

CONCEPTUAL PLAN

1. Introduction:

Proposed Himalaya Medical College & Hospital at Chiksi, Paliganj, Patna, Bihar. Total built-up area is **103022.63 sqm. (Existing= 31311 Sqm. + Proposed = 71711.63 Sqm.)**, construction of Existing Built-up area i.e. Sqm. has already been completed for which EC was not required as those Buildings are academic blocks.

The Project built up area is greater than 20,000 sqm and less than 1,50,000 sqm. therefore, designated under Category “B” and falls under Item 8 (a) (Building & Construction Project) of the Environmental Impact Assessment (EIA) Notification of September 14, 2006 and its subsequent amendments. The Land detail is attached as **Annexure-II**.

1.1 SITE SURROUNDING & CONNECTIVITY

The proposed project site is located at Patna, Bihar. Site surroundings and Connectivity details of the proposed project are given in **Table-1**.

- i. The surrounding features of the proposed site within 500 is shown in **Figure 1**
- ii. The Pillar Coordinates map is mentioned in **Figure 2**
- iii. Topographical map is mentioned in **Figure 3**.

Table-1: Site Surroundings and Connectivity Details

Connectivity & Site Surroundings			
S. No.	Description		Distance and Direction
1.	Nearest Junction Nearest Railway Station	Jehanabad Railway Station. Karona halt Railway Station	Approx.14.20 Km towards ESE. Approx.15.0 Km towards East.
2.	Nearest Airport	Jayprakash Narayan Airport Patna	Approx. 43.50 km towards NNE.
3.	Nearest Village	Kodahari Kharanti Khurd Chikasi Bahadurganj	Approx. 0.50 Km towards NE. Approx. 1.50 Km towards SE. Approx. 2.0 Km towards NE. Approx. 1.35 Km towards West.

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Connectivity & Site Surroundings			
S. No.	Description		Distance and Direction
4.	Nearest Highway/Roads	SH-69 Bahadurganj Rd	Adjacent to Site. Approx. 0.75 km. towards SW.
5.	Nearest School & College	Rajkiya Madhyamik Vidyalaya Lakshya Public School Little word Public School KPS College Kinjar	Approx. 0.70 Km towards South. Approx. 0.60 Km towards SSW. Approx. 1.35 Km towards West. Approx. 5.16 Km towards SSW.
6.	Nearest Hospital	Govt.hospital dehiya Sub-divisional Hospital Paliganj Aadarsh seva sadan Hospital Kinjar Hospitral	Approx. 3.84 Km towards WNW. Approx. 8.25 Km towards NW. Approx. 8.92 Km towards NW. Approx. 5.70 Km towards SSW.
7.	Places of worship	Bela devi Mandir Surya Mandir Durga Mandir Shiv Mandir Chiksi	Approx. 0.70 Km towards SE. Approx. 0.80 Km towards SW. Approx. 0.95 Km towards SSW. Approx. 1.0 Km towards NE.
8.	Water Bodies	Punpun River Lowai River	Adjacent to Site. Approx. 2.90 Km towards WNW.
9.	Nearest Town	Paliganj	Approx.8.90 Km towards NW.
10.	Sanctuary	Bird Sanctuary Rajbansi nagar Patna	Approx.45.60 Km towards NE.
11.	Reserve Forest / Zoo	Gorilla Sadan Zoo	Approx. 13.60 Km towards ESE.

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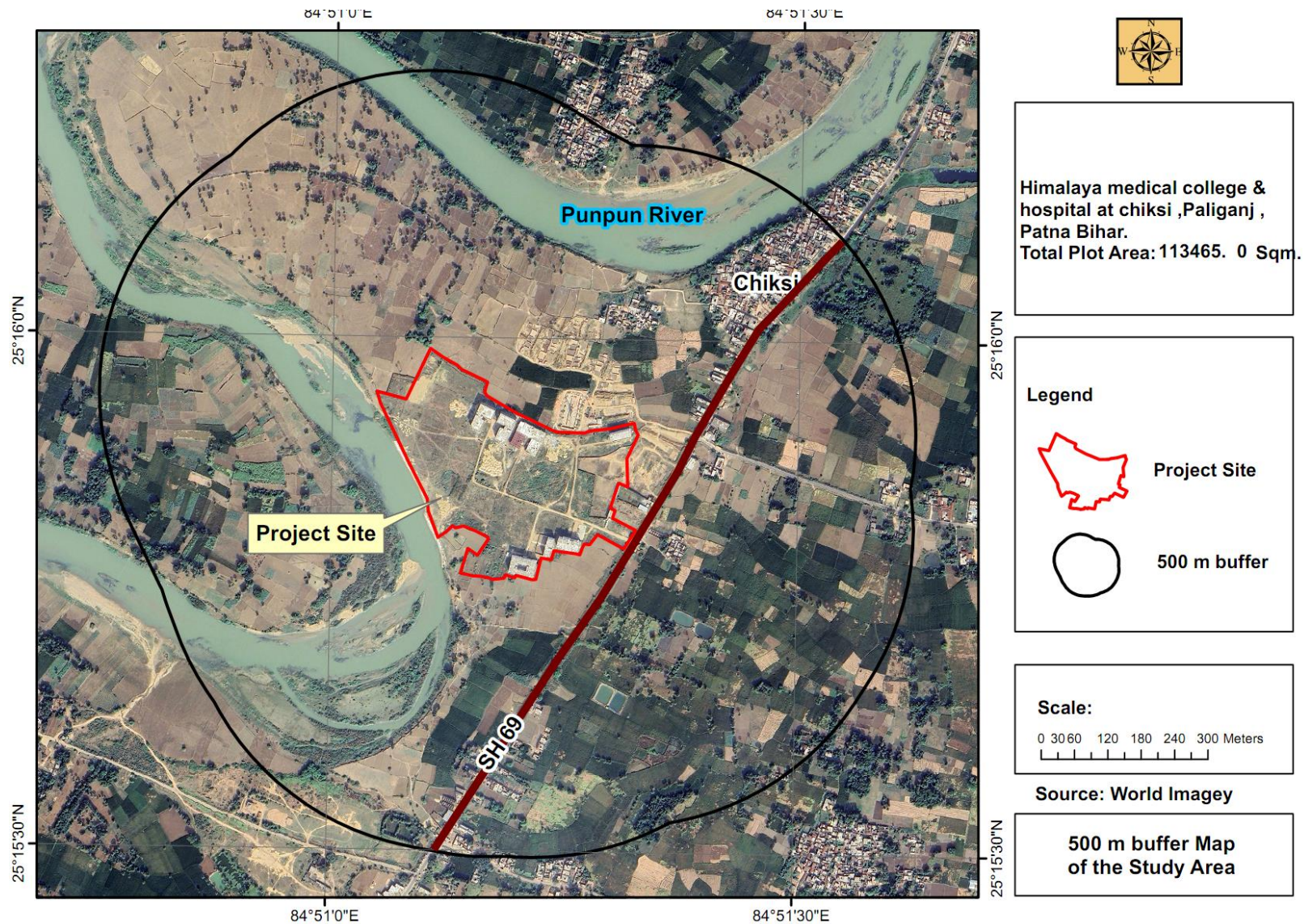


Figure 1: Surrounding features of the proposed site (within 500 meters)

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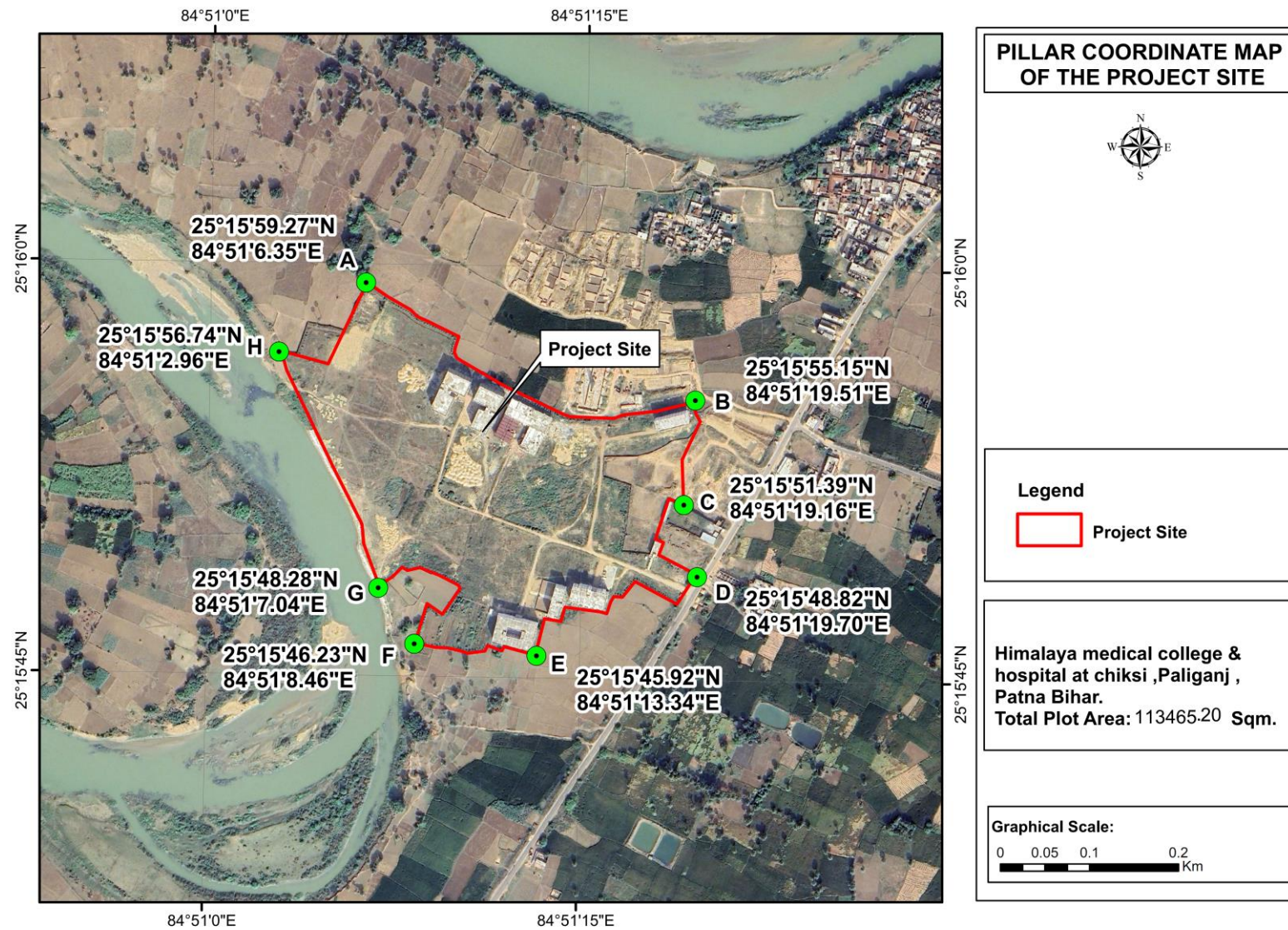


Figure 2: Project site coordinate map

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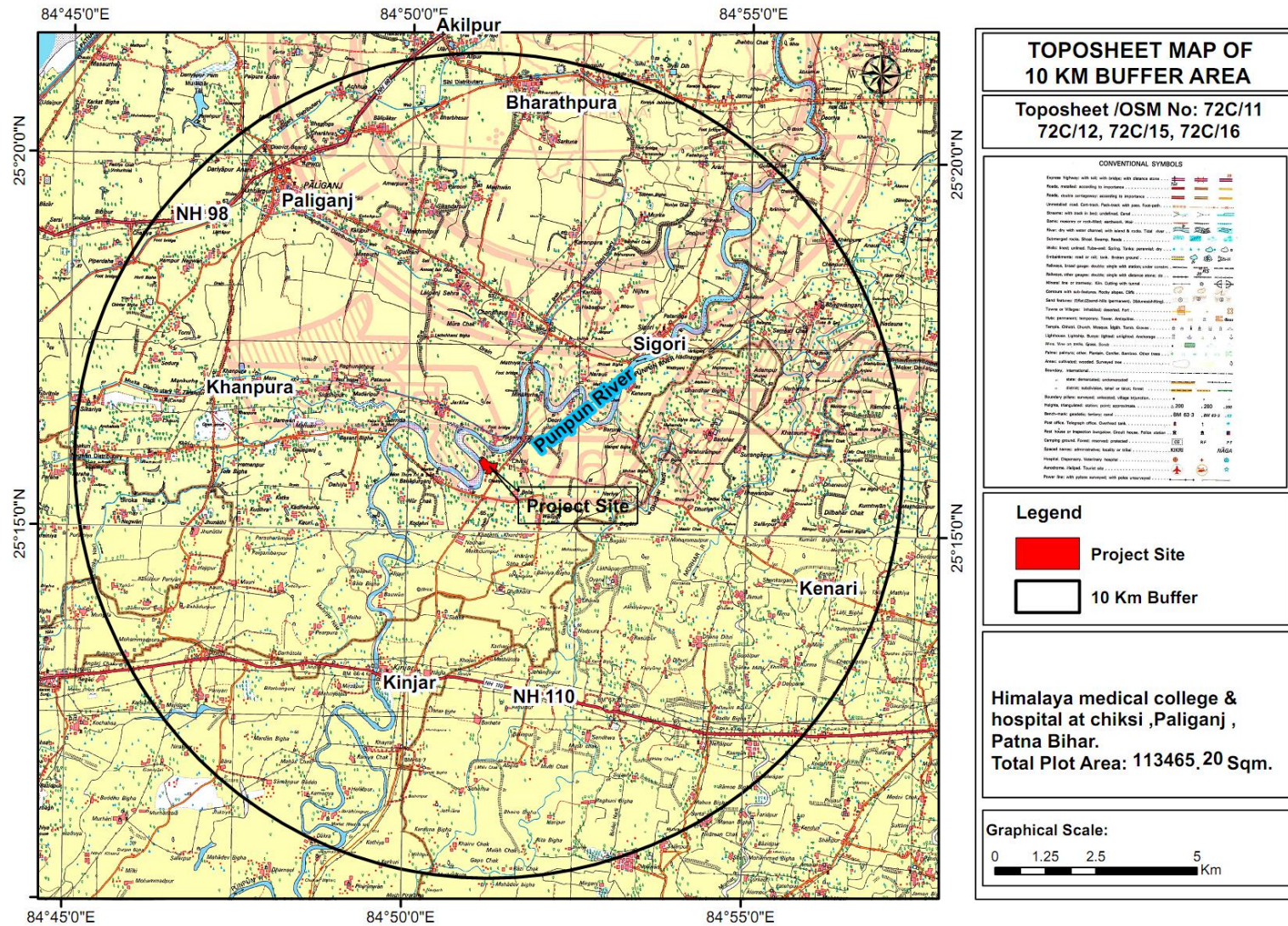


Figure 3: Topographical Map of 10 km radius

3. PROJECT LOCATION AND DESCRIPTION

Himalaya Medical College & Hospital located at Chiksi, Paliganj, Patna, Bihar. The coordinates of the project boundary is mentioned below in the **Table-2**.

Table-2: Coordinates of the Project Boundary

Sl. No.	Latitude	Longitude
1.	25°15'59.27"N	84°51'6.35"E
2.	25°15'55.15"N	84°51'19.51"E
3.	25°15'51.39"N	84°51'19.16"E
4.	25°15'48.82"N	84°51'19.70"E
5.	25°15'45.92"N	84°51'13.34"E
6.	25°15'46.23"N	84°51'8.46"E
7.	25°15'48.28"N	84°51'7.04"E
8.	25°15'56.74"N	84°51'2.96"E

The Salient Features of the Project is mentioned in **Table-3**.

Table 3: Salient feature of the Project

Sr. No.	Particulars	
1.	Total Plot area	113465.2 sqm
2.	Permissible max. FAR	1.75
3.	Total Built-up Area	103022.63 sqm
4.	Existing Built-up Area	31311 Sqm. <i>Note: construction of Existing Built-up area i.e. 31311 Sqm. has already been completed for which EC was not required as those Buildings are academic blocks.</i>
5.	Proposed Built-up Area	71711.63 Sqm.
6.	Total Parking Provided (Open Parking)	27528.2 Sqm.
7.	Greenbelt Area Provided @ 35% of the Plot area	39712.82 Sqm.
7.a	Hard Green Area Provided @ 65% of Greenbelt Area (@22.75% of plot area)	25813.33 Sqm
7.b	Soft Green Area Provided @ 35 % of Greenbelt Area (@12.25% of plot area)	13899.48 Sqm
8.	Existing Ground Coverage	6439 Sqm.
9.	Proposed Ground Coverage	16603.74 Sqm.
10.	Total Ground Coverage @20.30 %	23042.744 Sqm.
11.	Roads Area	23181.44 sqm
12.	Rain Water Harvesting Pits (with size)	10 (71.5 cu-mtr)
13.	STP Capacity	648 KLD
14.	ETP Capacity	15 KLD
15.	Maximum Height of the Building (m)	Max. 23.10 m
16.	Power Requirement	~4000 KW
17.	Power Backup	DG set (3 x 750 KVA, 1 x 500 KVA)
18.	Total Water Requirement	~832 KLD Fresh water –400 KLD Treated water- 432 KLD Source: Ground water
19.	Wastewater Generated	~540 KLD
20.	Solid Waste Generated	~1867 Kg/day
21.	Biodegradable Waste	~1120 Kg/day

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Sr. No.	Particulars		
22.	Non-Biodegradable Waste		~747 Kg/day
23.	Bio Medical Waste		Hospital Bed: 350 Kg/day OPD BMW: 35 Kg/day Total: 385 Kg/day
22.	Stories		G+5
23	Project Cost		200 Cr.
24	EMP Budget		During Construction Capital Cost: 35 Lakhs Recurring Cost: 12 Lakhs
			During Operation Capital Cost: 235 Lakhs Recurring Cost: 43 Lakhs
25	Connectivity	Jehanabad Railway Station.	Approx.14.20 Km towards ESE.
		Karona halt Railway Station	Approx.15.0 Km towards East
		SH-69 Bahadurganj Rd	Adjacent to Site. Approx. 0.75 km. towards SW
		Jay Prakash Narayn International Airport, Patna	Approx. 43.50 km towards NNE

4. DETAIL OF BUILDING BLOCK

The Project envisages construction of Hospital & College Building, Hostels & P.G, Residential and Supporting utilities. Details of Building Blocks are given in **Table 4**.

TABLE 4: DETAILS OF BUILDING BLOCKS

EXISTING BLOCK

S.NO	EXISTING BLOCK	BUILT-UP AREA(SQM)	FLOOR
B-01	HIMALAYA COLLEGE OF PHARMACY	6195	G+4
B-02	GIRLS HOSTEL	2160	G+4
B-03	HIMALAYA AYURVEDIC MEDICAL COLLEGE	5115	G+4
B-04	HIMALAYA COLLEGE OF PROFESSIONAL EDUCATION	5115	G+4

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B-05	HIMALAYA COLLEGE OF NURSING	10190	G+4
B-06	ADMISSION & COUNSELLING CENTER	376	G+3
B-07	BOYS HOSTEL	2160	G+4
	Total	31311	

PROPOSED BLOCK

Sl. No.	PROPOSED BLOCK	BUILT-UP AREA (SQM)	FLOOR
B-8	BANK	396	G+4
B-9	HIMALAYA MEDICAL COLLEGE & HOSPITAL (HOSPITAL BLOCK)	37931.86	G+5
B-10	HIMALAYA MEDICAL COLLEGE & HOSPITAL (COLLEGE BLOCK)	11230	G+4
B-11	PROPOSED BOYS HOSTEL	1172	G+4
B-12	PROPOSED GIRLS HOSTEL	2160	G+4
B-13	PROPOSED GIRLS HOSTEL	2160	G+4
B-14	COLLEGE CANTEEN / SHOPPING COMPLEX	1779.4	G+1
B-15	CENTRAL LIBRARY	1578.7	G+1
B-16	NON TEACHING STAFF BUILDING	2323.25	G+4
B-17	TEACHING STAFF BUILDING	2323.25	G+4
B-18	NURSES BUILDING	2323.25	G+4
B-19	RESIDENT DOCTOR BUILDING	2323.25	G+4
B-20	PRINCIPAL / OFFICER QUARTER	280.2	G+2
B-21	PRINCIPAL / OFFICER QUARTER	280.2	G+2
B-22	PRINCIPAL / OFFICER QUARTER	280.2	G+2
B-23	PRINCIPAL / OFFICER QUARTER	280.2	G+2
B-24	AUDITORIUM	2100.65	G+1
B-25	BIO MEDICAL WASTE	150.22	
B-26	ETP PLANT	177.5	G
B-27	STP PLANT	255.7	G
B-28	OXYGEN PLANT	60.45	G
B-29	DG SETS	145.35	G
	Total	71711.63	

5. POPULATION DETAIL

Total no. of population will be 10685 in the proposed hospital, which includes total no. of beds, visitors, OPD, Staffs, Medical, Hostels & Students.

Table-5: Calculation of Population

Sl. No.	Description	Total Capacity / Bed
1	Himalaya Medical College & Hospital (Beds in Hospital Block)	700
3	Attendant (For Patient)	700
4	OPDs	1400
5	Hospital Staff (Admin, Security & Miscellaneos)	575
6	Himalaya Medical College & Hospital - Students	3710
7	College & Guest house Canteen	400
8	Security & Miscellaneous Staff	25
9	Boys Hostels	480
10	Girls Hostels	720
11	Guest House & Officer Quarter	39
12	Staff quarters (2BHK 20 Units ,1BHK 20 Units 10 Single Room) x 4	760
13	Visitors @10% of Staff quarter population	76
Total		10685

6. PARKING DETAIL

The details of parking required and provided is mentioned in following **Table 6**.

Table 6: Parking Details

Sl. No.	Details	Area (Sqm.)
Parking Details		
1.	Total Parking Required	24497
2.	Total Parking Provided (Open Parking)	27528.2

7. LANDSCAPE DEVELOPMENT

Increasing vegetation in the form of greenbelt is one of the preferred methods to mitigate air pollution. Plants serve as a sink for pollutants, reduce the flow of dust and reduce noise pollution. Calculation of green area for proposed project is given in **Table-7** and **Table-8** indicates various suggested species to be used in greenbelt development.

Table-7: Calculation of Green Area and No. of Trees Proposed

Total Plot Area	113465.2 Sqm
Proposed greenbelt Area	39712.82
No. of Trees Required @ 1 tree /80 sq. m of Plot Area (Trees including Periphery + Green Belt + Avenue Plantation)	1418

Table-8: Suggested Species to be used for Greenbelt Development of Project Site

S. No.	Scientific Name	Family	Common Name	Hindi Name
1	<i>Azadirachta indica</i>	Meliaceae	Indian Lilac	Neem
2	<i>Alstonia scholaris</i>	Apocynaceae	Blackboard tree	Chitvan
3	<i>Cocos nucifera</i>	Arecaceae	Coconut palm	Coconut
4	<i>Cassia fistula</i>	Fabaceae	Cassia fistula Linn	Amaltas
5	<i>Delonix regia</i>	Fabaceae	Royal Poinciana	Gulmohar
6	<i>Ficus benghalensis</i>	Moraceae	Banyan fig	Banyan
7	<i>Ficus virens</i>	Moraceae	Grey Fig	Pakhad
8	<i>Ficus racemosa</i>	Moraceae	Cluster fig	Gular
9	<i>Mangifera indica</i>	Anacardiaceae	Mango Tree	Aam

10	<i>Monoon longifolium</i>	Annonaceae	False ashoka	Ashoka
11	<i>Psidium guajava</i>	Myrtaceae	Guava Tree	Amrud
12	<i>Saraca asoca</i>	Fabaceae	Asoka- Tree	Ashok
13	<i>Syzgium cumini</i>	Myrtaceae	Java Plum	Jamun

8. WATER REQUIREMENT, SUPPLY AND DISTRIBUTION

Water Requirement for the proposed project is discussed below.

8.1 Water requirement during Construction phase

Approx. 21 KLD water will be required for domestic as well as for construction purpose. Water requirement of construction phase will be met from STP treated water / Private water tanker.

No use of ground water or surface water will be used during the construction activity

- Cement mixing – 05 KLD
- Curing -02 KLD
- Sprinkling -05 KLD
- Domestic purposes – 9 KLD

8.2 Water requirement during operation phase

Water requirement during the operational phase of the proposed project of fresh water 400 KLD will be met through Ground water. This will be withdrawn only after getting permission of CGWB. The total water requirement for the proposed project has been estimated 832 KLD. This includes domestic water requirement, flushing, landscaping, Makeup Water for Cooling Tower of A/c Plant by HVAC. The water requirement for Flushing and landscaping, HVAC will be met through treated water from STP/ETP. The break-up of water requirement for the project is given in **Table-3**.

Total wastewater generated will be 540 KLD. After Treatment ~432 KLD water will be used for Flushing and Horticulture, Makeup Water for Cooling Tower of A/c Plant by HVAC. Water balance diagram for given in **Figure-4**.

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Table 9: Details of Water Requirement

SL. No	Description	Total Population	Water Requirement	Fresh/Domestic	Flushing	Total water Requirement	Total wastewater
			LPCD	LPD	LPD	LPD	LPD
Hospital Unit							
1	Hospital Bed	700	300	140000	70000	210000	182000
2	Attendant with patient (24 hours)	700	35	14000	10500	24500	21700
3	OPD	1400	15	14000	7000	21000	18200
4	Hospital Staff	575	35	11500	8625	20125	17825
Medical college unit							
5	Himalaya Medical college	3710	35	74200	55650	129850	115010
6	College & Guest house Canteen	400	35	8000	6000	14000	12400
8	Medical college staff	125	35	2500	1875	4375	3875
9	Water requirement for Lab, Pathology, Laundry	...		15000		15000	12000
Residential Unit							
10	Boys Hostel	480	90	28800	14400	43200	37440
11	Girls Hostels	720	90	43200	21600	64800	56160
12	Guest House & Officer Quarter	39	90	2340	1170	3510	5382
14	Staff Resident Quarter	760	90	45600	22800	68400	59280
15	Visitors @10% of total population	76	15	380	760	1140	1064
	Grand Total			399520	220380	619900	540200

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16	DG Set Cooling (3*750 KVA,1*500) = 2750 kva		1 lt./KVA/ 6 hr			2750	
17	Landscape area use 39712.82 Sqm. @ 4 Litres/Sqm.		4 liter/sqm of Landscape area			158848	
18	HVAC					50000	
	Say			400KLD	220 KLD	832 KLD	540 KLD

8.3 Wastewater Generation

The total estimated quantity of wastewater to be generated from proposed project is ~832 KLD.

Calculation of wastewater generation is shown below in **Table-10**.

Table-10: Calculation of Wastewater Generation

Details	Water (KLD)
Water requirement for domestic purpose	400
Wastewater to be generated from domestic use (@ 80% of domestic water requirement)	320
Water requirement for Flushing Purpose	220
Wastewater to be generated from Flushing @ 100% of flushing requirement)	220
Makeup Water for Cooling Tower of A/c Plant (By HVAC Dept.)	50
Total Wastewater generated	540
STP capacity	648
ETP capacity	15

Water balance diagram for given in **Figure-4**.

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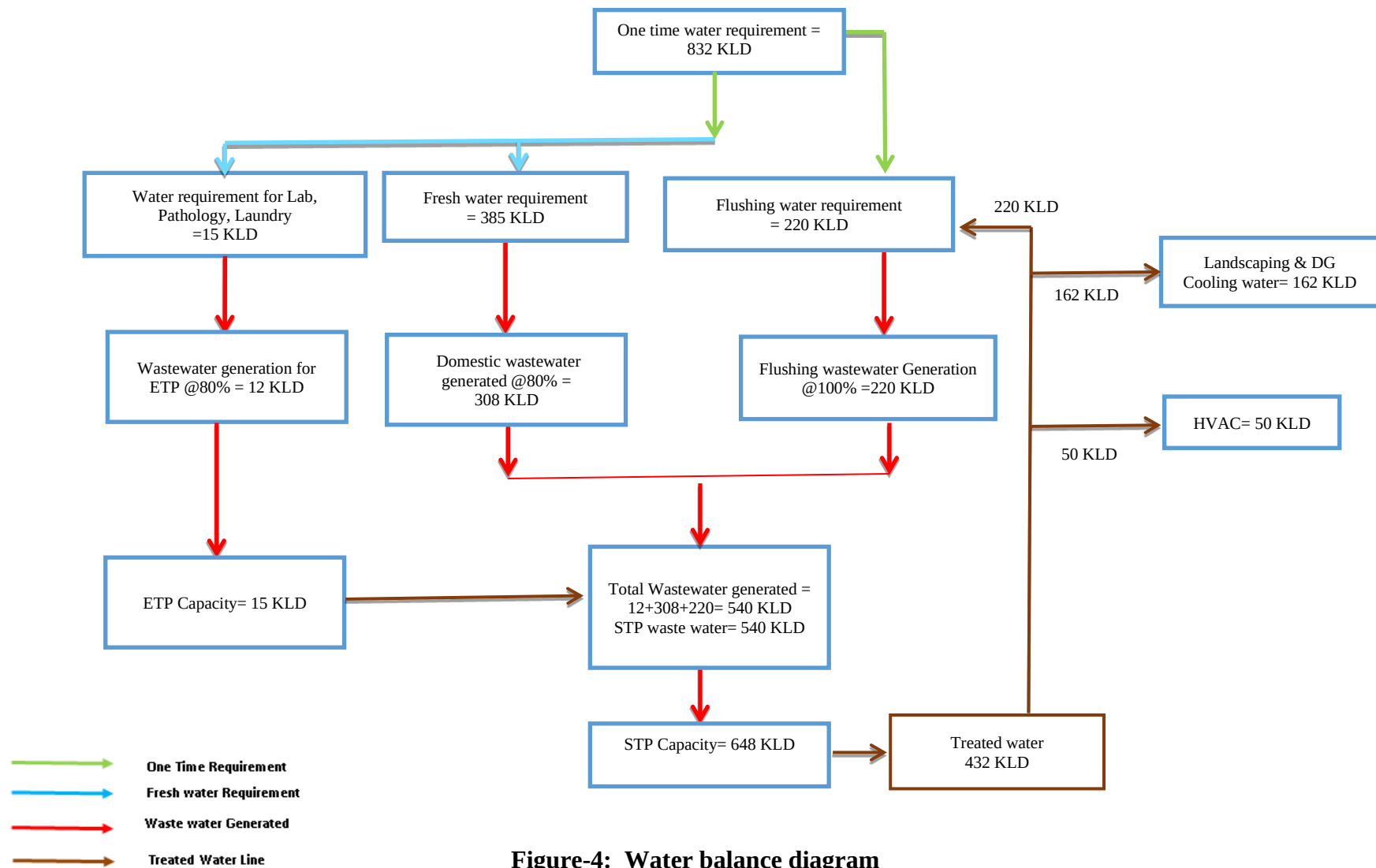


Figure-4: Water balance diagram

Reuse of Treated Water:

Wastewater generated is 540 KLD, which will be treated in the onsite STP of capacity 20% more than the wastewater generated i.e. 648 KLD and ETP of capacity 15 KLD. The treated water available is 432 KLD (@ of 80% of Total wastewater) and it will be recycled and re-used for flushing and landscaping purpose.

During the non-monsoon season, treated water will be used in Flushing & landscaping management and during the monsoon season, as there will be no requirement of water for landscaping, and the excess treated water depending up on requirement either will be used in nearby construction site or discharged into the sewer line.

Wastewater Treatment Scheme

The waste water generated will be treated in the Sewage Treatment Plan, and the capacity of Sewage Treatment Plant (STP) will be higher of waste water generated i.e., 648 KLD. The proposed STP is based on **Membrane Bio reactor (MBR)**. MBR is a process that combines a membrane ultra / micro filtration process and activated sludge process. The MBR process is used in place of the secondary sedimentation tank and sand filter used for tertiary treatment in the conventional activated sludge process.

Pre-treatment:

To reduce the chances of membrane damage, wastewater should undergo a high level of debris removal using screens prior to the MBR. Primary treatment is often provided in larger installations. In addition, all MBR systems require 1- to 3-mm-cutoff fine screens immediately before the membranes, depending on the MBR manufacturer. These screens require frequent cleaning.

Membrane Configuration:

MBR manufacturers employ membranes in two basic configurations: hollow fiber bundles and plate membranes. A number of **bundles** are connected by manifolds into units that can be readily changed for maintenance or replacement.

The other configuration, employ **membranes** in a flatplate configuration, again with manifolds to allow a number of membranes to be connected in readily changed units.

System Operation:

All MBR systems require some degree of pumping to force the water flowing through the membrane. While other membrane systems use a pressurized system to push the water through the membranes, the major systems used in MBRs draw a vacuum through the membranes so that the water outside is at ambient pressure. The advantage of the vacuum is that it is gentler to the membranes; the advantage of the pressure is that throughput can be controlled. All systems also include techniques for continually cleaning the system to maintain membrane life and keep the system operational for as long as possible. All the principal membrane systems used in MBRs use an air scour technique to reduce buildup of material on the membranes. This is done by blowing air around the membranes out of the manifolds.

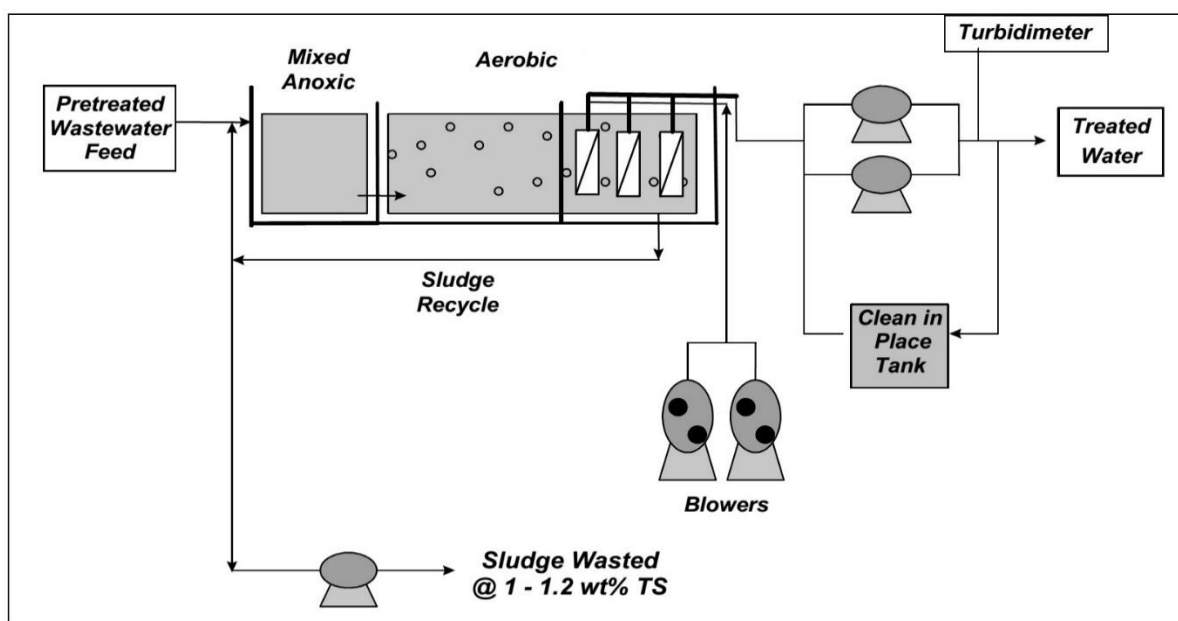
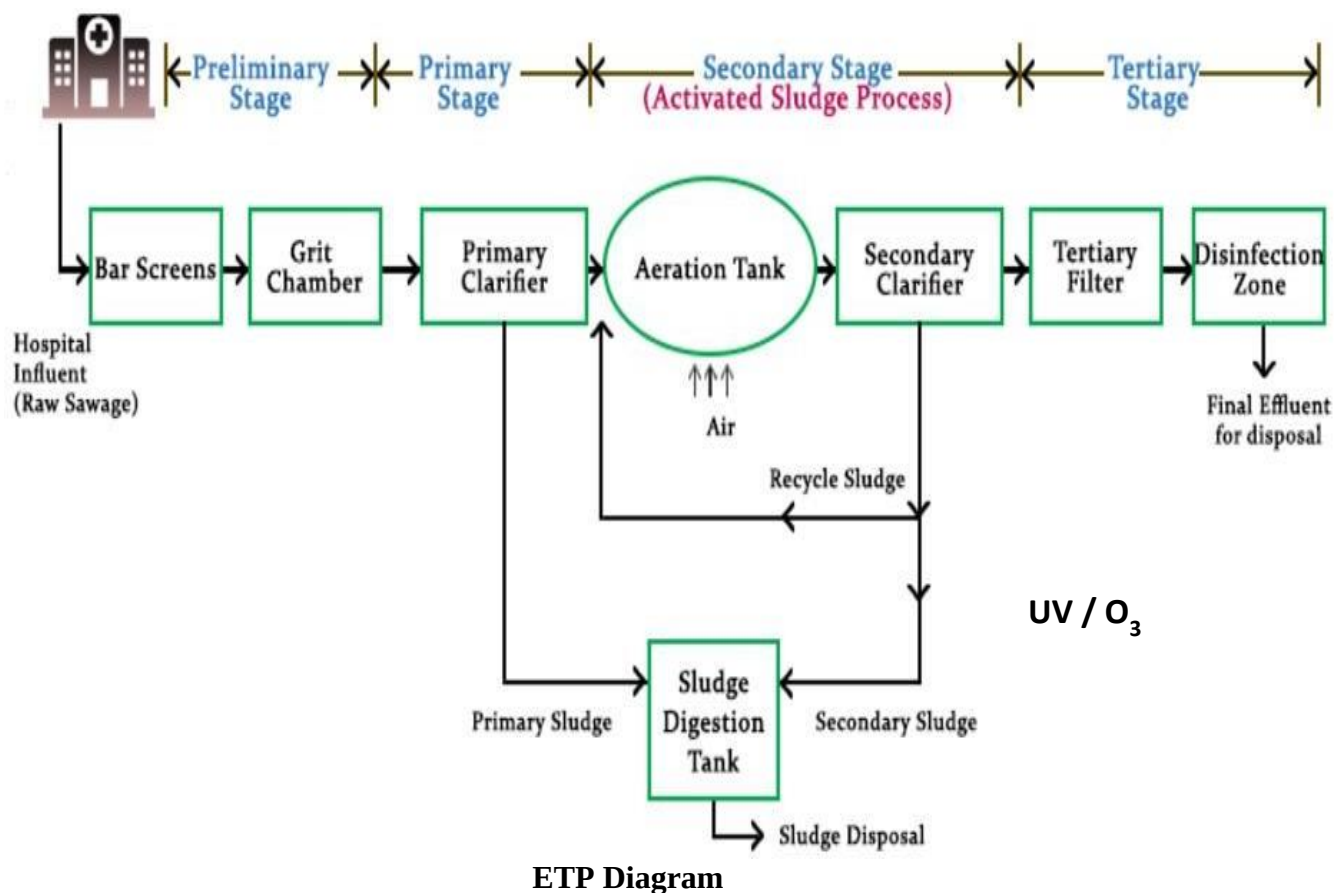


Figure-5: Schematic Diagram of MBR STP



9. SOLID WASTE GENERATION AND MANAGEMENT

The well adopted a systematic approach for solid waste collection and disposal from project activities. Solid waste generated from the project is collected properly and managed as per Solid waste Management Rules, 2016.

The domestic solid waste generated from the occupants of the College, Residence, Hostel, Visitors, Patients, and Staff; pertains to the two categories, Bio-degradable and non-biodegradable. These solid wastes are collected separately by putting different types of separate bins at the source of generation. It is estimated that maximum solid waste generation would be about ~1867 kg/day and biomedical waste would be generated 385 kg/day. The solid waste generation considered is given in **Table-11**.

Table-11: Solid waste Generation details

SL. No	Description	Total Population	Unit rate Waste Generation	Solid Waste (Kg/day)	Bio-degradable	Non-biodegradable
1	Hospital Bed	700	0.5	350		
2	Attendant with patient (24 hours)	700	0.45	315	189	126
3	OPD	1400	0.1	140	84	56
4	Hospital Staff	575	0.1	57.5	34.5	23
5	Himalaya Medical college	3710	0.1	371	222.6	148.4
6	College & Guest house Canteen	400	0.15	60	36	24
7	Medical college staff	125	0.1	12.5	7.5	5
8	Boys Hostel	480	0.45	216	129.6	86.4
9	Girls Hostels	720	0.45	324	194.4	129.6
10	Guest House & Officer Quarter	39	0.45	17.55	10.53	7.02
11	Staff Resident Quarter	760	0.45	342	205.2	136.8
12	Visitors @10% of total population	76	0.15	11.4	6.84	4.56
	Total solid Waste			1867	1120	747
	Biomedical Waste Generation	0.5 kg/bed		350 kg/day		
	OPD Medical Waste	10% of total BMW		35 Kg/day		

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

Separate color-coded bins will be provided in the hospital campus for collection of different types of Bio-Medical Waste for the proper treatment.

Bio-Medical Waste: Biomedical waste is waste that is either putrescible or potentially infectious. Biomedical waste is generated from biological and medical sources and activities, such as the diagnosis, prevention, or treatment of diseases. Biomedical waste may be solid or liquid. Examples of infectious waste include discarded blood, sharps, unwanted microbiological cultures and stocks, identifiable body parts, other human or animal tissue, used bandages and dressings, discarded gloves, other medical supplies that may have been in contact with blood and body

fluids, and laboratory waste. Biomedical waste is properly collected in the separate container and will be disposed by authorized processor for Biomedical Waste. Bio-medical Waste Treatment Facility (CBMWTF) for disposal of Bio-Medical Waste As per rule.

Cat.	Type of Bag/ Container used	TYPE OF WASTE	Treatment /Disposal options
Yellow 	non-chlorinated plastic bags Separate collection system leading to effluent treatment system ←	a) Human Anatomical Waste b) Animal Anatomical Waste c) Soiled Waste d) Expired or Discarded Medicines e) Chemical Waste f) Micro, Bio-t and other clinical lab waste g) Chemical Liquid Waste	Incineration or Plasma Pyrolysis or deep burial*
Red 	non-chlorinated plastic bags or containers	Contaminated Waste (Recyclable) tubing, bottles, intravenous tubes and sets, catheters, urine bags, syringes (without needles) and gloves.	Auto/ Micro/Hydro and then sent for recycling. not be sent to landfill
White 	(Translucent) Puncture, Leak, tamper proof containers	Waste sharps including Metals	Auto or Dry Heat Sterilization followed by shredding or mutilation or encapsulation
Blue 	Cardboard boxes with blue colored marking	Glassware	Disinfection or auto/ Micro/hydro and then sent for recycling.

The E-waste generated is managed as per the E-waste management and handling rules 2016.

10. RAINWATER HARVESTING/STORM WATER MANAGEMENT

Rainwater harvesting is the activity of direct collection of rainwater. Collected Rainwater is stored for direct use or for recharging the groundwater. Rain water Harvesting is the technique through which rain water is captured from the roof and paved surfaces and stored in sub-surface ground water reservoir by adopting artificial recharge techniques.

Advantages:

- ✓ To meet the ever-increasing demand for water.
- ✓ To avoid flooding of roads.
- ✓ To augment the ground water storage and control the decline of water table levels.
- ✓ To reduce ground water pollution.
- ✓ To improve the quality of ground water.
- ✓ To reduce the soil erosion.
- ✓ To supplement domestic water requirement during summer, drought etc.
- ✓ Improves the quality of ground water through dilution when recharged to ground water.
- ✓ In saline areas, rain water provides good quality water and when recharged to ground water, it reduces salinity and also helps in maintaining balance between the fresh-saline water inter-faces.

Rainwater Harvesting Calculation for the project is given in **Table-12**.

RAIN WATER HARVESTING

(i) Rainwater Collection Potential for Reuse

Rainwater harvesting is the activity of direct collection of rainwater. Collected Rainwater will be stored for direct use or for recharging the groundwater. Rain water Harvesting is the technique through which rain water is captured from the roof and paved surfaces and stored in sub-surface ground water reservoir by adopting artificial recharge techniques

Table 12: Rain water Harvesting Details

Input Data			Unit	Reference
Catchment Area		Value		
1	Rooftop Area of Building/shed	23042.7	sq-mtr	
2	Green Belt Area	39712.8	sq-mtr	
3	Open & Paved Area	50709.6	sq-mtr	
	Total	113465		
Run off Coefficient, c				
	Rooftop Area of Building/shed	0.85		RWH in India, MoEF&CC, e-book 2016
	Green Belt Area	0.15		
	Paved Area	0.75		
	Open Area	0.15		
				CGWB Patna
Rainfall				
	Average Annual Rainfall	1076	mm/year	
	Hourly Peak Rainfall Intensity, I	45	mm/hour	
	Peak Time taken	15	minutes	
Total Volume of Water to be Captured on Annual Basis				$Q = A * c * I$

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	Rooftop Area of Building/shed	21074.89	cu-m/year	
	Green Belt Area	6409.65	cu-m/year	
	Paved Area	40922.68	cu-m/year	
Runoff Calculation for the Peak Rainfall, Q				
	Rooftop Area of Building/shed	220.35	cu-mtr/hour	RWH in India, MoEF&CC, e-book 2016
	Green Belt Area	67.02	cu-mtr/hour	
	Paved Area	427.86	cu-mtr/hour	
	Total	715.22	cu-mtr/hour	
Annual Recharge Potential				IMD
	Recharge Potential	68407.22	cu-m/year	
	Rainy Season	June-Sep		
Design of Recharge Structure for Peak Flow				
Calculation for One Pit				
	Diameter of Pit	4.5	mtr	
	Depth of the Pit	4.5	mtr	
	Volume of the Pit	71.57	cu-mtr	
Number of Pits Required to store the peak discharge		10.0		
Rain water harvesting Pits provided		10		

Number of RWH Pits Proposed = ~10

11. POWER REQUIREMENT

Total Power requirement is 4000 KW

Power backup

Total No. of DG set is 4,

DG set with total power generation capacity of 2750, (3x750 & 1x500)

12. FIRE FIGHTING SYSTEM

INTRODUCTION

Engineering services systems for 800 beds of hospital at Chiski, Bihar, has been conceptualized based on conceptual architectural drawings and details mentioned in Architectural report, standards, to produce an integrated services system design.

FIRE FIGHTING SYSTEM

SALIENT FEATURES OF ENGINEERING SYSTEMS

OBJECTIVE

The complex is categorized under 'Ordinary Hazard' as per National Code of India 2016. The main objective of firefighting system shall be to protect loss to Life and Property duly complying or exceeding statutory provisions. Essential Life Safety aspects relating to fire compartmentation and emergency escapes/ egress route planning shall be dealt by Architect. However, scope of this report shall be to highlight the proposed firefighting measures including installation of sprinkler for the entire facility, external/ internal hydrants, handheld fire extinguishers, inert gas fire suppression system for electrical rooms.

The entire system shall be monitored from the Fire pump room / Fire Control Room

BASIS OF DESIGN

- National Building Code of India - 2016
- Relevant Bureau of Indian Standards (BIS) Codes
- Motors, cabling, wiring and accessories as per BIS codes/IE Rules/IS codes
- Recommended practices of Equipment manufacture.
- Recommendations of CFO, BIHAR

DESIGN PHILOSOPHY

In the event of fire, the occupant initial firefighting arrangements sprinkler system in the area shall get activated in case of fire.

Occupants on floors would evacuate the complex as announced on the P.A. System. Firefighting system sprinklers shall be activated in case of fire. Hose reel and landing valve on each floor will be provided.

SYSTEM DESCRIPTION

- A centralized Fire Pump Room having centrifugal pumps to maintain minimum pressure of 3.5 kg/cm² at the highest point.
- Separate risers for Hydrant system and Sprinkler system and for water curtain.
- System is designed that at no sprinkler / hydrant points water pressure is more than 3.5 Kg/cm² bar in static condition. Orifice plate will be used at each Valve to control the pressure.

- For External Protection of the buildings, Ring Main dia. 150 mm with Hydrants at 45m intervals is provided.
- Fire Water Tanks:
 - (i) Underground firewater tanks of 2 x 2, 00,000 liters (each tank in two halves) since the no. of hydrants exceed 100.

A) Pumps & Equipment's shall be as per requirement of NBC-2016 as detailed.

S. No.	Description	
1	Electrically driven Hydrant Pump	- 2280 LPM - One No
2	Electrically driven Sprinkler Pump	- Electrical Driven – 2280 LPM
3	Diesel engine driven pump (Stand by)	- 2 Nos 2280 LPM
4	Jockey pump	a. Hydrant – 180 LPM b. Sprinkler – 180 LPM
5	Water Curtain Pump	- 1 Nos 900 LPM

FIRE HYDRANT SYSTEM

INTERNAL HYDRANTS / FIRE HOSE CABINETS

All Buildings shall be provided with fire hydrant riser. Fire hose cabinet to have internal landing valve isolation valve, orifice plate, swinging hose reels with valve and shutoff nozzle, fire man's axe, 2 No 63 mm dia RRL hose, one standard nozzle, fire extinguishers Co₂ 1 x 4.5 kg and ABC 1 x 6 kg. Fire hose cabinet shall have framed glass door 1200 x 2000 mm.

YARD HYDRANTS / CABINETS

Yard hydrants shall be located at maximum 45-meter intervals. One no Butter fly valve, one no hydrant valve, 2 No RRL 63 mm dia hose pipe and one nozzle shall be placed in a closed cabinet with glass shutters in the cabinets. Yard Hydrants will be located between (2-15 mtrs.) away from the building.

FIRE DEPARTMENT CONNECTION

Fire Brigade Connections would be provided for feeding the wet risers and the sprinklers system directly by the fire brigade for each building. These would be provided at locations easily

accessible by the Fire Tender. 4-way fire brigade connection and draw off connection for the underground fire war tanks to be provided.

SPRINKLER SYSTEM

Sprinklers shall be installed in all buildings as per National Building Code 2016.

Range of Sprinklers: -

- (i) 12 sqm. area for pendant sprinklers for all floors except basements, 9 sqm. area for upright sprinklers in basements.
- (ii) Extended wall mounted sprinkler as per IS.
- (iii) Public areas shall have pendant/extended wall mounted type sprinklers.
- (iv) Upright Sprinklers will be installed above fall ceiling in case the gap between fall ceiling and slab exceeds 799 mm.

The sprinkler pump shall be automatic operation and will start in case of a drop of pressure in the system. Installation control valves along with hydraulic alarm will be provided in pump house. The operation theaters shall have normal sprinklers.

Flow switches shall be provided on each floor and connected to the fire control panel through intelligent fire alarm system in the fire control room, to announce the location of affected floor. Valves on flow switches shall have butterfly valves chain and lock to indicate the position of valve. Installation valves shall be provided as per NBC / Local Fire Authority.

PASSIVE FIRE PROTECTION MEASURES:

FIRE RATED SMOKE CHECK DOORS: - These shall be provided in accordance with N.B.C. Part IV, 2016 wherever required to stop ingress of fire/smoke to other areas. Viz all stairwells and lift lobbies etc.

All horizontal and vertical openings in the service shafts, cable ducts etc. shall be effectively sealed with non-combustible materials to stop spread of fire/smoke.

Ventilation: Adequate ventilation shall be provided complying with NBC 2016, using ducted system.

FIRE ALARM SYSTEM:

The entire complex shall be provided with intelligent addressable fire alarm system, public address system and manual call points.

Electrical Sub-Station, Electrical Panels & Wiring:

The electrical distribution system would confirm to NBC Part-4 as applicable all wires / cables used inside the building shall be fire resisting type. Separate circuits for firefighting pumps, lifts, staircases and corridor lighting & blowers for pressurizing system, smoke extraction system, water supply pumps, lifts exit signs, corridor and street lighting shall be provided so, that fire in one circuit will not affect the others.

No other Utility Lines would be laid in the Electrical Cable ducts.

Fire Control Room & Intercommunication System:

A Fire Control Room would be provided to conform to NBC Part 4, having communication system to all floors. This would be located on the ground floor.

PORTABLE FIRE EXTINGUISHERS

Portable fire extinguishers Carbon dioxide 4.5 kg and ABC 6 kg capacity shall be provided as first aid fire extinguishing appliances. These extinguishers shall be suitably distributed in the entire public as well as service areas. The appliances shall be so distributed over the entire floor area so that a person has to travel not more than 15 m to reach the nearest appliance. These shall be hung on wall in a group at suitable places. The number of extinguishers shall be as per IS: 2190. 5 kg Inert Gas fire extinguishers, ceiling mounted, operated through thermostats will be installed in each electrical room.

List of Machinery are used during Construction is as follows:

1. Dumper : Shall be used for mud and material handling
2. Concrete mixer with hopper : for RCC work
3. JCB/Pock line : Shall be used for digging and earth work
4. Concrete Batching Plant : used for concrete mixing
5. Road roller : For compacting the earth

Occupational Health and Safety (during construction)

The Management of the project has committed for the health and safety of workers as under;

- The management declares its intention and commitment with all relevant statutory requirements in regard to environment, health and safety of workers.
- The management has assigned the responsibility at different levels as:

Project Manager : For all the workers/employees.

Supervisor : For casual and daily/unskilled workers.

The management will ensure the occupational health and safety, at the site during construction, by adopting following practices;

- a) Every responsible effort will be made to provide and maintain safe and healthy working conditions, environment, and system of work for all employees.
- b) It will also endeavor of the project proponent to ensure that surrounding environment is not adversely effected by the work activity.
- c) The working environment would be healthy and co-operative.
- d) The prevention of accidents or accident hazards leading to personal injury or damage of equipment/property is recognized as essential as an integral part of efficient operations.
- e) Every employee will follow safety rules/regulations, operating procedures/safe work method design to protect people and equipment from risk of injury of damage to property.
- f) The project will endeavor to adequately train all employees suitably equip them to perform their duties in a safe and effective way.
- g) Every employee will discharge his personal responsibility, and shall co-operate and actively participate in maintaining and improving safety standards.
- h) A primary health care center will be provided within the campus. Besides, there is a multi-specialty private hospital (on panel of the institute) just opposite to the institute entrance.
- i) A doctor will be appointed for health checkup of workers at regular intervals and related records shall be maintained. A doctor and a hospital will be empanelled for attending off site health problems of the workers.

- j) First Aid kits will be kept ready and available to the workers, in case of emergencies; will provide fastest possible medical aid. Staff will be adequately trained for this.
- k) Adequate supply of clean drinking water, neat and clean toilets and washing facilities will be provided at the site.
- l) Proper ventilation, wherever required, shall be provided in the work areas.
- m) Proper safety and protections, steps and guards shall be provided at all required places.
- n) Suitable safety instructions will be displayed in writing (including that in vernacular language) for all critical areas and working conditions.
- o) A vehicle/ambulance will be specifically positioned at the site for emergency evacuation of workers in case of any health problem/accident.
- p) ***Budget of Rs. 3,00,000/- will be allocated under Occupational health & safety programme during construction phase.***
- q) ***Budget of Rs. 5,00,000/- will be allocated under Occupational health & safety programme during operational phase.***