

CONCEPTUAL PLAN

1. INTRODUCTION:

Darbhanga Airport (IATA: DBR, ICAO: VEDH) is an existing Indian Air Force Station wherein Airport Authority of India (AAI) is operating a temporary Civil Enclave for domestic operations under RCS-UDAN Scheme of MoCA, GoI. Civil operation in Darbhanga Airport commenced on 8th November, 2020. The Airport is located at the outskirts of the Darbhanga city near the NH-105 and NH-57 highways, which pass through Darbhanga.

Since launch of commercial flights, two-and-a-half years ago, the airport has seen a total of 6,81,945 arrivals while the number of departing passengers stood at 7,06,931 till March 31'2023. The number of passengers rose from 1,53,232 in financial year 2020-21 to 6,19,586 in FY 2021-22 and then to 6,16,058 in FY 2022-23.

The existing civil terminal building is capable of handling 300 peak hour passengers. AAI has decided to further develop the Darbhanga airport for operation of Commercial Flights to meet the increasing passenger traffic. For this purpose AAI has proposed a New Civil Enclave in an area of 52.65 Acres (~ 21.31 hectare) in land allotted by State Government of Bihar. Possession Certificate in favour of AAI is enclosed as **Annexure**. The total estimated Project cost of the proposed new civil enclave is about INR 911.66 Crores.

The total plot area of the project is 21.31 Hectare (52.65 acre). The built up area envisaged for the project is about 59,222 sq.m. (>20,000 sq. m. and <1,50,000sq.m.). Thus, the project requires prior Environmental Clearance under category B, Item 8(a) *Only expansion of terminal buildings and allied buildings within the existing Airport premises >20,000 shall require Environmental Clearance, and such expansion up to 1,50,000 sqm shall be appraised as per provisions of item 8(a) of the Schedule of this notification provided there is no increase in the existing area of the Airport.* As per MoEF&CC notification dated 14.07.2022 from the State Level Environmental Impact Assessment Authority (SEIAA),



Project: Proposed development & operation of New Civil Enclave	
Promoter: Airports Authority of India	CP & EMP

Bihar. Thus, the client has engaged M/s Gaurang Environmental Solutions Pvt. Ltd. (NABET approved EIA consultant Organization) for preparation of project proposal.

The report has been prepared on the basis of the information provided by the client, MEP consultants and other project consultants as well as on the basis of the site information collected by GESPL during site visit and other information collected from permissible/ authentic secondary data. This report gives the information on the major project activities such as land requirements, details of built up area, parking requirements, traffic circulation and traffic management, water requirement, power requirement, back up source, etc. as well as anticipated environmental impacts from the project activities and the project specific environmental management plan in line with the requirements of the MoEF&CC/ SEIAA, Rajasthan/ CPCB/ RSPCB/ any other relevant regulations in this regard.

2. PROJECT BRIEF:

Project details summarized as under:-

Table 1: Salient features of the Project

Items	Details		
Project address	Darbhanga Airport, Village Vasudeopur, District Darbhanga, Bihar		
Type of project	Terminal Building (Building & Construction).		
Screening category	Category B2, item 8(a) (Building & Construction).		
Total Plot	21.31 Hectare (52.65 acre)		
Gross Built up area	59,222 sq.m.		
Green Area	53275 sq.m. (~25% of total plot area)		
Maximum height	Upto terrace level: 22.00 m		
Infrastructure proposed at New Civil Enclave	S.no.	Particulars	Facility & area
	a.	Ground Support Equipment (GSE) area	5000 sq.m.
	b.	Apron	10 nos parking for A321
	c.	Taxiway	Link Taxiway: 2 No Apron Taxiways: 2 No.
	d.	Commercial & retail space (city side)	12,502 sq.m. (footprint area)

Project: Proposed development & operation of New Civil Enclave	
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	e.	Fuel station	6570 sq.m. (footprint area)
Parking facilities	As under: ✓ Cars: 238 nos. ✓ Bus: 04 nos. ✓ Car parking for staff: 66 nos. <i>Note: Provision of MLCP with 800 car parking space in the future</i>		
Power requirement & source	Total connected load: 2.9 MW Source: State Grid		
Power backup	DG Set: 750 kVA x 1 (W) 1750 kVA x 3 no (2 W +1 S) Fuel: HSD		
Renewable Energy	Roof mounted grid tied Solar photo voltaic (PV) plant : 1000 KW		
Water requirement & source	- Total daily water demand : 1,126 KLD - Daily fresh water demand : 597 KLD - Daily recycle water demand : 529 KLD - Source : Ground Water		
Sewage treatment & disposal	Waste water generated: 557 KLD Management: Treatment in STP of capacity 670 KLD to be developed on MBR Technology		
RWH Structure	48 Nos.		
Solid Waste	2170 kg/day - Biodegradable waste : 1302 kg/day (approx.40 %) - Non-Biodegradable waste : 868 kg/day (approx. 60 %) Three Organic waste convertor of capacity 500 kg/day each will be provided.		
Project cost	Rs. 911.66 Crores.		
EMP budget	Construction Phase Capital Cost : Rs. 36 Lacs Recurring cost : Rs. 15 Lacs	Operation Phase Capital Cost : Rs. 955 Lacs Recurring cost : Rs. 33 Lacs	



3. IDENTIFICATION OF THE PROJECT PROPONENTS:

The Airport Authority of India (AAI) plays a vital role in the development, management, and operation of airports across the country. It ensures the smooth functioning and safety of India's aviation sector. It carries out several key functions to ensure the efficient and safe operation of airports and the development of civil aviation infrastructure in India such as Airport Development and Management, Air Traffic Management (ATM), Safety and Security, Airside Operations, Terminal Management, Infrastructure Development, Regional Connectivity and International Cooperation.

Darbhanga airport was started as a private airstrip by Maharaj Kameshwar Singh Bahadur of Darbhanga. Later, the airport was acquired by the [Indian Air Force](#). In December 2018, the foundation stone was laid down for the interim civil enclave under Airport Authority of India and it became operational on 8th November, 2020.

Seeing the increasing growth and future demand at the airport, AAI has proposed new civil enclave for the development of New Domestic Terminal Building so that the future passenger traffic can be handled.

Details of the authorized signatory for the purpose of obtaining Environmental Clearance are as below:

Authorized Signatory	Mr. C.K. Talukdar
Designation	DGM (E-C)
Correspondence Address	Airports Authority of India, Darbhanga Airport, Darbhanga Sadar, District Darbhanga, Bihar- 846005.
Email	cktalukdar@aai.aero
Contact No.	8638457768

4. APPLICABLE LEGISLATIONS

- EIA Notification 2006, as amended thereof
- Water (Prevention and Control of Pollution) Act, 1974
- Air (Prevention and Control of Pollution) Act, 1981
- Environment Protection Act, 1986
- Hazardous & Other Wastes (Management & Transboundary Movement) Rules, 2016



- Solid Waste Management Rules, 2016.
- Biomedical waste Rules, 2016
- E-waste management Rules, 2016

5. LOCATION OF THE PROJECT & INFRASTRUCTURE FACILITIES:

Location of the project:

This project is coming up at Darbhanga Airport, Village Vasudepur, District Darbhanga, Bihar.

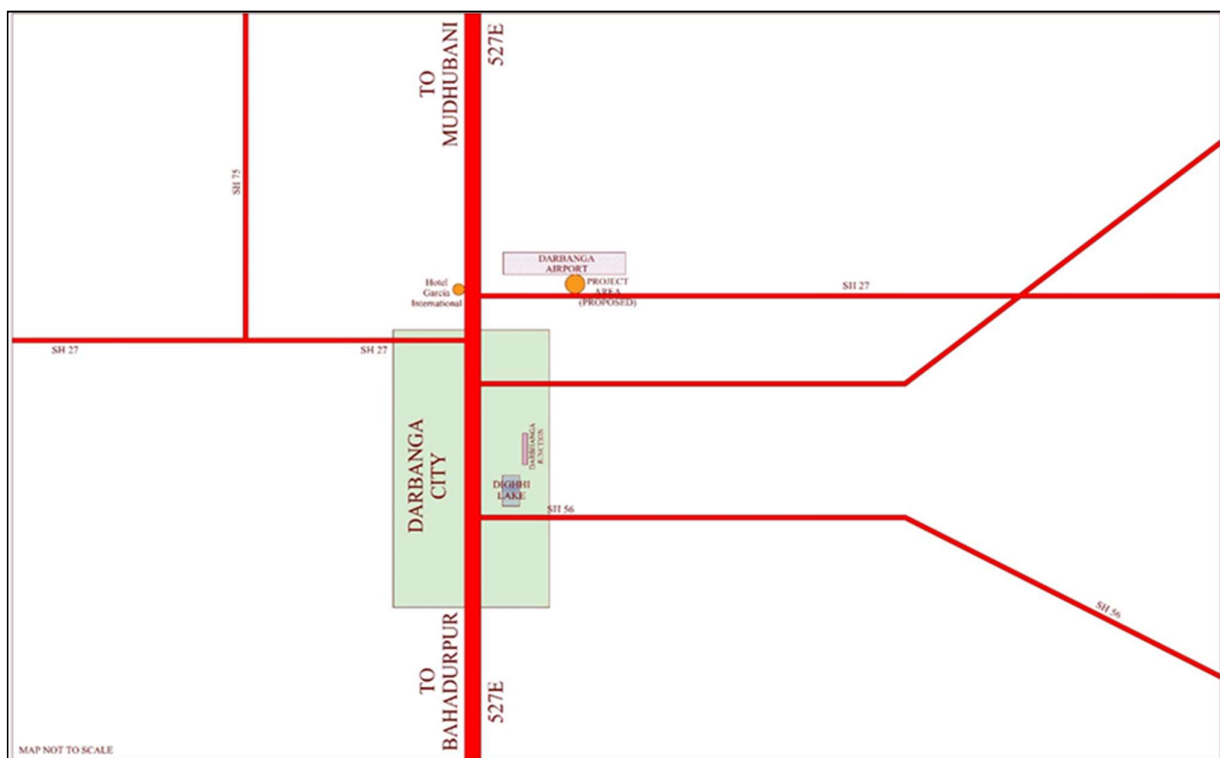


Figure 1: Road Location map



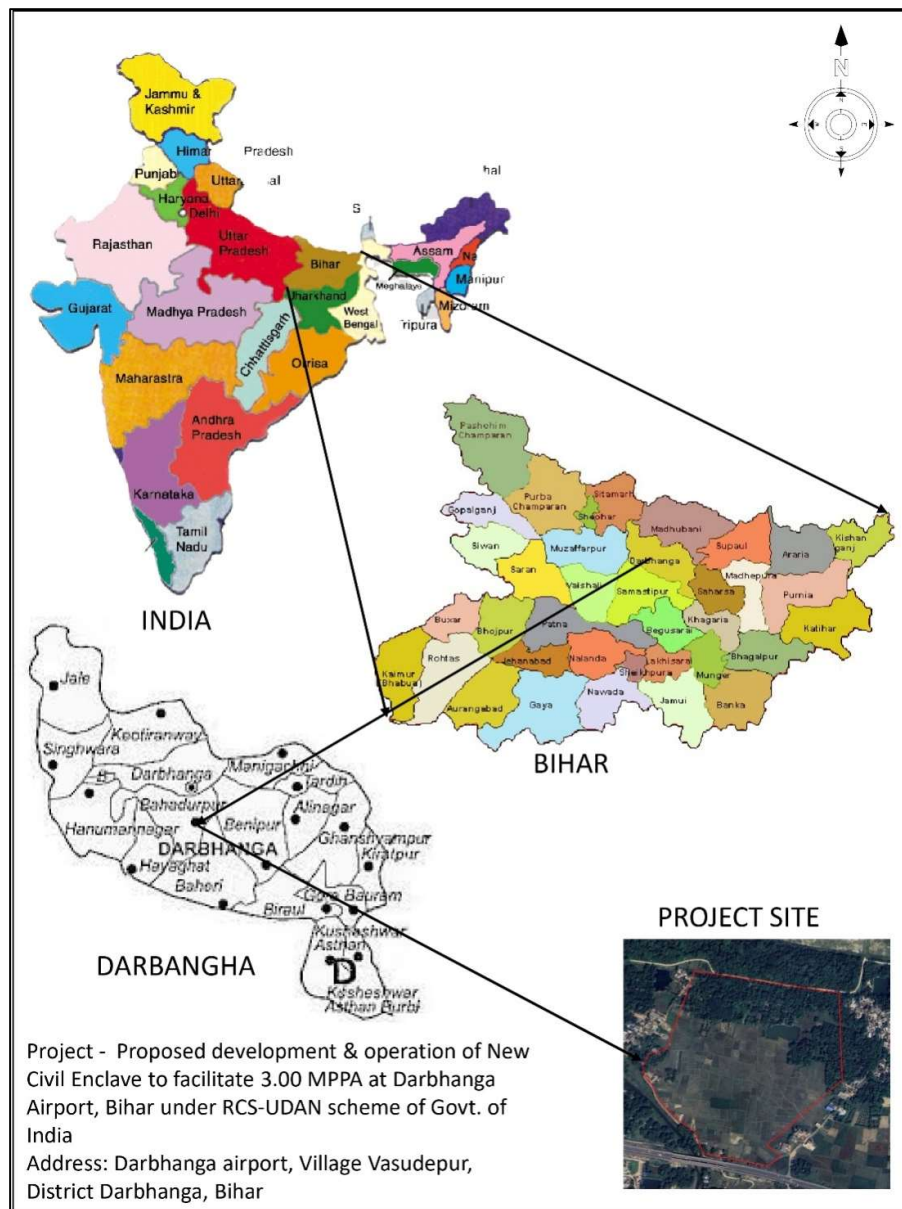


Figure 2: Location Map

Geographical coordinates

Coordinates	North	East	Coordinates	North	East
Point 1	85.92148	26.18722	Point 15	85.91646	26.18782
Point 2	85.92178	26.18884	Point 16	85.91693	26.18734
Point 3	85.92135	26.19624	Point 17	85.91747	26.1875
Point 4	85.91762	26.19113	Point 18	85.91759	26.1868
Point 5	85.91764	26.19889	Point 19	85.91775	26.18678



Point 6	85.91732	26.19596	Point 20	85.91778	26.18666
Point 7	85.91721	26.19542	Point 21	85.91764	26.18666
Point 8	85.9173	26.19361	Point 22	85.91775	26.18649
Point 9	85.91662	26.18926	Point 23	85.91828	26.18635
Point 10	85.91633	26.1899	Point 24	85.91962	26.18618
Point 11	85.91616	26.18997	Point 25	85.91996	26.18641
Point 12	85.91673	26.18895	Point 26	85.9195	26.18675
Point 13	85.91599	26.18855	Point 27	85.91993	26.18696
Point 14	85.9162	26.18832	Point 28	85.92148	26.18722

GOOGLE SNAPSHOT SHOWING SITE & SURROUNDING FEATURES

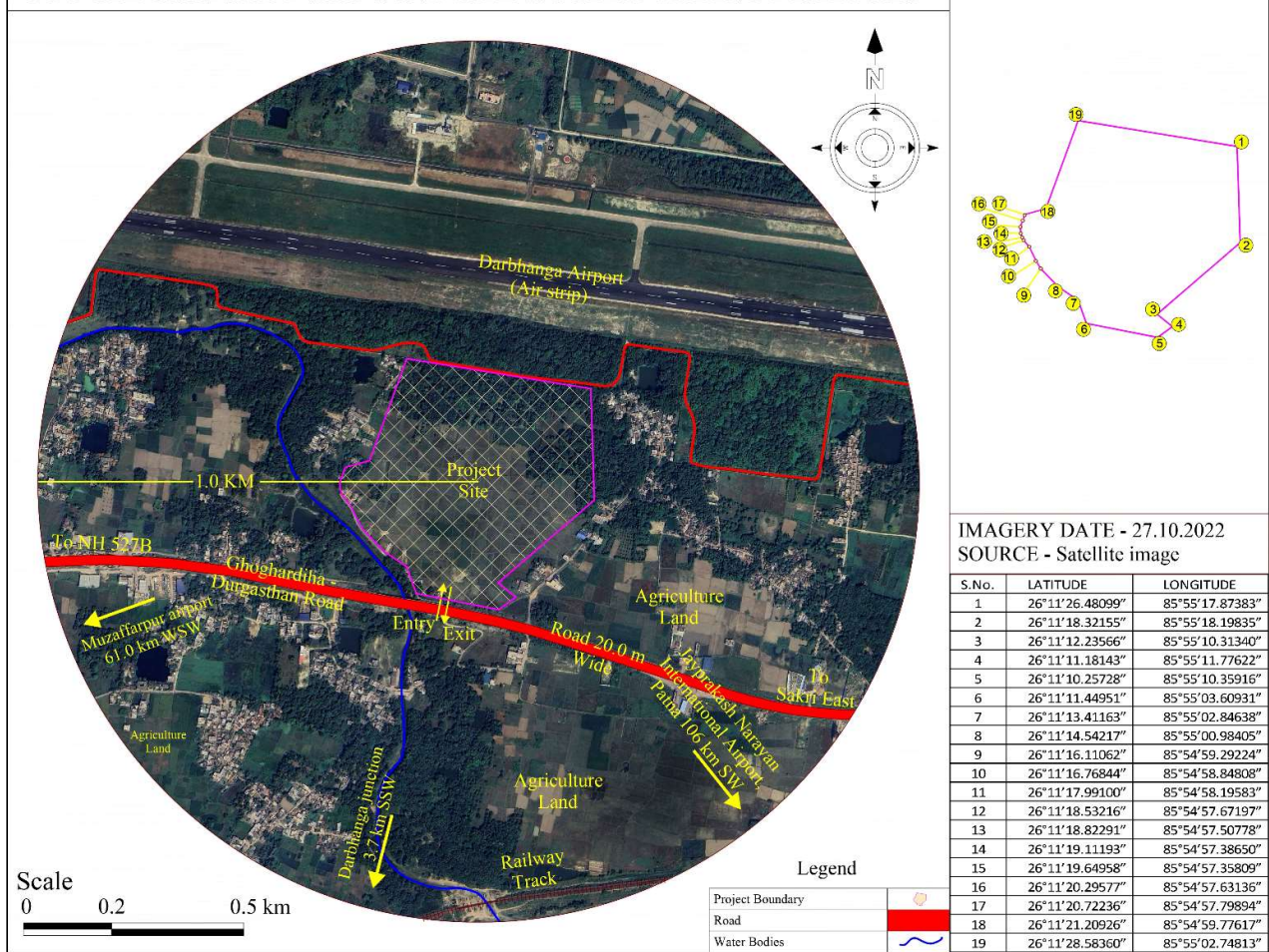


Figure 2: Google Map



Infrastructure Facilities

S. No	Particulars	Details
1.	Nearest Highway/Major Road	- S.H.-27 ~ 0.01 km (Adjacent) towards South 527-B ~1.5 km towards West - Darbhanga - Sakri Road ~2.7 km towards South - SH -56 ~4.6 km towards South - SH -75 ~5.6 km towards WSW 527-E ~7.8 km towards SSW
2.	Nearest Railway Station	Darbhanga Junction ~3.7 km towards SSW
3.	Nearest Airport	- Muzaffarpur Airport ~ 61.0 km towards WSW - Jayprakash Narayan International Airport, Patna ~106 km towards SW

6. PROJECT DETAILS:**• PROJECT BRIEF:**

The proposed development & operation of New Civil Enclave at Darbhanga Airport, Bihar by Airports Authority of India involving construction of centrally air-conditioned, carbon neutral & GRIHA-5 compliant New Domestic Terminal Building which includes basement (50% ground coverage) + Ground floor + 2 Floors to cater 1080 peak hour passengers. It consists of two ground support equipment (GSE) area of 5000 sq.m, construction of Apron for parking of 10 no. of A321 type aircraft, 2 Link Taxiways and Apron Taxiways. The master plan of new civil enclave includes new domestic terminal building, commercial & retail spaces, arrival plaza, parking areas, support facilities & utilities and road & transport. Provision for MLCP & cargo terminal has also been kept in the new civil enclave. This new development aims to facilitate 3.00 MPPA (Million Passengers per Annum)

• LANDUSE BREAKUP

Particular	Area in Sq. m.	Area in Ha.	% of total area
Terminal building	17771	1.7771	8.3
Green & open area	53267	5.3267	25.0
Area of services retail &	22498	2.2498	10.6



commercial space			
Paved/Pavement/Road area	109481	10.9481	51.4
Parking	10050	1.005	4.7
Total	213067	21.3067	100

• BUILT UP AREA DETAILS

Table 2: Built up Area Details

S. No	Particulars	Super Built up area/ Gross built up area (sq. m.)
1.	Basement	12,999
2.	Ground Floor	17,600
3.	Mezzanine Floor	8,793
4.	First Floor	17,600
5.	Utility block	2,230
Total		59,222 sq.m

7. PARKING REQUIREMENT:

Particulars	FAR area (sq. m.)	Basis	Required ECS
Mercantile (Shopping Complex)	59,045	@ 1 ECS/200 sq. m. Built Up Area	295.22
Total Required ECU			296 ECS

Source: NBC-2016

- ✓ Cars: 238 nos.
- ✓ Bus: 04 nos.
- ✓ Car parking for staff: 66 nos.

Note: Provision of MLCP with 800 car parking space in the future

Required Parking : 296 ECS

Proposed Parking : 316 ECS



8. POWER REQUIREMENT:

Power requirement for the proposed project is given as under:

Table 3: Power Requirement

Particulars	Operation Phase
Electrical Load	2.9 MW
DG sets (Power Backup)	
Number	4 Nos. ✓ 750 kVA x 1 (W) ✓ 1750 kVA x 3 no (2 W +1 S)
Cumulative Capacity	6000 kVA
Fuel Used	HSD
Fuel Consumption	26 KL
Renewable Energy	Roof mounted grid tied Solar photo voltaic (PV) plant : 1000 KW

9. ENERGY CONSERVATION:

Passive architectural techniques:

- Building envelope (Roof & Wall Assembly and fenestration) of the building will be optimized to reduce the heat gains into the buildings.
- Daylight simulation has been done to ensure proper lighting during daytime.

Other Conservation measures:

- Energy efficient motors (IE > 2: high efficiency class) and pumps will be used.
- BEE star rated DG sets (minimum 5 star) will be used.
- Permanently installed electrical metering: to record demand (kVA), energy (kWh), and total power factor. The metering will also display current (in each phase and neutral), voltage (between phases and between each phase and neutral), and total harmonic distortion (THD) as a percentage of total current.
- Power factor will be maintained around unity. APFC panel with capacitor will be used for Common Load & Fixed Capacitor for Transformer to minimize the losses.
- Lighting and switching of common area shall be designed keeping in mind day light integration.



- D.G. set will be provided with auto cut and auto start mechanism.
- The water supply pumping system will be provided with variable speed drive to conserve energy.
- All capacitors will be provided with Harmonic Filters to avoid distortion in Voltage.

S. No.	Description	Demand Load (KW)	% Saving	Load Saving (KW)
1	Usage of energy efficient Lifts (VVVF Non gear lifts)	273	15%	41
2	Providing solar power by PV panels with Street Light	1000	100%	1000
3	Providing LED Lamps instead of fluorescent lamps for all area.	266	60%	160
4	Providing LED lamp instead of HPSV /Metal halide lamps for street lighting.	30	70%	21
5	Providing LED Lamps instead of T-8 lamps for Basement lighting and going with electronic ballast instead of copper ballast.	20	60%	12
6	Usage of energy efficient / load sharing DG sets to save 10% energy	2905	10%	291
Total Energy Saved - (KVAH)				1905
Total Energy consumption - (KVAH)				10176
Total Savings in % - (KVA)				18.72

10. WATER REQUIREMENT

❖ Construction phase:

Total Domestic water consumption during construction phase for approx. 510 nos. of workers will be 50 KLD, which will be met through existing bore-wells.

❖ Operation phase:

The total daily consumption of water during operation phase will be about 1126 KLD out of which 597 KLD will be fresh water and 529 KLD will be recycled water. The water requirement will be met through ground water (bore-wells). Treated water. The details of water requirement and wastewater generation for operation phase are as follows:

Table 4: Water demand breakup

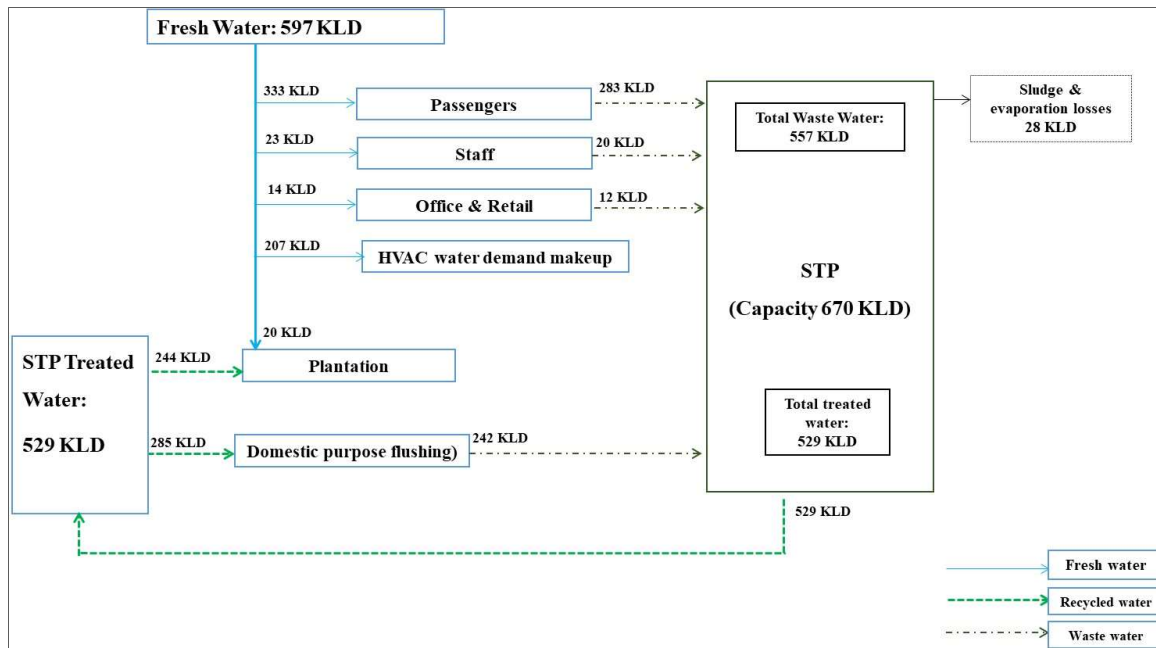
S. No.	Particulars	Total Population per day	Water requireme nt basis as per NBC (in LPCD)	Water Requirement per day				Total Water Required (in LPD)
				Domestic water requirement / fresh water requirement		Flushing water requirement / recycled water requirement		
				LPCD	LPD	LPCD	LPD	
1	Passengers							
a	Arrival	4110	70	40	164384	30	123288	287671
b	Departure	4110	70	40	164384	30	123288	287671
c	Meeters & Greeters at arrival / departure, 10% of total passengers	822	15	5	4110	10	8219	12329
Total For Passengers (A)		9041	--	--	332877	--	254795	587671
2	Office & Retail							
a	Retail / Shops at Departure Level	48	45	25	1200	20	960	2160
b	Office at Mezzanine	480	45	25	12000	20	9600	21600
c	Retail / Shops at Arrival Level	48	45	25	1200	20	9600	2160
Total for Office & Retails (B)		576	--	--	14400	--	11520	25920
3	Other Fixed Population							
a	E & M AC Plant / Substation / WTP / STP, CISF, Supporting Staff etc. for 3 Nos. of Shifts	900	45	25	22500	20	18000	40500
B	Employees (permanent)	30	45	25	750	20	600	1350
Total for Other Buildings (C)		930	--	--	23250	--	18600	41850
I	Total (A+B+C)	10547	--	--	370527	--	284915	655441
II	Greenbelt	53275 sq.m. (13 acres)	5 Litre per sq.m.	--	18691		244354	263045
III	HVAC water makeup	1800 TR	8 LPH / TR x 24 Hrs x 60% avg.	--	207360	--	--	207360



S. No.	Particulars	Total Population per day	Water requireme nt basis as per NBC (in LPCD)	Water Requirement per day				Total Water Required (in LPD)
				Domestic water requirement / fresh water requirement		Flushing water requirement / recycled water requirement		
				LPCD	LPD	LPCD	LPD	
			consumptio n yearly					
Grand total (I+II+III)				--	596578	--	529269	1125846
Say (KLD)					597	0	529	1126

*Source: National Building Code, 2016

WATER BALANCE



11. LIGHT & ELECTRICITY DETAILS:

RECOMMENDED LUX LEVELS:

The recommended values of illumination (in Lux) as per the National Building Code of India (2016) are as under:

S. No.	Space	Illumination Level (Lux)
i.	Entrance	150-200-300
ii.	Lifts	50-100-150
iii.	Corridor, passageways, stairs	50-100-150
iv.	Covered car par - Floor - Ramp and Corner - Entrance and exits	5-20 30 50-100-150
v.	Outdoor car park	5 – 20



Chapter 2: Environmental Management Plan

Environmental impact can be defined as any alteration of environmental conditions, adverse or beneficial, caused or induced by the action or set of actions under consideration.

Various operations involved in the project have been studied in details to identify, predict and evaluate impacts on various environmental components. The identified impacts were quantified using mathematical models to a possible extent so as to estimate the future environmental scenario.

Environmental Sensitivity (15 Kms)

Water bodies	:	S. No.	Name	Distance (Km) & Direction (From Project Boundary)
		1.	Nallah	Adjacent to the project site towards SW
		2.	Kamla Nadi	1.0 Km towards NW
		3.	Baghmati River	3.8 Km towards WSW
		4.	Project Brance Canal	5.3 Km towards ENE
		5.	Khiroli Nadi	7.7 Km towards WSW
		6.	Jiwachh Nadi	7.7 Km towards ENE
		7.	Majlis Pokhar	12.3 Km towards ESE
		<i>*Source: - All Distances are taken with respect to Toposheet.</i>		
National Park/ Sanctuaries	:	None		
Forests (RF, PF, etc.)	:	None		

1. AIR ENVIRONMENT

Air pollution has long been recognized as a brain storming issue worldwide. The onset of technological and scientific innovations in various fields and diverse activities of human race for its elegance have put extra load on the atmosphere by way of releasing air pollutants like particulate matter (PM₁₀, PM_{2.5}), sulphur dioxide (SO₂), oxides of nitrogen (NO_x), carbon monoxide (CO), unburned hydrocarbon (HC) and other organic as well as inorganic pollutants including trace metals responsible for causing health consequences. Entry of pollutants into the atmosphere occurs in the form of gases or particles. Continuous



mixing, transformation and trans-boundary transportation of air pollutants make air quality of a locality unpredictable. The growth of population, industry and number of vehicles and make the problem of air pollution still worse. Rapid industrialization and vehicular traffic especially in the urban areas of India is a great threat to air quality.

CONSTRUCTION PHASE:

SOURCES OF POLLUTION:

1. Vehicular Exhaust:

The major source of pollution in construction phase will be vehicles carrying construction material. Pollution load from the same is calculated as:

$$\text{Pollution Load} = \text{No. of trucks} \times \text{Emission Factors} \times \text{Deterioration Factor}$$

Due to movement of average 30 trucks, short-term pollution load is given in table:

Parameter	Emission Factor (g /km)*	Deterioration Factor (g /km)*	Pollution Load (g/km)
CO	4.5	1.33	29.92
NO _x	1.21	1	6.05
SPM	0.8	1.595	6.38
SO ₂	0.15	1	0.75
HC	1.21	1	6.05

* Source: CPCB Publication, 1998

Emissions from Construction equipments:

The fugitive dust emission sources are:

- Haul road Movements
- Construction
- Material Handling
- Finishing

Emissions factors for construction equipment are given in table below:

Table 5: Construction Equipment

Equipment	Emissions Factors (g/hr)				
	CO	VOC	NO _x	SO _x	PM ₁₀
Backhoe/ Front end loader	190.05	56.69	370.13	1.58	37.64
Rubber tired crane	161.02	39.00	464.02	2.67	23.58
Hydraulic Crane	161.02	39.00	464.02	2.67	23.58
Concrete Vibrator	72.57	13.60	122.46	0	4.53



Paving Equipment	186.42	48.53	412.31	1.95	29.93
Roller/ Compactor	165.10	34.92	316.15	1.90	23.13

**Source: SCAQMD CEQA Handbook*

MITIGATION MEASURES:

S.No.	Guidance on	Practices to reduce emission
1.	Water Application	Water will be applied to mitigate dust generation
2.	Storage Piles	- Storage pile activity will be conducted downwind - Enclosures/ coverings will be used for storage piles
3.	Vehicles & Equipments	- Speed of vehicles will be reduced to avoid blowing of dust - Proper lubrication of vehicles and machinery will be ensured to reduce emissions - Engines & exhaust systems will be properly maintained. - Low sulphur content fuel (HSD) will be used. - Idling time will be eliminated/ reduced to the minimum
4.	Material Handling & Transfer systems	- Mud and dirt track-out and carryout will be controlled properly. - Material drop will be minimized at the transfer point and enclosure - PM emissions from spills will be prevented. - Material handling operations will be minimized.
5.	Road Surfaces	- On-site vehicle restrictions will be established. - Unpaved roads will be properly maintained.

POST CONSTRUCTION PHASE:

The emission sources are mainly due to the vehicular emissions, diesel generator set of cumulative capacity 6000 kVA(600 x 3 nos.) & One D.G. Set capacity 600 kVA standby for the building.

SOURCES OF POLLUTION:

S. No	DG Set Capacity	Numbers	Fuel	Quantity	Stack Height	
					Above Roof	From Ground
1.	750 kVA	1 (W)	HSD	26 KL	5.5 m	22.5 m
2.	1750 kVA	3 (2 W +1 S)			8.0 m	23 m



A. D.G sets:**Calculation of stack height of D.G. sets****i. D. G Set of capacity 750 kVA- 1 nos.:**

The stack height of DG set is calculated as under:

$$\begin{aligned}
 H &= \text{Height of the building (h)} + 0.2 (\sqrt{\text{capacity of the DG set in kVA}}) \\
 &= 22 + 0.2 \times (\sqrt{750}) \\
 &= 22 + 0.2 \times 27.38 \\
 &= 22 \text{ m} + 5.47 \text{ m} \\
 &= 27.47 \text{ m say } 28 \text{ m}
 \end{aligned}$$

ii. D. G Set of capacity 1750 kVA- 3 nos.(2 W +1 S):

The stack height of DG set is calculated as under:

$$\begin{aligned}
 H &= \text{Height of the building (h)} + 0.2 (\sqrt{\text{capacity of the DG set in kVA}}) \\
 &= 22 + 0.2 \times (\sqrt{1750}) \\
 &= 22 + 0.2 \times 41.83 \\
 &= 22 \text{ m} + 8.36 \text{ m} \\
 &= 30.36 \text{ m say } 31 \text{ m}
 \end{aligned}$$

However, a safe stack height of 31 m above the roof of DG house is being/will be provided.

B. Vehicular emissions:

There will be increase of 316 ECS due to the proposed project. The emission details for point and line sources are tabulated as:

TABLE-1 (B) EMISSION DETAILS

Line emission details	
Parameter	Emission rate per ECU (g/sec/m)
NOx	1.17×10^{-6}
CO	1.46×10^{-5}

Emission Norms for 2/3 wheeler

Norms	CO (g/km)	HC+ Nox(g/km)
Bharat Stage-III	1.0	1.0



MANAGEMENT PLAN

SOURCES	MANAGEMENT
Exhaust from D.G. sets of cumulative capacity 6000 kVA.	- D.G. sets is being/will be provided with the effective stack height of 31 m above roof. - Low-sulphur-content fuel (HSD - Sulphur content 0.01%) is being/will be used.
Vehicular exhausts especially congestions during peak traffic hours.	- Sufficient width of driveways to ensure smooth traffic movements. - Provisions of fully internalized parking including the parking facilities for the visitors. - Guided traffic ways within the project site. - Speed humps will be installed for speed restrictions inside the project area.
Road Surface	Road sweeping machines will be provided

2. WATER ENVIRONMENT:

Great amount of water are used in the construction processess. The water is required for preparation of mortar, mixing of cement concrete and for curing work etc during construction work. The quality and quantity of water has much effect on the strength of mortar and cement concrete in construction work.

CONSTRUCTION PHASE:**WATER CONSERVATION TECHNIQUES:**

Best construction practices will be adopted to reduce the water demand:

- Use of curing water: Spraying of curing water and after liberal curing, all concrete structures will be covered with gunny bags, followed by spraying of water.
- Use of polymer dispersion and air entraining agents to reduce the construction water demand.
- Admixtures will be used to reduce water demand during construction.
- Discouraging the washing of vehicles and equipment on the construction site. Workers will not allow towash their personal vehicles on site.



CONSTRUCTION PHASE:

SOURCES	MANAGEMENT
• Generation of sewerage	• Mobile /portable toilets will be provided
• Un-captured run-off from the site may contaminate ground water aquifers.	• The rainwater entering into the pit will be screened for the removal of heavy silt and other materials. • Provisions will be made to ensure the construction vehicles stick to the access track to prevent mud & dirt being deposited on roads. • Fence will be constructed around the site to trap sediments whilst allowing the water to flow through. • Up slope water will be diverted with turf and due care will be taken not to mix mortar in locations that will drain into storm water system.
• Unsanitary conditions during rainy season.	• The civil contractor will be made responsible for site sanitation and will be bound by the management to adhere to healthy level of sanitation. • There will be no stagnant water at site, as the runoff from the relevant areas will be systematically drained into the storm water line. There will be provision of cleaning the storm water line periodically.

POST CONSTRUCTION PHASE:

The daily water requirement for the project is 1126 KLD. Fresh water requirement is 597 KLD while the about 529 KLD treated water from STP will be used for meeting the water requirement for flushing, landscaping. Best water management practices will be adopted keeping 3 R principle for best water management i.e. Reduce, recycle and reuse.

A. WATER CONSERVATION TECHNIQUES:

Following water conservation techniques have been proposed for the project:

- Dual plumbing system will be adopted to utilize the treated wastewater for flushing landscaping and general washing. This will help in reducing the fresh water demand.
- Dual flushing system will be used for reducing the water demand
- Low flow fixtures / faucets for showerheads, taps will be used for reducing the water demand.
- Landscape design & management of irrigation systems:
 - Drought tolerant species will be selected.
 - Sprinkler landscaping system will be used to conserve water



B. WASTE WATER GENERATION AND TREATMENT:

Approximate 557KLD wastewater will be generated which will be treated in STP of capacity 670KLD based on MBR Technology. Physico chemical characteristics of influent and effluent are given as:

Parameters	Inlet	Treated effluent
pH	7.5 - 8.5	As per the latest norms of BPPCB/CPCB
Suspended solids	200- 225 mg/l	
BOD	200 - 250 mg/l	
COD	350 - 400 mg/l	
Oil & Grease	20-25 mg/l	
Coliform (CFU /100 ml)	<100 MPN/100 ML	

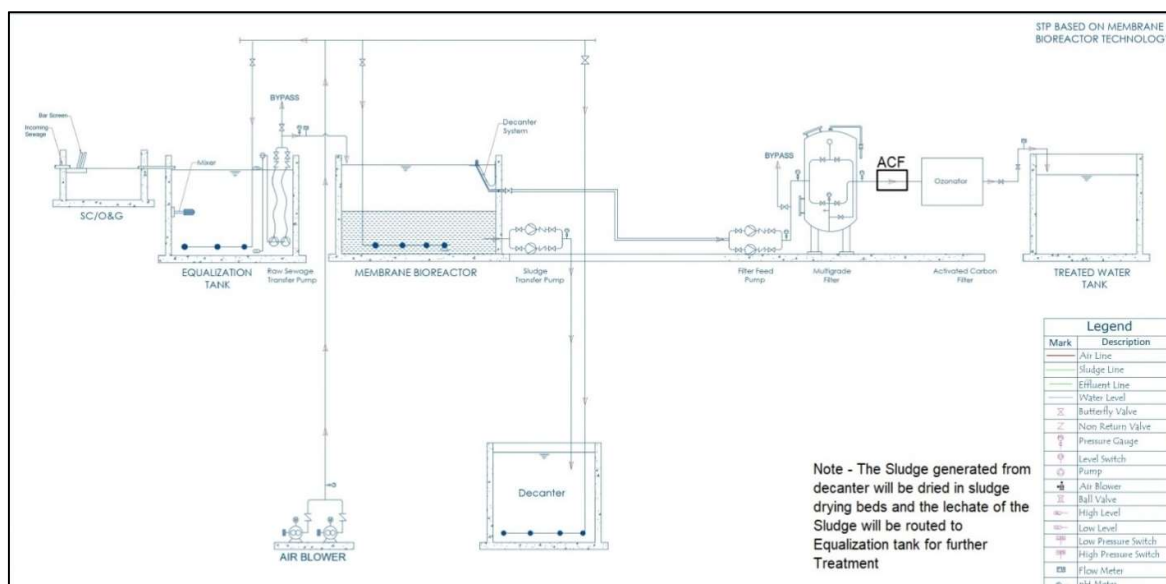


Figure 3: Schematic diagram of STP based on MBR

SEWAGE TREATMENT PLANT

Membrane bioreactor (MBR) technology has emerged as a wastewater treatment technology of choice over the activated sludge process (ASP), which has been the conventional municipal wastewater technology over the last century. MBR is, in fact, one of the most important innovations in wastewater treatment. MBRs have been used for both municipal and industrial wastewater treatment and reclamation. An MBR is a hybrid of a conventional biological treatment system and physical liquid–solid separation using membrane filtration. The inclusion



of membranes in the system eliminates the need for secondary clarifiers. The elimination of secondary clarifiers and operation of MBR at a shorter HRT results in significantly reduced plant area requirements. However, the use of MBR technology has disadvantages, including higher energy costs, the need to control membrane fouling problems, and potential high costs of periodic membrane replacement.

The heterogeneous nature of suspended solids and active microorganisms in mixed liquor suspended solids (MLSS) makes membrane fouling an inevitable challenge that is difficult to control in long-term MBR applications.

In operational terms, membrane fouling decreases the permeate flux when the MBR is operated at constant transmembrane pressure (TMP), and results in the increase of TMP when the MBR is operated at constant permeate flux. At constant flux operation, a sharp increase in TMP indicates severe membrane fouling. This sudden TMP increase is called a “TMP jump”. TMP jump has been described as a three-stage process.

Membrane foulants in MBR can be grouped into biofoulants, organic foulants and inorganic foulants based on their biological and chemical characteristics. The material the membrane is made of has an impact on its fouling propensity in MBRs. Based on the membrane material, membranes can be classified into: ceramic membranes, polymeric membranes, and composite membranes. Ceramic membranes exhibit good filtration performance due to their high chemical resistance, integrity, inert nature and ease of cleaning leading to low operating costs [13, 41, 42]. Ceramic membranes are also highly hydrophilic.

The water affinity (hydrophilicity or hydrophobicity) property of the membrane material affects fouling in MBRs. The water affinity behaviour of a membrane material is determined by measuring the contact angle of a water drop on its surface. Smaller angles indicate hydrophilicity, whereas larger angles indicate hydrophobicity. Due to the hydrophobic interactions occurring between the membrane material, microbial cell and solutes, membrane fouling is more severe in hydrophobic membranes compared to hydrophilic membranes. The membrane surface charge is another property of importance in relation to membrane fouling especially if there are charged particles in the feed. It has been indicated that most membrane materials are negatively charged under normal conditions.



The pore size of the membranes in relation to the sizes of the particles in the wastewater feed stream in MBRs can have an effect on membrane fouling. Pore blocking mechanism tends to increase with increasing membrane pore size. The F/M ratio is an important operational parameter in biological wastewater treatment systems.

It shall be ensured to have the quality of the treated waste water to comply with the local Authorities requirement and the following characteristics, whichever is stringent.

C. MONITORING THE WATER USAGE

Water meters will be installed for the following:

- Potable water consumption
- Landscape water consumption
- Hot water consumption through solar systems at building level
- Treated waste water consumption.

STORM WATER MANAGEMENT:

Construction phase

Contaminant	Sources	Impact Mitigation
Sediment & Floatables	Streets, lawns, driveways, roads, construction activities,	During construction, sediment fencing or other erosion control devices will be used to mitigate the short-term adverse impacts of sedimentation.
Oil & Grease	Roads, driveways, parking lots etc.	Oil & Grease trap will be provided to remove oil & grease, suspended matter, and ensure the quality of water.

Post Construction Phase:

a. Design:

For good design of rainwater harvesting, following points are to be kept under consideration:

- Ideal location with good ground slope.
- The location has adequate subsurface permeability of the aquifer to accommodate maximum recharge of rainwater through injection well.
- Rate of filtration should exceed average rainfall intensity.



- Clogging of filtration media should be cleaned periodically.
- Ground water pollution does not take place.

b. Calculation of annual recharge:

The average annual rainfall (based on last 10 years rainfall data) at Darbhanga station is 1230 mm.

Table 6: years Rainfall data of Darbhanga

S. No.	Year	Annual Rainfall (mm)
1.	2014	1169.77
2.	2015	964.38
3.	2016	1266.78
4.	2017	1443.55
5.	2018	996.85
6.	2019	1332.03
7.	2020	1434.8
8.	2021	1705.05
9.	2022	1097.29
10	2023	885.63
Total		12296.13
Average		1229.613 say 1230

c. Calculation of No. of RWH Structures:

The rain water harvesting structures are calculated on the basis of peak intensity of rainfall recorded as 100 mm/hr considering 15 minutes retention time. The same has been done to avoid flooding of the area.

S. No.	Particulars	Area (sq. m.) (A)	Intensity of rainfall (m/hour) [I]	Run off Coefficient [C]	Total Discharge [Q = CIA] (m3/hr)
1.	Terrace/Roof area	17,115	0.10	0.90	1540.35
2.	Paved/Pavement/Road area	1,76,968	0.10	0.85	15042.28
3.	Green/Playground/Loose Area	18,984	0.10	0.20	379.68
TOTAL		2,13,067			16962.31



Total Rain Water Flow : 16962.31 m³/hr

Considering 15 minutes retention time,

Runoff volume : 4240.58m³

Volume of each pit : $\pi r^2 h$

$$88.30 \text{ m}^3 (3.14 \times 2.5 \text{ m} \times 2.5 \text{ m} \times 4.5 \text{ m})$$

Total no. of rain water harvesting pits required : Total run-off volume/volume of each pit
 = 4240.58/88.30
 = 48.02 say 48 nos.

Therefore, 48 Number of Infiltration Wells will be Provide.

d. Design of Rain Water Harvesting Structure:

The dimensional parameters of Desilting/Settlement chamber would be (5 meters dia. and 4.5 meters eff. Depth). Infiltration Wells of 100mm depth depending upon the formation for recharge in aquifer through vadose zone. Each structure will be capable of handling rainwater volume @ 88.30 m³/day and such structures will accommodate up to total rainfall volume of 4240.58 m³ in any rainfall event at peak rainfall occurrence.

e. Calculation of Annual Recharge:

S. No	Type of Structure/ Surface	Area [A] (sq. m.)	Run off Coefficient [C]	Intensity of rainfall [I] (m/annum)	Total Recharge [Q= CIA] (m ³ / annum)
1.	Terrace/Roof area	17,115	0.90	1.230	18946.30
2.	Paved/Pavement/Road area	1,76,968	0.85	1.230	185020.04
3.	Green/Playground/Loose Area	18,984	0.20	1.230	4670.06
	Grand Total (1-3)	2,13,067			208636.40

Total Annual Recharge to Ground Water Regime of the area through rainwater harvesting structure would be **208636.40m³/ annum.**



3. SOLID WASTE MANAGEMENT:

Applicable Rules:

- Construction & Demolition Waste Management Rules, 2016
- Solid Waste Management Rules, 2016
- Hazardous & Other Waste Management Rules, 2016
- Bio-Medical Waste Management Rules, 2016
- Plastic Waste Management Rules, 2016
- Electronic waste Management Rules, 2016

CONSTRUCTION PHASE:

- **Construction waste:** About 3555 MT of the construction waste will be generated.

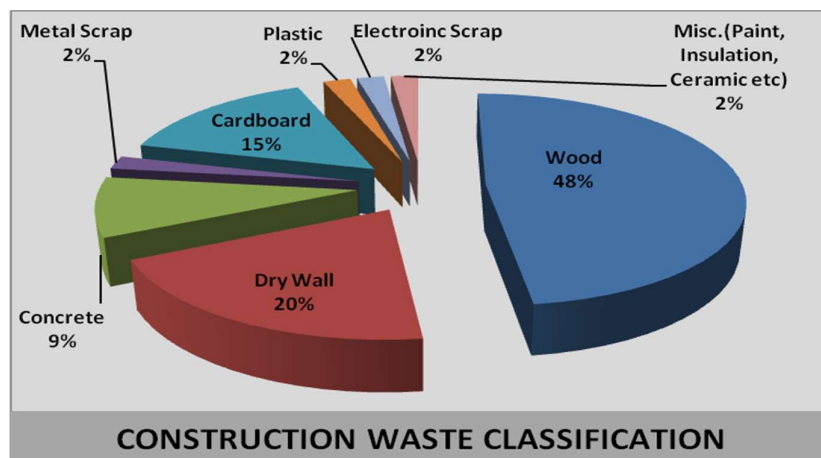
Details of the same is given as under:

S. No	Particulars	Area	Basis	Waste generation
1.	Construction waste for New Construction	59,222 sq.m	@ 60 kg/sq. m.	3553.32 kg say 3555

Source: TIFAC, 2001; Guidelines on Environmental Management of C & D Wastes (CPCB, 2017)

S. No.	Particulars	Approx. Qty, (MT)	Percentage
1.	Soil, Sand & Gravel	1280	36
2.	Brick & Masonary	1102	31
3.	Concrete	818	23
4.	Metals	177	5
5.	Bitumen	71	2
6.	Wood	71	2
7.	Others	36	1
Total		3555 MT	100





POST CONSTRUCTION PHASE:

MSW generated from labour camps during construction phase will be handled & disposed off in line with existing waste management practices at Darbhanga airport which include waste segregation at source & handing over for final disposal to municipal waste disposal site.

Solid waste generated from the new civil enclave during operation phase will mainly comprises of food waste and garbage waste. Further, small quantities of sludge from STP and other waste will be generated. The solid waste generated will be first segregated as plastic, glass, paper, and other waste separately and disposed off as per applicable Rules.

SOLID WASTE CALCULATION:

Particulars	Population / area	Basis	Quantity of waste generated (in kg/day)
Passengers	9041	@0.2 kg/day	1808.2
Staff	930	@0.2 kg/day	186
Office & retail	576	@0.2 kg/day	115.2
Landscaping	13 acre	@0.2kg/acre/day	2.6
STP sludge (dry)	--	--	55
Total			2167 Say 2170 Kg per day



BREAK UP OF RESIDENTIAL SOLID WASTE:**Table 7: Break Up of Residential Solid Waste**

Waste Type	Estimated Quantity (kg/day)	%
Biodegradable	1302	60 %
Non-Biodegradable	868	40%
Total waste	2170	100%

○ **Organic waste converter**

A waste converter is a machine used for the treatment and recycling of solid and liquid refuse material.

Biodegradable waste	1302Kg/day
Organic Waste Converter	3 nos.
Capacity	500kg/day each

MUNICIPAL SOLID WASTE MANAGEMENT

Municipal waste generated during the post construction phase will be managed properly as per the applicable rules.

Type of waste	Waste collection	Treatment / Disposal
Biodegradable Waste	Biodegradable Waste will be collected in colour coded bins (Green)	Biodegradable waste will be treated in organic waste convertor. Manure produced will be used as manure for plantation.
Plastic Waste	Plastic/rubber Waste will be collected in colour coded bins (Blue)	Segregated waste will be handed over to authorized waste recyclers or waste collectors.
Glass/Metal Waste	Glass/Metal Waste will be collected in colour coded bins (Yellow and Orange)	Segregated waste will be handed over to authorized waste recyclers or waste collectors.
Hazardous waste (Spent oil generated from DG sets and transformer)	Collected & stored at designated impervious areas.	Will be sold to the CPCB authorized recyclers
E Waste	Collected & stored at designated areas.	Will be sold to the CPCB authorized recyclers

Source: Municipal Solid Waste Management Manual, CPHEEO, MOUD, 2016



4. ECOLOGY AND BIODIVERSITY

Total Plot area : 212100 sq.m.

Total green area : 53275 sq.m (25 %)

Tree Calculation : Total Plot Area/80*

Tree required : Total Plot area/80 (1 tree per 80 sq.m)

: 53000/80= 662.5 nos. (Says 663)

Tree Provided : 663

Tree to Tree Distance : 2 m

(According to National Building Code, 2016)*

LIST OF PLANT SPECIES RECOMMENDED FOR GREEN BELT DEVELOPMENT

S. No.	Description		Qty
	Scientific Name	Common Name	
	Trees		
1.	<i>Alstonia scholaris</i>	Devils tree	100
2.	<i>Casuarinas equusetifolia</i>	Suru	100
Ornamental Tree			
1.	<i>Bauhinia purpurea</i>	Kaniar	50
2.	<i>Plumeria alba</i>	Champa	130
3.	<i>Callistemon lanceolatus</i>	Cheel	60
4.	<i>Phonix sylvestris</i>	Date Sugar Palm	30
5.	<i>Ficus benjamina</i>	Weeping fig	80
6.	<i>Polyalthia longifolia</i>	Ashok	113
Total			663

Shrubs		
1.	<i>Acalypha hispida</i>	Kuppi
2.	<i>Barleria cristata</i>	Jhinti
3.	<i>Bauhinia tomentosa</i> ,	Yellow orchid plant
4.	<i>Clerodendron inerme</i>	Chhoti-ari, sankuppi



5.	<i>Duranta plumieri</i>	Nilkanta
6.	<i>Hamelia patens</i>	Thalkamal
7.	<i>Hibiscus rosasinensis</i>	Gurhal
8.	<i>Mussaenda erthyrophylla</i>	Bedina
9.	<i>Nerium oleander</i>	Kaner
10.	<i>Poinsettia pulcherrima</i>	Lalpata
11.	<i>Tecoma stans</i>	Piliya
12.	<i>Thevetia nereifolia</i>	Peeli kaner
13.	<i>Codiaeum sp</i>	Garden croton
14.	<i>Pisonia alba</i>	Lettuce plant

CLIMBERS

1.	<i>Allamanda cathartica</i>	Pilaghanti
2.	<i>Asparagus densiflorus</i>	Shtawar
3.	<i>Bougainvillea sp</i>	Baganvilas
4.	<i>Clitoria ternatea</i>	Koyala
5.	<i>Ipomoea palmate</i>	Kamlata
6.	<i>Quisqualis indica</i>	Madhu Malati

FLOWERING PLANTS

1.	<i>Allamanda cathartica</i>	Pilaghanti
2.	<i>Asparagus densiflorus</i>	Shtawar
3.	<i>Bougainvillea sp</i>	Baganvilas
4.	<i>Clitoria ternatea</i>	Koyala
5.	<i>Ipomoea palmate</i>	Kamlata
6.	<i>Quisqualis indica</i>	Madhu Malati
7.	<i>Impatiens balsamina</i>	Gul-mehndi
8.	<i>Celosia sp</i>	Lalmurga
9.	<i>Chrysanthemum sp</i>	Chandramallika
10.	<i>Cosmos bipinnatus</i>	Cosmos
11.	<i>Gomphrena globosa</i>	Gul-e-makhmal
12.	<i>Tagetes erecta</i>	Jhenduphool
13.	<i>Petunia hybrida</i>	Petunia
14.	<i>Portulaca grandiflora</i>	Khursa



15.	<i>Salvia splendens</i>	Sefakuss
16.	<i>Solidago Canadensis</i>	Pinja phool
17.	<i>Vinca rosea</i>	Sadabahr
18.	<i>Zinnia elegans</i>	Jhinia

SPECIES FOR LAWN (TURF) GRASSES

S. NO	COMMON NAME	BOTANICAL NAME	TEXTURE	SITUATION
1.	<i>Cynodon dactylon</i>	Hariyali (or) Arugu (or) Doob grass	Medium	Suitable for open sunny location; drought tolerant
2.	<i>Stenotaphrum secundatum</i>	St. Augustine grass	Coarse	Suitable for shady situation with frequent irrigations
3.	<i>Zoysia japonica</i>	Japan grass	Coarse	Can grow well in poor sandy soil and suited for open sunny situation
4.	<i>Paspalum vaginatum</i>	Paspalum grass	Medium	Suitable for open sunny situation, highly drought tolerant

BUDGETARY PROVISIONS

No. of trees to be planted	Green area	Min. rate	Budget allocation for the project	Recurring cost
663	53000sq. m.	Rs. 1000. x 663 (trees). = Rs. 6.63Lacs	Rs. 30 Lacs	Rs. 5.0 Lac/ annum

FIRE PROTECTION

Preventing fire ignition is the first line of defense in fire safety. The second line of defense, if ignition does occur, is to manage the fire's impact and minimize the risk. The two main methods for managing the impact of a fire are Manage the People Exposed and Manage the Fire itself. The automatic fire alarm shall be provided depending on the height of the tower.



FIRE DETECTION

Despite the many precautions taken, fires may breakout. Hence the project will establish measures to detect a fire and to extinguish it. Automatic fire detection has many advantages such as speed and reliability and is recommended.

MANAGEMENT PLAN

Since the project may face fire hazards or other emergency situations; an emergency plan is provided to caution the persons during any accidents. The fundamental approach, governing fire safety attempts to ensure that fires do not at all start in the first place and should they occur, to restrain their spread by quick detection and extinguishments.

The task of accident and emergency control can be simplified and made effective if pre-planned systems and procedures are available. Without these, important matters may be overlooked at the time of an emergency.

Every management must survey the total operation to identify potential for fire losses and develop an action plan to put the business back to normal with minimum loss of time. A fire protection Manual should be prepared, preferably in 3-parts.

1. The first part should outline the fire risks in terms of plant locations, equipment and facilities and indicate the ways in which risks have been minimized.
2. The second part would set out operating procedures, standards of fire protection established, and maintenances of these standards action to be taken in the event of fire by every level of management responsibility for inspection and repair. It should also include instructions for staff responsible for building services.
3. The third part should outline the training required for existing and new staff, the inspection schedules and checklists, sources of additional information and help.

The Management Cell of the Airport shall keep ready a plan to alert and take care of residents in case there is any fire. There shall be designated an Emergency Team that shall consist of staff of maintenance department, security supervisor representative of residents from campus.



4. ENVIRONMENT MONITORING PLAN

❖ Environment Monitoring Plan-Construction Phase

Source	Monitoring location	Parameters to be Monitored	Frequency
Ambient Air Quality	At 1 location near boundary of the project site.	PM ₁₀ , PM _{2.5} , SO ₂ , NO ₂	Twice a year
Ambient Noise	At 1 location near the boundary of the project	Day and night equivalent noise level	Twice a year
Ground water	Near Project site/ Project site	As per IS: 10500	Twice a year
Soil	Project site near construction area	As per standards	Once a year

❖ Environment Monitoring Plan-Operation Phase

Source	Monitoring location	Parameters to be Monitored	Frequency
DG set emissions	DG stacks	PM, SO ₂ , NO ₂ , CO, HC	Twice in a year or as per requirement of BPPCB
DG set noise	At 0.5 m distance from enclosure	Noise level	Twice in a year or as per requirement of BPPCB
Sewage treatment Plant	Inlet and outlet	pH, BOD, Suspended Solid, Oil & Grease	Once in a month or as per requirement of BPPCB
Ambient Air Quality	At 1 Locations	PM ₁₀ , PM _{2.5} , SO ₂ , NO ₂ ,	Twice in a year or as per requirement of BPPCB
Ambient Noise	At 1 Locations	Day and night equivalent noise level	Twice in a year or as per requirement of BPPCB



5. EXPENDITURE ON ENVIRONMENTAL PROTECTION MEASURES:**Table 8: Environment Management Plan during Construction Phase**

S. No.	Particulars	Proposed Capital Cost (in lacs)	Annual recurring cost (in lacs)
1.	Air Pollution Control (Barricading of project site, dust screens)	20.0	3.0
2.	Solid Waste Management	2.0	0.5
3.	Labour health check up and first aid facility	2.0	1.5
4.	Labour welfare (Creche, Water, sanitation)	10.0	5.0
5.	Safety training to labour	2.0	2.0
6.	Environmental monitoring including submission of six monthly compliance reports to the conditions laid in EC, CTE, others (as applicable)	-	3.0
Total		Rs. 36.0 lacs	Rs. 15 lacs

Table 9: Environment Management Plan during Operational Phase

S. No.	Particulars	Total Rs. (in lacs)	Annual recurring cost Rs.(in lacs)
1.	STP	200	10.0
2.	Rain water harvesting	150	5.0
3.	Solid waste management (Organic waste convertor-500 kg/day)	20	5.0
4.	Environmental Monitoring including submission of six monthly compliance reports	-	3.0
5.	Green Belt	30	5.0
6.	Socio as EMP	455	-
7.	Roof top Solar PV (1000 KW)	100	5.0
TOTAL		955	33.0

