MSW site for composting.
- Overall it would be ensured that all waste fractions are appropriately recycled/ disposed of through authorized recyclers/re-refiners/contractors. Records will be kept regarding amount and characteristics of all types of wastes.
- Paper & cardboard wastes, plastic wastes, metal wastes and other recyclable wastes will be sold to authorized contractors.
- The STP sludge will be properly collect, store and used as manure or will be disposed through authorized agencies/or used for horticultural purposes.
- As regards hazardous wastes, the building management staff of the proposed project will review the proposed operations and make a thorough "*applicability analysis*" of the *Hazardous Waste Rules*, to identify specific wastes, to be generated in the proposed project, that shall be categorized as hazardous wastes. The management staff would then manage hazardous waste as per the prevailing rules. The management staff of the proposed project would ensure compliance with all the conditions on a continual basis.
- Hazardous wastes shall be stored in secured places with adequate secondary containment and labelling as per the requirements of Hazardous Waste Rules.

- Appropriate records of hazardous wastes generation and disposal (in *Form-3, Form-4, Form-9, Form-13 etc.*) shall be maintained as per the requirements of MoEFCC's Rule.

9. ENERGY CONSERVATION

9.1. Give details of the power requirements, source of supply, backup source etc. What is the energy consumption assumed per square foot of built-up area? How have you tried to minimize energy consumption?

The total electrical load demand has been estimated to be 6245 KVA. The possible sources of power will be State Electricity Supply.

In case of power failure, 3 DG sets of total capacity of 2000 KVA (3*2000) will be provided. The DG sets are water cooled type.

The DG sets will be provided with acoustic enclosure. Adequate stack heights of D.G. Sets will be provided as per the stipulated guidelines of Central Pollution Control Board (CPCB) to facilitate natural dispersion of exhaust gases.

Energy Conservation Measures:

All efforts are being taken to make the building in accordance with Energy Efficiency Features of Green Building concept by using various techniques.

- LED light fittings will be installed in all areas to conserve electricity and all electrical appliances shall be of star rating and occupancy sensors
- Solar water heaters will be installed on the roof of buildings for supply of hot water
- PV Cell system will be installed for all street and compound lighting and is part of the power requirement.
- Roofs will be insulated with rigid polyurethane foam to reduce the heat gain through the roof
- Use of electrical fittings, fans, A/c pumps and plants with ultra-star rating to save electricity
- Rain water harvesting and provision of sewage treatment plant and re-use of waste water for flushing and gardening

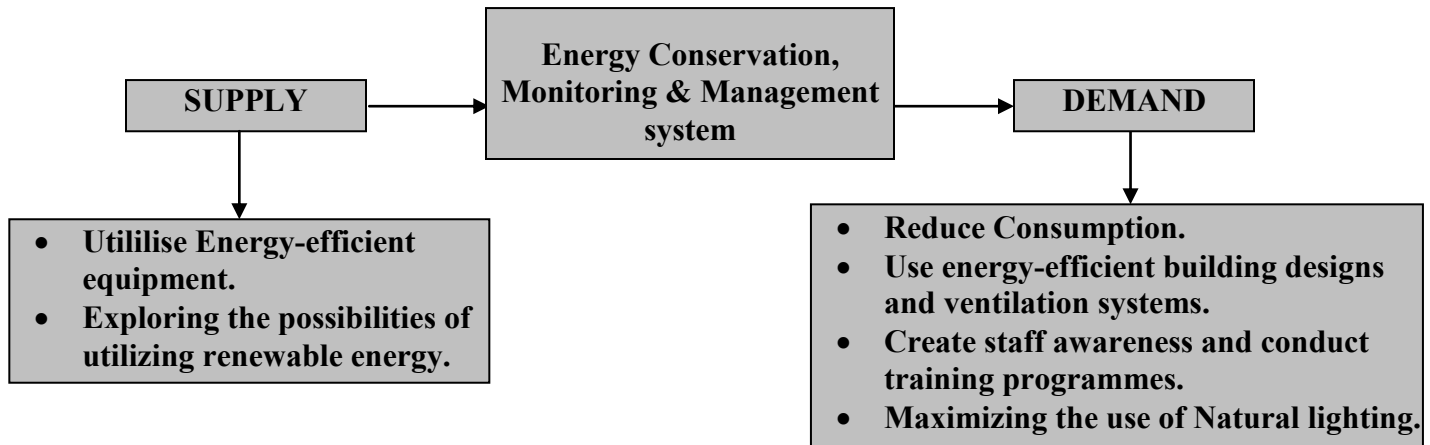
Proposed Inter State Bus Terminal (ISBT) at Khata no.-660, 662,100,336,313, Plot no.-1348, 1349, 1400, 1416 Mauza Pahari (Patna- Gaya Road) district Patna, State Bihar.

- Use of permanent, durable and local materials with low heat transmission reflective glass would ensure sustainable development.
- Use of natural cooling & ventilation system resulting in savings in HVAC system.
- Use of recycled waste water for horticulture purpose by providing STP system.
- Zero or near zero discharge from the building both solid and liquid.
- Use of waste efficient sanitary fixtures to reduce water use and use of treated effluent.
- Mineral fiber heat resistant terrace tiles with SRI (Solar Reflective Index) more than 78; Solar reflection > 0.70, on waterproof roof surface to save energy as per green building norms.
- Hermetically sealed double glass with air gap in windows to meet the Green Building norms.
- High efficiency lighting fixtures and occupancy sensors.
- Services like water supply, electrical cables etc. planned through service ducts.

The proposed project will adopt various energy conservation measures. The range of these energy efficiency measures can be broadly categorized under:

- Architectural Design Features;
- Energy saving preventive practices; and
- Behavioral change and raising awareness.

Energy conservation program will include measures taken for both energy demand as well as supply management.



The Energy Conservation efforts may consist of the following mitigation measures:

a. Architectural Design Features

- Most of the external surface of the building will be design in way to have an air gap between the wall surface and the external skin. This should reduce the transmission of heat into the building as the heat would get dissipated into the air gap to an extent. Landscaping will be carefully considered within the overall architectural concept.

b. Energy Saving Practices:

- Purchase of energy efficient appliances.
- Constant monitoring of energy consumption and defining targets for energy conservation.
- Adjusting the settings and illumination levels to ensure minimum energy used for desired comfort levels.
- Use of Light Emitting Diodes (LED) and low voltage lighting.

c. Behavioral Change for Reducing the Consumption

- Train all staff and operators for energy efficiency measures.
- Promoting staffs' awareness on energy conservation.
- Training of staffs on methods of energy conservation and to be vigilant of such opportunities.
- Turn on all lights when not in use, especially in conference rooms and turn down remaining lighting levels where ever possible.

Passive Solar Design Considerations

Following are the consideration adopted for passive solar design of the buildings in the proposed project:

- Maximum openings would be towards the north to get natural light that will not unduly heat up the interiors.
- Least opening would be provided towards southern and western walls so as to cut out the hot incident rays of the sun.
- Windows provided would be shaded adequately by designing double layer glass glazing so that no direct rays of sun can come into the building.

Most of the external surface of the building will be designed in a way to have an air gap between the wall surface and the external skin. This should reduce the transmission of heat into the building as the heat would get dissipated into the air gap to an extent.

As an endnote, the design has been a conscious effort to make a modern building with local materials and will not use excessive amount of glass and steel.

9.2 What type of, and capacity of, power back-up to you plan to provide?

In case of power failure, 3 DG sets of total capacity of 2000 KVA (3*2000) will be provided. The DG sets are water cooled type.

The DG sets will be provided with acoustic enclosure. Adequate stack heights of D.G. Sets will be provided as per the stipulated guidelines of Central Pollution Control Board (CPCB) to facilitate natural dispersion of exhaust gases.

9.3. What are the characteristics of the glass you plan to use? Provide specifications of its characteristics related to both short wave and long wave radiation?

Glass panel will have maximum light transmission but low solar heat radiation. This will reduce quantity of heat inflow into the building. Single pane glass of 0.25 inches thickness with visible transmittance up to 85% day lighting may be used.

Wall assembly: – U Value:0.7 W/Sqm⁰K

Outside Plaster + 230 Thick Fly Ash Wall + Inside Plaster

Roof Assembly: U Value: 0.45 0.7 W/Sqm⁰K

Internal Plaster + 150 THK RCC Slab + 50 mm Insulation + 200 Thk Brick Bat Coba+ Tile Finish

Glass Assembly:

U Value: 5.00 Or less, SHGC: 0.58 or less, VLT: 50% of higher

9.4. What passive solar architectural features are being used in the building? Illustrate the applications made in the proposed project.

Passive solar design in Architecture: Solar design is the use of architectural features to replace the use of grid electricity and fossil fuel with the use of solar energy and decrease the energy needed in a home or building with insulation and efficient lighting and appliances.

Architectural features used in solar design includes:

- Large south facing windows and minimum north-facing glazing.
- Use of materials with high thermal masses such as walls or roofs that absorbs and hold the sun's heat. Materials with high specific heat capacities, like stone, concrete, adobe or water work bests.
- Insulation to reduce heat loss
- Sunspaces such as conservatories on south-facing elevations. These collect heat which can be distributed throughout the building and reduce heat losses by creating thermal buffer.
- Insulating shutters for windows to be closed at night and on overcast days. These trap the solar heat in the building.
- Planting deciduous trees near the windows. The leaves will give shade in summer but falls in winter to let the sunlight enter the building.

9.5. Does the layout of streets & buildings maximize the potential for solar energy devices?

Have you considered the use of street lighting, emergency lighting and solar hot water systems for use in the building complex? Substantiate with details.

Yes, the streets and building is designed to maximize the potential of solar energy devices.

9.6. Is shading effectively used to reduce cooling/heating loads? What principles have been used to maximize the shading of Walls on the East and the West and the Roof? How much energy saving has been effected?

Yes. Shading has been effectively used to reduce the cooling loads. The following techniques have been adopted:

- For walls on the east and west side of the building a maximum of 10% window to wall ratio is recommend to minimize solar radiations, which further helps minimize cooling/ventilation.
- Living areas to be aligned to get maximum north south light and services areas are to be located on the western side.
- Shading is used to increase cooling effects in the building.
- There will be less numbers of openings on the west side and ore numbers of openings on south side
- Projections such as balconies are provided on the south direction such that summer sun is stopped and winter sun is let in.
- Promoting residents awareness on energy conservation.

9.7. Do the structures use energy-efficient space conditioning, lighting and mechanical systems? Provide technical details. Provide details of the transformers and motor efficiencies, lighting intensity and air-conditioning load assumptions? Are you using CFC and HCFC free chillers? Provide specifications.

Suitable energy optimization will be adopted during the calculation of the energy load of the proposed project. The space heating load will be minimized using passive solar structure, suitable building envelop materials. Use of incandescent and halogen lamps will be avoided and energy efficient compact fluorescent lamps /LED will be used for all common area.

9.8. What are the likely effects of the building activity in altering the micro-climates? Provide a self-assessment on the likely impacts of the proposed construction on creation of heat island & inversion effects?

Heat emission from the proposed construction can be from the following sources: Heat absorbed from the paved and concrete structures, heat generated from equipments / appliances, and due to increased population in the proposed project site. However the heat generated will not be significant and will be dissipated in the lush greens and open areas provided within the project site. Hence it can be concluded that the heat island effect shall not be a concern for the concerned project.

Moreover, Green cover will be provided at site and will incorporate such design considerations that control formation of heat islands.

The buildup of indoor air contaminants is contributed by inadequate ventilation, contamination from inside and outside the building, besides microbial contamination and contamination from building fabric. The measures proposed for maintaining indoor air quality is presented in **Table 12**.

Table 12: Indoor air contaminants, Source and Health Effects

Sr.no.	Indoor air contaminant	Source	Health Effects	Measure to be considered
1.	Volatile organic compounds (VOCs)	Paints, Cleaning compounds , glues, photocopiers, “Spirit duplicators, signature machines, Tobacco smokes, dried out floor drains, cosmetics and other personal products	Nausea, Dizziness, Eye, respiratory tract, mucous membrane irritation, headache and fatigue	Adequate ventilation
2.	Miscellaneous inorganic gases which included	Window cleaners, acid drain cleaners, combustion products, tobacco smoked , blue print	Eye, respiratory tract, mucous membrane	Adequate ventilation

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	ammonia, Hydrogen sulfide, sulphur dioxide	equipment	irritation , aggravation of chronic respiratory diseases.	
3.	Asbestos	Insulation and other building material such as floor tiles dry wall compounds, reinforces plaster	Asbestos is normally not a source of acute health effects. However, during renovation or maintenance operations asbestos may be dislodged and become airborne.	Avoidance of use of asbestos in buildings and equipments to the extent possible.
4.	Synthetic fibers	Fibrous glass and mineral wool	Irritation to the eyes, skin and lungs dermatitis	Avoid use of these material in insulation
5.	Carbon Dioxide	Unvented gas, improperly vented devices, processes or operations, which produce combustion products, human respiration.	Difficulty concentrating, drowsiness, increased Respiration rate.	Proper venting any combustion equipment.
6.	Carbon Monoxide	Fossil-fuel engine exhausts, improperly vented fossil-fuel appliances.	Dizziness, headache, nausea, cyanosis, Cardiovascular effects and death.	Adequate venting and ventilation.
7.	Nitrogen Oxides	Combustion products from gas	Eye, respiratory	Adequate venting

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		furnaces and appliances, tobacco smoke, welding, and gas and diesel engine exhausts.	and mucous membrane irritation.	of combustion stacks.
8.	Ozone	Copy machines, electrostatic air cleaners, electrical arcing, and smog	Eye, respiratory tract, mucous membrane irritation; aggravation of chronic respiratory diseases.	Adequate ventilation.

9.9. What are the thermal characteristics of the building envelope? (a) roof; (b) external walls; and (c) fenestration? Give details of the material used and the U-values or the R values of the individual components.

The building envelope for external walls will be made of bricks, concrete and steel. The R and U values building material will be considered as per ECBC norms at the designing stage. The Thermal characteristic is provided in **Table-13** below:

Table-13: Thermal Characteristic of Building

S.No.	Building Envelope	U-Factor (W/m ² -°C)	R-Value (m ² -°C/W)
1	Roof	0.409	2.1
2	Opaque wall	0.44	2.1
3	Vertical Fenestration	3.30 (max.)	SHGC:0.25(max) (for WWR less than or equal to 40%)

9.10. What precautions & safety measures are proposed against fire hazards? Furnish details of emergency plans.

Adequate fire protection facilities will be installed including fire detectors, fire alarm and firefighting system. All fire protection facilities would be designed as per the National Building Code.

Response in case of Fire

- Required response during in the event of a fire should be described in signs located in the lobby.
- On sighting a fire, it should be immediately informed to the environment manager giving the exact location and type of fire in detail.
- Initiate the Emergency Response Team for fires.
- If the fire is small, engage in extinguishing the fire using the nearest fire extinguisher.
- Guide the Emergency Response Team staff to the emergency assembly point.
- The Emergency Response Team should immediately inform the nearest dispensary and security force. If required a fire tender should be summoned.
- The response team should immediately move to the point of fire and take all necessary steps to stop the fire. If the fire is not controllable and spreads then the manager in charge should inform the district authorities and call for external help.
- The Emergency Response Team will provide immediate relief to the injured residents at the scene of incident. Any injured persons should be evacuated on priority to the dispensary or one of the nearest hospitals based on their condition.

General Instructions for Occupants in case of Fire

- Get out of buildings as quickly and as safely as possible.
- Use the stairs to escape. When evacuating, stay low to the ground.
- If possible, cover mouth with a cloth to avoid inhaling smoke and gases.
- Close doors in each room after escaping to delay the spread of the fire.
- If in a room with a closed door.
- If smoke is pouring in around bottom of the door or if it feels hot, keep the door closed

- Open a window to escape or for fresh air while awaiting rescue.
- If there is no smoke at bottom or top and the door is not hot, then open the door slowly
- If there is too much smoke or fire in the hall, slam the door shut.
- Stay out of damaged buildings.
- Check that all wiring and utilities are safe.

Firefighting system is proposed to prevent and control fire outbreaks for the project. The firefighting system will consist of portable fire extinguishers, hose reel, wet riser, yard hydrant, automatic sprinkler system, and manual fire alarm system. The project will also be provided with automatic fire detection and alarm system.

9.11. If you are using glass as wall material provides details and specifications including emissivity and thermal characteristics.

Glass panel will have maximum light transmission but low solar heat radiation. This will reduce quantity of heat inflow into the building. Single pane glass of 0.25 inches thickness with visible transmittance up to 85% day lighting may be used.

The Single pane glass (clear/tinted) with a transmission coefficient of ‘U factor’ as $3.3 \text{ W/m}^2 \text{ } ^\circ\text{C}$ (for clear) and ‘U factor’ as $3.4 \text{ W/m}^2 \text{ } ^\circ\text{C}$ (for tinted) may be used for composite climate zone. The Solar heat gain coefficient (SHGC) is 0.59 (clear) and 0.42 (tinted).

9.12 What is the rate of air infiltration into the building? Provide details of how you are mitigating the effects of infiltration.

Reduced air infiltration combined with proper ventilation can not only reduce energy bills but it can also improve the quality of indoor air. Outdoor air that leaks indoor makes it difficult to maintain comfort and energy efficiency. In addition, air leakage accounts for 25-40% energy used for heating and cooling in a typical building. For this purpose the building has been designed in a compact manner, leaving ventilation shaft in between buildings for facilitating the escape of hot exhaust air.

9.13 To what extent the non-conventional energy technologies are utilized in the overall energy consumption? Provide details of the renewable energy technologies used.

- The Energy efficient lighting will be done with the use of CFL and LED lamps. Additionally solar energy will be explored.
- Use of Solar energy for street lightening will be explored.

10. ENVIRONMENT MANAGEMENT PLAN

10.1. The Environment Management Plan would consist of all mitigation measures for each item wise activity to be undertaken during the construction, operation and the entire life cycle to minimize adverse environmental impacts as a result of the activities of the project. It would also delineate the environmental monitoring plan for compliance of various environmental regulations. It will state the steps to be taken in case of emergency such as accidents at the site including fire.

The mitigation measures suggested for the impacts identified on the various environmental components due to the project activities are given in this section. A detailed environmental management plan is presented in **Table-14** to mitigate all the identified environmental impacts that are found to be significant.

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Table-14: Environmental Management Plan – Construction Phase and Operational phase

S.No.	Environmental components	Potential Impacts	Potential Source of Impact	Controls Through EMP & Design	Impact Evaluation	Remedial Measures
1	Ground Water Quality	Ground Water Contamination	<u>Construction Phase</u> <ul style="list-style-type: none"> Sewage generated from temporary labor tents. 	<ul style="list-style-type: none"> Soak pit / septic tank will be provided 	No significant impact as majority of labors would be locally deployed	
			<u>Operation Phase</u> <ul style="list-style-type: none"> Sewage Discharge from the project 	<ul style="list-style-type: none"> Proponent will provide the STP to treat the sewage of Project. 	No negative impact on ground water quality envisaged. Not significant.	In an unlikely event of soil and ground water contamination. Remediation measures shall be implemented.
2.	Ground Water Quantity	Ground Water Depletion	<u>Construction Phase</u> <ul style="list-style-type: none"> Ground water will be not be used during construction. 	<ul style="list-style-type: none"> Not Applicable 	No significant impact on ground water quantity envisaged.	

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			<p><u>Operation Phase</u></p> <ul style="list-style-type: none"> • Groundwater will not be used during operation phase. The required water will be met through the municipal supply 	<ul style="list-style-type: none"> • Rain water harvesting scheme. • Black and Grey water treatment and reuse. • Storm water collection for water harvesting. • Percolation well to be introduced in landscape plan. • Awareness Campaign to reduce the water consumption 	<p>No significant impact on surface/ground water quantity envisaged.</p>	<p>In an unlikely event of non-availability of water supply, water will be brought using tankers.</p>
3.	Surface Water Quality	Surface water contamination	<p><u>Construction Phase</u></p> <ul style="list-style-type: none"> • Surface runoff from site during 	<ul style="list-style-type: none"> • Silt traps and other measures such as additional on site diversion 	<p>No off site impact envisaged as no surface water receiving body is</p>	

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			construction activity.	ditches will be constructed to control surface run-off during site development	present in the core zone.	
			<u>Operation Phase</u> • Discharge of domestic wastewater to STP.	• Domestic waste water will be treated in STP	No off site impact envisaged	Excess of water will be discharged as per CPCB standards.
4.	Air Quality	Dust Emissions	<u>Construction Phase</u> • All heavy construction activities	• Suitable control measures will be adopted for subsiding the PM level in the air as per air pollution control plan.	Not significant because dust generation will be temporary and will settle fast due to dust suppression techniques	During construction phase the contractors are advised to facilitate masks for the labors. Water sprinklers will be used for suppression of dust during construction phase.
		Emissions of PM ₁₀ , PM _{2.5} , SO ₂ , NO ₂ and	<u>Operational Phase</u> • Operation of construction	• Rapid on-site construction and improved	Not significant.	Regular monitoring of emissions and control measures will be taken

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		CO	equipment and vehicles during site development.	maintenance of equipment		to reduce the emission levels.
			<p><u>Operation Phase</u></p> <ul style="list-style-type: none"> Emission from vehicular traffic in use <p><u>Construction Phase</u></p> <ul style="list-style-type: none"> Operation of construction equipment and vehicle movements during site development. 	<ul style="list-style-type: none"> Use of low sulphur diesel in vehicles and machinery Providing Footpath and pedestrian ways within the site. Green belt will be developed with specific species to help to reduce PM level Use of equipment fitted with turbo chargers Proper maintenance of 	<p>Not significant</p> <p>There are no sensitive receptors located within the vicinity of site.</p>	<p>Use of Personal Protective Equipment (PPE) like earmuffs and earplugs during construction activities.</p>

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				<p>equipment</p> <ul style="list-style-type: none"> • Provision of noise shields near the heavy construction operations and acoustic enclosures for DG sets <p>Construction activity will be limited to day time hours only</p>		
5.	Noise Environment		<p><u>Operation Phase</u></p> <ul style="list-style-type: none"> • Noise from vehicular movement 	<p>Green Belt Development</p> <p>Green belt development shall make a barrier both for noise and air pollution.</p>	No significant impact due to suitable width of Greenbelt.	

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6.	Land Environment	Soil contamination	<u>Construction Phase</u> <ul style="list-style-type: none"> Disposal of construction debris 	<ul style="list-style-type: none"> Construction debris will be collected and suitably used on site as per the solid waste management plan for construction phase 	<p>No significant impact.</p> <p>Impact will be local, as waste generated will be reused for filling of low lying areas etc.</p>	
			<u>Operation Phase</u> <ul style="list-style-type: none"> Dumping of municipal solid waste on land. 	<ul style="list-style-type: none"> It is proposed that the solid waste generated will be managed by an authorized agency. Collection, segregation, transportation and disposal will be done as per 	<p>Since solid waste is handled by the authorized agency, waste dumping is not going to be allowed. Not significant.</p> <p>Negligible impact.</p>	

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				Solid Waste Management Rules, 2016 by the authorized agency		
7.	Biological Environment (Flora and Fauna)	Displacement of Flora and Fauna on site	<u>Construction Phase</u> Site Development during construction	Important species of trees, if any, will be identified and marked and will be planted for landscape development.	The site has scanty vegetation	
			<u>Operation Phase</u> • Increase in green cover	• Suitable green belts will be developed as per landscaping plan in and around the site using local flora	Beneficial impact.	

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8.	Socio-Economic Environment	Employment and livelihood options.	<u>Construction Phase</u> Construction activities leading to gain in direct & indirect employment	<ul style="list-style-type: none"> Project development as per the Bihar Building bye laws. 	No negative impact.	
			<u>Operation Phase</u> Site operation	<ul style="list-style-type: none"> Project will provide direct and indirect employment during the two phases. Providing quality-Integrated facility 	Beneficial impact	
9.	Traffic Pattern	Increase of vehicular traffic	<u>Construction Phase</u> <ul style="list-style-type: none"> Heavy Vehicular 	<ul style="list-style-type: none"> Heavy Vehicular movement will be restricted to 	No negative impact	

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			movement during construction	daytime only and adequate parking facility will be provided		
			<u>Operation Phase</u> <ul style="list-style-type: none"> Traffic due to personal cars 	<ul style="list-style-type: none"> Vehicular movement will be regulated inside the project with adequate roads and parking lots in the site. 	No major significant impact	

Environmental Monitoring Plan

It is proposed to monitor essential parameters for ambient air quality, ambient noise quality, ground water quality, and waste water quality both during the construction and operation phases of the project. However the monitoring schedule for the compliance report is given in **Table-15**

Table-15: Environmental Monitoring Schedule for Compliance

S. No	Particulars	Monitoring Frequency	Duration of Sampling	Important Monitoring Parameters
1	Ambient Air Quality Monitoring			
	Project site	Once in 6 Months	24 hr continuously except CO (8 hourly)	PM ₁₀ , PM _{2.5} , SO ₂ , NO ₂ & CO
3	Ambient Noise Level			
	Near DG set	Once in 6 Months	8 hr continuous with 1 hr interval	Noise level in dB(A)
4	Ground/Drinking Water Quality Monitoring			
	Ground Water – at project site	Once in 6 Months	Grab Sampling	Parameters specified under IS:10500, 2012
5	Soil Quality			
	At the green belt area	Twice in a year	Samples will be collected from three different depths viz., 30cm, 60cm, and 100cm below the surface	Parameter for soil quality: pH, texture, electrical conductivity, organic matter, nitrogen, phosphate, sodium, calcium, potassium and Magnesium.

Environmental Monitoring:

Various environmental protection and mitigation measures have been suggested in the previous Chapter/section for ensuring compliance with the stipulated environmental regulations and applicable standards. Also, there are specified environmental monitoring and record keeping

requirements for operating facilities that the proposed Project will have to comply with. Though record keeping would be largely an in-house activity, environmental monitoring within and outside of the proposed Project would be carried out through recognized environmental laboratories as per the requirements of MoEFCC.

The purpose of environmental monitoring is to evaluate the effectiveness of implementation of EMP by periodically monitoring the important environmental parameters within the impact area, so that any potential adverse impacts are detected and timely action can be taken. In order to ensure compliance with the applicable regulatory requirements, the Project plans to conduct the following environmental monitoring activities.

Wastewater Quality Monitoring and Record Keeping

The wastewater discharges from the proposed Project will mainly comprise of domestic sewage and other wastewater discharges from drinking water points, toilets, washbasins, food court and kitchen, backwashing of filters (used in water treatment) etc.

Therefore, as per the requirements of *the Water (Prevention and Control of Pollution) Act 1974*, the Project proponent will apply to Bihar State Pollution Control Board for the *Consent to Establish*. Before starting the operation, the Project proponent will apply to Bihar State Pollution Control Board for the *Consent to Operate for Wastewater Discharges* and thereafter periodically renew its *Consent to Operate*. Subsequently, whenever there is a change in the operations, the Project will get the requisite amendments in its Consent.

The Project would maintain an inventory of all sources of wastewater and maintain records of waste water quality and quantity for the wastewater streams, as required. The Project will ensure that wastewater analysis is conducted for all regulated parameters as per Bihar State Pollution Control Board's specification or as per conditions of *Consent to Operate* and to ensure compliance with any other specifically applicable standards. The frequency of wastewater quality monitoring would be decided in consultation with the Bihar State Pollution Control

Board officials. Care will be taken to ensure that wastewater analysis is conducted at such a frequency that potential variations due to various operational factors are recorded.

Noise Level Monitoring and Record keeping

The Project would maintain an inventory of all point and non-point sources of noise emissions and identify regulated sources, specified in the Bihar State Pollution Control Board's *Consent to Operate for Air Emissions*. Main source of noise would be DG sets during the construction phase, But as DG sets with acoustic enclosure has been proposed, there would be minimal chance of noise pollution. However, the Project management would conduct noise level monitoring at the specified locations within, on the fence line/boundary, and outside the Project's premises to ensure compliance with the specific standards and conditions of the *Consent to Operate*. The locations of the noise monitoring stations and frequency of noise level monitoring would be decided in consultation with the Bihar State Pollution Control Board officials. The noise level monitoring would be conducted at such a frequency that potential variations due to various operational factors are recorded.

Awareness and Training

Training and human resource development is an important link for achieving sustainable operation of the facility and environmental management. For successful functioning of the project, relevant EMPs will be communicated to the residents of the project. Everyone will be made aware of importance of their various environmental responsibilities including waste segregation and storage, water and energy conservation, etc. This awareness will be provided through documents and periodic meetings. They will be informed of their responsibilities for successful operation of various environmental management schemes inside the Project premises. Relevant personnel at site will be trained for the following:

- Applicable EH&S regulations and compliance requirements for the same.
- Collection, Segregation, Storage and Disposal of solid and hazardous wastes.
- Operation and maintenance of Sewage Treatment Plant and recycling system
- Techniques for waste minimization, water conservation and energy conservation, etc.
- Functioning of the Project's Environmental Management System (EMS) including environmental monitoring, reporting and documentation needs.

- Requirements and responsibilities in case of an emergency as per emergency response plan.

Environmental Monitoring Program during Construction period

Based on the above, the following environmental monitoring program during construction activities is proposed for the Project. The monitoring program would be discussed and approved by Bihar State Pollution Control Board are given in **Table-16**.

Table-16: Proposed Monitoring Program for Construction Phase of the Project

S. No.	Type	Locations	Parameters	Period and Frequency
1.	Ambient Air Quality Monitoring	As per requirement	SO ₂ , NO ₂ , PM ₁₀ , PM _{2.5} and CO	As per Bihar State Pollution Control Board's requirements
2.	Ambient Noise Monitoring	As per requirement	Noise level L _{eq} both during daytimeand nighttime	As per Bihar State Pollution Control Board's requirements
3.	Water Quality Testing (Portability testing)	(i) Any operational bore well (ii) One of the Drinking Water Point	Drinking water parameters as per IS 10500:2005.	As per Bihar State Pollution Control Board's requirements
4.	Treated Wastewater Quality	Inlet and outlet of the STP	Parameters for assessing compliance with standards for recycling and horticulture use	As per Bihar State Pollution Control Board's requirements

Post-Project Environmental Monitoring Program

Based on the above, the following post-project environmental monitoring program is proposed for the Project. The monitoring program would be discussed and approved by Bihar State Pollution Control Board are given in **Table-17**.

Table-17: Proposed Monitoring Program for Operational Phase of the Project

S. No.	Type	Locations	Parameters	Period and Frequency
1.	Ambient Air Quality Monitoring	As per requirement	SO ₂ , NO ₂ , PM 10, PM2.5 and CO	As per Bihar State Pollution Control Board's requirements
2.	Ambient Noise Monitoring	As per requirement	Noise level L _{eq} both during daytime and night time	As per Bihar State Pollution Control Board's requirements
3.	Water Quality Testing (Potability testing)	(iii) Any operational borewell (iv) One of the Drinking Water Point	Drinking water parameters as per IS 10500:2012.	As per Bihar State Pollution Control Board's requirements
4.	Treated Wastewater Quality	Inlet and outlet of the STP	Parameters for assessing compliance with standards for recycling and horticulture use	As per Bihar State Pollution Control Board's requirements

Environmental Documentation

Documentation and reporting of environmental performance is an important management tool for ensuring sustainable operation of the Project. Documents/Records shall be maintained for

regulatory, monitoring and operational issues. Typical documentation requirements for the “Project” are summarized in **Table-18**.

Table-18: Environmental Documentation for Operational Phase of the Project

PARAMETER	PARTICULARS
Air Emissions (incl. Noise)	<ul style="list-style-type: none"> • <i>Consent to Establish</i> from Bihar State Pollution Control Board • <i>Consent to Operate</i> for Air Emissions from Bihar State Pollution Control Board • Ambient Air Quality Monitoring records • Ambient Noise Monitoring Records
Water Supply	<ul style="list-style-type: none"> • Water Quality Monitoring records • Water Cess Returns
Wastewater Discharges	<ul style="list-style-type: none"> • <i>Consent to Establish</i> from Bihar State Pollution Control Board • <i>Consent to Operate for Wastewater Discharges</i> from Bihar State Pollution Control Board • Details of quantity of wastewater discharged from various sources and discharged from the outlet of the STP for recycling/into the sewer • Operational details of STP including number of hours of operation, chemical usage, in-process wastewater quality, etc. • Wastewater Quality and Quantity Monitoring records
Waste Management	<ul style="list-style-type: none"> • Permission for disposal of solid wastes from concerned municipality/authority • Wastes Management Inventory including details of quantity of wastes generated on-site and mode of their disposal • Inventory of wastes stored on-site • Records of hazardous wastes stored on-site (in <i>Form-3</i>) (if generated) • Annual Returns for hazardous wastes (in <i>Form-4</i> and <i>Form-13</i>) to Bihar State Pollution Control Board

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PARAMETER	PARTICULARS
	<ul style="list-style-type: none"> Documentation related to off-site transportation and disposal of hazardous wastes (including <i>Form-9</i> and <i>Form-10</i>)
Environmental Statement	<ul style="list-style-type: none"> Submission of Environmental Statement to Bihar State Pollution Control Board before 30th September every year
Petroleum Storage	<ul style="list-style-type: none"> License from PESO for storage of HSD and other petroleum substances (based on their quantities) Inventory of petroleum substances stored on-site both at storage and usage locations Regular integrity testing/inspection reports for the storage tanks

Table-19: Environmental Management Cost

COMPONENT	CAPITAL COST (RS. IN LACS)	RECURRING COST (RS. IN LACS)
Sewage Treatment Plant	1091	218
Rain Water Harvesting System	9	2
Solid Waste Management	235	47
Environmental Monitoring	-	7
Green Area	17	5
Others (Energy saving devices, miscellaneous)	30	6
Total	1382	285