

## Environmental Assessment Report for 120 Bedded Specialized Orthopaedic Unit Including Six Bedded ICU in Bone & Joint Hospital, Srinagar under JTFR Project

### Section-1 EIA & EMP



## LIST OF ABBREVIATIONS

B&J	Bone & Joint Hospital
BOD	Biochemical Oxygen Demand
COD	Chemical Oxygen Demand
CPCB	Central Pollution Control Board
DPR	Detailed Project Report
EA	Environmental Assessment
EIA	Environment Impact Assessment
EMP	Environmental Management Plan
ESMF	Environment and Social Management Framework
Gol	Government of India
GRC	Grievance Redressal Cell
GRIHA	Green Rating for Integrated Habitat Assessment
ICT	Information, Communication and Technology
IGBC	Indian Green Building Council
INR	Indian Rupee
J&K	Jammu and Kashmir
R&B	Road & Building Department
JTFRP	Jhelum and Tawi Flood Recovery Project
NBC	National Building Codes
NGO	Non-Government Organization
NPCC	National Project Construction Corporation
OBC	Other Backward Castes
OP	Operational Policies
PAP	Project Affected Persons
PIU	Project Implementation Unit
RAP	Resettlement Action Plan
SC	Scheduled Caste
SIA	Social Impact Assessment
SMP	Social Management Plan
SPMU	State Project Management Unit
ST	Scheduled Tribe
STP	Sewage Treatment Plant
TSS	Total Suspended Solids
WB	World Bank

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## EXECUTIVE SUMMARY

1. Postgraduate Department of Orthopaedics, Govt. Medical College, Srinagar (Hospital for Bone and Joint surgery Srinagar) was started in 1959. The Department of Orthopaedics at that time was an extension of the main general surgery department. The Bone and Joint Hospital at Barzulla started in year 1982 as 150 bedded hospital.
2. In the devastating floods of 2014, the water level was reached up to 2-3 feet's on ground floor of Bone and Joint hospital causing huge loss to infrastructure and services of existing hospital. Given the increasing pressure and demand for improved facilities, including the needs of present and future and to create a more resilient infrastructure, a new building/block of hospital has been felt.
3. The Government of Jammu and Kashmir (J&K) state, through PWD, R&B Department engaged National Projects Construction Corporation Limited (NPCC) for planning and construction of 120 bedded specialized block for orthopaedic cases under the Jhelum and Tawi Flood Recovery Project (JTFRP) with financial assistance from the World Bank.
4. The proposed new 120 bedded hospital building/block site is located within the premise of existing Bone & Joint Hospital admeasuring 4.67 acres approx. Its located on the Airport Road on the banks of Doodh Ganga Canal Srinagar. Maximum height of this proposed G+4 unit is considered 22.6 meters and total ground area of the proposed site is estimated approx. 1636 Sqm. On this ground area, total built up area 7994 sqm will be developed with modern medical facilities
5. Under this project, Govt. of J & K, intends to set up a 120 Bedded specialized Ortho Unit including six bedded ICU and three modular operation theatres in the existing Hospital premises by demolishing the old nurses & PG hostels and a vacant residential unit at Bone & Joint Hospital at Barzulla, Sri Nagar J&K. Total 20119 SQF area will be demolished which is standing on 7600 SQF floor area. Total quantity of Construction and demolition waste to be disposed of is estimated 1988 Cum.
6. The subproject mainly involved hospital building development on land in urban area in a systematic and planned way with no additional requirement of land acquisition or purchase of land property.
7. In view of above and to fulfil the World Bank Safeguard requirements, M/s. GSI Planning and Management, New Delhi engaged to undertake an Environmental Assessment (EA), Social Assessment and to prepare appropriate Environment and Social Management Plans as per the safeguard polices of World Bank and ESMF prepared under Jhelum and Tawi Flood Recovery Project. The overall objective of carrying out Environmental Assessment (EA) and Social Impact Assessment (SIA) study is to help the R&B in identifying environment and social impacts; prepare commensurate management plans to determine the specific measures to reduce, mitigate and/or offset potential adverse impacts during pre-construction, construction and operation phases of the proposed sub-project. Review of drawing and designs on environmental aspects of the project and suggest sustainability measures was also the major part this assignment.

8. Standard Methodology was adopted for Environmental Assessment which include reconnaissance survey, review of safeguard policies and regulations, sub-project screening, establishment of baseline and environmental utilities assessment, stakeholder consultations, identification and assessment of the environmental impacts then preparation of environmental management plan.
9. The Proposed 120 bedded Specialized Orthopaedic Unit with separate facilities such as 120 bedded wards, 2 private rooms, 6 bedded ICU, 12 bedded Pre OP and Post OP rooms, 3 Modular OTs, Radiology, Physiotherapy rooms and Faculty rooms. Certain existing facilities such as Kitchen, Laundry, CSSD, MGPS etc. to be augmented.
10. The proposed 120 bedded Orthopaedic unit shall run under the same administrative set-up and also share some of the existing facilities. The designing of the proposed project in the existing set-up called for locating the 120 bedded Orthopaedic Block on the site at present being occupied by the PG hostel and other staff residential quarters and connecting it with the existing IPD (Ward) Block and OT Block by creating an connecting corridor at 1st and 2nd floor levels.
11. Proposed 120 bedded unit building has been designed to accommodate non-critical spaces / departments on the ground floor. The first floor has the radiology department and 40 beds, divided into two 20 bedded female wards. The second floor accommodates the ICU and OT Complex. The third and fourth have 40 beds each, which are subdivided into two 20 bedded male wards on each floor. The fifth floor accommodates the academic department, as well as the server room. The wards have been designed such that all beds get natural light and view to outside. 50% of the beds get view of the Doodh Ganga Canal. Learning from evidence based design that access to nature plays an important role in the recovery of a patient, a healing garden has been proposed on the Ground Floor. As explained above the new building is connected to existing buildings through the extended corridor system and thus, functionally, becomes a part of the existing set-up, while being independently accessible to the general public also.
12. Existing Bone & Joint Hospital facilities were assessed as a part of Baseline status of project. Several physical and environmental aspects viz. water, wastewater, biomedical and solid waste management etc. were examined. However, present project is confined to develop facilities for proposed new 120 bedded hospital unit only but recommendations to improve existing infrastructure and to reduce environmental foot prints are also screened out and communicated to project proponent and hospital administration for improvement to create overall sustainable infrastructure and facilities of whole Bone & Joint Hospital.
13. It is expected that certain permission, clearances and authorizations viz. Building Permission, tree shifting/cutting, Permission for Establishment & operation of STP, Disposal of Biomedical wastes etc. need to be obtained from competent authorities during the design, planning and implementation phase of this project.
14. Water balance exercise has been done to estimate hospital water demand of proposed block. NBC norms @450 litres per day per bed supply is used to estimate water demand. Several other factors such as visitors, staff population and attendant population are also consider to calculate total water demand. Total water requirement is estimated 206.4 KLD which include fresh water requirement of 153.5 KLD while 52.9 KLD recycled water will be

used to satisfy total daily water requirement. Water will be supplied by existing treatment plant operated by Public health engineering department. Dual plumbing system is also proposed in this new building to promote recycling and reuse of treated water.

15. In the operational phase of the proposed hospital unit, total 170.4 KLD wastewater will be generated which include 122.8 KLD domestic wastewater and 47.6 KLD flushed wastewater. Considering wastewater generation, capacity of proposed STP 175 KLD is estimated. Therefore, a Sewage treatment plan for 175 KLD capacity is proposed for this unit. Small amount (47 KLD) of laundry and laboratory effluent will also be generated from this block. Ideally there should be an ETP of 50 KLD to treat this effluent. It is advisable to treat this influent in proposed STP/ETP with phosphorus and nitrogen removal units, tertiary treatment unit and with UV treatment as disinfection system.
16. In the proposed block of Bone & Joint Hospital, total 78 kg of biomedical wastes/day will be generated from 120 beds considering 650 gm wastes per bed per day. In this block also as per the regulatory requirement, biomedical wastes will be managed as per Bio medical waste Management (Amendment) Rules, 2018. A detailed assessment on prevailing biomedical waste management system has been carried out for existing blocks of Bone & Joint Hospital and several suggestions and recommendation made. The total waste for existing and proposed new 120 bedded hospital approx. 205 kg/day
17. All necessary information and applicable information required for study were collected through survey conducted by environmental and social survey team, secondary data sources and community consultations in the study area for the different segments of the environment. Environmental monitoring data collected by JKERA in between 2017 and 2018 is used to set ambient Environmental baseline for Air, water, Noise etc. Secondary data and information on various aspects (like hydrogeology, hydrology, drainage pattern, ecology etc.), meteorology and socio-economic aspects were collected from Census of India, IMD, and Survey of India (SOI) etc.
18. Stakeholder meeting and consultations was also conducted by the subject area experts in between 5<sup>th</sup>-8<sup>th</sup> November 2019 and in the month of June 2020 with the help of local team on ground with domain expert overphone and virtual meeting. Proper precaution was taken due to the Covid-19 situation.
19. Environmental impacts during construction and operational phases of the project on Land & Soil, Water, Air, Noise, Biological and Socio-economic environment were assessed and overall significance of the impacts were found minor. Effective control and mitigation measures were also suggested in EMP to avoid, minimise and mitigate the adverse impacts.
20. The geographical extent of the potential impact on land cover is anticipated to be local; Overall impact significance of the change in land cover is assessed to be minor. During the construction phase, soil erosion and loss top soil will be susceptible to erosion to some extent due to site clearance activities. The scale of site clearance activities would be limited to construction footprints of Bone & Joint Hospital. For the mitigation, Areas for top soil utilization should be identified before start of construction activities and excavated top soil shall be utilized for plantations and landscaping within the project site and the disturbed areas and soil stock piles should be kept moist to avoid wind erosion of soil.

21. The operational phase of the Project will have limited impacts on soil in form of waste and waste water generation and soil contamination due to accidental spillages/ leakages and improper disposal of hazardous and biomedical wastes. In the operational phase of the project wastewater will be treated in 175KLD capacity treatment plant while only 78 kg of Bio-medical waste will be generated daily from this newly constructed unit which would be collected, transported and disposed as per Bio-Medical Waste Management (Amendment) Rules, 2018.
22. Water will be required for civil works during the construction of the foundation for both buildings and utility structures, dust prevention, curing etc. and for consumption and use by workers. It is advisable to use recycled water, if available nearby or to use river water (after permission) for construction purpose. For labour camp it is estimated that 4.5 KLD water will be required to supply at labour camp considering 90 LPCD for peak labour force of 50 persons. For tanker water supply of labour camp from PHED or other authorized source will be ensured by the Contractor during construction phase. Proposed project is not going to use ground water resource, thus there will not be any impact envisaged on ground water resources.
23. Total water requirement for New Hospital unit is estimated 153.5 KLD which will continue to be met through PHED water supply and reuse of 52.9 KLD treated water. Total sewage generation during operation phase of the proposed project is estimated 170.4 KLD while 47 KLD effluent will be generated from laundry and laboratory. Total wastewater generated from proposed Hospital unit will be treated through proposed STP of 175 KLD and ETP of 50 KLD capacity. The treated wastewater from STP will be reused in flushing and landscaping development within hospital Campus.
24. Certain amount of dust and gaseous emissions will generate during the construction phase from excavation machine and road construction machines. Pollutants of primary concern include particulate matters i.e. PM<sub>10</sub> and PM<sub>2.5</sub>. However, suspended dust particles matter may be coarse and will be settled within a short distance of construction area. Therefore, impact will be temporary and restricted within the closed vicinity of the construction activities only. Some of the mitigation measures were suggested for control over dust and gaseous emission viz. Proper maintenance of engines and use of vehicles with "Pollution Under Control Certificate, emissions from diesel generators (meant for emergency power suppression of fugitive dust emissions by spraying water, wetting of the stockpile and to providing adequate stack height of DG sets for construction activities from ground level for wider dispersion of gaseous emissions.
25. During the construction phase of Proposed 120 bedded hospital unit, the major sources of noise pollution are vehicles transporting the construction material to the construction yard and the noise generating activities at the yard itself. Mixing, casting and material movement are primary noise generating activities in the yard and will be uniformly distributed over the entire construction period. Construction activities are anticipated to produce noise levels in the range of 75-85 dB (A). Use of proper Personal Protective Equipment's (PPE) such as earmuffs will mitigate any adverse impact of the noise generated by such equipment. Noisy equipment if any will be provided in separate enclosures and noise barriers near to the receptor need to be considered.

26. Proposed 120 bedded hospital unit site is located within a confined area and there are no ecologically sensitive areas like national parks or wildlife sanctuaries and reserved forests located nearby. Even on site also, no major tree cover exists except 4 small Chinar trees which will have to be relocated/de-rooted with prior permission of the forests department.
27. To avoid disruption and inconvenience to hospital services during the constructional phase of the project, control measures shall contain finding out an alternate route, temporary diversions of traffic, separate entry and parking for construction, visitors' vehicles and ambulances, traffic safety arrangements, ensuring proper signs, temporary barriers and/or danger tape and flagmen to prevent unwanted labour entry to the hospital and to exposed construction work to warn the public and ensure smooth traffic flow and safety of the hospital visitors.
28. The extent of the impact of labour influx is local and regional, as the labourers will be domiciled in the local area or perhaps migrant workers from other states. However, the proponent should put in place a contractor management plan and labour management plan to incorporate aspects such as contractor selection and evaluation, labour compliance with respect to the legal specifications and ensuring good labour working conditions, timely payment of wages and other benefits etc. As part of the contract agreements, the contractor will be required to ensure provision of basic amenities of drinking water, adequate number of toilets, wash rooms, sanitation and cleanliness, lighting, availability of provisions and groceries and recreational facilities, at the labour camp site. The proponent should develop a systematic monitoring and auditing mechanism for monitoring the contractors and sub-contractors in terms of resources, migrant workers, child labour and forced labour, health and safety, payment of wages, grievance redressal etc.
29. To evaluate the effectiveness of the environmental management programme, regular monitoring of the important environmental parameters will be taken up. Environmental Monitoring Plan, schedule, duration and parameters etc. are also mentioned in the Environmental Assessment Report.
30. The budget for the implementation of various mitigation measures is estimated at Rs. 79.34 Lacs (INR 7.934 Million).
31. Analysis of alternatives exercise is also done for the project which includes with and without project scenarios, Green Vs Conventional Building and use of alternative building materials.
32. Emergency and disaster prevention through good design, operation, maintenance and inspection are essential to reduce the probability of occurrence and consequential effect of such eventualities in the proposed 120 bedded hospital unit. A well-defined Emergency and disaster management plan is prepared for fire hazard, Flood Emergency response plan, earthquake and Bomb threats and evacuation plan.

## CHAPTER-1: INTRODUCTION

### 1.1. Introduction

Postgraduate Department of Orthopaedics, Govt. Medical College, Srinagar (Hospital for Bone and Joint surgery Srinagar) was started in 1959. The Department of Orthopaedics at that time was an extension of the main general surgery department. Govt. Bone & Joint Hospital is geographically located at 74°48'24.59"E & 34° 2'49.18"N, which is at Barzalla, Srinagar (J&K),. Most of the valley population depends on this hospital. However, In this devastating floods of 2014, Postgraduate



Department of Orthopaedics, Govt Medical College, Srinagar (known as Bone and Joint Hospital Srinagar) was also badly affected and water level was almost 3 feet's above from the hospital ground level causes loss to infrastructure and services of existing hospital. As this Bone and Joint Hospital is an important hospital of the valley for bone and joint surgery which annually serve thousands of patients and given the increasing pressure and demand for improved facilities, including the needs of present and future and to create a more resilient infrastructure, a new building/block of hospital has been felt necessary to construct.

Due to the unprecedented heavy rainfall, the catchment areas particularly the low laying areas were flooded for more than two weeks. Some areas in urban Srinagar remained flooded for 28 days. Water level was as high as 27 feet in many parts of Srinagar.

Looking the region's vulnerability to both flood and earthquakes, Government of India has received a loan from the World Bank towards the cost of "Jhelum & Tawi Flood Recovery Project" for Government of Jammu & Kashmir that will focus on restoring critical infrastructure using international best practice of resilient infrastructures and contingency planning for future disaster events.

The Government of Jammu and Kashmir (J&K) through PW(R&B) Department-Kashmir is implementing some subprojects and components under the Jhelum and Tawi Flood Recovery Project (JTFRP) with financial assistance from the World Bank. The construction of a new 120 Bedded Specialized Orthopaedic Units Including Six Bedded ICU in Bone & Joint Hospital in Srinagar is one the subproject identified and is to be constructed. For the project execution, PW(R&B) Department, Govt. of J&K engaged National Projects Construction Corporation Ltd. (NPCC) for Design, Construction and AMC of 120 Bedded Specialized Orthopaedic Units proposed for Bone and Joint Hospital.

Proposed 120 bedded unit building has been designed to accommodate non-critical spaces / departments on the ground floor. The first floor has the radiology department and 40 beds,

divided into two 20 bedded female wards. The second floor accommodates the ICU and OT Complex. The third and fourth have 40 beds each, which are subdivided into two 20 bedded male wards on each floor. The fifth floor accommodates the academic department, as well as the server room. The wards have been designed such that all beds get natural light and view to outside. 50% of the beds get view of the Doodh Ganga Canal. Learning from evidence based design that access to nature plays an important role in the recovery of a patient, a healing garden has been proposed on the Ground Floor. As explained above the new building is connected to existing buildings through the extended corridor system and thus, functionally, becomes a part of the existing set-up, while being independently accessible to the general public also Geographical Location and corner coordinates of the proposed project site is shown in Fig.1.1.

The proposed new building/block site is geographically located within the premises of Bone & Joint Hospital at Barzalla, District- Srinagar, Jammu and Kashmir. The subproject is proposing Construction of Additional 120 bedded with ground cover area 6255 Sqm of total plot area of 18902 Sq.m The subproject mainly involved hospital building development on land in urban area in a systematic and planned way with no additional requirement of land acquisition or purchase of land property.

In view of above and to fulfil the World Bank Safeguard requirements, M/s. GSI planning and management, New Delhi has been engaged to undertake an Environmental Assessment (EA), Social Assessment and prepare appropriate Environment and Social Management Plans as per the safeguard polices of World bank and ESMF prepared under Jhelum and Tawi Flood Recovery Project.



Fig.1. 1: Geographical Location of Proposed Project site within Srinagar, J&K (India)

## 1.2. Broad Scope of the Assignment

The overall objective of carrying out Environmental Assessment (EA) and Social Impact Assessment (SIA) study is to help the NPCC in identifying environment and social impacts; prepare commensurate management plans to determine the specific measures to reduce, mitigate and/or offset potential adverse impacts during pre-construction, construction and operation phases of the proposed sub-project. The broad scope of the assignment is divided into three following tasks depicted in the Fig. 1.2.



Fig.1. 2: Broad Scope of the Assignment

## 1.3 Scope of this Report

Scope of this report is to provide overall environmental assessment of proposed 120 bedded hospital unit and to prepare environmental management plan for design, construction and operational phases of the project. Condition assessment of existing and proposed facilities were also done to cover holistic assessment. This section of the report is mainly dealt with environmental assessment and preparation of Environmental Management Plan for proposed 120 bedded hospital Project.

## 1.4 Justification and Benefits of the Proposed Project

The Postgraduate Department of Orthopaedics, Govt Medical College, Srinagar (known as Bone and Joint Hospital Srinagar) Hospital Srinagar has been established for Orthopaedic care and it is an associate hospital Department of Orthopaedic Govt. Medical College Srinagar. Lot of damages and casualties were reported during 2014 flood event in the absence of resilient infrastructure and proper planning. As this Bone and Joint Hospital is an important hospital of the valley for bone and joint surgery which annually serve thousands of patients and given the increasing pressure and demand for improved facilities, including the needs of present and future and to create a more resilient infrastructure, a new building/block of hospital has been felt necessary to construct. Therefore, it has been decided by the authorities to construct a new 120 bedded hospital which will ease the increasing pressure and demand for improved facilities, including the needs of present and

future and to create a more resilient infrastructure. The proposed project will not only provide advance medical treatment facilities in orthopaedic but also provide employment opportunities both during construction and operation phase thereby enhancing the socio-economic and of living standard the locality.

### Proposed Project Benefits

Detailed benefits of the proposed project are summarized below.

- Development of Flood resilient physical infrastructures and precedent for sustainable building designs in the region
- Development of advanced medical facilities to fulfil valley's orthopaedic medical needs
- Development of sustainable hospital building designs and practices to reduce environmental foot prints
- Promotion of water optimization, wastewater treatment and rainwater harvesting for water conservation
- Application of dual plumbing and advanced wastewater treatment system to increase reuse and recycling of water
- Application of solar energy for lighting and water heating to reduce energy demand
- Application of national and international best practices and codes to provide fire safety and tackle emergency situations and disasters
- Application of alternate building materials to achieve green building targets
- Development of a well-defined Emergency and disaster management plan for fire hazard, Flood Emergency response, earthquake and Bomb threats
- Development of necessary facilities viz. parking place, waiting and sitting arrangements for visitors, drinking water points etc.
- Application of landscaping and peripheral plantation
- Direct and indirect employment to during construction and operational phase of the project.
- Opportunities and exposure to medical research and vocational skills by training

### 1.5. Need of Environmental Assessment

The site of proposed Hospital block is located within the existing hospital complex and the surroundings have many commercial and residential facilities. During the construction stage of the proposed project, existing hospital will remain functional and efforts would be made to ensure any of the medical service, patients and visitors should not be disturbed by proposed construction. A well-defined Environmental Assessment will ensure that appropriate measures would be taken during the design, construction and operational phase of the project to eliminate or minimize any of the negative effect anticipated at the proposed site and immediate neighbourhood.

## 1.6. Structure of Environmental Assessment Report

Overall environmental Assessment Report is structured in 9 Chapters and an executive summary at the beginning of the report. Executive summary provides an over view of the proposed project and its impacts on environmental components during project design, construction and operational phase of the project. It also provide summary of measures proposed in management plan to eliminate or minimise the identified impacts.

**Chapter 1 as Introduction** describes project background, broad scope of the assignment, scope of the report and project benefits. It also describes need of environmental assessment for this proposed 120 bedded Hospital unit project.

**Chapter 2 as Approach and Methodology** presents steps taken in to account during preparation of Environmental Assessment and Environmental Management Plan for 120 bedded Hospital unit project.

**Chapter 3 as Existing Environmental Conditions (Baseline)** provide description of existing hospital details and facilities including details of existing hospital environment such as water supply, sewage system, storm water management, solid waste management, HVAC arrangements and fire safety arrangements/Emergency/evacuation plan. This chapter also summarized existing biomedical waste management system of Bone & Joint hospital. Details description of natural and physical environment, status of environmental attributes near Bone & Joint project site is also given in this chapter.

**Chapter 4 as Description of the Proposed Project (Design and Proposed Interventions)** describes details of infrastructure and facilities that to be created under the project. It include key design consideration, codes and standards adopted during designing of the project. This chapter also furnished an idea about layout and main functional elements, proposed services, building materials to be used, management of environmental exposure conditions, access and circulation management, HVAC arrangement, Indoor air quality management, acoustics, water and wastewater management, solid and biomedical waste management in the proposed hospital unit.

**Chapter 5 as Policy, Legal and Regulatory Framework** defines safeguard operational policies and directives of the World Bank relent to the proposed project. It also provides environmental policies and regulatory framework of Govt. of India and the State which may be triggered during design, construction and operational phase of the project. At the end of this chapter, a list of statutory clearances and authorizations required is also furnished.

**Chapter 6 as Potential Environmental Impacts** describes probable impacts that may arise during project design, construction and operational phase of the project.

**Chapter 7 as Analysis of Alternatives** provide alternative analysis with respect to geographical location, green vs. conventional building designs, with and without project scenario and alternative building materials. This chapter also provides option analysis for sewage /effluent treatment technologies and recommendation for proposed project.

**Chapter 8 as Consultations with Stakeholders** presents details of stakeholders (departments, individual) and key point discussed during consultation process. Details of public consultation and socio-economic survey was also summarized in this chapter.

**Chapter 9 as Environmental Management Plans** presents environmental management Plans including mitigation measures, monitoring plan and budget of EMP. Risk and Disaster management plan is also included in this chapter.

## CHAPTER-2: APPROACH AND METHODOLOGY

### 2.1. Introduction

Environmental Assessment (EA) is a systematic process that identifies and evaluates the potential impacts that may have by any project on the biophysical and socio-economic environment, and identifies mitigation measures. These measures need to be implemented in order to avoid, minimize and mitigate negative impacts of the proposed project. Based on the project components and in compliance with the Environmental and Social Management Framework of the JTFRP, following steps were taken in to account during preparation of Environmental Assessment and Environmental Management Plan for 120 bedded Bone & Joint Hospital Project

### 2.2. Reconnaissance survey and Field Visit:

Reconnaissance survey was conducted by the subject area experts in November 2019 at the project site of proposed component and activity areas including existing blocks of Bone & Joint hospital. Prime objective of the visit was to assess the ground situations, data collection, key environmental issues and problems that need to be addressed and highlighted in environmental assessment report.

### 2.3. Review of World Bank Safeguard Policies, Govt. of India and State Regulations

During preparation of Environmental Assessment report, World Bank safeguard policies, ESMF prepared for JTFRP, Govt. of India and State regulations were taken into consideration to fulfil the regulatory requirements of the proposed sub project.

### 2.4. Sub-Project Screening

According to World Bank OP 4.01, the Bank screens each proposed project to determine the appropriate extent and type of Environmental Assessment required. It classifies the proposed project into one of four categories, depending on the type, location, sensitivity, scale of the project and the nature and magnitude of its potential environmental impacts. Screening of JTFRP was done at initial stages of the project and it was categorized A category project (World Bank Category). However, sub project screening for Bone & Joint Hospital was also done to identify and screened out significant environmental issues specifically for this project.

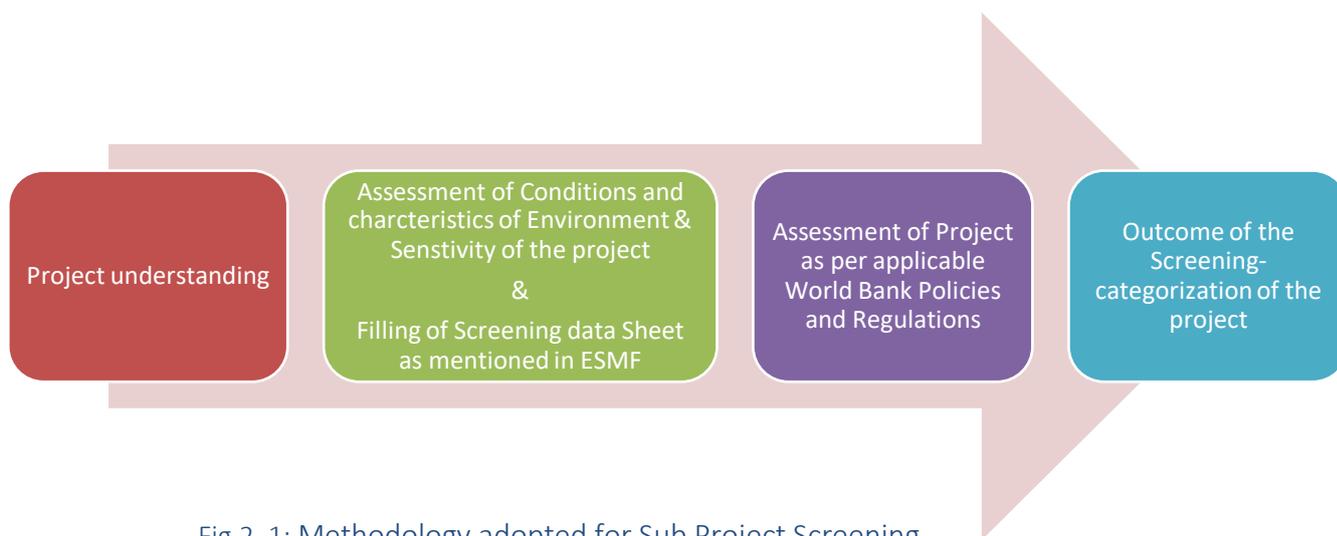


Fig.2. 1: Methodology adopted for Sub Project Screening

Screening was done by well-defined methodology and by following the steps depicted in the figure 2.1 and a screening data sheet given in the Environment and Social Management Framework of the JTFRP was filled. Comprehensive and detailed information about sub project location, scale and nature and magnitude of its potential environmental impact were used to fill the screening data sheet which is mentioned in Annexure-1.

Proposed project location is within the existing campus of Hospital which made this project critical and sensitive because lot of efforts need to be made for prevention and mitigation of environmental impacts during design, construction and operational phase of the project. As an outcome of the screening process, environmental impacts of Bone & Joint Hospital sub-project is categorized to A category because of its location which require conducting a comprehensive Environmental Assessment (EA) and preparation of an Environmental Management Plan (EMP) by Independent Consultants prior to preparation of DPR for appraisal by PMU. Prepared Environmental Assessment and Environmental Management Plan need to be disclosed before the start of execution of the sub-project.

## 2.5. Data Collection, Establishment of Baseline and Environmental Utilities Assessment for Existing & Proposed Hospital

All available information and data (quantitative and qualitative) regarding the proposed sub project have been collected from NPCC, Bone & Joint hospital administration and other stakeholders departments. A detailed list of required data for existing and proposed facilities was prepared and shared with each concerned department. Available details of Environmental Utilities viz. water, wastewater, storm water, solid and biomedical wastes were also requested with hospital administration and concerned PHED officials. Based on secondary information and data, a description and analysis of the sub-project activities and a creditable baseline is established.

I- **Establishment of environmental Baseline**-The baseline environmental data was collected to determine the existing status of various environmental attributes viz., climate

and atmospheric conditions, air, water, noise, soil, hydro geological, ecological and socio-economic environment, prior to setting up of the proposed sub project. This study helped to undertake corrective mitigation measures for protection of the environment on account of any change deviation of attributes due to activities of the proposed project. As shown in the Fig.2.2, study area for baseline divided in two parts as follows:

- **Project Area/Core Area-** Bone & Joint Hospital campus is considered as core area and Project site.
- **Influence Area-** As per the EIA notification, 10 Km radius from the project site could be considered for identifying and assessing impacts. However, looking to the nature of the project which is confined to boundary of the Bone & Joint hospital, would have very limited impacts on the area located few kilo meters away from Bone & Joint hospital. Thus, areas surrounded to the Bone & Joint hospital may considered as project influence. However, ecological sensitive areas/features, flora and fauna were studied for 10 km radius from the project site by using secondary data sources. Baseline data and their Sources for Bone & Joint Hospital Project is summarized in the Table 2.1.

Table 2. 1: Baseline data and their Sources for the project

S.No	Baseline Data	Source of data	Remarks
1.	Environmental Baseline Data for Air, water, Noise etc.	Environmental Monitoring conducted at various locations by JKERA Lab under different projects of JTFRP during 2017-2018	Parameters considered PM2.5, PM10, SO2, NO2 and Ambient Noise,
2.	Details of existing hospital environment	Hospital Administration & Concerned Stakeholders Govt. Departments	-
3.	Details/description of Natural/Physical Environment	Secondary data sources such as Reports, Research articles & publications etc. 1-Ground water information booklet of Srinagar district, J&K, March 2013 2-District survey report 2017, Directorate of geology and mining, J&K 3- Socio- economic profile of Jammu and kashmir-2008, Directorate of economics & statistics, J & K	Data was used to establish baseline data for Natural/Physical Environment  Exact source of data is mentioned in the text.
4.	Details/description of Biological Environment	Secondary data sources	Study conducted by previous EIA consultant under JTFRP was used to describe biological baseline data
5.	Details/description of Socio-cultural Environment	Primary discussion, Secondary Source-Socio- economic profile of Jammu and kashmir-2008,	Representative Primary survey was conducted to describe Socio-cultural Environment under SIA of this assignment.

S.No	Baseline Data	Source of data	Remarks
		Directorate of economics & statistics, J&K	Study conducted by previous EIA consultant was also used for this section of baseline data.

Note- Appropriate referencing of information and data sources are given at relevant pages of chapters.

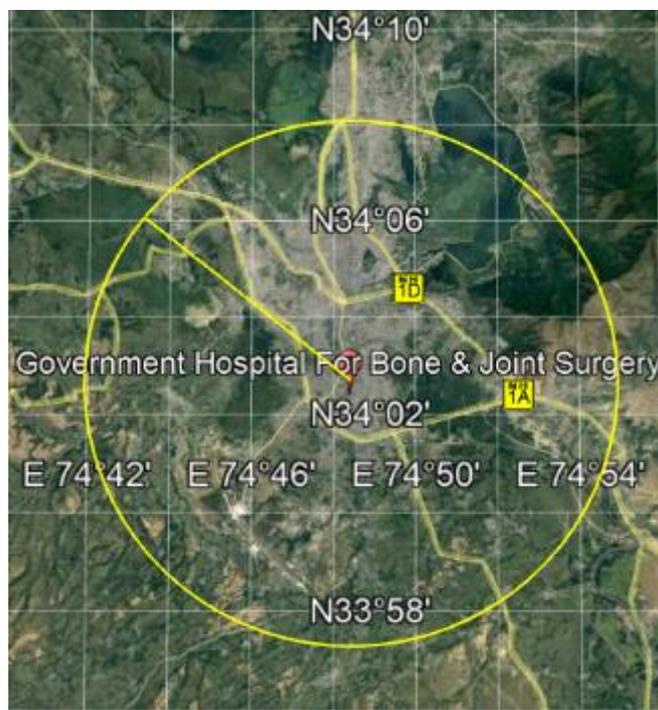


Fig.2. 2: Study Area showing Project and buffer Area

### Limitation/s or constraints in the primary or secondary data collection

The consultant has made sincere efforts to collect relevant, updated and accurate data from various sources and respondents. However, due to geopolitical scenario and COVID 19 lockdown issues limited primary information was collected for environmental baseline. Available secondary data was used to define physical, biological, socio-economic environment of the study area. Available primary and secondary data from the JK ERA reports prepared in 2017 and 2018 was used to describe environmental baseline of the project which has its own limitation as it was conducted for some other project in Srinagar City near to the project site.

## II- Environmental Utilities Assessment

Environmental Utilities Assessment of the existing blocks and proposed new block have been conducted under environmental assessment. The deficiencies in the existing and in the proposed new block were identified in this exercise and recommendations have been given to overcome these deficiencies. As shown in the Fig.2.3 to Fig. 2.6, Four matrix for the assessment environmental utilities viz. water supply and demand, sewage and wastewater management, solid and hospital waste management and storm water Management were

developed (depicted below) which contain different valuation parameters and assessment tools were used for utility assessment.

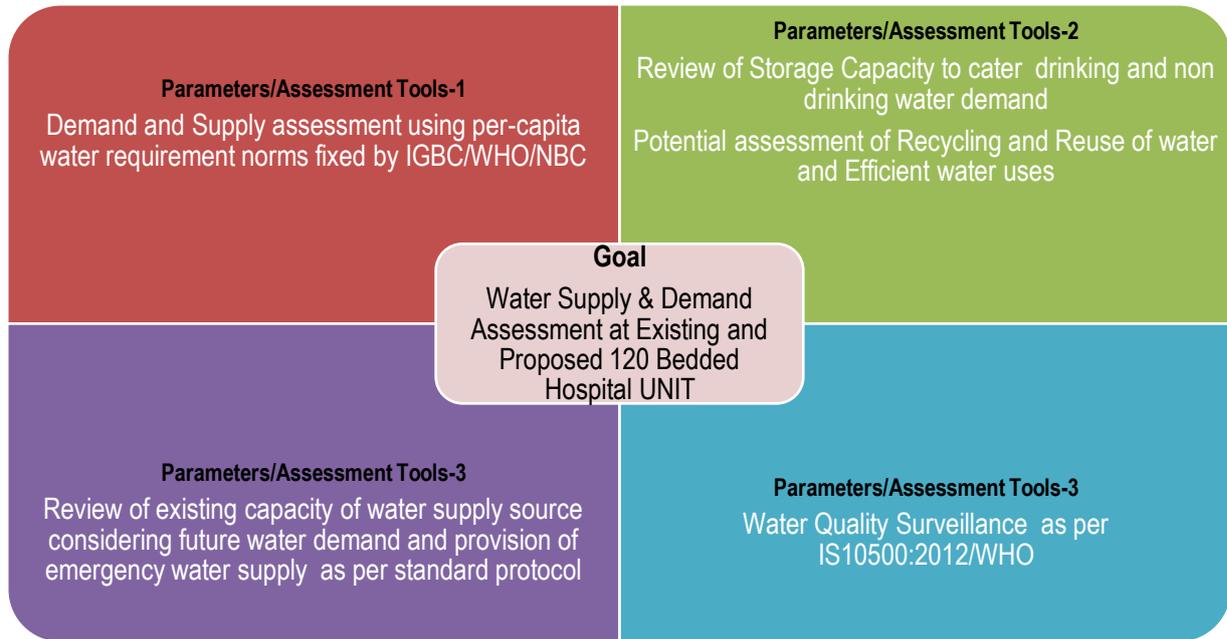


Fig.2. 3: Matrix for Water Supply & Demand Assessment & Management

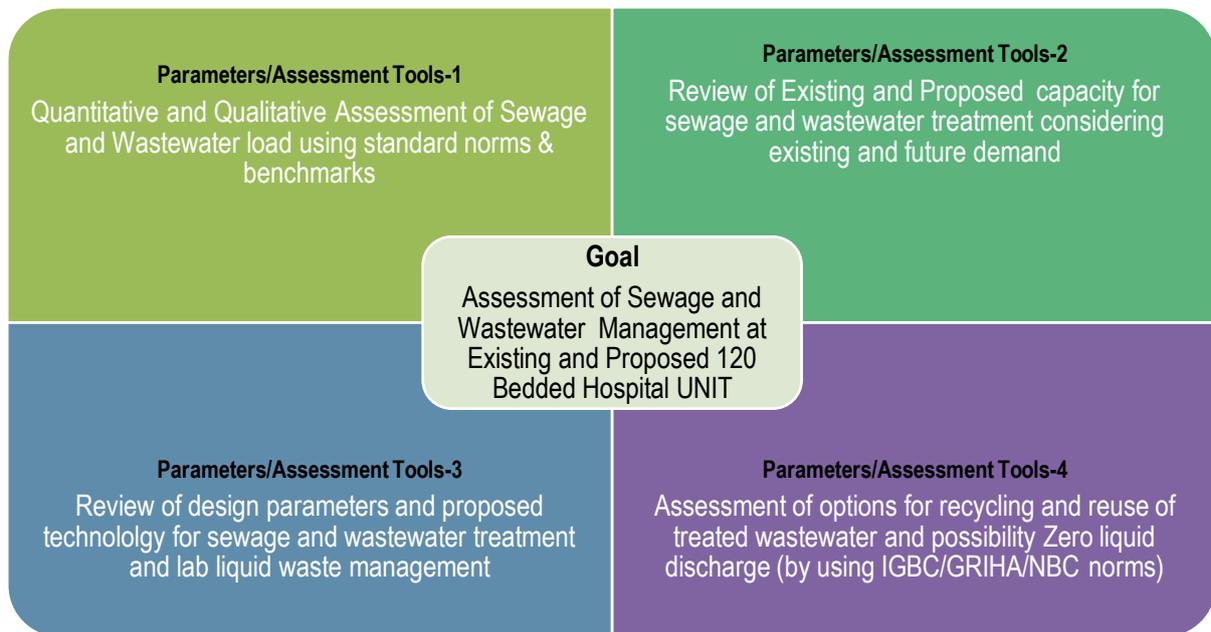


Fig.2. 4: Matrix for Assessment of Sewage and Wastewater Management at Existing and Proposed Hospital Unit

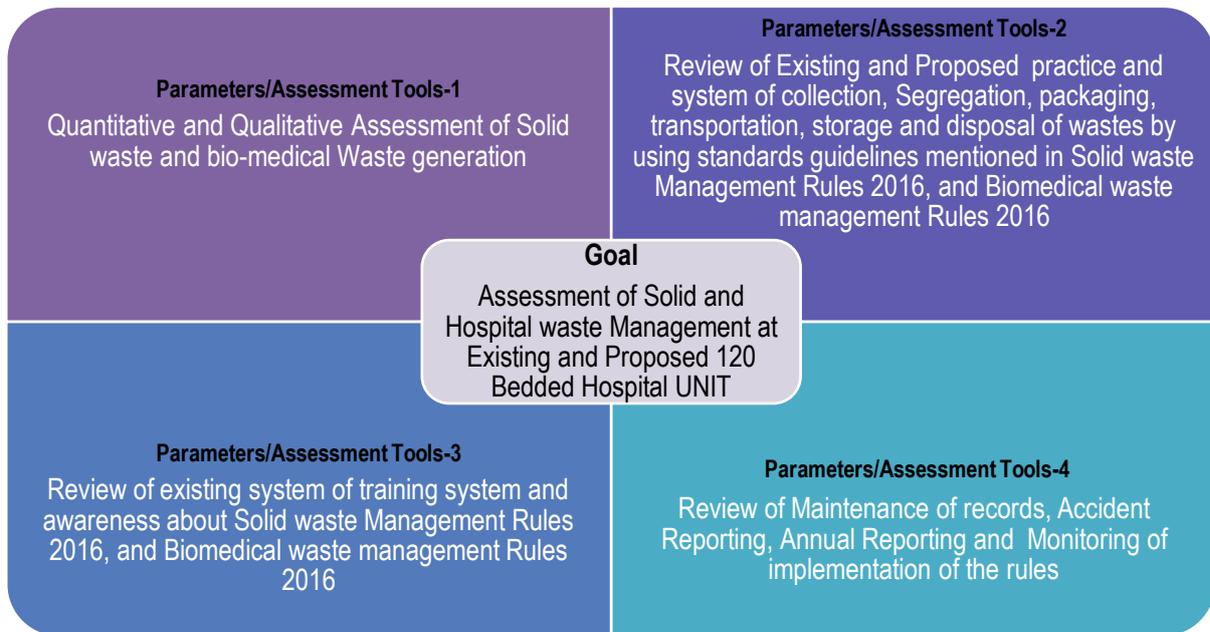


Fig.2. 5: Matrix for Assessment of Solid and Hospital Waste Management at Existing and Proposed Hospital Unit

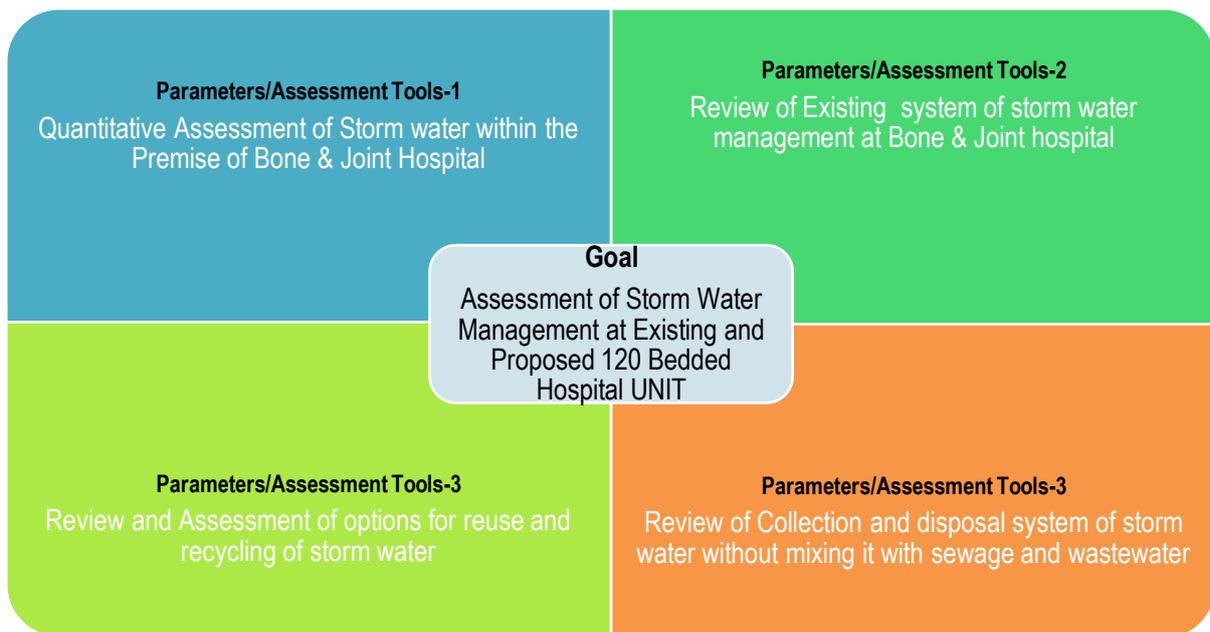


Fig.2. 6: Matrix for Assessment of Storm Water Management at Existing and Proposed Hospital Unit

## 2.6. Stakeholder Consultations

Stakeholder consultation was conducted by the subject area experts on 5<sup>th</sup>-8<sup>th</sup> November 2019. During the initial visit, meeting with stakeholder departments were conducted to understand and communicate them about their roles and responsibilities for success of this project. Due to COVID -19, the consultations were limited to one to one discussion following the guidelines of social distancing. The external and internal stakeholders were informed about subproject development objectives and components. They were requested to give their perception on the anticipated positive and negative impacts of the project and also their suggestions.

Consultation conducted in the month of June 2020 with help of local team on ground with help of domain experts over phone and virtual meeting.

Their views and suggestions were also recorded. The list of required data were shared with each concerned stakeholder departments. A walk through with the concerned department members and staff were also conducted at existing hospital blocks and at the site where a new 120 bedded hospital proposed.

### 2.7. Identification and Assessment of the Environmental Impacts of sub project Activities

Based on the analysis of the data that gathered from field survey, secondary sources and primary sources, issues and impacts related to the environmental sector had been identified for the project activities (construction and operational phase of the project) in the form of environment impact assessment report. The identified impacts were also be compared with the existing environmental settings and condition of the project area.

### 2.8. Development of an Environmental Management Plan

Based on the identified environmental issues, the EMP recommends measures required to prevent, minimize, mitigate, or compensate for identified impacts and to improve environmental performance of the project activities. The EMP also suggests for setting up an agency for management measures that need to be taken at various stages of implementation (construction and operational phase) along with Cost of EMP. Flowchart describing the steps adopted for preparation of EMP is depicted in Fig. 2.7.

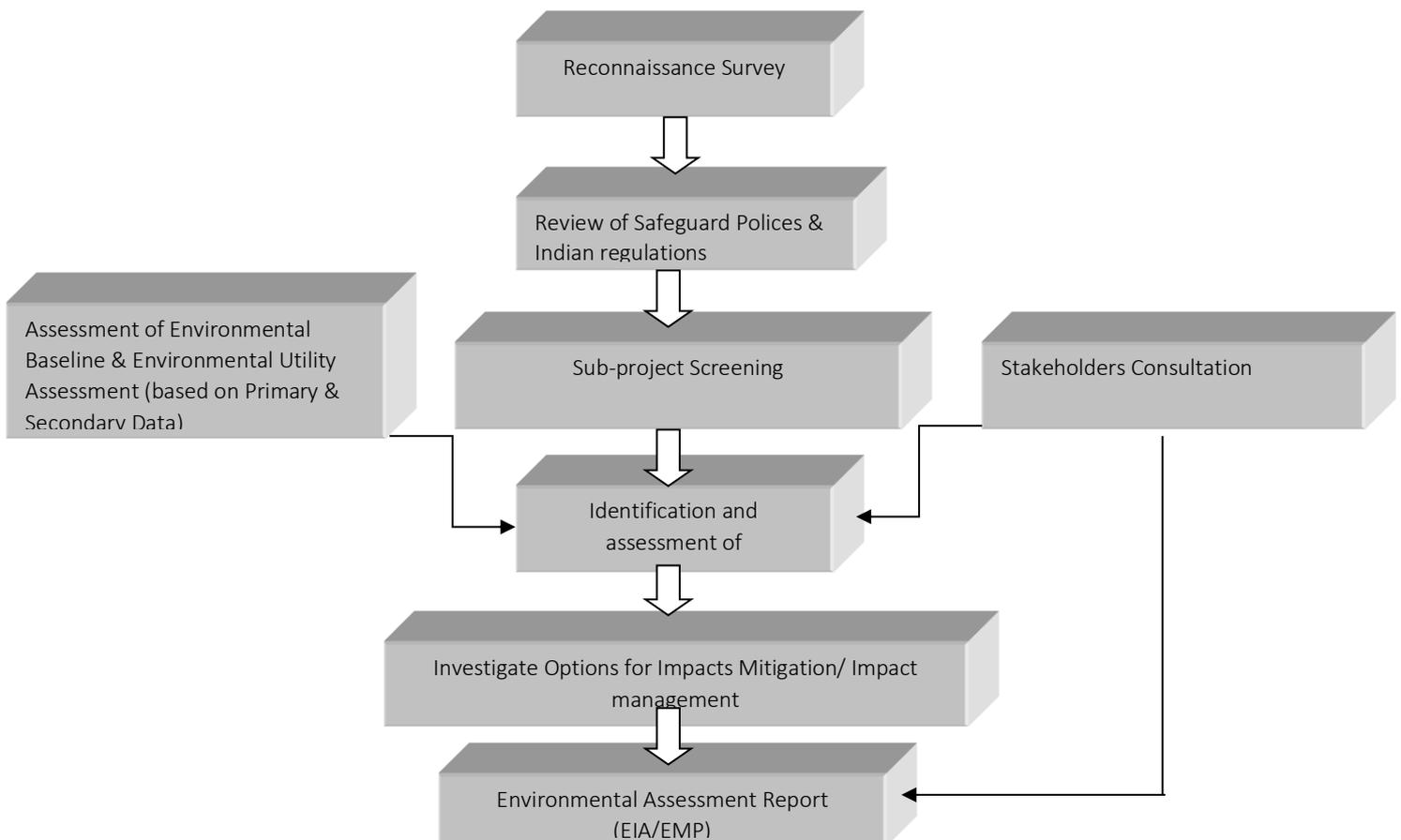


Fig.2. 7: Flowchart Describing the Steps Adopted for Preparation for Environmental Assessment Report

## CHAPTER -3: EXISTING ENVIRONMENTAL CONDITIONS (BASELINE)

### 3.1. Details of Existing Hospital and it Facilities

Existing Bone and Joint Hospital details and its facilities were assessed as a part of baseline status of project. Several physical and environmental aspects viz. water, wastewater, biomedical and solid waste management etc. were examined under condition assessment. Several observations and suggestions are made to improvements. However, present project is confined to develop facilities for proposed new hospital building only but recommendations to improve existing infrastructure and to reduce environmental foot prints are also screened out and will be communicated to project proponent and hospital administration for improvement to create overall sustainable infrastructure and facilities of whole Bone & Joint Hospital .

#### 3.1.1. Overview of Bone & Joint Hospital and its Facilities

The Bone and Joint Hospital is a government orthopaedic hospital which provides exclusive services, emergency and interventional care for orthopaedic cases comes from valley. It also provide expert management for all aspects of musculoskeletal conditions. This includes outpatient care, inpatient surgical treatment, rehabilitation and orthotics and prosthetics.

The total plot area of the entire Bone & Joint Hospital campus is approximately 18902 Sq.m which comes around 4.67acres. As far as built-up area is concern which is estimated approx. 13283 Sq.m which is existed on 6255 sqm ground coverage area. In the present site plan of Bone and Joint Hospital campus, there are 6 non-residential buildings that include main hospital blocks. Apart from this, 5 services infrastructure buildings and 5 residential and garage buildings are also existed on the site. Area statement and block details of existing hospital are given in the table adjacent to this text while layout plan is depicted in Fig.3.1.

AREA STATEMENT			
S. No.	Block	Ground Coverage (sqm)	Built Up Area (sqm)
1	Staff & Doctors Quarters (Proposal Site)	708	1898
2	O.T. & Wards Block	2505	7515
3	Blood Bank & Casualty	867	1695
4	OPD	887	887
5	Physiotherapy	447	447
6	MRI	105	105
7	Miscellaneous Blocks	736	736
<b>TOTAL:</b>		<b>6255</b>	<b>13283</b>
Site Area: 18902sqm or 4.67 Acre			

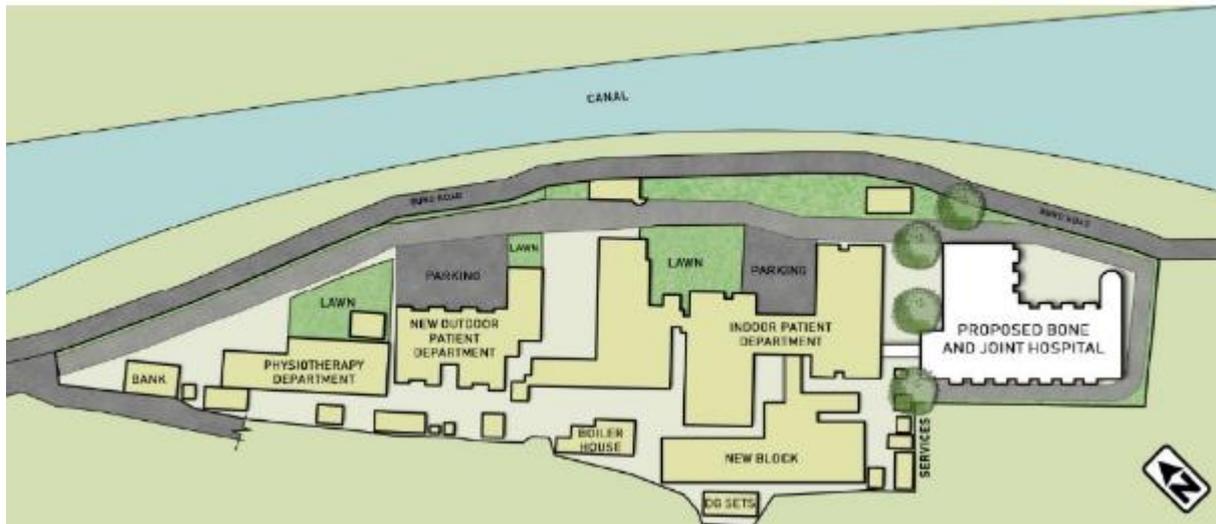


Fig.3. 1: Layout map of Bone & Joint Hospital

Infrastructure, facilities and block wise area details of the existing hospital are summarized below:

**NON-RESIDENTIAL BUILDINGS:**

1.	MRI Unit	Single Storied
2.	Physiotherapy & ALC Block	Single Storied
3.	OPD Block.	Single Storied
4.	Casualty, Emergency Ward & Blood Bank	Double Storied
5.	Old IPD Block	Three storied
6.	J&K Bank	Single Storied

**SERVICES INFRASTRUCTURE:**

1.	Water treatment Plant	Single Storied
2.	Boiler Room	Single Storied
3.	Electric Sub-Station.	Single Storied
4.	Garbage Shed	Single Storied
5.	Generator House	Single Storied

**RESIDENTIAL BUILDINGS:**

1.	PG Hostel	Triple Storied
2.	MS Quarter	Single Storied
3.	Nurses Hostel	Triple Storied
4.	Residential Quarter	Double Storied
5.	Garage	Single Storied

**3.1.2. Details of the Existing Facilities Available In the Hospital**

Details of existing facilities available at present in the Bone & Joint Hospital are summarized below:

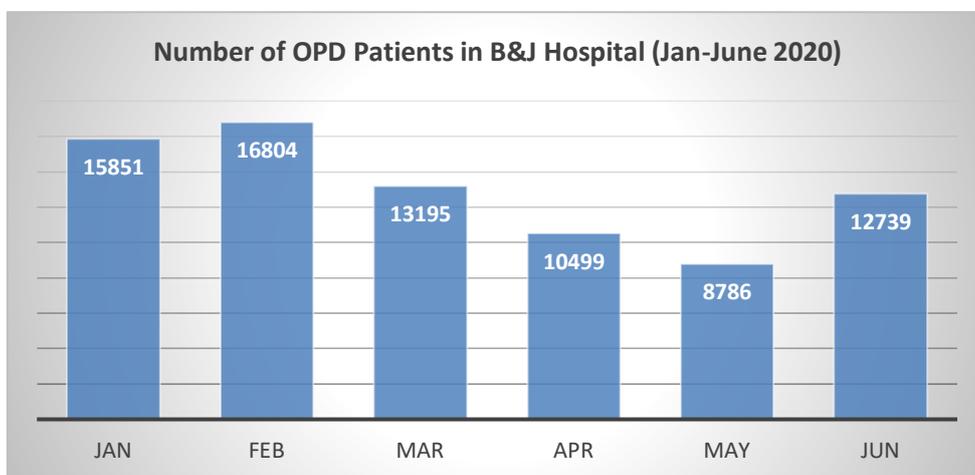
- Waiting Hall & Registration Counter
- Out Patient Department (OPD)

- Operation Theatres
- Central Sterile Supply Department (CSSD)
- Pharmacy

Existing facilities in the Bone & Joint Hospital are overloaded due to number of patients reporting for health services. There is urgent need for construction of additional building block (which is now being proposed under JTFRP) to overcome space limitation to create more advance medical facilities. Even the old buildings needs repair and re-construction of different blocks which will be taken care by the hospital administration and State Government in due course of time.

### 3.2. Patient inflow and Trends

Bone and Joint Hospital is very important Orthopaedic Hospital and only Orthopaedic trauma hospital which caters the needs of the Kashmir valley, Leh, Ladakh and Kishtwar, Poonch, Rajoori and Ramban districts of Jammu Division. This hospital providing Orthopaedic facilities free of cost to all patients and cater the medical needs of at least 400 patients per day. As per the hospital administration, OPD of Bone and Joint Hospital has provided medical services to total 77874 patients in between January-June 2020. Monthly patients load of Bone and Joint Hospital is depicted below



### 3.3. Accreditations and/or Environment Management System

Bone & Joint Hospital is associated with Srinagar Govt. Medical College (SGMC). At present, there is no accreditation taken by Bone & Joint Hospital. However, in the discussion, hospital administration informed that hospital is keen to take accreditation from National Board of Accreditation of Hospitals and Healthcare Providers (NABH) in the direction of SGMC. As far as environment management system is concerned, Hospital is complying all the environmental rules and regulations implies on hospital and health care services including

Biomedical Waste Management rules 2016. However, ISO 14001 (EMS) is not obtained by the hospital.

#### 3.4. Out Sourcing of Services

At present hospital is taking out sourcing services for management of biomedical waste, sanitation and security. Services of M/s. Kashmir Health Care System (Government approved Common Biomedical Waste Treatment and Disposal facility) is being taken by the hospital administration to ensure timely collection, transportation, treatment and disposal of biomedical waste as per BMWM Rules, 2018.

#### 3.5. Details of existing hospital environment

Details of existing hospital environment has been conducted during the assignment and discussed in the subsequent paras mentioned below. However, a composite matrix as shown in Table 3.1 is also prepared to highlight the status of existing of hospital utilities, key Observations and recommendations for their Improvement.

Table 3.1- Matrix Highlighting Status of Existing Utilities, Key Observations and Recommendations for their Improvement

S.No	Existing Utilities & Infrastructure	Status & Key Observations	Recommendations for its Improvement
1.	Water Supply	<ul style="list-style-type: none"> <li>• Supplying water more than the standard norm of 450 Litres/day/bed</li> <li>• Existing Water Demand-70 KLD</li> <li>• Source of Water- PHED &amp; Ground water</li> <li>• Excess water supply exceeding standard norms</li> <li>• No Permission obtained for Ground Water abstraction</li> <li>• No provision of recycling and reuse of water</li> <li>• No provision of water quality testing</li> </ul>	<ul style="list-style-type: none"> <li>• Reduce excess water uses by adopting water management practices</li> <li>• Permission should be taken for ground water abstraction</li> <li>• Dual plumbing system should be adopted for recycling and reuse of water</li> <li>• Periodic water quality of Ground water and PHED water (at intake point of hospital) should be checked periodically by NABL/MOEFCC accredited lab</li> </ul>

<p>2.</p>	<p><b>Sewage/Wastewater</b></p>	<ul style="list-style-type: none"> <li>• Quantum of Sewage generation 50 KLD</li> <li>• No sewage treatment plant (STP)</li> <li>• No effluent treatment plant (ETP) at Hospital to treat laundry waste</li> <li>• Direct discharge of untreated sewage and laundry waste in to the Doodh Ganga river</li> <li>• No provision of recycling and reuse of water and wastewater</li> <li>• At some portion, wastewater is flowing in open channels creating unhygienic conditions</li> </ul>	<ul style="list-style-type: none"> <li>• STP and ETP are required to treat sewage and laundry effluent</li> <li>• No untreated waste should be discharge in Dhoodh ganga river</li> <li>• Dual plumbing system should be adopted for recycling and reuse of waste water</li> <li>• Treated wastewater should be used for horticulture to minimise the use of fresh water</li> </ul>
<p>3.</p>	<p><b>Storm Water Management</b></p>	<ul style="list-style-type: none"> <li>• Storm water channels provided only at periphery of key Buildings</li> <li>• Level difference from main Road to entry gate of hospital creates water stagnation/logging at entry gate of the Hospital</li> <li>• Undulating terrain within campus creates water logging at many places such as opposite to IPD, OPD buildings and parking sites located within the hospital</li> <li>• During the rains, high water level in river creates backflow in sewage/storm water pipes and water finds its way to the hospital which required pumping to drain out</li> </ul>	<ul style="list-style-type: none"> <li>• Covered Storm water channels should be provided at all necessary places</li> <li>• Slope gradients should be maintained while creating storm water channels to avoid water stagnation</li> <li>• Outlet of STP/ETP and storm water pipes should be higher to HFL of Doodh Ganga river</li> <li>• Provision of rain water harvesting should be planned considering ground water table and accordance to CGWA guidelines</li> </ul>

4.	<b>Solid Waste Management</b>	<ul style="list-style-type: none"> <li>Quantity of solid waste generated @ 300kg/day</li> <li>Segregation of solid waste at source should be strengthen in accordance to SWM rules 2016</li> <li>Mixing of solid waste and bio-medical waste are observed at secondary collection point</li> <li>Collection and storage of solid waste at secondary collection point is not being done properly</li> <li>Open and Unhygienic conditions at secondary collection point</li> </ul>	<ul style="list-style-type: none"> <li>Segregation, collection and transportation of solid waste should be strengthen and it should be in accordance to SWM rules 2016</li> <li>Mixing of solid waste and bio-medical waste should be avoided within wards and at secondary collection point</li> <li>Compost plant should be placed within campus</li> <li>Bins should be provided at common areas such as park, parking and corridors etc.</li> </ul>
5.	<b>Parking &amp; Access</b>	<ul style="list-style-type: none"> <li>Limited availability of parking place</li> <li>Haphazard ground parking within the campus preventing traffic movement and smooth circulation of vehicles.</li> <li>Road side parking near main entry gate creates congestion and chaos.</li> <li>No separate parking space for ambulance</li> </ul>	<ul style="list-style-type: none"> <li>Parking space should be built according to NBC norms</li> <li>It is recommended that looking to the high demand of parking space, multi-level parking should be built near to Bone and Joint Hospital which will ease the existing traffic circulation and parking issues.</li> <li>Haphazard ground and road side parking's should be prohibited</li> <li>Separate place for ambulance parking should be provided</li> </ul>
6.	<b>Canteen/Kitchen Facility</b>	<ul style="list-style-type: none"> <li>Small area is provided for Canteen facility and existing kitchen is insufficient to meet the requirements of patient and visitors load</li> <li>Cooking facilities and conditions are very basics and unhygienic</li> </ul>	<ul style="list-style-type: none"> <li>It is recommended for the future to replace or reconstruct this existing kitchen space with a new kitchen block having all modern catering facilities.</li> </ul>

			<ul style="list-style-type: none"> <li>On the basis of 4 meals pattern for 150 beds, total 600 meals require to be prepare daily. Thus, considering a large industrial kitchen preparing 150 meals in a two hours period, International standard says minimum space 1.3 sq.m per meal is required. Therefore, minimum 780 sq.m area is required for existing kitchen</li> <li>A new kitchen building be built having following facilities             <ul style="list-style-type: none"> <li>Store receiving area (having direct access from a vehicular road).</li> <li>Cold and ambient storage</li> <li>Food preparation area</li> <li>Cooking area</li> <li>Dietician’s office</li> <li>Food trolley preparation and dispatch area</li> <li>Empty food trolley return area and dirty trolley wash area</li> <li>Swill room for emptying dirty dishes</li> <li>Dishwashing area with dirty dishes storage, dishwashers and clean dishes storage.</li> <li>Staff toilets and change rooms.</li> </ul> </li> </ul>
7.	<b>Laundry Services</b>	<p>In the existing laundry there are</p> <ul style="list-style-type: none"> <li>3 laundry machines: 60kg-2 Nos., 30kg-1 No. =150 Kg/cycle</li> <li>Drying tumbler- 3 Nos., Chest Iron (Steam Iron)- 1No.,Steam Boiler- 1 No. (850 kg, ) &amp; Vacuum Boiler- 1 No.</li> </ul>	<p>Laundry capacity is sufficient for present system. However, modernization can be done</p>

		As per thump rule, 3.5kg linen per bed is used to calculate laundry load. Thus, total laundry load for 150 beds@ 3.5 kg is 525 kg which require 4 washing cycles per day that is achievable.	
8.	<b>Fire safety Arrangement</b>	<ul style="list-style-type: none"> <li>Existing blocks of Bone &amp; Joint hospital are provided with fire hose, fire exits and fire extinguisher (ABC, CO2 and Foam types).</li> <li>Smoke detectors are not provided at all the new and old blocks which are currently not provided in all the areas of old blocks.</li> </ul>	<p>NBC 2016 should be followed for Fire safety including</p> <ul style="list-style-type: none"> <li>Fire exits</li> <li>Wet risers with hose reels at each floor</li> <li>Yard hydrants on the periphery of the building</li> <li>Manual call alarm system on each floor</li> <li>Automatic fire detection &amp; alarm system</li> <li>Public Address and Communication System</li> <li>Good Housekeeping &amp; Maintenance and training of staff</li> </ul>
9.	<b>Biomedical Waste Management</b>	<ul style="list-style-type: none"> <li>At few places / wards, general waste is being mixed with BMW or BMW is not in the right bin as per the segregation code.</li> <li>placing of bins containing waste at few places in near to patient beds &amp; not desirable. It should be placed secluded from sight.</li> <li>Even bags are not used to collect the waste (waste is being poured in buckets) at places.</li> <li>the waste is also being given to the common Bio medical treatment facility in black colored bags, which is against the color coding scheme of BMW rules.</li> <li>the hospital is conducting the health check-up of staff but not maintaining any proper record of this check-up of staff nurses &amp;</li> </ul>	<p>Biomedical waste shall be segregated, collected, transported and disposed of accordance to Biomedical Waste Management Rules 2016/2018 including</p> <ul style="list-style-type: none"> <li><b>Segregation of waste</b> in colour coded bags should be done as per the New rules, 2016</li> <li><b>No chlorinated plastic bag, gloves and blood bag should be used as Bio-Medical Waste Management (Amendment) Rules, 2018).</b></li> <li>A bar code based software system for collection, transportation and handling of BMW is should be ensured at earliest.</li> <li><b>Display waste management monthly record on the hospital website</b></li> <li>Till the construction of new waste storage room in the new block, the present waste</li> </ul>

		<p>workers. (There are only few old records of Vaccination to some staff), which is a regulatory violation</p> <ul style="list-style-type: none"> <li>• Only 12 nos needle cutters have been provided for the full hospital.</li> <li>• The waste storage room is in quite a neglected condition and needs immediate repair and proper ventilation as well secured boundary in order to avoid any unwanted person /animal coming in contact with waste</li> </ul> <p><b>Detailed assessment of Bio-medical waste management practice at Hospital is provided in Chapter 3.</b></p>	<p>storage room be immediately attended for proper ventilation as well secured shutter / lock up be provided in order to avoid any unwanted person /animal coming in contact with waste</p> <ul style="list-style-type: none"> <li>• The area outside the waste storage room be cleaned of any unwanted debris or other items</li> <li>• In addition, this area should be fenced / secured to avoid the entry of any rag pickers / animals in that area</li> <li>• The hospital should get 2 or 3 senior doctors &amp; nurses fully trained in all aspects of BMW management (These persons can preferably be a part of the BMW committee) and they become the master trainers.</li> <li>• The Bone &amp; Joint Hospital should set up its own website very soon. Subsequent to the setting up of this web site, it will be possible for hospital to upload its monthly data as well annual reports as per regulatory requirements</li> </ul> <p>Details measures and standard practices for BMW management are discussed in Chapter 3 and Chapter 9 of the Report</p>
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### 3.5.1. Water supply

Currently hospital is getting water considering the standard norms of water supply for the hospitals which is 450 litres per bed per day. The total water demand of existing hospital blocks approximately 70 KLD which include 40 KLD none drinking and 30 KLD drinking water demand of the hospital. Apart from this, 15 KLD water is being supplied and used for laundry activities.

Majority of total water demand is being fulfilled by PHED water supply. However, hospital is also using ground water bore well in case of limited supply and to satisfy higher demand.

Total water storage capacity of the existing hospital is estimated 150 KL (1.5 Lacs litres) which is being stored in 3 OHT and 3 UGR located within the campus. Sump located near PG hostel is having capacity 55KL while sump near laundry plant is holds capacity 95KL. Storage capacity is found more than sufficient considering present demand. There is no further water treatment process plant (chlorination) existed on the hospital site.

### 3.6.2. Sewage System

As per the data provided by the concerned hospital department, total 50 KLD sewage is being discharged from the hospital. In the absence of any treatment plant, presently sewage and laundry waste is being directly discharged in to Doodh Ganga River (canal) located adjacent to the hospital.

#### Issues Observed:

- No sewage treatment plant (STP)
- No effluent treatment plant (ETP) at Hospital to treat laundry waste
- Direct discharge of untreated sewage and laundry waste in to the Doodh Ganga river
- No provision of recycling and reuse of water and wastewater
- At some portion, wastewater is flowing in open channels



Open Channels and open manhole at Bone and Joint hospital

### 3.6.3 Storm water drainage

In the existing premises, open storm water channels are provided at the periphery of main buildings only which collect rain and melted snow water. However, water inundation and water logging are common during rains. As storm water and sewage both are being discharged in Dhoodh Ganga river (canal). Consequently, in the rains, high water level in river creates backflow and water finds its way to the hospital which required pumping to drain out. Apart from this, due to slightly undulating terrain within the campus creates water logging problem at many places especially at entry gate and opposite to OPD and IPD departments. Water logging sites within the hospital campus are shown in the Fig.3.2.

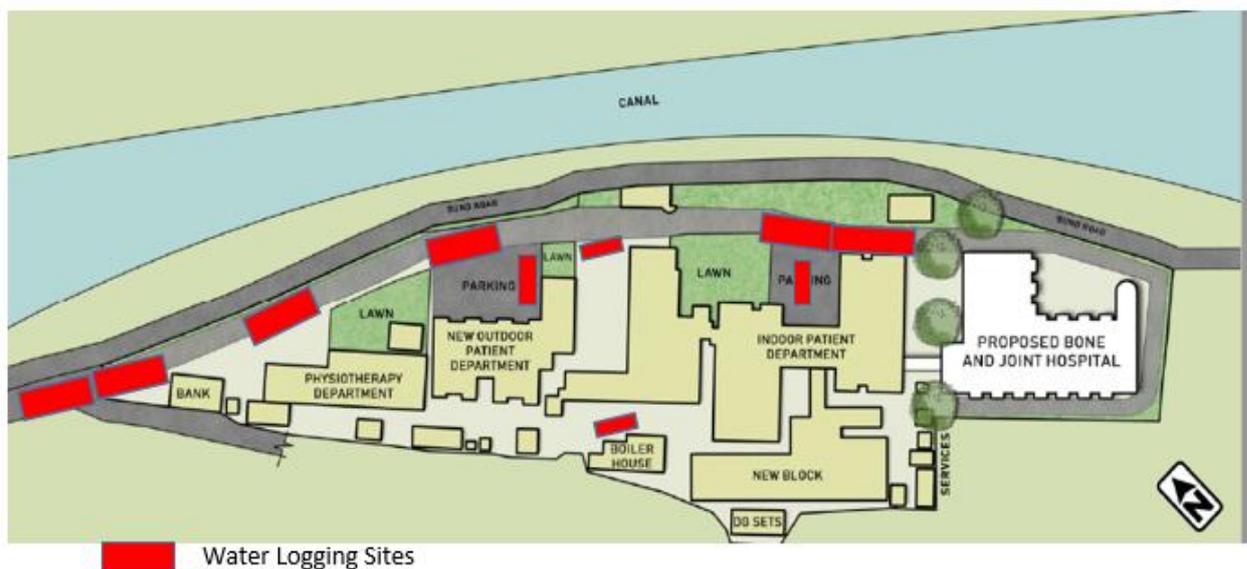


Fig.3. 2: Water Logging Sites within Bone & Joint Hospital

#### Issues Observed:

- Storm water channels provided only at periphery of key Buildings
- Level difference from main Road to entry gate of hospital creates water stagnation/logging at entry gate of the Hospital
- Undulating terrain within campus creates water logging at many places such as opposite to IPD, OPD buildings and parking sites located within the hospital (shown in Fig.)
- During the rains, high water level in river creates backflow in sewage/storm water pipes and water finds its way to the hospital which required pumping to drain out



Storm water Channels within Hospital Complex

### 3.6.4 Solid Waste Management

A small quantity of solid waste is generated @ 300kg/day which are mainly generated from canteen and hostel areas of Bone & Joint hospital. As per the data provided by the hospital staff (shown in Table 3.2) generated solid waste mostly having organic waste composition (58%) followed by inert waste (24%). A small percentage of plastic, glass and paper waste is also recorded in solid waste. In the hospital, efforts have been made to provide separate bins at different hospital blocks as per SWM Rules 2016. However, lot of improvement is required to maintain hygiene. Outsourced sanitation staff emptied these small bin wastes in to the large bins provided by the municipal authority. Municipal staff collect all the waste on regular intervals and disposed it at dump yard. However, to reduce the environmental foot prints, it is better to establish a small mechanical compost plant to produce compost from generated solid wastes which can easily be used in horticulture/plantation at small parks located within hospital premises.



Table 3.2- Composition of Solid Waste Generated within B&J Hospital

S.No	Physical Composition	% Value
1	Organic Waste	58.0%
2	Inert waste	24.0%
3	Plastic	3.0%
4	Papers	3.0%
5	Glass	5.3%
6	Other Wastes	6.7%

**Issues Observed:**

- Segregation of solid waste at source should be strengthen in accordance to SWM rules 2016
- Mixing of solid waste and bio-medical waste should be avoided at secondary collection point
- Collection and storage of solid waste at secondary collection point is not being done properly
- Open and Unhygienic conditions at secondary collection point
- Waste should be collected daily



Secondary storage point for Bio-medical & Solid waste

### 3.6.5 Energy – Sources and footprint

Total energy load of the hospital is estimated 400 kVA. There are two DG sets having capacity 250 kVA and 125 kVA are also installed in hospital for the emergency supply. Apart from this a UPS of 50 kW capacity is also operational in the Hospital. A CSSD of 180 kW and three numbers of autoclave of 369 kW are also available in the hospital.



### 3.6.6 HVAC Arrangements/conditions

The hospital building have a great deal of infections and bacteria in the air, especially in the patient areas. Therefore, air handling system of any hospital must counter these hazards and provide comfortable healing environments. The detailed HVAC design must follow NABH and ASHRE standards for hospital.

The existing status of HVAC services in the hospital are summarized below:

- ACs are mostly individual units.
- Oxygen plant capacity is 300 lpm
- 3 Central Heating plant (Boilers) with capacity of 6 lakh kcal/hr.
- Vertical Boiler capacity-600 kg/hr

### 3.6.7 Fire Safety Arrangements/Emergency/evacuation plan and arrangements

Existing blocks of Bone & Joint hospital are provided with fire hose, fire exits and fire extinguisher (ABC, CO2 and Foam types). However, as per NBC 2016, smoke detectors should be provided at all the new and old blocks which are currently not provided in all the areas of old blocks.

### 3.6.8 Canteen facilities and Laundry Services

#### Canteen/Kitchen facilities

Existing kitchen is insufficient to meet the requirements of patient and visitors load which is operational in a single room having limited infrastructure. The existing kitchen is inadequate to serve the projected hospital population and it is located in a structurally dilapidated building. On the basis of 4 meals pattern for 150 beds, total 600 meals require to be prepared daily. Thus, considering a large industrial kitchen preparing 150 meals in a two hours period, International standard says minimum space 1.3 sq.m per meal is required. Therefore, minimum 195 sq.m area is required for existing kitchen. It has been recommended for the future to replace or reconstruct this existing kitchen space with a new kitchen block having all modern catering facilities.



View of Existing Kitchen Spaces (Cooking facilities and conditions are very basics and unhygienic)

### Laundry Services

In the existing laundry of Bone and Joint Hospital following facilities are available,

- There are three laundry machines: 60kg-2 Nos., 30kg-1 No.
- Drying tumbler- 3 Nos.
- Chest Iron (Steam Iron) - 1No.
- Steam Boiler- 1 No. (850 kg, )
- Vacuum Boiler- 1 No.

As per thump rule, 3.5kg linen per bed is used to calculate laundry load. Thus, total laundry load for 150 beds@ 3.5 kg is 525 kg which require 4 washing cycles per day that is achievable. Thus, laundry capacity is sufficient for present system. However, modernization can be done.



View of Laundry Facilities at Bone and Joint Hospital

### 3.6.9 Traffic circulation and Parking management within the existing hospital

Traffic circulation and parking is the major issue in the current situation. Haphazard ground parking within the campus is preventing traffic movement and smooth circulation of vehicles. Even many times, ambulances carrying patient doesn't find space to reach at IPD. Road side parking near main entry gate creates congestion and chaos. Hot-spots related to traffic circulations and parking issues within hospital campus are marked in the Fig.3.3.

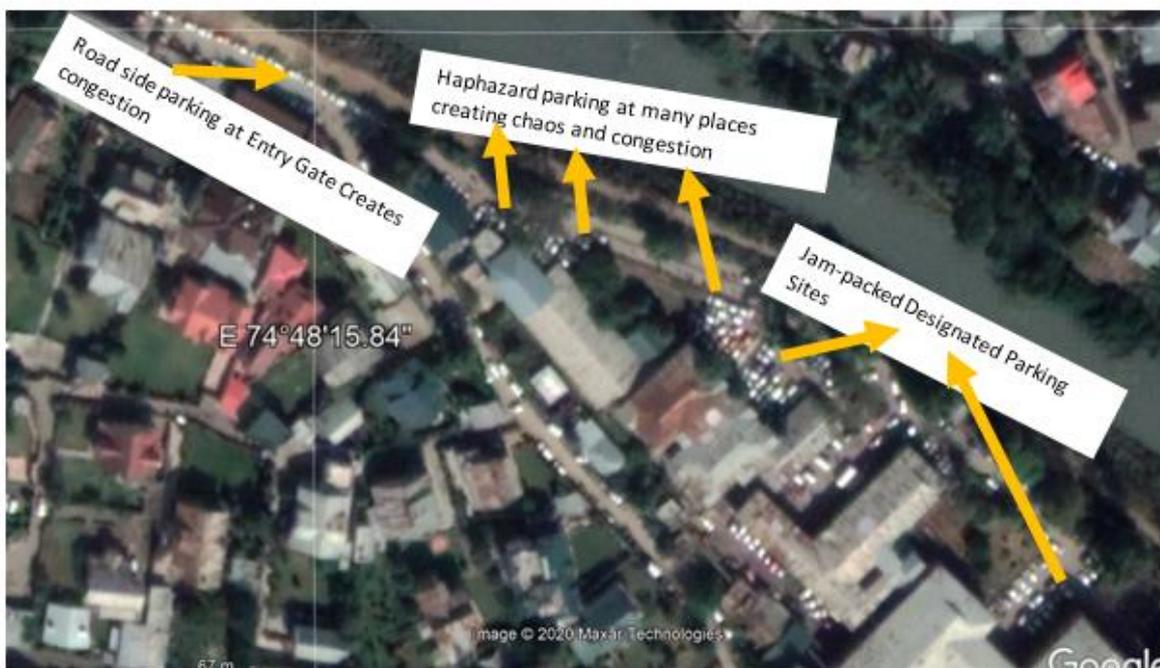


Fig.3.3- Marking of Hot-spots Related to Traffic Circulations and Parking Issues within Hospital campus

Apart from above issue, there only one approach road is available within hospital campus for patients, hence use the same approach road is not advisable for construction vehicles especially in day time. Therefore, use of alternate approach road would be a better option for the construction vehicles or else use of the existing route at night only. Alternative route and existing route are shown in Fig. 3.4.

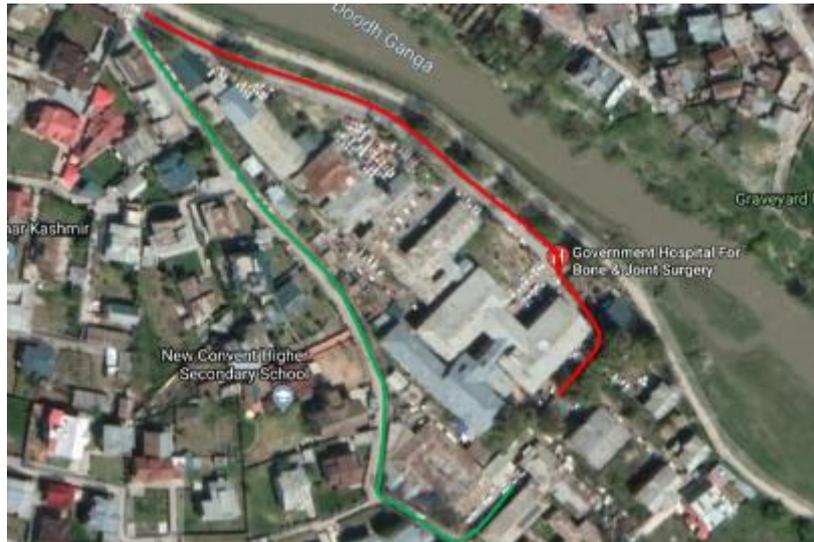


Fig.3.4- Marking of Alternative route (in Green) and existing route (in red) for Construction Vehicles

**Parking:**

Parking is the major issue, there is very limited space for parking available even patient ambulances have difficulty to find space for parking. Parking estimation for the B&J hospital is estimated by considering SMC building by laws and NBC norms.

**Estimation of Parking as Per Srinagar Development Authority building by-laws ( For Hospital Building)**

- a. 2 Cabins = 1Car : No OPDs Cabins in This Block
- b. 10 Beds = 1 Car : 120 Beds = 12 Cars
- c. 3 Nos. Doctors = 1 Car : 20 Doctors = 6.77 Or 7 Cars
- Total Cars Required = 19 Cars



**Estimation of Parking Requirement as per NBC:**

Considering the Building by Laws norms @ 2 ECS (Equivalent Car Space) /100 sq.m of Floor Area to calculate the parking numbers, following estimation is made to calculate parking requirements for B& J hospital:

Floor Area	Parking Norms	Estimation of Parking No.
Total Floor Area for New Building	@ 2 ECS per 100 sq.m	163 No.

(Proposed)-8132 sq.m		
Total Floor Area for Future plan - 27872 sq.m	@ 2 ECS per 100 sq.m	556 No.

Looking to the land constrain within the campus, only 740 sq.m area is designated for parking which can only accommodate 37 Cars. Proposed parking spaces is fulfilling the SMC building bylaws norms however, looking to the ground reality parking place requirement for the this hospital is much more than SMC norms. As per NBC norms, considering the total floor area that will be used for future development of existing hospital, total 556 number of car parking would be required that demands more than 11120 Sq.m area.

It is recommended that looking to the high demand of parking space, multi-level parking should be built near to Bone and Joint Hospital which will ease the existing traffic circulation and parking issues.

### 3.6.10 Trees/Plantation and Landscaping

There are very few trees are planted within the hospital area. At the proposed site, there are 4 Chinar trees and 8 shrubs are existed which need to be relocated or de-rooted with taking NOC from State Forests Dept.

## 3.7. Biomedical Waste Management at Bone & Joint Hospital

There has been a rapid growth of hospitals and other healthcare facilities resulting out of the expanding population, the epidemiological profile and the modern medical practice fuelling this demand. The advent of new technology, drugs / chemicals and the culture of 'disposables' etc. have brought into focus the issue of tackling the increased generation of Bio-Medical Waste. The fall outs of Poor Hospital Waste Management are affecting all constituents of our Environment and humans. In view of the above, the systematic handling & management of Bio medical waste is extremely important. The same becomes more critical to Bone & Joint Hospital, being a very important hospital of Kashmir Valley & aspiring to be a premier institution of India.

### 3.7.1. Site Assessment

Keeping in mind the fact that BMW generated due to proposed expansion shall contribute only about 10-15% of the total waste of the expanded hospital, the understanding of adequacy / management of present practices is much more important since the deficiencies in the present set up, if any , need immediate removal / redressed so that the overall

expanded capacity is able to meet with the desired standards / guidelines /parameters , when the expanded portion of hospital merges with the present capacity & becomes a single unit from all regulatory angles. All parameters required to study for a new hospital were applied to the existing hospital so that present status could be evaluated with a goal of their merger with the expanded hospital

### Present Statistics / Data

Some of the basic data of Bio Medical waste generated from the Bone & Joint Hospital are given in Table 3.3 and their composition is summarized in Table 3.4.

Table 3. 3: Composition of Bio medical waste Generated at Bone & Joint Hospital

Particulars	Existing Hospital
No. of beds	150
Total Biomedical waste generation per day (Avg.)	125 Kg/day
Per capita bio medical waste generation	About 835 Grams /capita/day
No of red bags (average)	16
No of yellow bags (average)	23
No of blue bags (average)	11

Table 3. 4: Composition of Biomedical waste generated from Existing facilities

S. No.	Color coding of bags /bins	% composition	Type of waste	Ultimate disposal arrangement
1	Yellow	30- 35%	Human anatomical Waste, Soiled waste, Discarded linen mattress, Microbiology & biotechnology waste, Blood bags etc.	Being sent to Common Bio medical waste treatment & disposal facility
2	Red	45-50 %	All recyclable plastics	Being sent to Common Bio medical waste treatment & disposal facility
3	Blue	20-25%	All glassware , metallic body implants	Being sent to Common Bio medical waste treatment & disposal facility
4	Others (Black) (To be discontinued)	8-15%	To be discontinued	Being sent to Common Bio medical waste treatment & disposal facility

5	White	0.05%	Sharp waste excluding broken glass	To be sent to Common Bio medical waste treatment & disposal facility
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The Bone & Joint Hospital was visited by the team once in the month of November 2019 followed by stakeholder consultation with help of local team and Bio Medical Waste and Safety Experts. Considering precautions in this situation of Corona Pandemic, Interaction was carried out with all the stake holders including the Dean, Medical Supdt, Deputy MS, Staff nurses, workers and the sanitation staff. While discussing, it was concluded that there is an awareness about the new rules at most of levels but still there are many gaps in full understanding of new rules & their amendments.

### 3.7.2. Condition Assessment

Condition assessment for biomedical waste management system was conducted as a part of the assignment. Detailed findings of the condition assessment are described in Table 3.5.

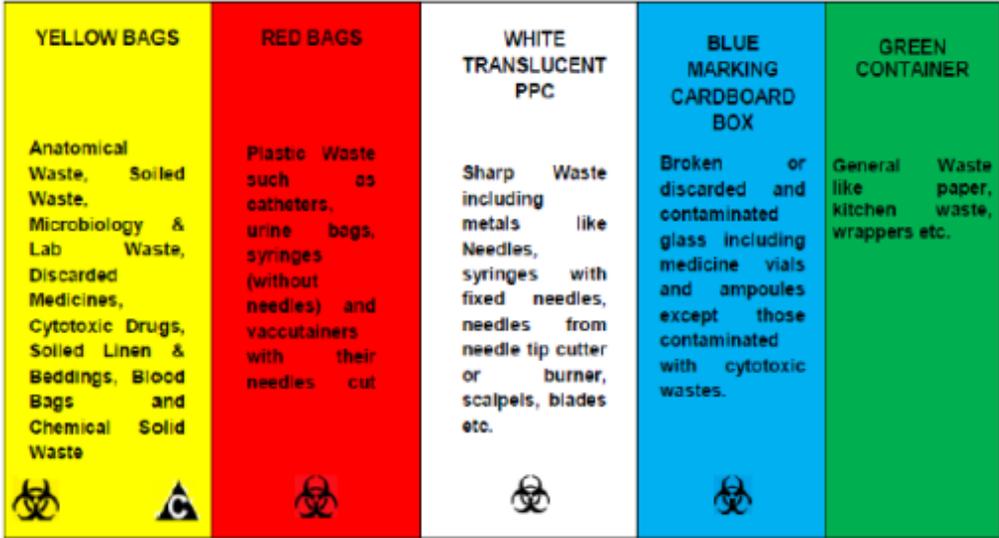
Table 3. 5: Condition Assessment of Existing System of Bio medical Waste Management at Bone & Joint Hospital		
Particulars	Norms as per Bio medical waste Management (Amendment) Rules, 2018	Existing Situation/findings at Bone & Joint hospital
1.BMW Segregation	The BMW segregation protocol has been totally modified in the new rules as under :	<p>The Assessment was carried out by visiting various wards of hospitals, discussing with various staff nurses and workers involved in segregation.</p> <p><b>1.1 Findings :</b> Some of the deficiencies in the hospital needs to implement for existing block as well incorporated in the expansion block are as under :</p> <p>a) At few places / wards, it was found that the general waste is being mixed with BMW or BMW is not in the right bin as per the segregation code . Even bags are not used to collect the waste (waste is being poured in buckets) at places. Further, very less no of blue bins have been provided. The BMW segregation posters also need corrections to include the white waste</p>
		

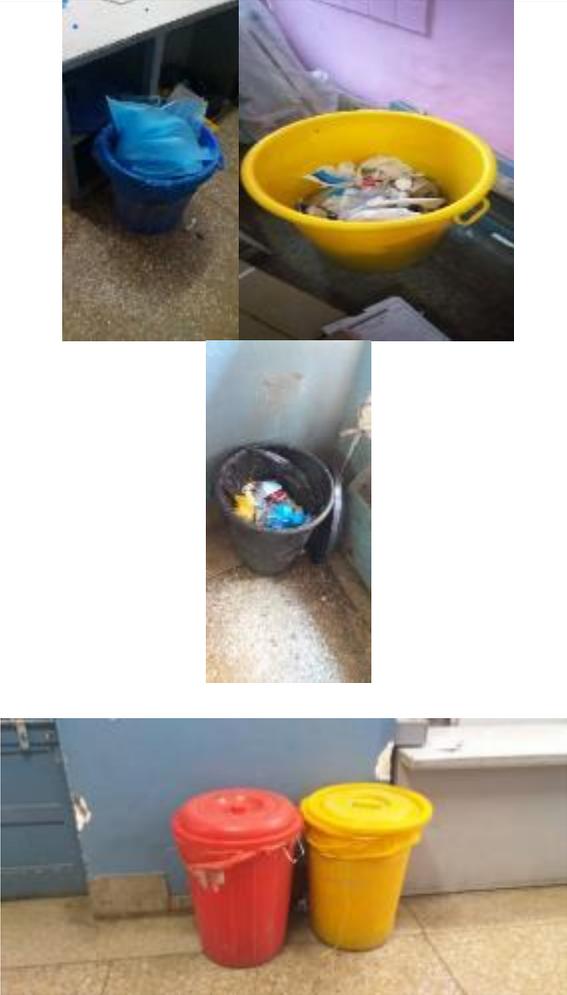
Table 3. 5: Condition Assessment of Existing System of Bio medical Waste Management at Bone & Joint Hospital		
Particulars	Norms as per Bio medical waste Management (Amendment) Rules, 2018	Existing Situation/findings at Bone & Joint hospital
		

Table 3. 5: Condition Assessment of Existing System of Bio medical Waste Management at Bone & Joint Hospital		
Particulars	Norms as per Bio medical waste Management (Amendment) Rules, 2018	Existing Situation/findings at Bone & Joint hospital
		
	.	<p>As seen from sample manifests at Sr No 10 below ( Record keeping), the waste is also being given to the common Bio medical treatment facility in black colored bags, which is against the color coding scheme of BMW rules.</p> <p><b>Conclusions :</b>                      The reasons of this can be all or any of following :</p> <ul style="list-style-type: none"> <li>a) Lack of awareness among patients &amp; attendants.</li> <li>b) Lack of training / casualness of staff nurses.</li> <li>c) Lack of adequate no of bins for storage of the waste.</li> <li>d) Lack of proper supervision/administration.</li> </ul>
		<p>The hospital has constituted 2 committees for issues related to BMW management as per rules.</p>

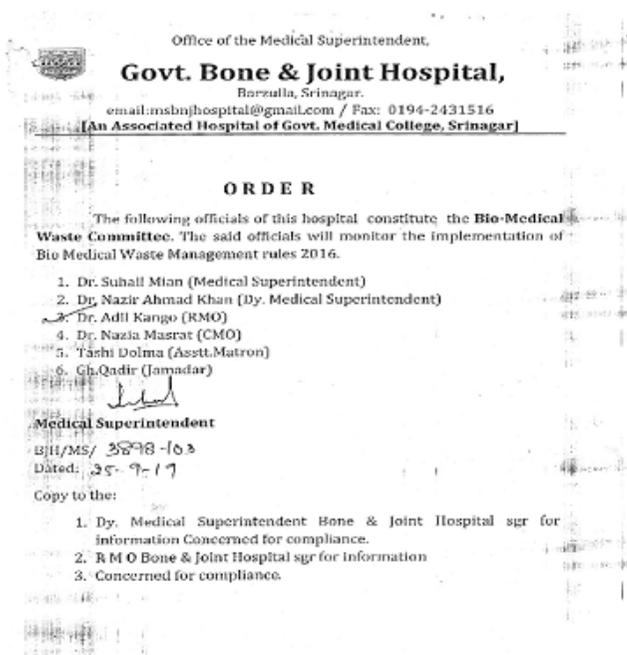
Table 3. 5: Condition Assessment of Existing System of Bio medical Waste Management at Bone & Joint Hospital		
Particulars	Norms as per Bio medical waste Management (Amendment) Rules, 2018	Existing Situation/findings at Bone & Joint hospital
2. BMW Management Committee	<p>The formation of such a committee is essential from regulatory point of view as well better administration of rules.</p> 	<p>However, there is not sufficient record available to support the regular meetings of the committee as well management of various issues related to BMW in the hospital.</p>

Table 3. 5: Condition Assessment of Existing System of Bio medical Waste Management at Bone & Joint Hospital		
Particulars	Norms as per Bio medical waste Management (Amendment) Rules, 2018	Existing Situation/findings at Bone & Joint hospital
	<p>Office of the Medical Superintendent,  <b>Govt. Bone &amp; Joint Hospital,</b>          Barzulla, Srinagar.          email:msbnjhospital@gmail.com / Fax: 0194-2431516          [An Associated Hospital of Govt. Medical College, Srinagar]</p> <p><b>ORDER</b></p> <p>The following officials of this hospital constitute the <b>Bio-Medical Waste Management Team</b>. The said officials will Supervise segregation of Bio-Medical Waste at source and record maintenance including the maintenance of the log book.</p> <ol style="list-style-type: none"> <li>1. Dr. Adil Kango (RMO)</li> <li>2. Dr. Nazia Masrat (CMO)</li> <li>3. Tashi Dolma (Asst. Matron)</li> <li>4. Gurdeep Singh (Head pharmacist)</li> <li>5. Sandesh Kaur (Nursing Supervisor)</li> <li>6. Gh. Qadir (Jamadar)</li> </ol> <p>The said team will submit report weekly to the Medical Superintendent so that the report is forwarded to Principal Govt Medical College Srinagar regularly in time.</p> <p><i>[Signature]</i>  <b>Medical Superintendent</b>          BJH/MS/ 3891-99          Dated: 28-9-19</p> <p>Copy to the:          1. Dy. Medical Superintendent Bone &amp; Joint Hospital sgr for information</p>	
3. Health Check-up of Staff nurses & Workers	This is a regulatory requirement & is also very important in view of the various risks associated with handling of this waste.	It was found that the hospital is conducting the health check-up of staff but not maintaining any proper record of this check-up of staff nurses &

Table 3. 5: Condition Assessment of Existing System of Bio medical Waste Management at Bone & Joint Hospital		
Particulars	Norms as per Bio medical waste Management (Amendment) Rules, 2018	Existing Situation/findings at Bone & Joint hospital
		<p>workers. (There are only few old records of Vaccination to some staff), which is a regulatory violation also.</p> <p>In addition, it is the risk for the individual as well his/her co-workers, in case of contracting any disease during the waste handling</p> <p>The authorities should start maintaining the same for the existing hospital forthwith as well plan for the expanded hospital.</p>
<b>4.BMW Management Trainings</b>	Regular training of various staff & workers involved in BMW management is very essential for efficient management of waste as well to comply the regulatory requirement	Apparently, though most of senior staff in existing hospital has a good understanding of segregation but only few trainings have been conducted. It is very essential that new staff nurses / workers are imparted the BMW training as well old staff keeps refreshing their knowledge of BMW management through regular training programs in the hospital itself.
<b>5.Assessment of overall Infrastructure , facilities &amp; materials for efficient BMW Management</b>	<p>This assessment helped to understand the likely risk of any health hazard due to any deficiency in any of materials, infrastructure &amp; facilities for efficient handling of BMW.</p> <p>An assessment made to understand the overall infrastructure / facilities / materials available for BMW management so that the same, if required, can be upgraded / improved in the existing hospital as well incorporated in the expanded block.</p>	<p>Over all, infrastructure was assessed to be deficient in respect of the following points :</p> <p>a) The no of bins provided are inadequate. At some locations, they are without any lids. At many places , blue bins are missing</p>

Table 3. 5: Condition Assessment of Existing System of Bio medical Waste Management at Bone & Joint Hospital		
Particulars	Norms as per Bio medical waste Management (Amendment) Rules, 2018	Existing Situation/findings at Bone & Joint hospital
		  <p>b) At some locations, the bins provided are oversized</p> <p>c) No needle blasters have been provided . Only 12 nos needle cutters have been provided for the full hospital.</p> <p>d) The trolleys for transportation of waste from various locations to waste storage room</p>

Table 3. 5: Condition Assessment of Existing System of Bio medical Waste Management at Bone & Joint Hospital		
Particulars	Norms as per Bio medical waste Management (Amendment) Rules, 2018	Existing Situation/findings at Bone & Joint hospital
		<p>(common collection point) have not been maintained properly.</p>  
<p><b>6.Assessment of Personal Protective Equipment (PPEs) Usage</b></p>	<p>This assessment was carried out to understand the likely risk of any health hazard due to any deficiency or improper use of PPEs</p> <p>One of the most important methods of infection control in the hospital is the proper &amp; adequate use of PPEs.</p>	<p>It was found to be inadequate at some places, particularly the use of masks was not up to the mark at places (even in times of Covid-19). In addition, some sweepers were not wearing any gum boots.</p>

**Table 3. 5: Condition Assessment of Existing System of Bio medical Waste Management at Bone & Joint Hospital**

Particulars	Norms as per Bio medical waste Management (Amendment) Rules, 2018	Existing Situation/findings at Bone & Joint hospital
	<p>This helps to reduce the hospital acquired infections to a greater extent.</p> <p>The proposed assessment helped to understand the likely risk of any health hazard due to any deficiency or improper use of PPEs in the present block and the same shall be implemented for the expanded block</p>	

Table 3. 5: Condition Assessment of Existing System of Bio medical Waste Management at Bone & Joint Hospital		
Particulars	Norms as per Bio medical waste Management (Amendment) Rules, 2018	Existing Situation/findings at Bone & Joint hospital
		
<p><b>7.Waste Storage Room (Common Collection Point)</b></p>	<p>Assessment of waste storage room was done to understand the practices adopted and risks involved before handing over the waste to centralised facility for its final disposal at this common collection point.</p>	<p>a) The waste storage room is in quite a neglected condition and needs immediate repair and proper ventilation as well secured boundary in order to avoid any unwanted person /animal coming in contact with waste</p> 

Table 3. 5: Condition Assessment of Existing System of Bio medical Waste Management at Bone & Joint Hospital

Particulars	Norms as per Bio medical waste Management (Amendment) Rules, 2018	Existing Situation/findings at Bone & Joint hospital
		  <p>b) The area outside the waste storage room also needs improvement. It should be fenced / secured to avoid the entry of any rag pickers / animals in that area. Dogs seem to have a free access to the waste storage room and may carry the waste and spread the diseases.</p>

Table 3. 5: Condition Assessment of Existing System of Bio medical Waste Management at Bone & Joint Hospital		
Particulars	Norms as per Bio medical waste Management (Amendment) Rules, 2018	Existing Situation/findings at Bone & Joint hospital
		<p>The details of new waste storage room are still not available and same shall be added in the final report</p> 
8.Liquid Waste (blood, urine & other liquid samples) Management	This aspect is an important regulatory requirement	Apparently, the liquids are disposed off after treatment with Sodium hypochlorite but the details are still awaited from hospital.
9.Health Safety Measures	Assessment of any risk (despite taking various safety measures adopted by hospital) while handling the waste for the existing hospital & using the same for expanded portions also was studied.	The placing of bins containing waste at few places in near to patient beds & not desirable. It should be placed secluded from sight.

Table 3. 5: Condition Assessment of Existing System of Bio medical Waste Management at Bone & Joint Hospital		
Particulars	Norms as per Bio medical waste Management (Amendment) Rules, 2018	Existing Situation/findings at Bone & Joint hospital
	<p>The hospital was assessed to understand the overall safety measures available while handling BMW, its deficiency, if any so that the same, if required , can be upgraded / improved in the existing hospital as well incorporated in the expanded block.</p>	<p>Some of bins containing waste are without any proper covers.</p>  <p>Some of the bins are even placed in urinals / toilets being used by patients / attendants, which should be avoided.</p>

Table 3. 5: Condition Assessment of Existing System of Bio medical Waste Management at Bone & Joint Hospital

Particulars	Norms as per Bio medical waste Management (Amendment) Rules, 2018	Existing Situation/findings at Bone & Joint hospital
		 <p>Waste storage room needs to be immediately made ready with proper ventilation &amp; fencing arrangement, since this can be misused by rag pickers /stray animals</p> 

Table 3. 5: Condition Assessment of Existing System of Bio medical Waste Management at Bone & Joint Hospital		
Particulars	Norms as per Bio medical waste Management (Amendment) Rules, 2018	Existing Situation/findings at Bone & Joint hospital
		<p>The no of bins used is quite insufficient , particularly blue bins. The area outside the storage room need proper cleaning and maintenance.</p> 
<b>10.Record Keeping</b>	<p>Assessment of various record keeping practices helps to protect against any regulatory violations as well risks of pilferage while waste handling. A review of all records of BMW management was done. Also, the random record of waste (Manifests) handed over to common BMW treatment facility is produced below.</p>	<ul style="list-style-type: none"> <li>(i) Records of annual reports for last 3 years are available</li> <li>(ii) The records of BMW trainings not available</li> <li>(iii) Records of health check ups of staff nurses &amp; workers not available</li> <li>(iv) No records of discarded medicines /expired drugs being maintained</li> <li>(v) No records of major accidents being maintained</li> <li>(vi) As seen from sample manifests , the waste is also being given to the common Bio medical</li> </ul>

Table 3. 5: Condition Assessment of Existing System of Bio medical Waste Management at Bone & Joint Hospital		
Particulars	Norms as per Bio medical waste Management (Amendment) Rules, 2018	Existing Situation/findings at Bone & Joint hospital
		<p>treatment facility in black colored bags, which is against the color coding scheme of BMW rules.</p>

SSIREGD.DICPC/SWC-108/PMT/00/1117 Cell : # 9858991991  
JKSPCB/IT/NO.C/SWC/82/83353

### KASHMIR HEALTH CARE SYSTEM

Common Bio Medical Waste Treatment & Disposal Facility  
4154, I.G.C Laspipora, Pulwama, Kashmir

**SCHEDULE-III**  
See rule 8 (4)

**COLLECTION FORM**

S. No. **27211**  
 Day 11 Name of Generator Geno and mint Syr  
 Month 01 Waste Category :  
 Year 2020

Red	Blue	Yellow	Black	White	Total
140	20	80	60	x	200
120	72	480	303	x	975 kg

Waste Quantity \_\_\_\_\_  
 Whether Waste lifted or  
 Otherwise \_\_\_\_\_

Bio Medical Waste has been lifted by the service provider from the generator as per Bio Medical Waste (Management & Handling) Rule-2011

Authorised Waste Generator Signature <u>[Signature]</u> Name <u>M. A. J. Khan</u> Designation <u>SI</u> Phone No. _____	Services Providers Signature <u>[Signature]</u> Name <u>Sajad Ak.</u> Designation <u>Driver</u> Phone No. <u>7006011479</u>
---	---

Note : In case of expiry / Complaint  
 Contact :- 9858990991, 9796540102

Table 3. 5: Condition Assessment of Existing System of Bio medical Waste Management at Bone & Joint Hospital

Particulars	Norms as per Bio medical waste Management (Amendment) Rules, 2018	Existing Situation/findings at Bone & Joint hospital																		
	 <p><b>KASHMIR HEALTH CARE SYSTEM</b>  <small>Comprehensive Medical Waste Treatment &amp; Disposal Facility</small>          4114, LG-C Ladwara, Pulwama, Kashmir  <b>SCHEDULE-B</b>  <small>Part Form B (1)</small>  <b>COLLECTION FORM</b></p> <p>F. No. <u>27226</u>          Date <u>07</u> Name of Generator <u>Bone and Joint Hosp</u>          Month <u>01</u> Waste Category:          Year <u>2020</u></p> <table border="1"> <thead> <tr> <th>Red</th> <th>Blue</th> <th>Yellow</th> <th>Black</th> <th>White</th> <th>Total</th> </tr> </thead> <tbody> <tr> <td>40</td> <td>60</td> <td>100</td> <td>20</td> <td>0</td> <td>260</td> </tr> <tr> <td>200</td> <td>100</td> <td>100</td> <td></td> <td></td> <td>400</td> </tr> </tbody> </table> <p>Waste Quantity <u>900 kg</u>          Whether Waste Used or Collected <u>✓</u></p> <p>Bio Medical Waste Bag Generated by the service provider from the generator as per the Management (Amendment &amp; Repealing) Rule-2018</p> <p>Authorized Waste Generator: <u>[Signature]</u> Service Provider: <u>[Signature]</u>          Name: <u>B. Akhtar</u> Name: <u>Sajad Ak.</u>          Designation: <u>CAN</u> Designation: <u>DRIVER</u>          Phone No: <u>9119552673</u> Phone No: <u>700641439</u></p> <p>Note: In case of expiry / Complaint          Contact - 50810091, 57665022</p>	Red	Blue	Yellow	Black	White	Total	40	60	100	20	0	260	200	100	100			400	
Red	Blue	Yellow	Black	White	Total															
40	60	100	20	0	260															
200	100	100			400															

Table 3. 5: Condition Assessment of Existing System of Bio medical Waste Management at Bone & Joint Hospital

Particulars	Norms as per Bio medical waste Management (Amendment) Rules, 2018	Existing Situation/findings at Bone & Joint hospital																		
	 <p><b>KASHMIR HEALTH CARE SYSTEM</b>  <small>Common Bio Medical Waste Treatment &amp; Disposal Facility          4104, 10, C Lane (near, P. House), Srinagar</small></p> <p><b>SCHEDULE-III</b>  <small>See rule 9 (4)</small></p> <p><b>COLLECTION FORM</b></p> <p>D. No. <u>27222</u>          Date <u>23</u> Name of Generator <u>Bone and Joint Hospital</u>          Month <u>01</u> Waste Category <u>Waste</u>          Year <u>2020</u></p> <table border="1"> <thead> <tr> <th>Pink</th> <th>Blue</th> <th>Yellow</th> <th>Black</th> <th>White</th> <th>Total</th> </tr> </thead> <tbody> <tr> <td>40</td> <td>30</td> <td>80</td> <td>65</td> <td>45</td> <td>205</td> </tr> <tr> <td>120</td> <td>92</td> <td>90</td> <td>80</td> <td>100</td> <td>482</td> </tr> </tbody> </table> <p>Waste Quantity <u>450 kg</u>          Whether Waste Sharp or Other <u>Other</u></p> <p><small>Bio Medical Waste (as per the) has to be removed from the generator as per Bio Med (Waste) Management &amp; Handling Rule 2018</small></p> <p>Authorized Waste Generator: Signature <u>[Signature]</u>, Name <u>Dr. A. J. Khan</u>, Designation <u>CMO</u>, Phone No. <u>9906722803</u></p> <p>Service Provider: Signature <u>[Signature]</u>, Name <u>Sajad AH</u>, Designation <u>Driver</u>, Phone No. <u>706604112</u></p> <p>Note: In case of expiry / Complaint          Contact = 01909051, 019049132</p>	Pink	Blue	Yellow	Black	White	Total	40	30	80	65	45	205	120	92	90	80	100	482	
Pink	Blue	Yellow	Black	White	Total															
40	30	80	65	45	205															
120	92	90	80	100	482															

Table 3. 5: Condition Assessment of Existing System of Bio medical Waste Management at Bone & Joint Hospital

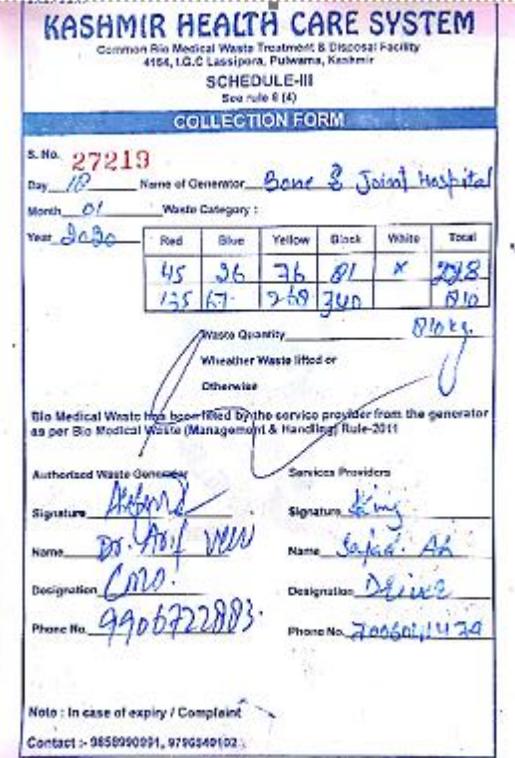
Particulars	Norms as per Bio medical waste Management (Amendment) Rules, 2018	Existing Situation/findings at Bone & Joint hospital																		
	 <p><b>KASHMIR HEALTH CARE SYSTEM</b> Common Bio Medical Waste Treatment &amp; Disposal Facility 4154, I.G.C Laspipora, Pulwama, Kashmir SCHEDULE-III See rule 6 (4)</p> <p><b>COLLECTION FORM</b></p> <p>S. No. <u>27219</u> Day <u>10</u> Name of Generator <u>Bone &amp; Joint Hospital</u> Month <u>01</u> Waste Category : Year <u>2020</u></p> <table border="1"> <thead> <tr> <th>Red</th> <th>Blue</th> <th>Yellow</th> <th>Black</th> <th>White</th> <th>Total</th> </tr> </thead> <tbody> <tr> <td>45</td> <td>26</td> <td>76</td> <td>01</td> <td>X</td> <td>208</td> </tr> <tr> <td>135</td> <td>67</td> <td>259</td> <td>340</td> <td></td> <td>810</td> </tr> </tbody> </table> <p>Waste Quantity <u>810 kg.</u> Whether Waste lifted or Otherwise</p> <p>Bio Medical Waste has been lifted by the service provider from the generator as per Bio Medical Waste (Management) &amp; Handling Rule-2011</p> <p>Authorized Waste Generator: Signature <u>[Signature]</u> Name <u>Dr. Anil Wani</u> Designation <u>MD</u> Phone No <u>9906722883</u> Service Provider: Signature <u>[Signature]</u> Name <u>Sajid Ahmad</u> Designation <u>Driver</u> Phone No <u>7066011179</u></p> <p>Note : In case of expiry / Complaint Contact :- 985990991, 9792549102</p>	Red	Blue	Yellow	Black	White	Total	45	26	76	01	X	208	135	67	259	340		810	
Red	Blue	Yellow	Black	White	Total															
45	26	76	01	X	208															
135	67	259	340		810															

Table 3. 5: Condition Assessment of Existing System of Bio medical Waste Management at Bone & Joint Hospital

Particulars	Norms as per Bio medical waste Management (Amendment) Rules, 2018	Existing Situation/findings at Bone & Joint hospital																		
	<p>SS/REGD.DICPC/SWC-188/PMT/06/1117 Cell : # 9868991991 JKSPCB/IT/NOC/SWCS/2/183353</p> <p><b>KASHMIR HEALTH CARE SYSTEM</b> Common Bio Medical Waste Treatment &amp; Disposal Facility 4154, I.G.C Laspipora, Pulwama, Kashmir</p> <p>SCHEDULE-III See rule 8 (4)</p> <p><b>COLLECTION FORM</b></p> <p>S. No. <b>27211</b> Day <b>01</b> Name of Generator <b>Bone and Joint Spg</b> Month <b>01</b> Waste Category : Year <b>2020</b></p> <table border="1"> <thead> <tr> <th>Red</th> <th>Blue</th> <th>Yellow</th> <th>Black</th> <th>White</th> <th>Total</th> </tr> </thead> <tbody> <tr> <td>40</td> <td>20</td> <td>80</td> <td>60</td> <td>20</td> <td>220</td> </tr> <tr> <td>120</td> <td>72</td> <td>480</td> <td>303</td> <td>20</td> <td>975kg</td> </tr> </tbody> </table> <p>Waste Quantity Whether Waste lifted or Otherwise</p> <p>Bio Medical Waste has been lifted by the service provider from the generator as per Bio Medical Waste (Management &amp; Handling) Rule-2011</p> <p>Authorized Waste Generator Signature <i>[Signature]</i> Name <b>M. A. J.</b> Designation <b>ST</b> Phone No. _____</p> <p>Services Providers Signature <i>[Signature]</i> Name <b>Sajid Ak.</b> Designation <b>Driver</b> Phone No. <b>7066011479</b></p>	Red	Blue	Yellow	Black	White	Total	40	20	80	60	20	220	120	72	480	303	20	975kg	
Red	Blue	Yellow	Black	White	Total															
40	20	80	60	20	220															
120	72	480	303	20	975kg															

**Table 3. 5: Condition Assessment of Existing System of Bio medical Waste Management at Bone & Joint Hospital**

Particulars	Norms as per Bio medical waste Management (Amendment) Rules, 2018	Existing Situation/findings at Bone & Joint hospital
<p>11. Final disposal of Bio Medical waste</p>	<p>The total Bio medical waste from the common collection point is handed over to common Bio Medical waste treatment facility (CBWTF)</p>	<p>Findings /Observations :</p> <ul style="list-style-type: none"> <li>a)The CBWTF does not collect the waste from the common collection point on daily basis, which is a violation of rules</li> <li>b)A manifest (as shown in para 10 above)is issued by the CBWTF against receipt of the waste.</li> <li>c)The CBWTF is located at Lassipora, Pulwama about 40 Km from the LD Hospital</li> </ul> 

Table 3. 5: Condition Assessment of Existing System of Bio medical Waste Management at Bone & Joint Hospital

Particulars	Norms as per Bio medical waste Management (Amendment) Rules, 2018	Existing Situation/findings at Bone & Joint hospital
		 <p>d) During the earlier site visit of CBWTF, the segregation of waste was found to be a major issue for all hospitals of Srinagar including Bone &amp; Joint Hospital. The same was again confirmed by the facility</p> <p>e) The hospital is handing over some waste in black bags, which is against the rules</p>

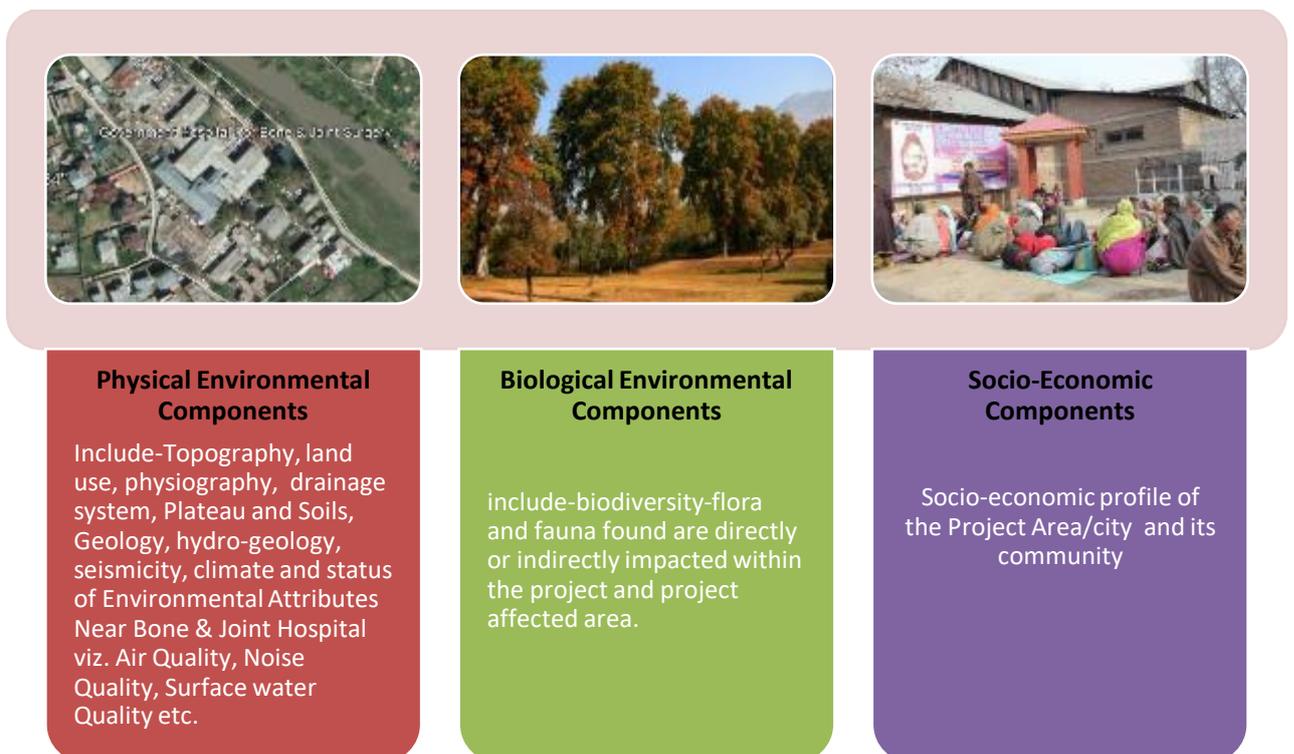
### 3.7. Details/description of Natural/Physical Environment

#### 3.7.1. Background

This section presents the existing environmental and socio-economic baseline status of the study and buffer area in which Physical, Biological and Socio-economic environmental conditions described for the immediate vicinity/influence zone of the site (1 km) and also discussed features of 10 km radius buffer zone.

Establishment of environmental baseline helps in understanding the prevailing environmental and socio-economic statuses of the area. It provides requisite information of the environment to decision makers to take appropriate measures regarding its surrounding environment. Apart from this, it also helps to compare post project changes in the environmental conditions.

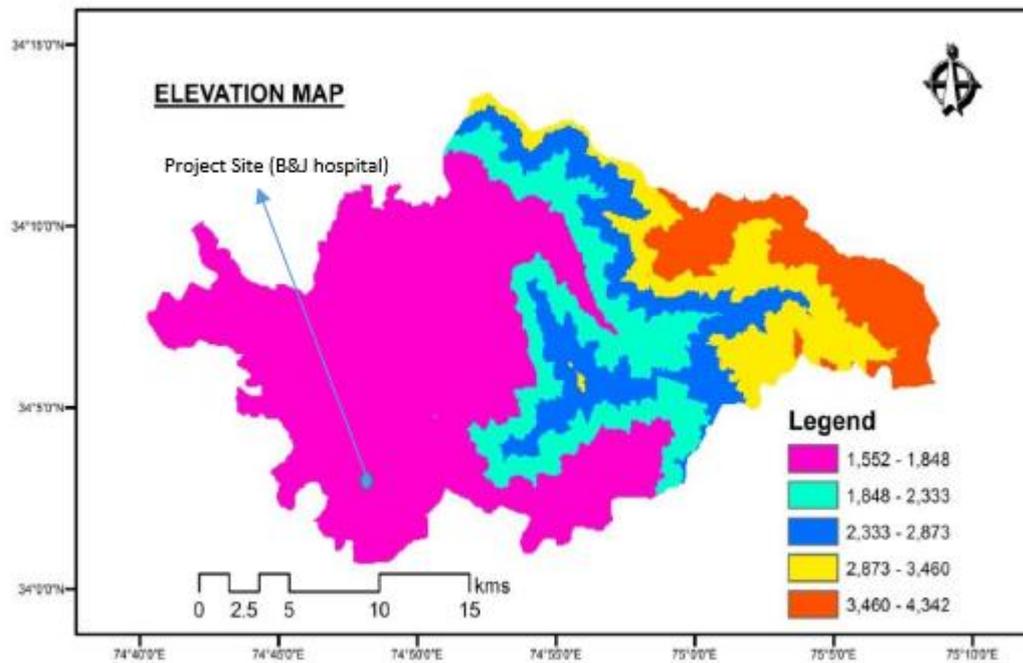
All necessary information and applicable information required for study were collected through survey conducted by environmental and social survey team, secondary data sources and community consultations in the study area for the different segments of the environment. Environmental monitoring data collected by JKERA in between July-September (considerably dry months for Srinagar) 2018 is used to set ambient Environmental Baseline for Air, water, Noise etc. Secondary data and information on various aspects (like hydrogeology, hydrology, drainage pattern, ecology etc.), meteorology and socio-economic aspects were collected from Census of India, IMD, and Survey of Indian etc. appropriate referencing of data has been done in the text. The entire baseline is broadly structured in the following pattern:



### 3.7.2. Physical Environmental Components

#### 3.7.2.1. Topography & Physiography

The proposed new hospital block is geographically located at 34° 2'48.90"N, 74°48'24.63"E with an average elevation of 1592 meters AMSL. Average elevation of project buffer area is also found in between 1552 -2258 meter AMSL. Topography of the proposed project site is almost flat terrain. Location of project site on district elevation map of Srinagar is shown in Figure 3.5.



(Source: District Survey Report 2017. Directorate of Geology & Mining, J&K)

Fig.3. 5: Elevation Map of District Srinagar showing Project Location

#### 3.7.2.2. Land Use Pattern in 10 Km buffer Area

Land use map of district Srinagar showing project location is depicted as Figure 3.6. It can be seen in land use map, that predominant land use in the study area is built up area followed by open vegetation and agriculture land. Regarding the project site where proposed Bone and Joint hospital building will be built is a part of existing hospital campus having some permanent and semi-permanent structures which will be demolished to provide land for proposed 120 bedded hospital.

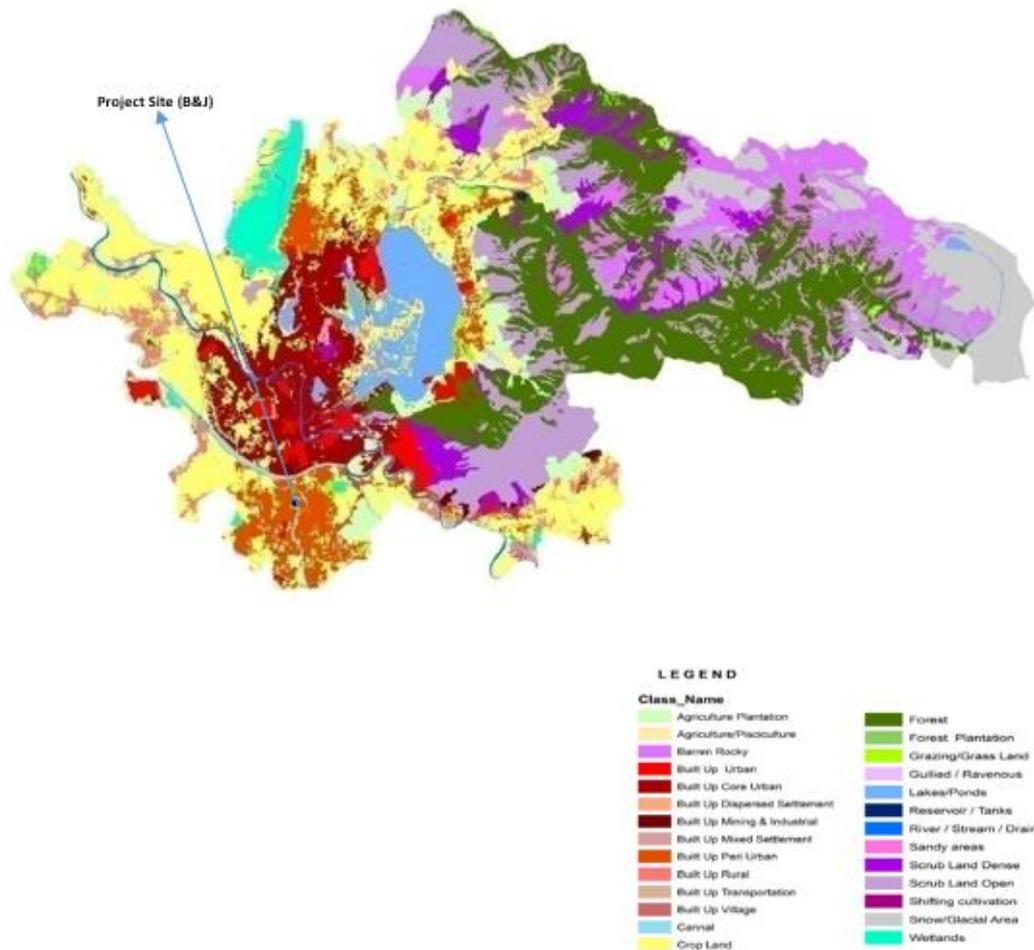
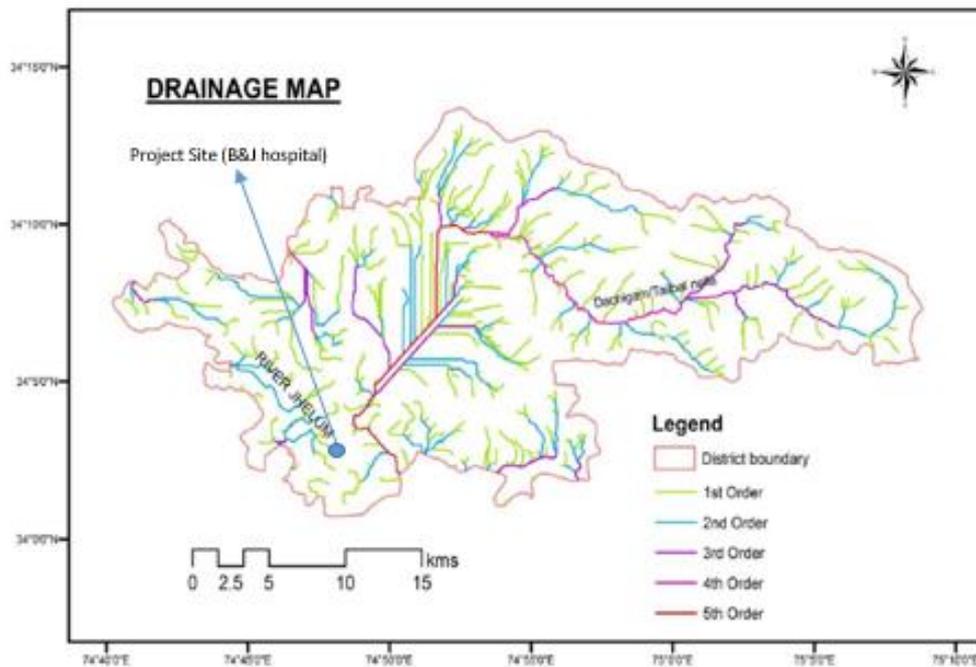


Fig.3. 6: Land use map of District Srinagar Showing Project Site

### 3.7.2.3. Drainage system

The drainage system within the buffer area is characterised by Jhelum River having an open dendritic antecedent type drainage. Project site is located in the immediate vicinity of Dhood Ganga canal. River Jhelum which originates from Verinag spring at the foothill of the Pir Panjal in the south-eastern part of the Kashmir Valley at an altitude of 1890 m. It flows in loops through the valley in northwest direction till it enters the Wular Lake. The river in general flows in north-westerly direction in district Srinagar. River Jhelum represents one of the main sources of well sorted river borne sand. The replenishment of the Jhelum load with minor mineral occurs naturally with the high speed water flowing into the river during rainy season and post melting season. Location of project site on drainage map of Srinagar district is shown at Fig. 3.7.



(Source: District Survey Report 2017. Directorate of Geology & Mining, J&K)

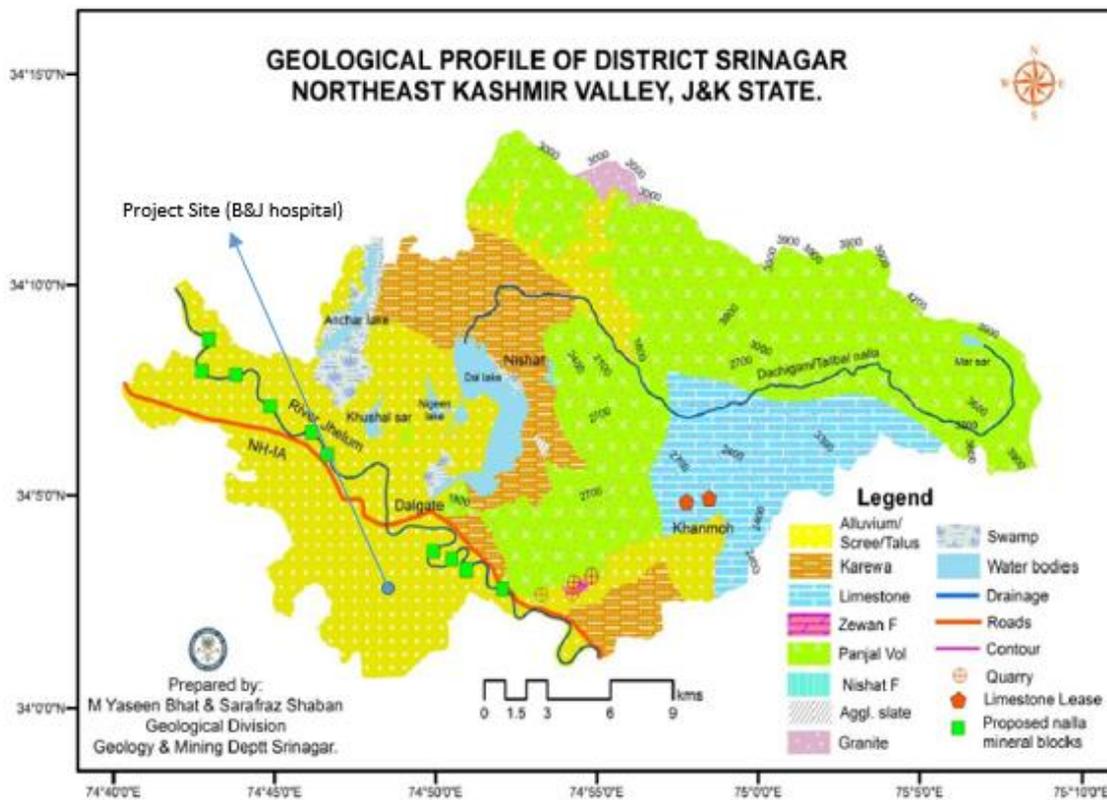
Fig.3. 7: Drainage Map of District Srinagar

#### 3.7.2.4. Lake

The most distinctive feature of the Srinagar is Dal Lake having an area of about 15 sq.km. Dal Lake is situated approx. 8 km from the Proposed Bone & Joint Hospital Block. This lake has unique life of its own with floating vegetable gardens, fields of lotus blossom and communities depended upon Dal living in house boats. Another lake Anchar lies in north western part of the district.

#### 3.7.2.5. Geology & Soils

Proposed project site and 10 km buffer area is having Alluvium geological formation. Recent Alluvium, in the low-lying areas adjoining the Jhelum river and its tributaries consist of finely compacted detrital sediments such as loam, clay, silt and sand with occasional gravel. Location of project site on geological map of District Srinagar is given in Fig.3.8.



(Source: District Survey Report 2017. Directorate of Geology & Mining, J&K)

Fig.3. 8: Geological Map of District Srinagar Showing Project Site

### 3.7.2.6. Hydrogeology

The hydrogeological conditions of the district are dependent on the lithology, structure and geomorphic set up. Groundwater in the area occurs both under water table and confined conditions in Soft Rock Aquifers. Depth to water table varies widely in different hydro geomorphic depending upon rainfall, the draft and the topography of the area. The depth to summer water levels in the ranges from 1.5 to 4.00 m bgl while winter water levels vary from 1.75 to 6.00 m bgl. It is important to mention here that water level behaviour in the Kashmir Valley is entirely different from the other parts of the country. This is mainly because of the fact that about 60 to 70% of the precipitation is received in the form of snow during December to February while March to April are the months of heavy rainfall. May to September are relatively dry months. Hence recharge to the ground water takes place in the valley in the months of April to June with the melting of snow and with the onset of rainfall. Therefore water level shows trends of rising from April onwards and falling from August onwards.

### 3.7.2.7. Seismicity of the Area

The site area is located in a seismically active part of Kashmir valley. Keeping in view the maximum credible earthquake magnitudes in the region the site area as per BIS Code of practice IS-1893-2002 is classified in zone fifth, Earthquake of 1905 (Mw 7.8) & in 1885 (Mw

7.5). According to the seismic zonation map for India, the region falls in seismic zone V. Most of the earthquakes are generated by the fault movements and in Jammu & Kashmir region, there are parallel faults trending northwest to south east. Seismic hazard map for Jammu & Kashmir State and location of project site on that map is shown in Fig.3.9.

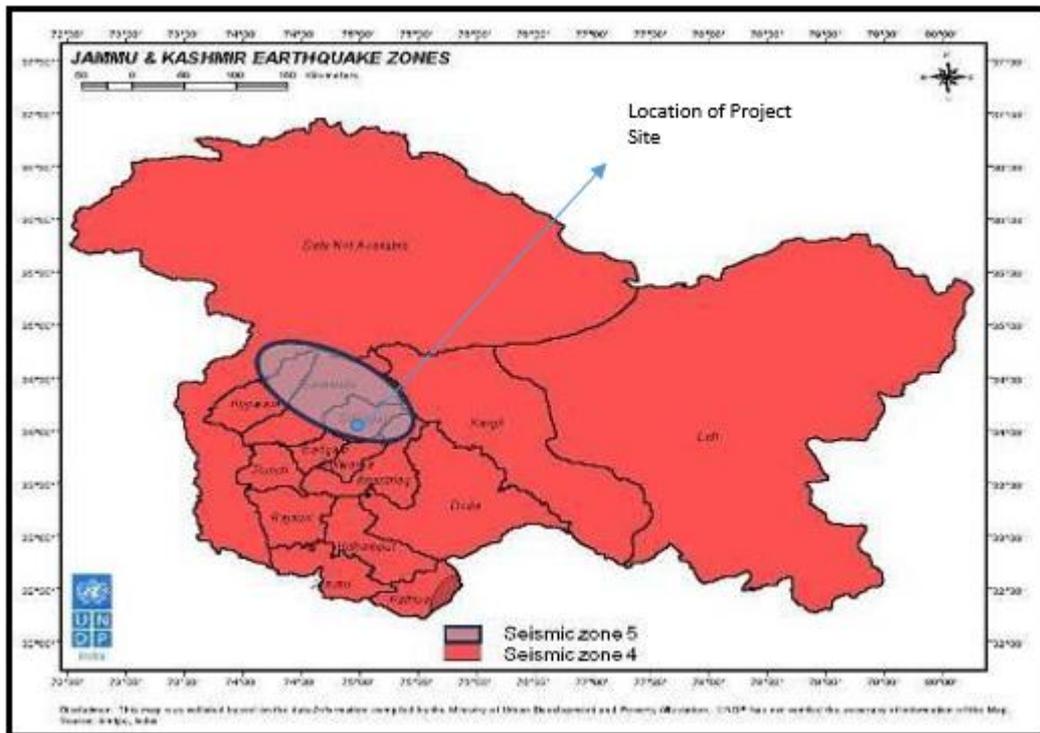


Fig.3.9: Seismic hazard map for Jammu & Kashmir State

### 3.7.3. Climate

Srinagar district falls under the Temperate to Mediterranean type of climate and is characterized by mild summers and chilling winters. Due to latitudinal variation from 1,600 meters to 5,000 meters above mean sea level there is a wide variation in climatic conditions in different parts of the district experiencing a typical temperate climate in high altitude which experience snowfall and severe cold in the winter and tropical climate at low altitude. The winter commences from early November and lasts till end of March. Most of the precipitation received during this period is in the form of snow & the temperature, at times falls as low as  $-13^{\circ}\text{C}$ . In December-January the minimum temperature is generally below freezing point. The period from March to June constitutes warm summers with temperature rising up to  $33^{\circ}\text{C}$ .

Precipitation takes place in the form of rainfall as well as snow with occasional hailstorms. The average rainfall in the district is about 680 mm. About 60 to 70% of the precipitation is received in the form of snow during December to February. March to April are the months of heavy rainfall. May to September are relatively dry months. The humidity is very low in the morning throughout the year. It is 40 % during December to February which is said to

be maximum. The highest humidity 90 % is recorded during May-June. Monthly Temperature and Rainfall of Srinagar (based on over the Period of 98 Years weather data) is summarized in Table 3.6.

Table 3.6: Monthly Temperature and Rainfall of Srinagar (based on over the Period of 98 Years weather data)

Month	Duration of Data	No. of Years	Mean Max Tem. °C	Mean Min Temp. °C	Rainfall (mm)
January	1901-2000	98	5.0	-2.3	62.2
February	1901-2000	98	7.6	-0.8	71.4
March	1901-2000	98	13.5	3.4	101.1
April	1901-2000	98	19.3	7.4	90.7
May	1901-2000	98	24.2	10.9	68.2
June	1901-2000	98	28.9	14.5	26.3
July	1901-2000	98	30.3	18.2	54.3
August	1901-2000	98	29.7	17.7	64.6
September	1901-2000	98	27.6	12.5	35.4
October	1901-2000	98	22.1	5.6	30.9
November	1901-2000	98	15.4	0.3	19.7
December	1901-2000	98	8.5	-2.0	41.4

Source: <http://www.imd.gov.in/section/climate/climateimp.pdf>

### Meteorological variations during Year 2011 to Year 2015

Monthly mean meteorological data for the Srinagar town has been collected from IMD for the period of Jan 2011 to March 2015. July and August are the hottest months while December and January are the coldest. The temperature varies from freezing cold in winter with minimum temperature touching -3.1°C to mild hot in summers when the temperature shoots up to 30 °C. The mean maximum and minimum temperature (°C) recorded at meteorological observatory (Rambagh, Srinagar) during 2011 – March 2015 are summarized in Table 3.7.

Table 3.7: Mean maximum and minimum temperature recorded during 2011 – March 2015 of Srinagar city

Months/ Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Year 2011												
Max Temp. (°C)	07.9	09.5	17.1	18.6	27.7	30.3	29.8	30.1	27.8	22.3	15.7	10.4
Max Temp. (°C)	-02.7	01.5	03.9	07.0	12.6	16.7	18.3	18.1	14.1	06.9	02.8	-01.9
Year 2012												
Max Temp. (°C)	04.8	09.7	16.2	19.9	23.8	27.4	30.9	29.9	26.3	21.2	16.8	09.0
Max Temp. (°C)	-03.1	00.2	04.3	08.2	10.1	14.1	18.6	19.1	14.5	05.8	01.6	-00.4
Year 2013												
Max Temp. (°C)	07.8	10.8	18.3	20.0	24.9	29.4	31.1	28.8	27.6	24.4	15.9	10.7
Max Temp. (°C)	-02.2	00.9	05.4	08.3	11.4	16.9	19.3	19.1	13.9	09.7	0.6	-01.4
Year 2014												
Max Temp. (°C)	05.5	09.9	12.3	19.0	23.9	29.4	30.4	29.3	24.8	21.8	14.8	10.7
Max Temp. (°C)	-0.1.4	00.5	03.4	07.7	11.3	15.2	19.2	16.9	13.7	8.7	2.0	-2.6
Year 2015												
Max Temp. (°C)	11.2	10.3	12.5	-	-	-	-	-	-	-	-	-
Max Temp. (°C)	-2.0	1.4	3.7	-	-	-	-	-	-	-	-	-

Source: Indian Meteorological Department, Srinagar

## Rainfall

The area experiences rainfall in all seasons in Kashmir Valley however, most of the precipitation in form of Snow is received in winter followed by rainfall in spring season generated from western disturbances. The month's total rainfall recorded at meteorological observatory at Rambagh; Srinagar during 2011 to May 2015 is shown in Table 3.8. Wherein, the 2014 has received 892.9 mm of rainfall and in 2015 up-to May received a total rainfall of 780.4 mm. In September 2014, Kashmir Valley witnessed devastated floods and Srinagar was worst affected.

Table 3.8: Rainfall data of Srinagar (Month's Total Rainfall in mm)

Months / Years	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2011	54.2	100.9	100.8	105.8	20.1	27.0	37.1	68.4	46.5	29.1	24.1	33.1	647.1
2012	60.2	78.7	58.0	82.7	39.8	24.3	12.1	26.6	111.5	10.8	11.7	27.1	543.5
2013	58.7	111.9	69.4	102.0	51.8	54.1	79.8	88.8	34.2	18.5	04.1	16.6	689.9
2014	86.9	39.1	220.1	113.7	50.9	18.6	55.8	72.2	184.8	35.7	15.1	0.0	892.9
2015	5.6	164.9	294.6	NA	NA	NA	NA	NA	NA	-	-	-	465.1 till March

Source: Indian Meteorological Department, Srinagar

## Humidity

The mean relative humidity (MRH %) recorded at meteorological observatory at Rambagh, Srinagar during Jan 2011 to March 2015 at 0830 hours and 1730 hours Indian Standard Time (IST) are presented in Table 3.9.

Table 3.9: Monthly Relative Humidity Data of Srinagar City

Months		Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec
2011	Max	084	087	075	075	066	065	073	076	077	081	087	088
	Min	060	066	052	058	044	047	051	050	054	057	064	064
2012	Max	088	086	070	073	071	066	070	078	081	081	083	089
	Min	070	061	043	055	049	043	045	056	060	054	056	071
2013	Max	087	088	074	074	069	071	072	080	078	078	082	086
	Min	063	058	043	053	045	046	047	060	051	055	054	065
2014	Max	088	087	084	073	073	063	073	077	086	084	090	090
	Min	069	060	064	053	058	041	052	054	060	060	066	065
2015	Max	086	088	082	NA	NA	NA	NA	NA	NA	-	-	-
	Min	053	063	062	NA	NA	NA	NA	NA	NA	-	-	-

Source: Indian Meteorological Department, Srinagar

Apart from above climate data, detailed climatic condition of Srinagar has been presented in the form of figures that produced from a weather model Meteoblue which has compiled global historical weather data from 1985 onwards and generated a continuous 30-year global history with hourly weather data.

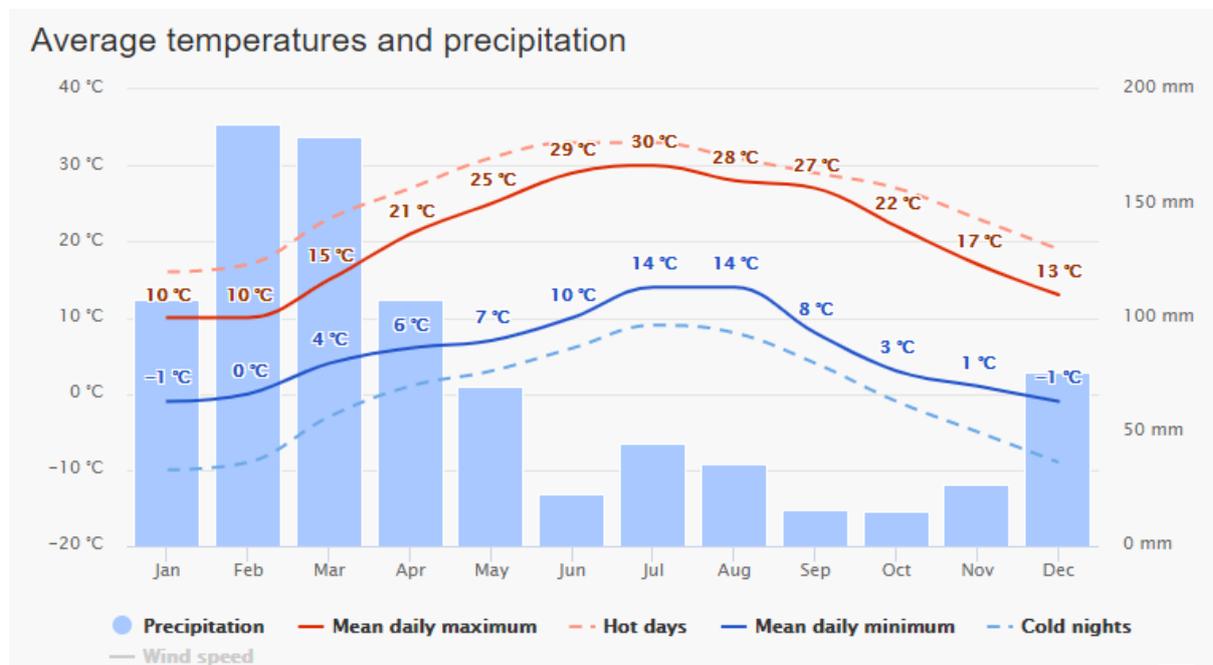


Fig.3.10: Variation in Average Temperature & Precipitation of Srinagar

In Figure 3.10 "mean daily maximum" (solid red line) shows the maximum temperature of an average day for every month for Varanasi. Likewise, "mean daily minimum" (solid blue line) shows the average minimum temperature. Hot days and cold nights (dashed red and blue lines) show the average of the hottest day and coldest night of each month of the last 30 years.

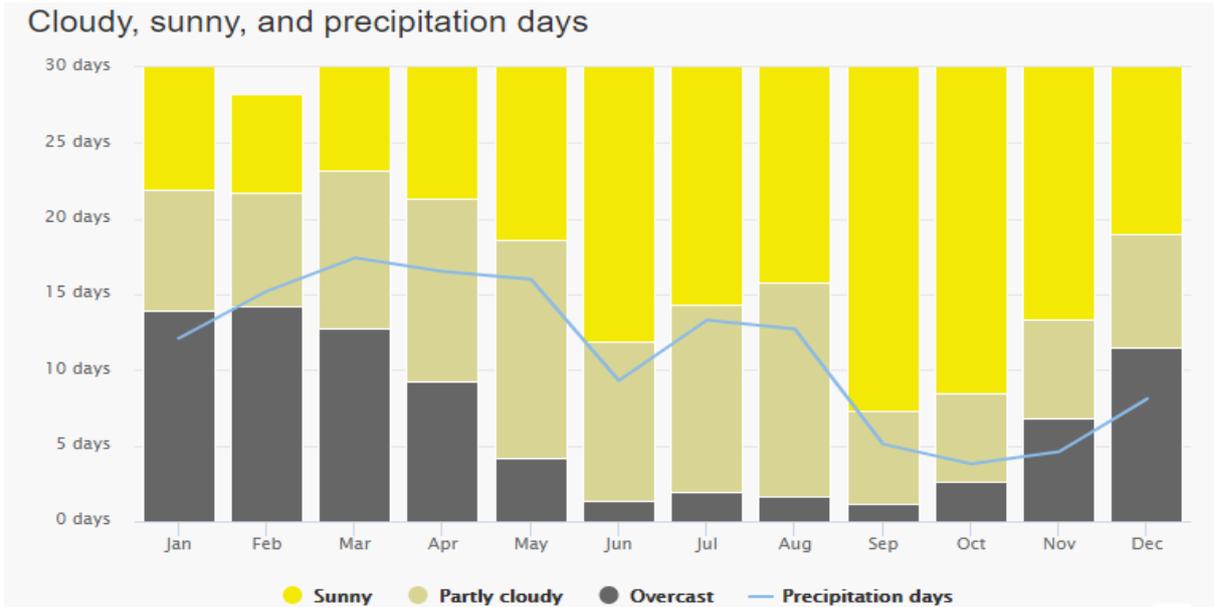


Fig.3. 11: Variation in Average Cloudy Sunny and Precipitation Days

Figure 3.11 shows the monthly number of sunny, partly cloudy, overcast and precipitation days. Days with less than 20% cloud cover are considered as sunny, with 20-80% cloud cover as partly cloudy and with more than 80% as overcast.

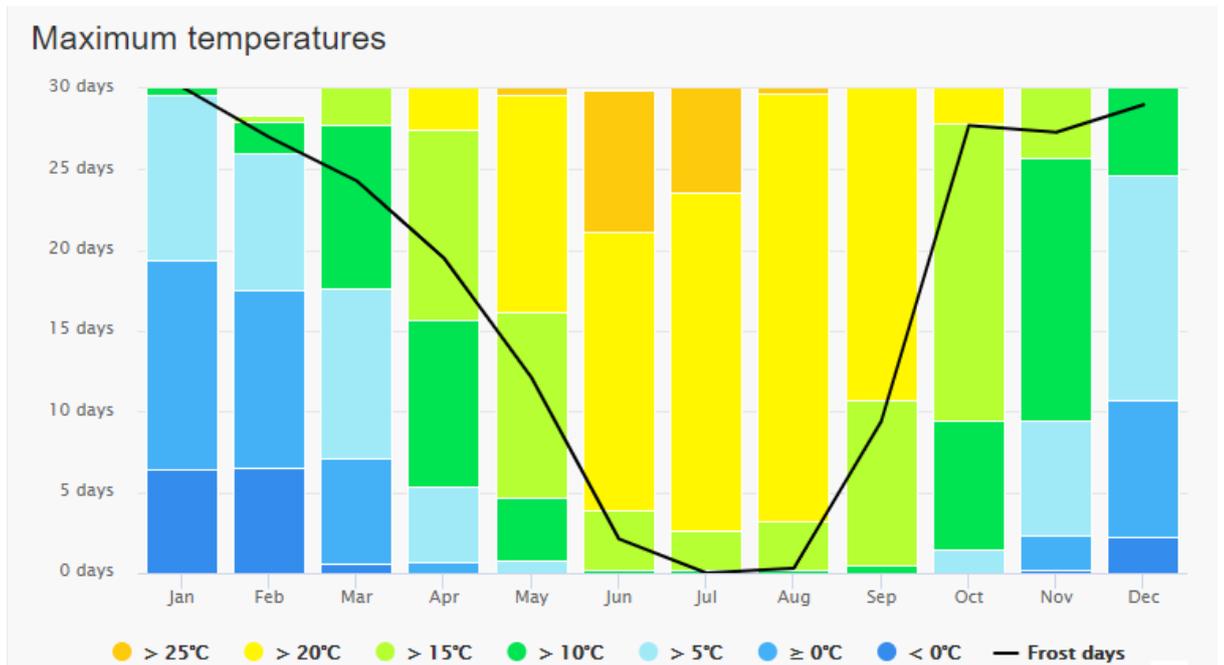


Fig.3.13: Variation in Maximum Temperature

Figure 3.12 shows; the maximum temperature diagram for Srinagar displays how many days per month reach certain temperatures while Fig.3.13 shows the variation in precipitation amount in the City.

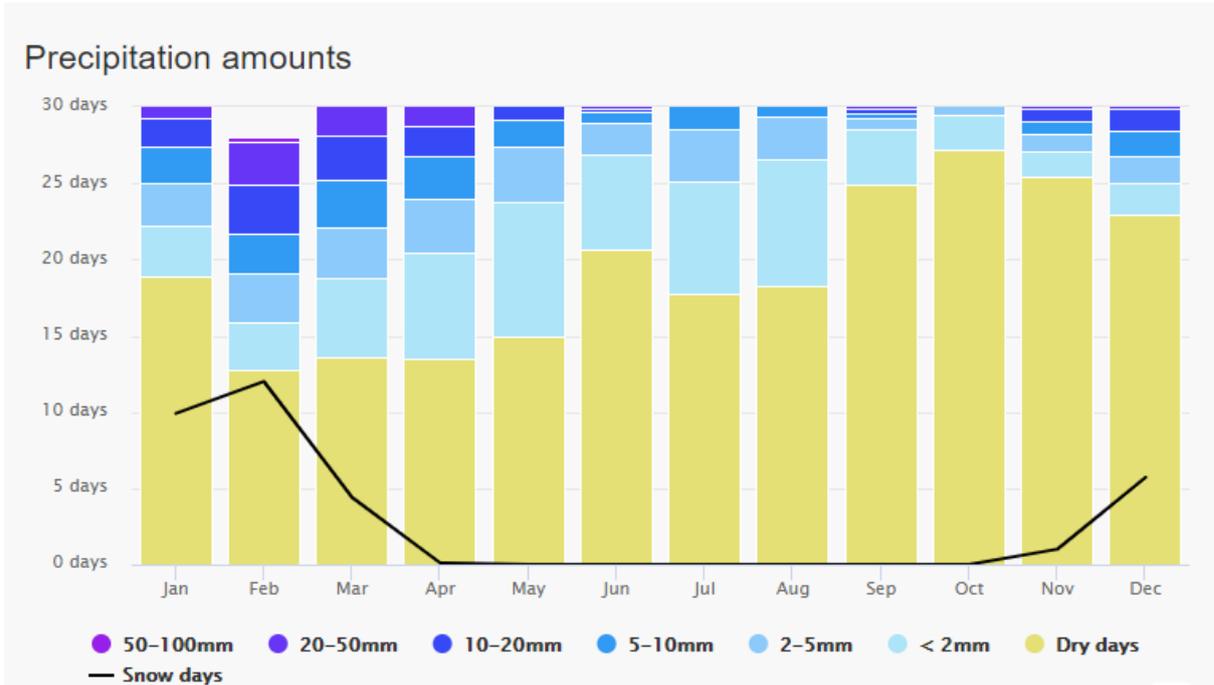


Fig.3.13: Variation in Precipitation Amount in the Srinagar

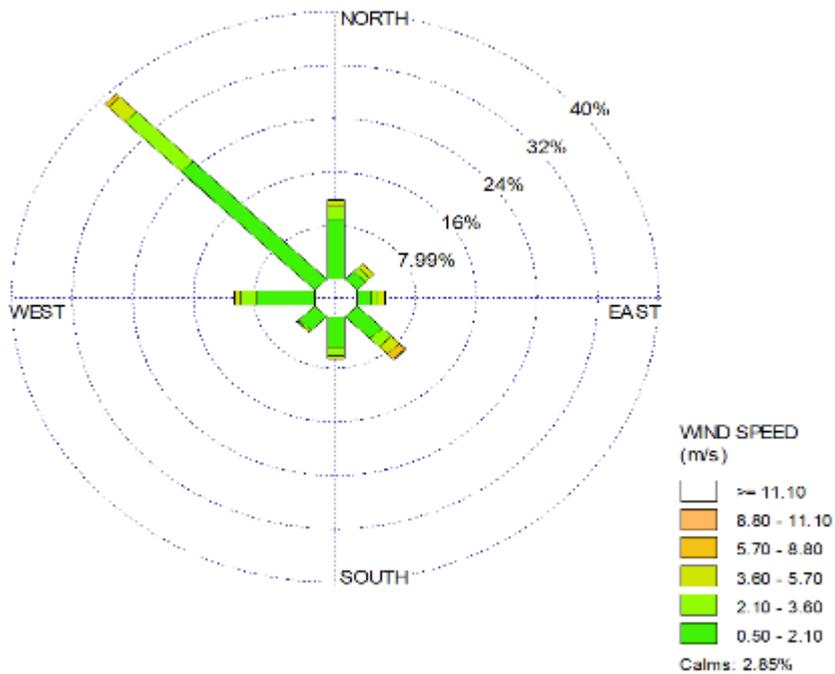


Fig.3.14: Wind Rose Diagram of Srinagar

A "wind rose" diagram based on IMD data of March- May 2017 is prepared. Figure 3.14 represent the wind rose diagram of Srinagar city that indicates wind blows mostly from NW direction.

### 3.8. Status of Environmental Attributes Near Bone & Joint Hospital (Project Site)

#### 3.8.1. Ambient Air Quality

The ambient air quality with respect to the project site forms the baseline information. The prime objective of the baseline air quality study was to assess the existing air quality of the area. This will also be useful for assessing the conformity to standards of the ambient air quality during the implementation and operation of the proposed project.

Data Used- Air Quality Monitoring conducted in the year 2017 & 2018 by JKERA under various projects of JTFRP is used here to describe baseline status of ambient air quality in and around Bone & Joint hospital. Two sampling locations situated near hospital were chosen to establish baseline ambient data. Sampling was carried out as per the standard protocol prescribed by Central Pollution Control Board, GoI. The monitoring locations and parameters monitored are shown in Table 3.10.

Table 3. 10: Ambient Air Quality Sampling Locations and Parameters analyzed

Sampling Location	Type of Area	Monitoring parameters
Near Iqbal Park	Commercial	PM <sub>2.5</sub> , PM <sub>10</sub> , SO <sub>2</sub> , NO <sub>2</sub> , Noise
Ram Bagh	Residential	

#### 3.8.2. Observations based on Ambient Air Quality Data near Bone & Joint Hospital Area:

##### I- Ambient Air Quality Data near Bone & Joint Hospital Area (Core Area-1 km-3 Km)

As mentioned above, data has been collected and analyzed for four parameters viz. Particulate matter size  $\leq 2.5\mu\text{m}$  (PM<sub>2.5</sub>), Particulate matter size  $\leq 10\mu\text{m}$  (PM<sub>10</sub>), Sulphur Dioxide (SO<sub>2</sub>), Nitrogen dioxide (NO<sub>2</sub>) during year 2017 and 2018. Monitoring results compared with the standards laid down by Central Pollution Control Board. During the monitoring period PM<sub>10</sub> and PM<sub>2.5</sub> concentration in different air quality monitoring stations were varied in between from 112.9-152.4  $\mu\text{g}/\text{m}^3$  and 28.9-64.5  $\mu\text{g}/\text{m}^3$  respectively. PM<sub>10</sub> concentrations were found well above to NAAQ standard while PM<sub>2.5</sub> concentration values were also recorded above to NAAQ standard on two monitoring days. SO<sub>2</sub> and NO<sub>2</sub> concentration in different air quality monitoring station was found to vary from 15.1-41.2  $\mu\text{g}/\text{m}^3$  and 21.2-36.7  $\mu\text{g}/\text{m}^3$  respectively. Both of these parameters were recorded well below to NAAQ standards prescribed by CPCB. Summary results of air quality data are shown in Figure 3.15 depicted below.

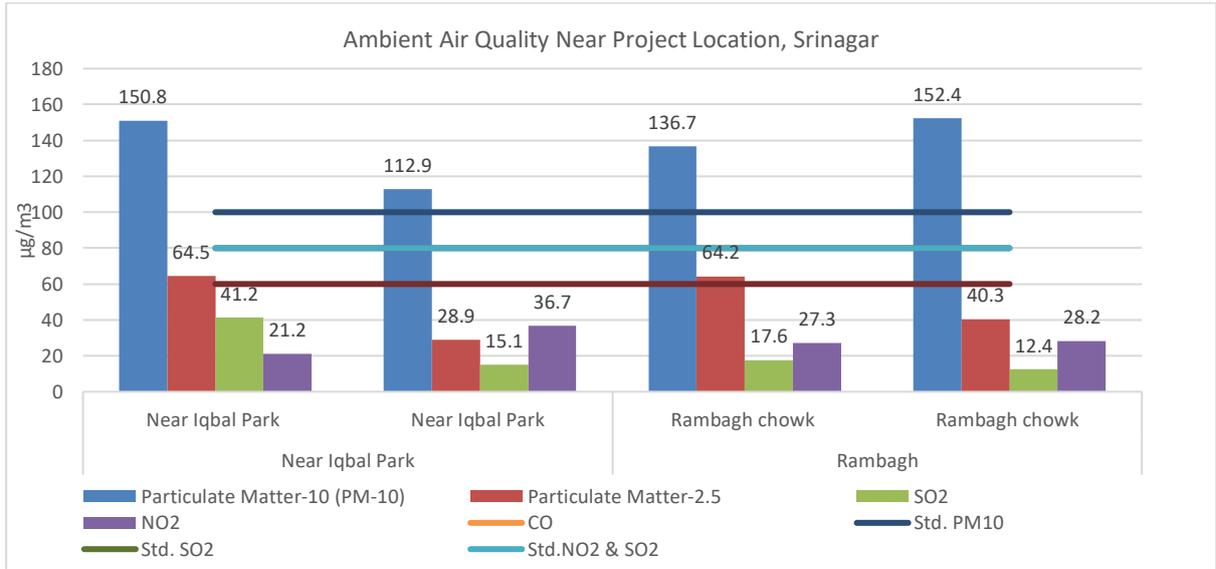


Fig.3.15: Ambient Air Quality Near Project Location, Srinagar

## II- Ambient Air Quality in Buffer Area (within 10 Km from Bone & Joint Hospital)

Air Quality Monitoring conducted in by JKERA under various projects of JTFRP on 8 different location situated within 10 Km from Bone & Joint Hospital is used here to describe baseline status of ambient air quality of project buffer area. During the monitoring, PM<sub>10</sub> and PM<sub>2.5</sub> concentration in different air quality monitoring stations were varied in between from 77.3-194.8 µg/m<sup>3</sup> and 28.1-79.3 µg/m<sup>3</sup> respectively. PM<sub>10</sub> concentrations were found above to NAAQ standard except while PM<sub>2.5</sub> concentration was mostly found lower to NAAQ standard except one. SO<sub>2</sub> and NO<sub>2</sub> concentration in different air quality monitoring station was found well below to NAAQ standards prescribed by CPCB. Summary of Ambient Air Quality monitoring results conducted in the year 2018 at 8 different locations are depicted in the Fig.3.16.

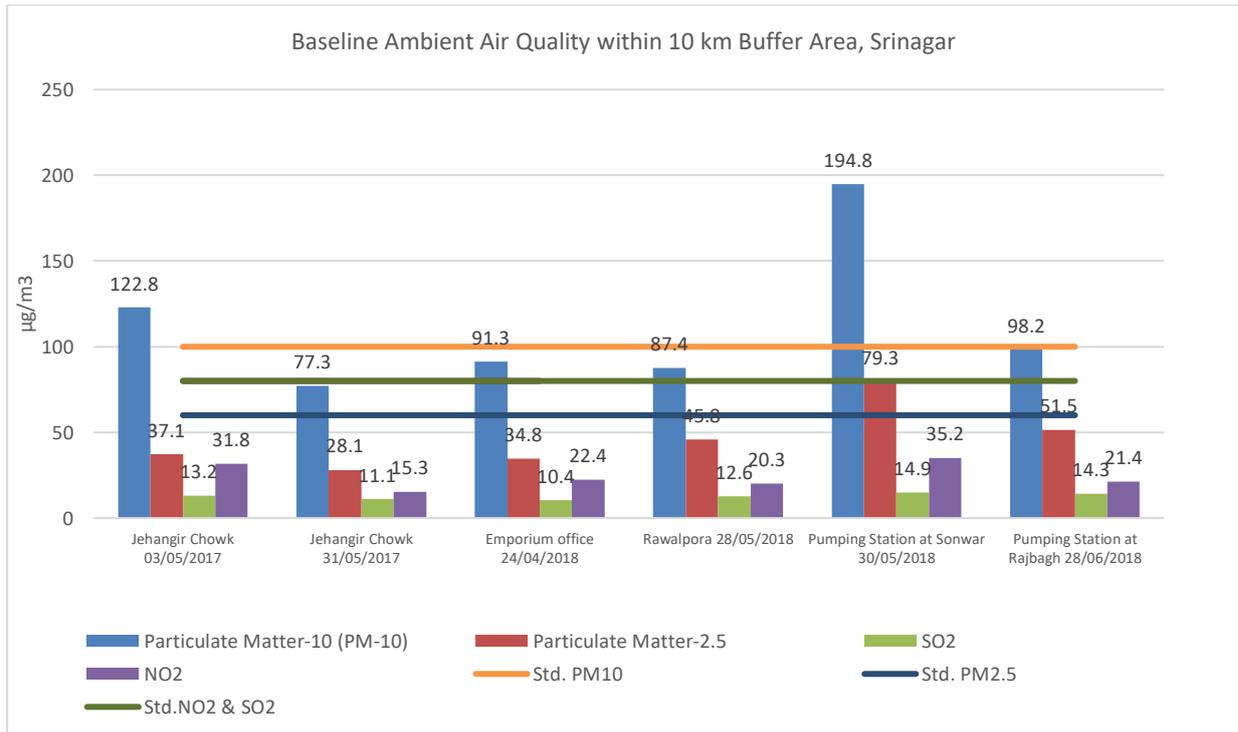


Fig.3.16: Ambient Air Quality at Buffer Area within 10 km from project location

Based on the air quality data recorded in core and buffer area during Year 2017-2018, following are concentration range fixed as baseline values for different Air Quality parameters.

Location	Setting of Baseline Ambient Air Quality (Range)			
	PM (PM <sub>10</sub> ) (µg/m³)	PM (PM <sub>2.5</sub> ) (µg/m³)	SO <sub>2</sub> (µg/m³)	NO <sub>2</sub> (µg/m³)
Core Area	112.9-152.4	28.9-64.5	15.1-41.2	21.2-36.7
Within 10 km Buffer Area	77.3-194.8	28.1-79.3	10.4-23.6	15.3-35.2

### 3.8.3. Ambient Noise Levels

#### I- Ambient Noise Levels near Bone & Joint Hospital Area (Core Area)

Noise can be defined as any sound that is undesirable because it interferes with speech and hearing, and is intense enough to damage hearing or is otherwise annoying. Noise impacts can be of concern during construction and operational phases of the project. Factors those are important in determining noise levels include distance from the noise source, natural or manmade barriers between the source and the receptors, whether conditions, etc. The environment/ health impacts of noise can vary from noise induced hearing loss (NIHL) to annoyance depending on loudness of noise levels and tolerance levels of individuals.

**Observations:** A preliminary reconnaissance survey has been undertaken to identify the major noise generating sources in the study area. Noise at different noise generation sources based on the activities in the project area, ambient noise due to commercial activities, traffic and noise at sensitive areas like B&J hospital. The noise monitoring has been conducted for determination of noise levels at same locations in which air quality monitored. The monitoring was done as per prescribed method laid down by CPCB. Results as shown in Fig.3.17 reveals that most of the noise level recorded at Iqbal Park and Ram Bagh were very close to the permissible limits. However, some exceed to the permissible standard may be due to traffic movement, commercial activities and public gathering.

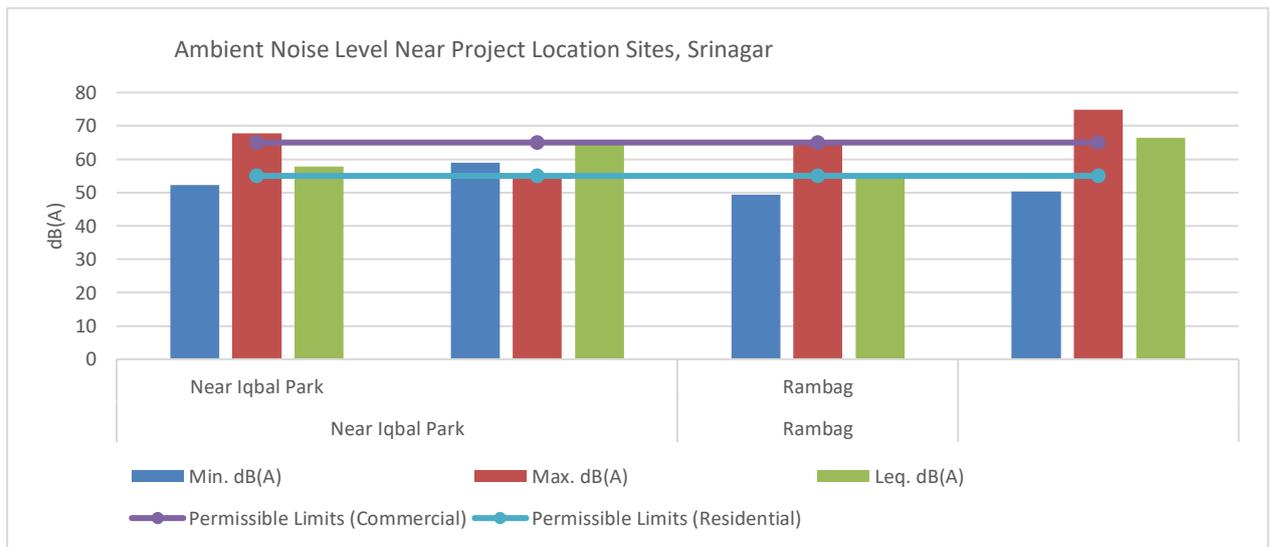


Fig.3.17: Ambient Noise Levels Near Project Location

**II- Ambient Noise Level Collected at Various locations In the Buffer Area (within 10 Km from Bone & Joint Hospital)**

Ambient noise level collected at various locations in the buffer area (within 10 Km from Bone & Joint Hospital) are depicted in Fig.3.18.

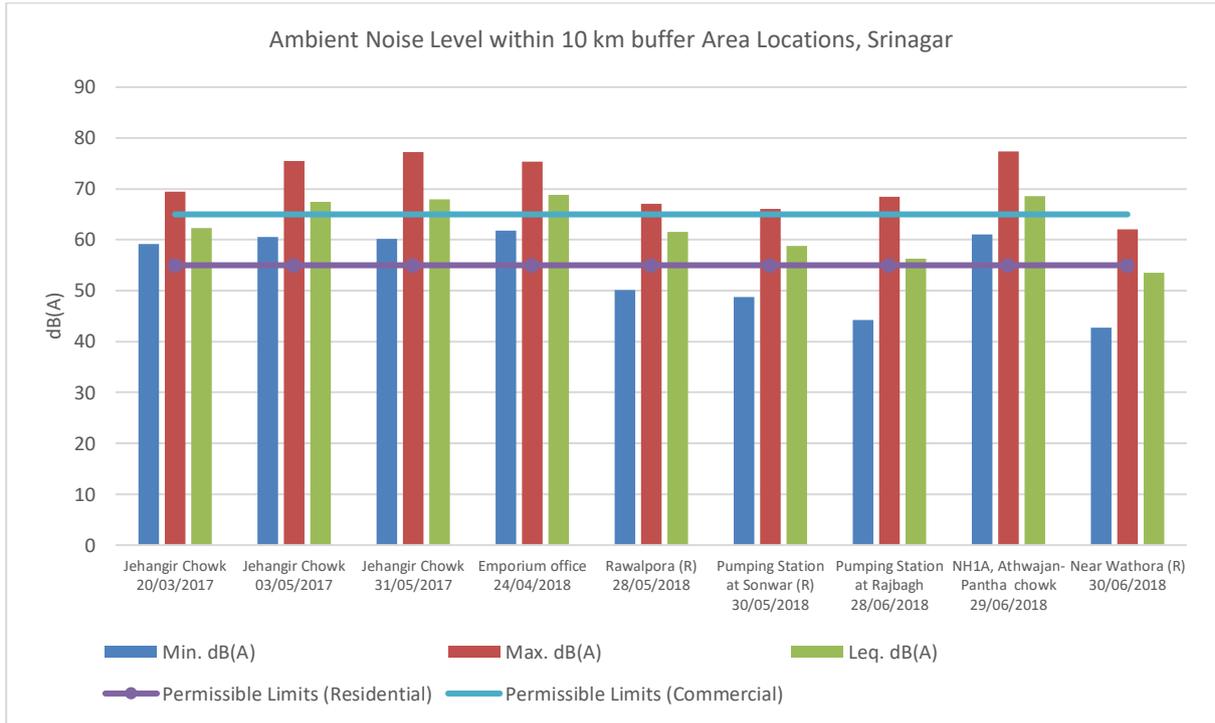


Fig.3.18: Ambient Noise Levels at Buffer Area locations within 10 km from project site

Based on the noise levels collected in core and buffer areas during Year 2017-2018, following ranges were observed as baseline noise levels core and buffer areas.

Location	Setting of Baseline Ambient Noise Level (Range)			
	Type	Min. dB(A)	Max. dB(A)	Leq. dB(A)
Core Area	-	49.4-50.3	54.3-74.8	57.8-66.4
Within 10 km Buffer Area	Residential	42.7-50.1	62.1-67.1	53.5-61.6
	Commercial	44.2-61.8	68.4-77.4	56.3-68.8

#### 3.8.4. Water quality of River Jhelum

River Jhelum is important lotic ecosystem and key water source for meeting increasing water demand. It has significant economic values including supplying water for drinking and irrigation, providing food via fish and aquatic products, and preserving the health and biodiversity of important life support ecosystem. However, all these functions depend on the water quality which is based on a well-balanced environment in terms of its physical, chemical and biological variables. Water quality also plays a very important role to ascertain

the quantum of pollution load and health of the ecosystem. The qualitative and quantitative data of various physico-chemical and biological parameters are significant for characterization of river water quality and any changes and alterations due to any unsystematic development processes influence the water quality. In the view of this and to understand the status of baseline values, central pollution control data for year 2016 (annual average) is used to understand water quality status of river. Results reveals that all the physico-chemical parameters chosen for analysis were found well within the permissible limits of Class C water. Summary of results are shown in Fig.3.19-3.21.

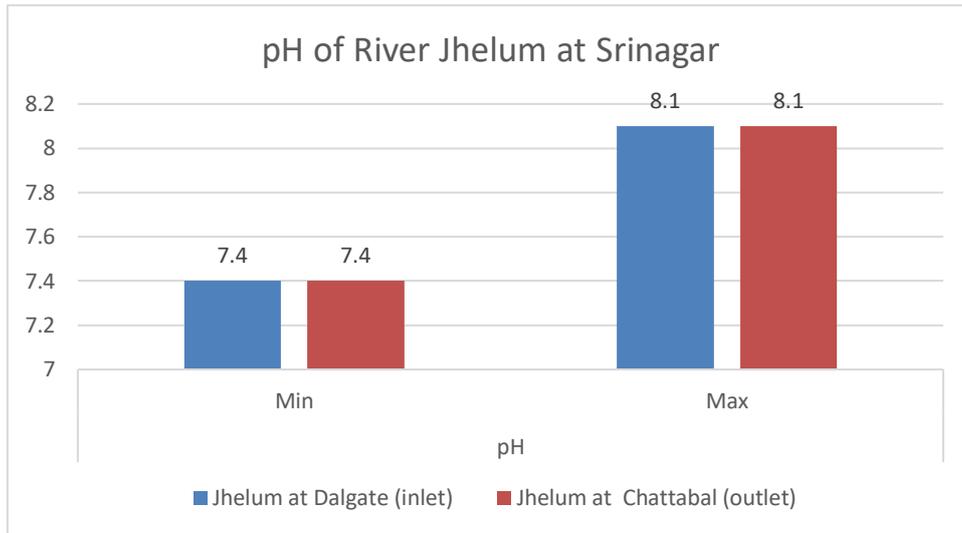


Fig.3.19: pH of River Jhelum water Sample

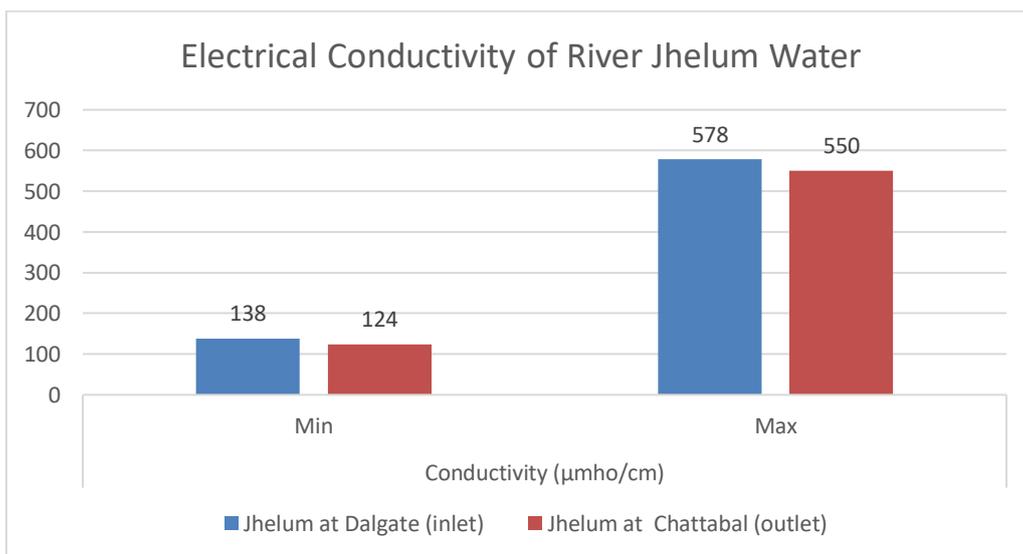


Fig.3.20: Electrical Conductivity of River Jhelum Water at Srinagar

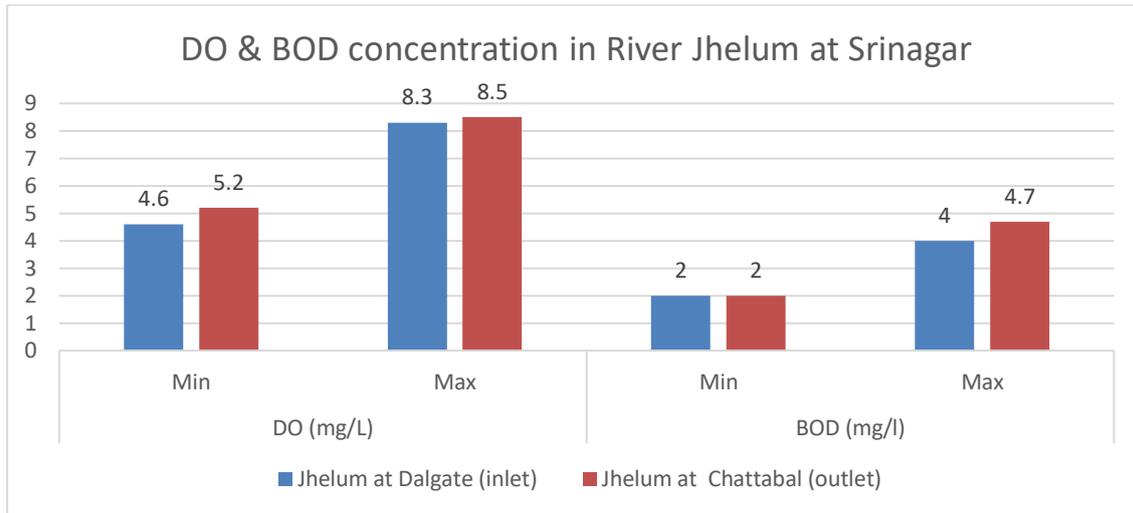


Fig.3.21: Water Quality of River Jhelum-DO & BOD Concentration

### 3.7.1. Water Quality of Dhoodh Ganga River:

Govt. Bone and Joint hospital is located at the bank of Doodh Ganga River near Barzulla at Srinagar. Dhoodh Ganga River originates from eastern slopes of Pir Panjal mountain range of Himalaya beneath Tatakuti peak approximately 4500m above mean sea level. Water is fed to this stream by variety of sources such as snow fields, springs and small lakes. The stream is important source of water for residents of district Budgam and Srinagar.

To understand the status of baseline values, data generated by Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, J&K, is used to understand water quality status of river. This study was carried out during April 2018 for the preliminary assessment of pollution level in Doodhganga stream. Approximately 65 km stretch of the stream from Yousmarg to Barzulla was selected in the order of increasing human disturbance and urbanization. In total, four sites were selected with three locations within each site viz. Site-A-Yousmarg-(33° 52' N, 74° 39' E), Site-B Nowhar (33° 53' N, 85° 48' E), Site-C Chadoora, (33° 56' N, 74° 48' E), and Site-D Barzulla (34° 02' N, 74° 47' E). With reference to B&J hospital, site C is located upstream and Site D is located downstream portion of the river (See Fig. 3.22).

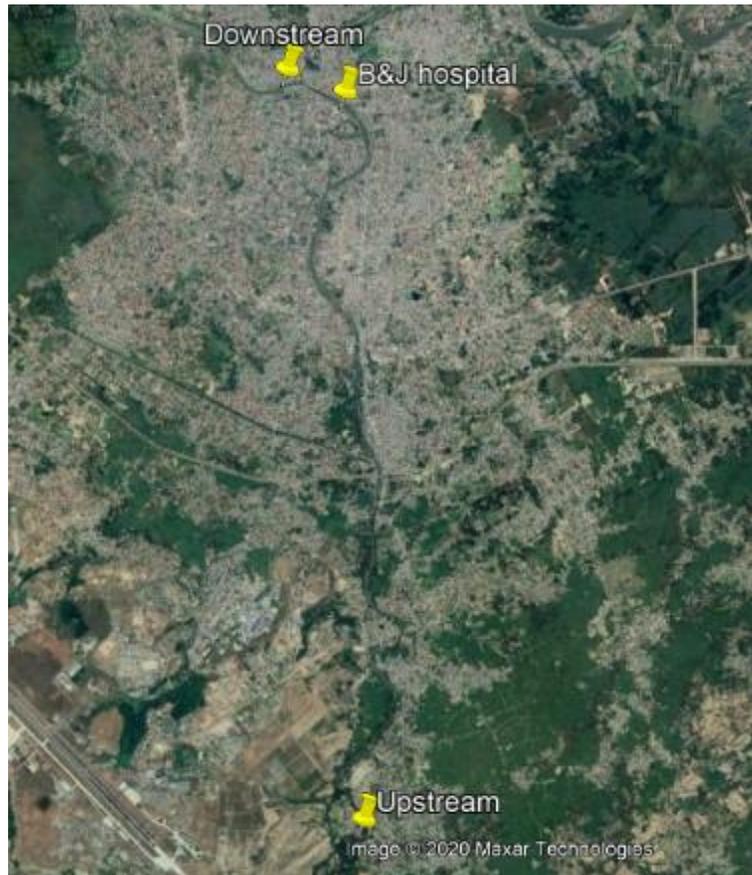


Fig.3.22- Location map of Upstream and Downstream Sampling Sites with reference to B&J Hospital

Results of water quality reveals that pH of this stream showed alkaline nature of the water. Site wise comparison of PH shows significant increasing trend of pH down the gradient with minimum mean value at Site-A (7.7) and maximum mean value at Site-D (8.1).

As far as Electrical Conductivity is concerned, in Doodhganga stream it shows significant increasing trend. Minimum mean value ( $72.2 \mu\text{Scm}^{-1}$ ) was detected at Site-A. At Site C, it was recorded around  $145 \mu\text{Scm}^{-1}$  while maximum mean value was recorded at Site-D ( $179.8 \mu\text{Scm}^{-1}$ ). The increase in conductivity in middle and lower reaches of the stream may be due to increased stream bank erosion, agricultural and urban runoff.

Dissolved oxygen significantly decreased downstream. Its maximum mean value was recorded at Site-A ( $8.6 \pm 0.08 \text{mg/L}$ ). At site C which is upstream of B&J hospital, it was found around 7 mg/l while minimum mean value was recorded at Site-D 6.0 mg/l. DO was recorded decreasing trend in lower reaches of the stream may be attributed to increased temperature, less discharge of the stream, high organic load, discharge of agricultural runoff, domestic and municipal sewage.

Biochemical oxygen demand (BOD) of Doodhganga stream followed increasing trend from upstream to downstream and varied negatively with dissolved oxygen and positively with temperature. The minimum mean value of BOD was recorded at Site-A 1.5 mg/l, at Site C it was recorded almost 2 mg/l while maximum value was recorded at Site-D 3.5 mg/l.

Orthophosphate concentration of water increased significantly downstream with minimum mean value recorded at Site-A 0.09 mg/l and maximum mean value recorded at Site-B (0.35 mg/l) while at Site C, concentration of orthophosphate was recorded 0.15 mg/l which has slightly increased at Site D with the concentration almost 0.3 mg/l. Values and concentration of various water quality parameters in Doodh Ganga River are depicted in Fig.3.23.

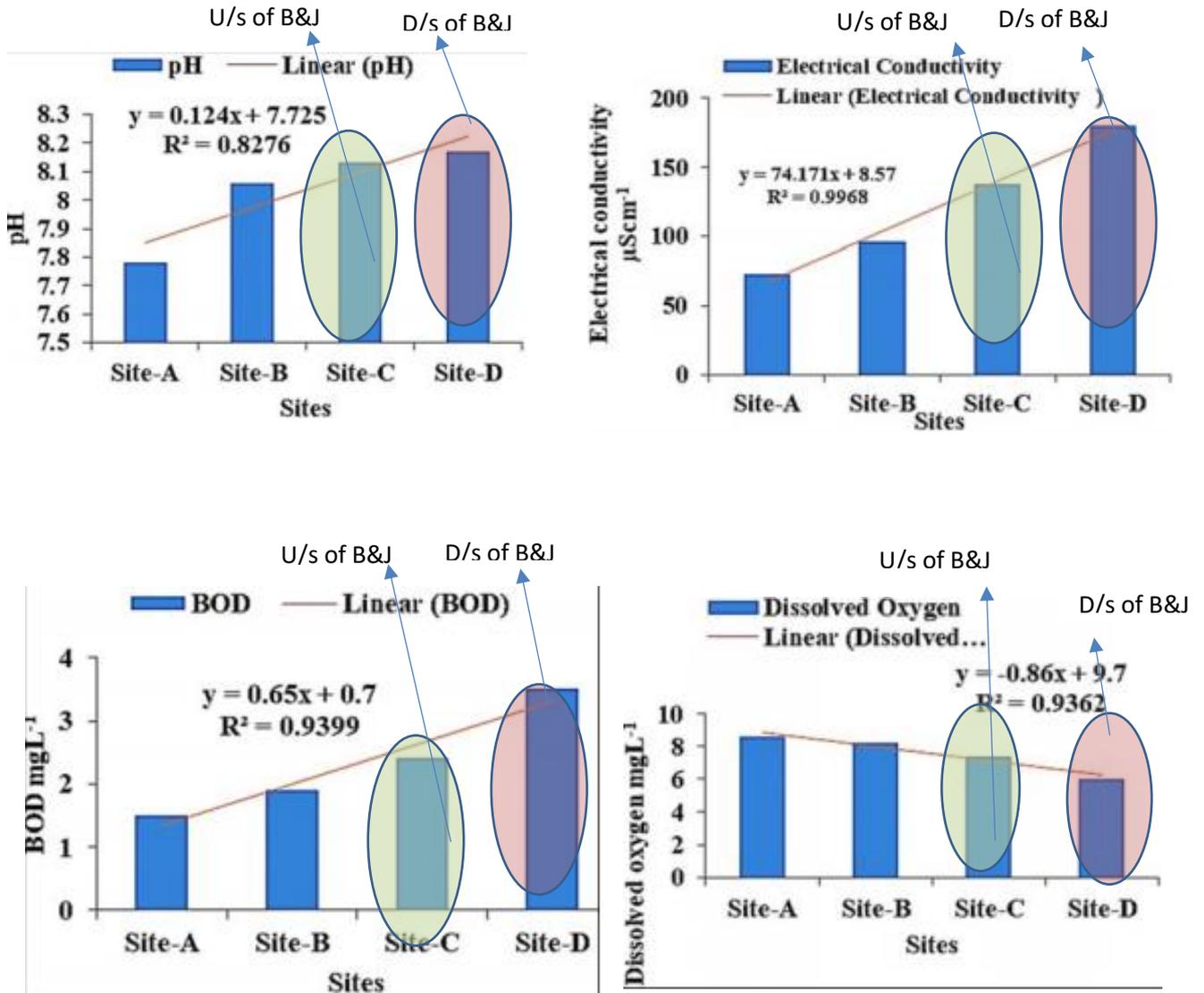


Fig. 3.23-Concentration of Water Quality Parameters in Doodh Ganga River

### 3.8. Biological Environment

Study of biological environment is one of the important aspects for the Environmental Impact Assessment, in view of the need for conservation of Environmental quality and biodiversity of particular geographical area. Generally, biological communities are the good indicators of climatic and edaphic factors. Studies on biological aspects of ecosystems are important in Environmental Impact Assessment for safety of natural flora and fauna. Biological environment includes mainly terrestrial and aquatic flora and fauna. Data presented here is based on secondary information collected under another JTFRP project namely Bone and Joint Hospital Project which is located 2.5 km from the Project site. Mode of data collection and parameters considered during the Survey is summarized below:

#### 3.8.1.1. Terrestrial flora

**Core Area:** There is no major vegetation on the proposed project site except 4 chinar tree (*Platanus*) located on the site.

**Buffer Area:** The prominent vegetation types in buffer zone of the proposed Bone & Joint Hospital project comprised evergreen scherophyll forests (*Pinus wallichiana* and *Abies pindrow*), deciduous forests communities of *Platanus occidentalis*, *Robinia pseudoacacia*, *Salix*, spp., *Quercus rober*, *Fraxinus hookeri*, *Ulmus villosa*, *Ivforus alba*, *Juglans regia*, *Ailanthus altissima* and stands or isolated patches of *Betula utilis* at higher elevations), deciduous scrub (*Parroptiopsis jacquemontiana*, *Corylus colurna*, *Isodonplectranthoides*, *Rosa webbiana*, *Berberis* spp., *Viburnum foetens*, *Lonicera* spp.), evergreen scrub (*Dephneolesides*, *Contan Easterna muullaria* and *Rhododendron* spp, and *Juniperus recurva* at higher elevations), Savanna (mid grasses like *Therneda anathera*, *Stipa siberica*, *Daetylis glometrata*, *Phraginitis conimunis* with scattered trees or scrub plants), grasslands (*Chrysopogone hinulatus*, *Cynodon dactylon*, *Themeda anathera*, *Bothriocloa pertusa*, *Pennisetum* spp. etc) and broad-leaved herbs (*Anemone biflora*, *Germanium* spp. *Fritillaria imperialis*, *Sambucus wightiana*, *Ferula jaeschkaina* etc). The conspicuous absence of such higher sub alpinas and alpinas as *Betula utilis*, *Rhododendron*, spp., and *Juniper usrecurve* is attributable to the difference in altitude and climate which is a noteworthy feature of the Kashmir Valley.

#### 3.8.1.2. Grasslands

No prominent grass land ecosystem has been found in core and buffer zone of the project. However the grass lands were mixed with natural vegetation in low lands and cultivable waste lands are now being utilized as grazing grounds to the livestock species. The grass species and sedges of core and buffer zone are listed below with the natural vegetation of buffer zone.

### 3.8.1.3. Endemic/Endangered Flora

No endangered and endemic flora was recorded from core and buffer zone of the project area.

### 3.8.1.4. National Park/Sanctuaries

There is no Bio-sphere Reserve, National Parks, Wildlife Sanctuary, Tiger Reserve and Elephant Reserve within 10 km radius of the project site.

### 3.8.1.5. Macrophytes Diversity

Dal Lake, a shallow eutrophic lake located on the North Eastern side of Srinagar city. Fresh water lakes are usually rich in aquatic vegetation and constitute one of the important components of biodiversity. The team has recorded a total of 31- species of plants from the Dal. Among the Emergents, *Typha angustata* and *Phragmites australia* covered vast expanses of the Lake. While among the rooted floating leaf type, *Nelumbo nucifera*, *Nymphaea mexicana*, *Nymphoides peltatum* & *Trapa natans* dominated the lake. The water zone has been colonized by submerged species, mainly *Ceratophyllum demersum*.

## 3.8.2. Faunal Diversity:

Majority of the buffer area is completely covered with human habitations thus no major faunal diversity exist in this area. Apart from this, there is no migratory route passing through proposed project location because it is confined to a small location. Therefore, there will not be any disturbance envisage for migratory birds of Dal lake and Wular lake of Kashmir. Based on secondary data, a complete list of fauna along with their global and national conservation priority status are summarized in Table 3.11.

Table 3. 11: Faunal Diversity from Study Area

#### A. Mammals

Sr. No.	Common Name	Scientific Name	Status as per Schedule of the Act
1.	Jungle Cat	<i>Felis chaus</i>	Schedule-II
2.	Red Fox	<i>Vulpes vulpes</i>	Schedule-II
3.	Jackal	<i>Canis aureus</i>	Schedule-II
4.	Indian porcupine	<i>Hystrix indica</i>	Schedule-IV
5.	Himalayan Mouse Hare	<i>Ochotona roylei</i>	Schedule-IV
6.	Common langur	<i>Semnopithecus ajex</i>	Schedule-II
7.	Rhesus macaque	<i>Macaca mullata</i>	Schedule-II

B. Aves

Family	Common Name	Scientific Name	Status
1. Accipitridae	1. Black kite	<i>Milvus migrans</i>	S-IV
	2. Sparrow Hawk	<i>Hieratus nisus nisosimilis</i>	
	3. Booted Eagle	<i>Hieratus pennatus</i>	
	4. Golden Eagle	<i>Aquila chrysaetos</i>	
	5. Lammergier	<i>Gypaetus barbatus</i>	
	6. Eurasian Griffon	<i>Gyps fulvus</i>	
	7. White Rumped vulture	<i>Gyps bengalensis</i>	
2. Falconidae	8. Common kestrel	<i>Falco tinnunculus</i>	S-IV
3. Phasianidae	9. Snow Partridge	<i>Lerwa lerwa</i>	S-IV
	10. Himalayan Monal	<i>Lophophorus impejanus</i>	
	11. Himalayan Snowcock	<i>Tetraogallus himalayensis</i>	
	12. Western Tragopan	<i>Tragopan melanocephalus</i>	
	13. Chukar	<i>Alectoris chukar</i>	
4. Columbidae	14. Snow Pigeon	<i>Columba leuconota</i>	S-IV
	15. Rock Pigeon	<i>Columba livia</i>	
	16. Oriental Turtle Dove	<i>Streptopelia orientalis</i>	
	17. Eurasian Collared Dove	<i>Streptopelia decaocta</i>	
	18. Spotted Dove	<i>Streptopelia chinensis</i>	
5. Psittacidae	19. Rose Ringed Parakeet	<i>Psittacula krameri</i>	S-IV
	20. Slaty Headed Parakeet	<i>Psittacula himalayana</i>	
	21. Indian Cuckoo	<i>Cuculus micropterus</i>	
	22. Eurasian Cuckoo	<i>Cuculus conorus</i>	
6. Strigidae	23. Eurasian Eagle Owl	<i>Bubo bubo</i>	S-IV
	24. Little Owl	<i>Athene noctua</i>	
7. Aodidae	25. Himalayan Swiftlet	<i>Collocalia brevirostris</i>	S-IV
	26. Alpine Swift	<i>Tachymarptis melba</i>	
	27. Common Swift	<i>Apus apus</i>	
	28. House Swift	<i>Apus affinis</i>	
8. Alcedinidae	29. Pied Kingfisher	<i>Ceryle rudis</i>	S-IV
	30. Common Kingfisher	<i>Alcedo atthis</i>	
	31. White-Throated Kingfisher	<i>Halcyon smyrnensis</i>	
9. Coraciidae	32. European roller	<i>Coracias garrulous</i>	S-IV
10. Upupidae	33. Common hoopoe	<i>Upupa epops</i>	S-IV

11. Picidae	34. Scaly Bellied Woodpecker	<i>Picus squamatus</i>	S-IV
	35. Grey-Headed Woodpecker	<i>Picus canus</i>	
	36. Himalayan Woodpecker	<i>Dendrocopos himalayensis</i>	
12. Alaudidae	37. Crested lark	<i>Melanocorypha bimaculata</i>	NA
13. Hirundinidae	38. Dusky crag martin	<i>Hirundo concolor</i>	S-IV
	39. Barn swallow	<i>Hirundo rustica</i>	
	40. Striated swallow	<i>Hirundo daurica</i>	
14. Oriolidae	41. Eurasian Golden Oriole	<i>Oriolus oriolus</i>	S-IV
15. Surnidae	42. Common Starling	<i>Sturnus vulgaris</i>	S-IV
	43. Common Myna	<i>Acridotheres tristis</i>	
	44. Jungle Myna	<i>Acridotheres fuscus</i>	
16. Corvidae	45. House Crow	<i>Corvus splendens</i>	S-IV
	46. Alpine Chough	<i>Pyrrhocorax graculus</i>	
	47. Jungle Crow	<i>Corvus macrorhynchos</i>	

### C. Butterflies

Family	Common Name	Scientific Name	Status
Papilionidae	1. Common Yellow Swallow tail	<i>Papilio machaon</i>	Common
Pieridae	2. Indian Cabbage White	<i>Pieris canidia</i>	Common
	3. Large Cabbage White	<i>Pieris canidia</i>	Common
	4. Common Gull	<i>Cepora nerissa</i>	Common
	5. Dark Clouded Yellow	<i>Colias fieldii</i>	Common
	6. Pale Clouded Yellow	<i>Colias erate</i>	Common
	7. Bath White	<i>Pontia daplidice</i>	Common
	Lycaenidae	8. Common Copper	<i>Lycaena phaeas</i>
9. Dark Grass Blue		<i>Zizeeria karsandra</i>	Common
10. Indian Cupid		<i>Everres lacturnus</i>	Common
11. Plains Cupid		<i>Chilades pandava</i>	Common
12. Lime Blue		<i>Chilades lajus</i>	Common
13. Red Pierrot		<i>Talicauda nyseus</i>	Common
14. White Bordered Copper		<i>Lycaena pavana</i>	Common
15. Dusky Hedge Blue		<i>Oreolyce vardhana</i>	Common
16. White Hedge Blue		<i>Udara akasa</i>	Common

	17. Lime blue	<i>Chilades lajus</i>	Common
Nymphalidae	18. Common Beak	<i>Libythea lepita</i>	Common
	19. Club beak	<i>Libythea myrrha</i>	Common
	20. Striped Tiger	<i>Danaus genutia</i>	Common
	21. Plain Tiger	<i>Danaus chrysippus</i>	Common
	22. Indian fritillary	<i>Argyreus hyperbius</i>	Common
	23. Small leopard	<i>Phalantha alcippe</i>	Common
	24. Great Satyr	<i>Aulocera padma</i>	Common
	25. Common fourring	<i>Ypthima baldus</i>	Common
	26. Indian fritillary	<i>Argyreus hyperbius</i>	Common
	27. Large silver stripe	<i>Childrena children</i>	Common
	28. Common leopard	<i>Phalantha phalantha</i>	Common
	29. Himalayan Sergeant	<i>Athyma opalina</i>	Common
	30. Common sailer	<i>Neptis hylas</i>	Common
	31. Short banded sailer	<i>Phaedyma columella</i>	Common
	32. Painted Lady	<i>Vanessa cardui</i>	Common
	33. Mountain tortoiseshell	<i>Aglais casmiriensis</i>	Rare

### 3.9. Socio-Economic Profile

#### 3.9.1. Demography and Socio-economic features of Srinagar Town

Srinagar is the summer capital of Jammu and Kashmir. It is a hub of all sorts of activities particularly relating to trade, business and tourism and affecting Kashmir valley. It is an ancient historic city, a holiday resort, a venue for conference, seminars, workshops and similar other gatherings of National and State level importance. As shown in Table 3.12, The total population of the district as per 2011 Census is 1236829 persons. It consists of 651124 males and 585705 females. The rural sector of the district is inhabited by 17313 persons comprising of 8916 males and 8397 females spread over the 11 inhabited villages and two tehsils. The urban areas are inhabited by 1219516 persons comprising 642208 males and 577308 females spread over two statutory towns and two Census Towns, Srinagar Municipal Corporation, Badamibagh Cantonment and Kralpora (CT), Khonmoh (CT) respectively.

Table 3. 12: Srinagar District Population as per 2011 Census

Population	Total	Persons	1236829
		Males	651124
		Females	585705
	Rural	Persons	17313
		Males	8916
		Females	8397
	Urban	Persons	1219516
		Males	642208
		Females	577308

### Population Growth

The district Srinagar growth rate of population between 2001-2011 is 20.35 % i.e. an increase of 209159 persons which is at par with State's average of 23.64 %. The district ranks number 2 in terms of population, as it constitutes 9.86 % of the total population of the State after Jammu. Srinagar district with 30.79 per cent urbanisation stands at the top in Jammu and Kashmir. The highest population was recorded in Srinagar tahsil viz. 9905 among all tahsils of 22 districts of the State.

### Density

Srinagar district is the second largest populated after Jammu. The density of population is 625 persons per square kilometer as against 124 persons per square kilometer for State, as it ranks 6th after Jammu among districts of the State.

### Sex Ratio

The sex ratio of the district as a whole stands at 900 i.e. the number of females per thousand males as against the State average of 889.

### Child Population

Population of children in the age group (0-6) years accounts for 158300 or 12.80 % of the total population of the district. A comparison of rural/urban of child population as well as sex wise total population revealed that the percentage of child population in rural and urban sector was 15.40 and 9.49 respectively. The sex wise proportion shows that male rural is 14.63 and urban 9.07 %. However, the percentage of female shows a tilt towards a rural population (viz. 10.00 to 16.23).

### Work participation rate

Out of a total working population of the Srinagar district 330547 persons consisting of 81.2 per cent are the main worker which is 20 per cent higher than the main workers of the State. 76641 persons constituting 18.8 per cent are marginal workers, which is lower by 20 per

cent than the marginal workers of the State. The percentage of non-workers stands at 67.08 per cent, which is 1.55 per cent higher than the percentage level of the total non-workers of the State. 32.9 per cent of total population of the district is workers. Of these 12228 persons constituting 3 per cent are engaged in cultivation while as 10408 persons constituting 2.6 per cent do not own any cultivable land and are employed as agricultural labourers. 89.5 per cent workers are engaged in other services. The remaining 4.9 per cent remain busy in household activities.

### **Literacy**

The literacy percentage in the Srinagar district is recorded as 69.41 % which is higher by 2.24 % than the State literacy rate and this has ranked the district at 6th in the literacy in the State.

### **Agriculture**

Agriculture is the main source of livelihood in the rural areas of the district. The district has a total area of 0.51 lakh hectares of which 0.46 lakh hectares of land is used for agricultural purposes excluding 0.04 lakh hectares which are sown more than once in a year.

### **Horticulture**

Apples, walnuts, almonds, pears, cherry, grapes and apricots are the main fruits of the district. The Horticulture department is striving to improve the quality plant material and production of the fruit grown in the district. Orchardists were provided plants and fencing material on subsidized rates. Many departmental nurseries were developed. A Fruit Preservation and Utilization Extension Centre is functioning at Lal Mandi where people are trained in converting fruit and vegetables into various by-products.

### **Animal husbandry**

Livestock rearing is an important occupation of the village folks in general and migratory population in the district. The Government is giving special attention in animal husbandry and sheep breeding. According to Livestock Census the total number of animals recorded in the district in 2007 is 1.02 lakh livestock heads out of a total 2.82 lakh heads in the State.

### **Fisheries**

Srinagar region abounds in different water bodies, like river Jehlum, lakes, wetlands and streams, springs etc. These resources have been utilized for providing quality of fish proteins to common people for this area. The most important sources of fish are spring fed, snow fed river Jehlum and the Dal Lake.

### **Industry**

Small Scale Sector enjoys a place of pride in Srinagar. The sector has made a considerable contribution to economic advancement of the district. There are 193 units in the field of food products, hosiery, carving wood products, paper machine, leather products, metallic and non-metallic products and electronic products etc. are flourishing under the medium sector.

## CHAPTER - 4: DESCRIPTION OF THE PROPOSED PROJECT (DESIGN AND PROPOSED INTERVENTIONS)

### 4.1. About Jhelum Tawi Flood Recovery Project (JTFRP)

In September 2014, the Northern Region of India experienced torrential monsoon rains in the region causing major flooding and landslides. The continuous spell of rains from September 2nd to 6th, 2014, caused Jhelum and Chenab Rivers as well as many other streams/tributaries to flow above the danger mark. The Jhelum River also breached its banks flooding many low-lying areas in Srinagar and adjoining districts. In many districts, the rainfall exceeded the normal by 600 percent. The Indian Meteorological Department (IMD) records precipitation above 244.4mm as extremely heavy rainfall, and the region received 558mm of rain in the June-September period, as against the normal 477.4 mm. Due to the unprecedented heavy rainfall the catchment areas particularly the low lying areas were flooded for more than two weeks. Some areas in urban Srinagar stayed flooded for 28 days. Water levels were as high as 27 feet in many parts of Srinagar. The areas from the main tributaries of river Jhelum vis-à-vis Brenginallah, Vishavnallah, Lidernallah and Sandrannallah started overflowing due to the heavy rainfall causing water levels in Jhelum River to rise. Water levels also increased in the rivers of Chenab and Tawi, both of which were flowing above normal levels. Due to the rivers overflowing nearly 20 districts were impacted.

In the aftermath of the devastating floods the Government of India requested assistance from the World Bank and an emergency project figured by the Natural Disaster was started, the Project is named as Jehlum Tawi Flood Recovery Project (JTFRP).

The project is focusing on restoring critical infrastructure using international best practice on resilient infrastructure. Given the region's vulnerability to both floods and earthquakes, the infrastructure will be designed with upgraded resilient features, and will include contingency planning for future disaster events. Therefore, the project aims at both restoring essential services disrupted by the floods and improving the design standard and practices to increase resilience.

### 4.1. Proposed 120 Bedded Specialized Orthopaedic Hospital Unit

Bone and Joint Hospital is an important hospital of the valley for bone and joint surgery which annually serve thousands of patients. In the devastating floods of 2014, Postgraduate Department of Orthopaedics, Govt. Medical College, Srinagar (known as Bone and Joint Hospital Srinagar) was also badly affected and water level was almost 3 feet's above from the hospital ground level causes loss to infrastructure and services of existing hospital. In view of

increasing pressure and demand for improved facilities, including the needs of present and future and to create a more resilient infrastructure. A new 120 bedded orthopedic hospital unit has been proposed under Jhelum Tawi Flood Recovery Project.

The proposed new building/block site is geographically located at 34.046903, 74.806890 near Barzulla at Srinagar, India within the premises of Bone & Joint hospital District- Srinagar, Jammu and Kashmir. Proposed 120 bedded hospital unit will be constructed under the project. Maximum height of proposed G+4 unit is considered 22.6 meters and total ground area of the proposed site is estimated approx. 1636 Sqm. On this ground area, total built up area 7994 sqm will be developed with modern medical facilities. A summary of proposed project is depicted in Fig.4.1.

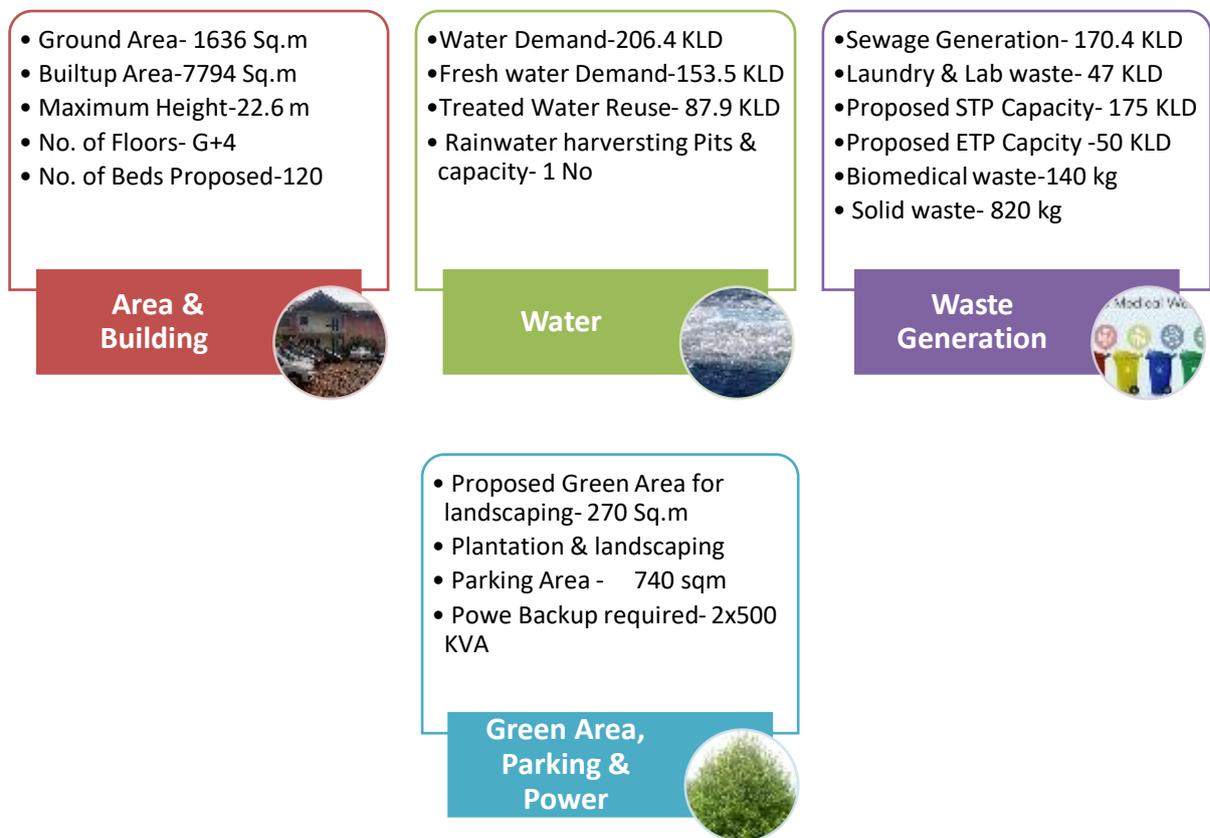


Fig.4. 1: Summary of Proposed Project Features

#### 4.2. Details of Proposed 120 Bedded Hospital Unit & Proposed Master Planning for Future Development

The Proposed development envisages construction of a 120 bedded Specialized Orthopaedic Unit with separate facilities such as 120 bedded wards, 2 private rooms, 6 bedded ICU, 12 bedded Pre OP and Post OP rooms, 3 Modular OTs, Radiology, Physiotherapy rooms and

Faculty rooms. Certain existing facilities such as Kitchen, Laundry, CSSD, MGPS etc. shall be augmented. A layout plan of proposed block is depicted in Fig.4.2.

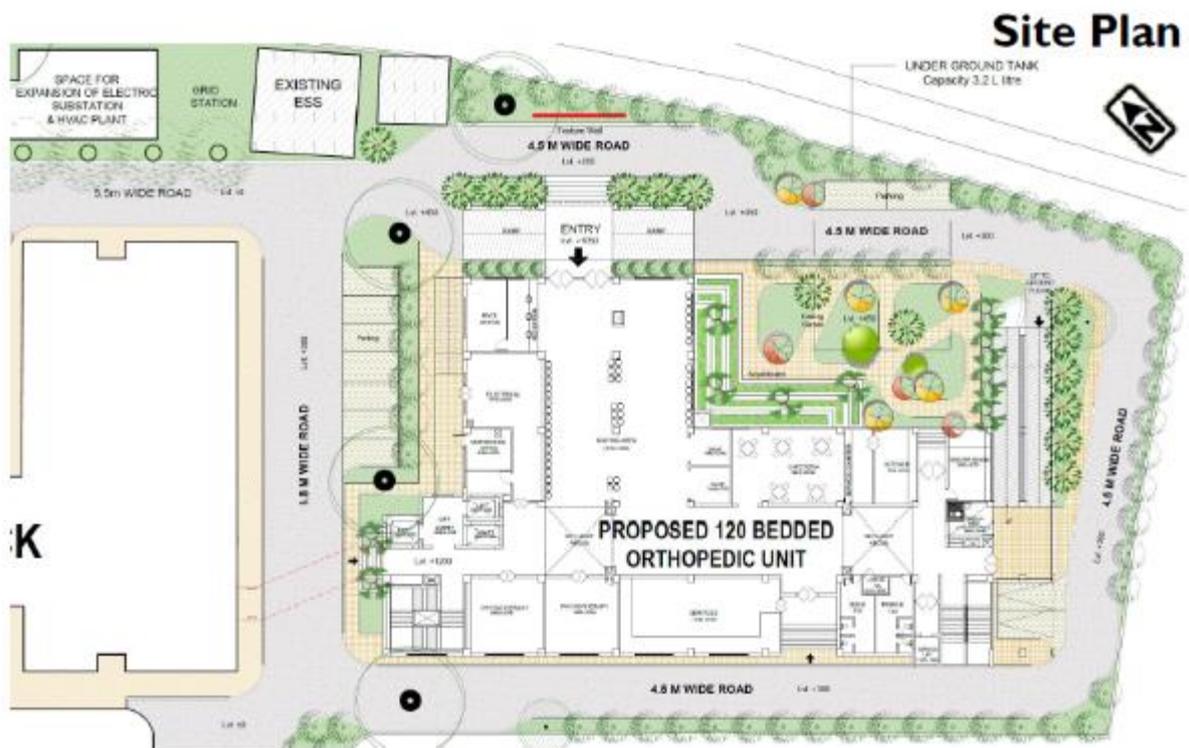
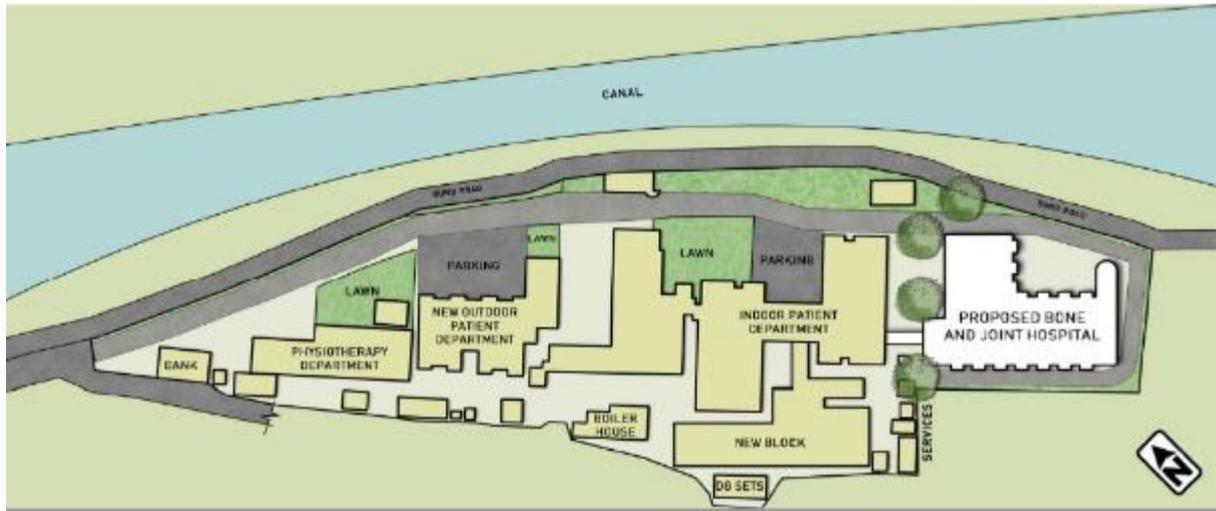


Fig.4.2: Existing Site Layout and location of Proposed 120 Bedded Hospital

## Proposed Master Plan for Future Development

Master Plan, for the entire campus keeping in view the existing Buildings, topography, and service design is prepared by the design architect. In the future, existing blocks and old building having total built up area 13283 sq.m will be demolished in phased manner and new 5 blocks will be constructed having total built-up area approx. 26984 sq.m. Area statement of existing buildings and proposed master plan are summarized in the Table 4.1 and 4.2 while location of proposed new blocks suggested in the Master Plan are depicted in Fig. 4.3.

Table 4.1- Area Statement of Existing Blocks and New Blocks proposed under Master Plan

AREA STATEMENT				
Phase	Block(s) Demolished	Built-Up Area Reduced (sqm)	Block(s) Constructed	Built-Up Area Added (sqm)
1	Staff & Doctors Quarters	1898	120 Bedded Orthopedic Unit	7994
2	MRI & Physiotherapy Block	552	Block 1 (Casualty, Blood Bank & Wards)	3450
3	OPD Block	887	Block 2 (OPD, Admin & Physiotherapy)	2520
4	Blood Bank & Casualty	1695	Block 3 (Radiology & Labs)	3520
5	O.T. & Wards Block	7515	Block 4 (Kitchen, Laundry & CSSD), Block 5 (Wards & O.T.) & Doctors' Hostel	8300
	Miscellaneous Structures	736	Services	1200
	<b>Total Demolished:</b>	<b>13283</b>	<b>Total Constructed:</b>	<b>26984</b>

Table 4.2- Area Statement of New Blocks, Ground coverage and Built-up area of Each block proposed under Master Plan

AREA STATEMENT				
S. No.	Block	Floors	Ground Coverage (sqm)	Built Up Area (sqm)
<b>CURRENT PHASE</b>				
1	120 Bedded Orthopedic Unit	G+5	1636	7994
<b>SUBSEQUENT PHASES</b>				
2	Block 1 (Casualty, Blood Bank & Wards)	G+5	575	3450
3	Block 2 (OPD, Admin & Physiotherapy)	G+3	630	2520
4	Block 3 (Radiology & Labs)	G+3	880	3520
5	Block 4 (Kitchen, Laundry & CSSD)	G+3	370	1480
6	Block 5 (Wards & OT)	G+3	880	3520
7	Connecting Corridor		600	1800
8	Doctors' Hostel	G+4	300	1500
9	Services		430	1200
	<b>TOTAL:</b>		<b>6301</b>	<b>26984</b>
			<b>Ground Coverage = 33%</b>	<b>FAR = 1.43</b>

18990sqm



Fig.4.3- Proposed Master Plan for Bone and Joint Hospital for Future Development

#### 4.2.1. Key design considerations

Sustainable design practices were adhered as per the norms of Green Building and National Building Code, 2018. During designing of the project, several consideration have been adopted to create flood resilient physical infrastructures. Application of dual plumbing, rainwater harvesting and advanced wastewater treatment system to increase reuse and recycling for treated water were also proposed for this new medical facility. Energy conservation measures including solar energy for lighting and water heating will be adopted in the proposed building as per Energy Conservation Building Code (ECBC) 2017 to reduce the energy foot prints of the project. National and international best practices and codes to provide fire safety and tackle emergency situations were also considered in the designing to provide better safety features in the proposed building.

#### 4.2.2. Codes and standards followed/adopted

As listed below, Codes and standard were adopted during design part of the project and dealt with throughout the Architectural Report, wherever applicable. The Building standards of the National Building Code, 2018 and National Accreditation Board (NABH) norms have been found lacking at several places and recommendations for these have been given in the Architectural Assessment Report. Codes and standards followed under project are listed below:

#### Codes & Standards Followed

- National Building Code,2018
- SMC Building Bye-laws
- Energy Conservation Building Code, 2017
- Automatic Sprinkler System- IS: 15105
- Fire Extinguishing system-NFPA 13
- automatic fire detection and alarm system-IS 15908
- External Hydrant Systems- IS 13039
- Specification for Coarse and Fine aggregate for use in mass concrete- IS 383
- Code of practice for construction of reinforced concrete shell roof-IS-2204
- Code of practice for plain and reinforced concrete (fourth revision)-IS 456:2000
- Criteria for earthquake resistant design of structures (fourth revision)-IS 1893

#### 4.2.3. Lay-out of the new block and main functional elements

The Site Plan shows the overall layout of the site as well the location of the various buildings. The Proposed 120 bedded hospital unit is to be constructed within the confined area of existing hospital. The ground coverage of this site is estimated 1636 sqm and total built up area is estimated 8744 sq.m including services and utility blocks. Area statement, major functional elements and facilities provided under proposed building block are described below in Table while section view of the proposed block is depicted in Fig.4.4.

Table 4.3- Area statement, major functional elements and facilities provided under proposed building block

Floor	Usage	Area (sqm)
Ground / Stilt Floor	Cafeteria, Waiting areas, Physiotherapy	1641
First Floor	Radiology & Wards	1679
Second Floor	OT Complex and ICU	1679
Third Floor	Wards	1407
Fourth Floor	Wards	1407
Terrace & Machine Room		181
Services & Utility Blocks	UG Tank, STP/ETP, Services Block	750
	<b>TOTAL</b>	<b>8744</b>

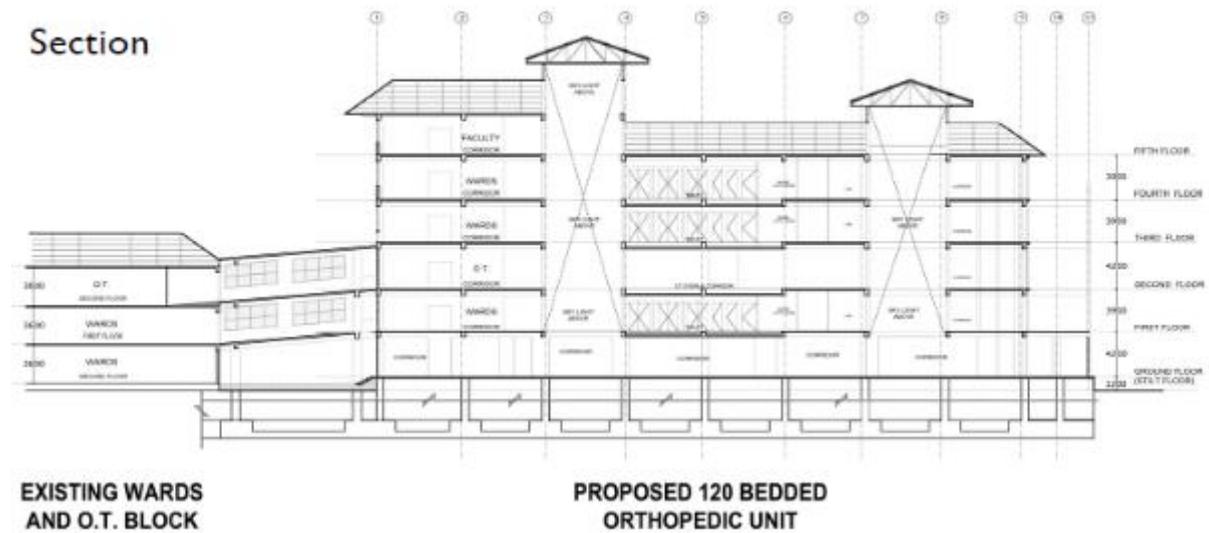


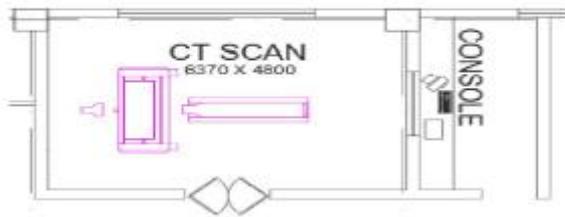
Fig. 4.4-Section of Proposed 120 Bedded Orthopaedic Unit

#### Room Data & Medical Equipment Planning:

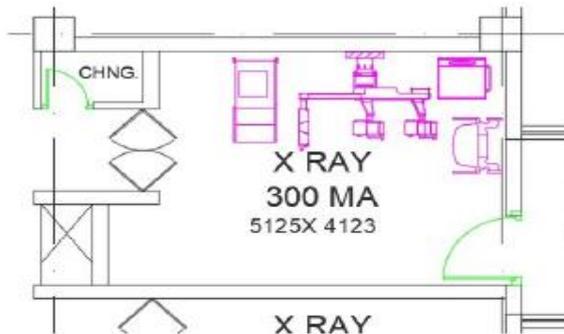
Following are the rooms and medical equipment's are proposed for new block. Layout of rooms and pictorial representation is depicted below:

- CT Scan
- X-Ray
- Bone Densitometry
- Ultrasound
- Modular Operation Theaters
- MGPS
- ICUs & Wards
- Physiotherapy
- Pneumatic Tube System
- Pneumatic Waste System

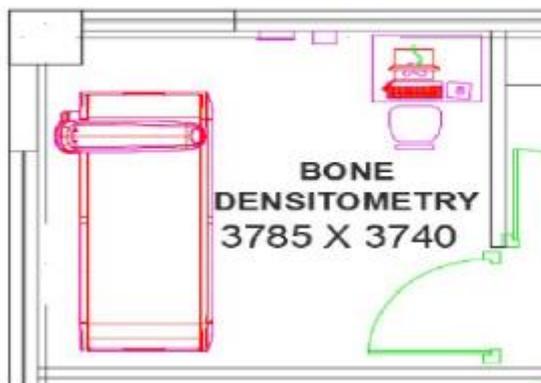
## CT Scan



## X-Ray



## Bone Densitometry



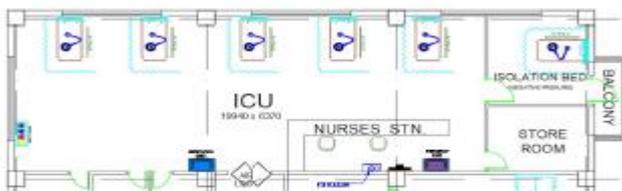
Bone Densitometer (Dexa Scanner)– 1 Nos.



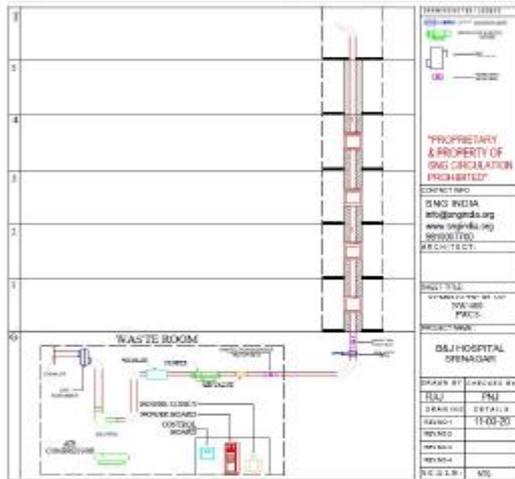
# Physiotherapy



# ICU



# Pneumatic Waste Conveyance System



## 4.2.4. Service (Kitchen, Laundry)

### 1. Kitchen

For the Hospital, it is essential that the catering services should be well designed and well equipped. The Catering services are concerned with storage, preparation and serving of the food to the patients. The existing kitchen is insufficient to meet the requirements existing and future requirements. The existing cooking area of the kitchen is small and not sufficient to cater the requirement for new 120 bedded hospital. It is recommended that the existing Kitchen will be upgraded and remodeled and designed keeping in view the size of the Hospital and the need to deliver hygienic food to all patients in shortest possible time. The need to have a central kitchen or satellite kitchens will be explored and design developed keeping in view the need for efficiency and economy Kitchen will have Dry store, cold room, preparation area, cooking area, vegetable cutting area, dish washer and Pot wash, Dietician room, set-up area, special feed area, staff rest room, change room, trolley wash area & Trolley bay. Kitchen will also have stainless steel equipment and furniture like automatic chapatti making machine, Dough kneader, boiler, microwave, dish washer, hot food trolley, SS table and sink, bain-marie, deep freezer, refrigerator etc. (Kitchen will have good ventilation system, with plumbing, drain, electrical works and fire-fighting system). List of Kitchen Appliances/ Equipment's Proposed under the project are summarized below:

List of Kitchen Appliances/ Equipment's Proposed Under the Project	
1- Grain storage box-capacity 100 kg size	14- Platform trolley
2- Double door vertical fridge	15- Tea Thermos: 10 ltr & 5 ltr
3- Vertical storage rack (5 shelf) i	16- Hot food trolley: 12 ltr cap x 3 containers and 7.5 ltr. x 3 containers

List of Kitchen Appliances/ Equipment's Proposed Under the Project	
4- Work table with single sink unit	17- Breakfast trolley: & Masala trolley
5- Three Sink Unit	18- Potato, onion storage unit
6- Dough Kneading Machine: 25 Kg capacity	19- Soiled Dish Landing Table
7- Work Table with Under shelf	20- Water storage tank with two ½ inch tap capacity: 150 ltrs
8- Single burner gas range With suitable size Ventilation Hoo	21- Stainless Steel Tray
9- Double burner gas range	22- Chapati making machine
10- Hot plate with puffer	23- Food pickup counter with hot and ambient bainmarie with tray slide
11- Blower Unit for Ducting	24- Wet grinder
12- Stone top table with Under shelf	25- Walk in Cold Room
13- Utility Trolley (2 tier)	

## 2. Central Sterile Supply Department (CSSD)

Central Sterile Supply Department will be upgraded. CSSD will have barriers to prevent cross contamination. Central Sterile Supply Department (CSSD) will be designed to receive, store, process, sterilize, distribute and control the supplies and instruments, linens, equipment, both sterile and non-sterile essentials to all the departments of the Hospital for care and safety of the patients. It should have Wash area, packing area, sterile area with sterile store, change rooms, gauges cutting room and low temperature sterile system, Dedicated RO water requirement. CSSD shall have comfort condition in packing area and HEPA filtered air supply to sterile area. CSSD shall have Plumbing, drainage, electrical works and fire-fighting system. Location, design and internal planning will be done keeping in view the functional requirements ensuring efficiency in working and the type of machinery and equipment that will be best for being procured and deployed. Assistance will be given in selection of suitable equipment/technologies that should be procured and the best practices being followed internationally. (all the equipment and furniture of CSSD shall be of SS-304/316/3166. Equipment shall be of European CE/US FDA certified,)

It was observed during the site visit that the dirty linen receiving area, inspection area, cleaning area, packing and sorting area, pre sterile store, sterilizers area and the clean linen store are not well separated. As per the Govt. of India Lakshya guidelines, the CSSD must be separated into receiving area, sterile storage and dispatch area.

Design considerations for the CSSD:

- Shall have three zones namely dirty, clean and sterile zone.
- The clean room shall have separate wet and dry areas.
- Material flow should be from dirty zone to sterile zone.
- Physical barriers should separate dirty areas from clean areas from sterile areas to prevent cross contamination.
- Double washing machines and sterilizers shall be used.

- Shall have storage areas with necessary furniture, rest rooms, supervisor room, changing rooms, etc.
- The CSSD designed shall cater the need of the entire hospital

### 3. Laundry

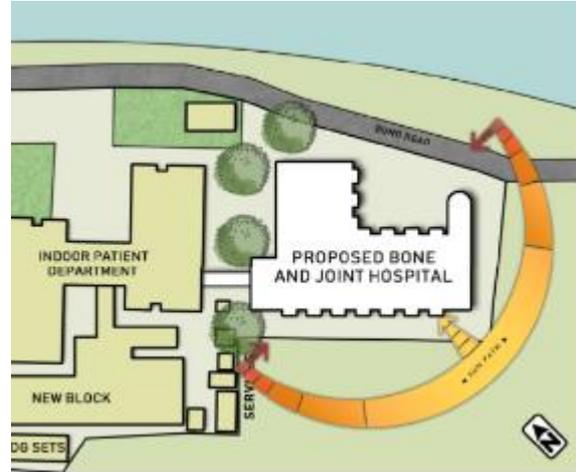
The Hospital laundry is seems sufficient for the present capacity. However up-gradation required to cater the need for additional 120 bedded hospital unit. As per prevailing thumb rule, 3.5 kg of linen per bed is considered for calculating laundry load. Laundry will have barriers to prevent cross contamination. It should have Sorting area, sluice area, wash area, finish area, store and change room. It should be equipped with sluicer, washer extractor, drier, Ironer, boiler, compressor and finishing machine. Laundry will also have plumbing, drain, electrical works, fire-fighting and ventilation system. As per the project requirement, following specifications have been proposed for mechanized laundry:

<p><b>1- Sluicing Cum Washer extractor</b> For removal of blood stains, fecal matter, vomit and other residue Capacity -25 kg, Electrically Heated, Front loading, Heavy duty, High Spin, Soft Mount, Suspended, Variable frequency drive &amp; Auto reverse &amp; forward, Open pocket &amp; Front display.</p> <p><b>2- Washer extractor</b> For washing cleaning and extraction <b>Capacity -30kg</b>, Electrically Heated, Front loading, Heavy duty, High Spin, Soft Mount, Suspended, Variable frequency drive &amp; Auto reverse &amp; forward, Open pocket &amp; Front display.</p> <p><b>3- Drying tumbler</b> Capacity – 15kg Electrically Heated, Heavy duty, Front Loading, Cool down Feature, Auto-timed, Auto-reversible, Auto digital temperature control, Dual Motor drive, Open Pocket &amp; Front display</p> <p><b>4- Flatbed press</b> Suitable for linen like uniform, room furnishing, personal garments, Bed sheets &amp; Pillow Covers Head &amp; Bed Size - 1500X750mm electrically heated, Auto-timed, Auto-temperature controlled, Double Switch operation, Built-in Suction Blower, pneumatically controlled,</p> <p><b>5- Vacuum finishing table with iron adjustable height.</b> Table Top Size -1300mm X 800mm</p> <p><b>6- Air compressor</b> a. The air compressor of reputed make shall be multistage stage, fully automatic suitable for delivering dry compressed air at pressure compatible to Ironer. b. Drive Belt driven with pulleys, belts and belt guard.</p>	<p><b>7- Wash room trolley</b> Capacity -70Kg The wash room trolley shall be fabricated out of Stainless Steel AISI-304 tubes and flats I all welded construction ground smooth &amp; finished, supported on swivelling wheels.</p> <p><b>8- Shelf trolley (Finished linen)</b> Capacity -70Kg The linen trolley shall be designed in Stainless Steel AISI-304 construction with all welded joints ground &amp; smooth finished out of Stainless Steel tubes and bars and foldable front. The trolley shall be fitted with at least 4 Nos. AISI-304 Stainless Steel shelves (2-shelves removable). The base frame shall be supported on swiveling wheels.</p> <p><b>9- Mobile table</b> Table top size-1200mm x 750mm The folding table shall be specially designed for carrying rolling and folding of linen in the laundry. The frame of the table shall be fabricated out of MS welded construction with one bottom shelf for storage. Complete with heavy duty ball bearing for swiveling wheels. The table top shall be of polished Stainless steel.</p> <p><b>10- Storage rack</b> Size - 1200mmx460mmx1800mm :4 shelves; Made of Mild Steel, Finished with Stoving paints</p> <p><b>11- Shelf for finished goods</b> Size- 1200mmx460mmx1800mm 4 shelves; Made of Mild Steel, Finished with Stoving paints</p> <p><b>12- Electric distribution panel</b> Completed with all switchgears, wiring and controls etc. for distribution of power supply to various load points in the Laundry Room</p>
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Lighting levels need to be improved and treated fresh air supply may be provided to avoid the stale smell in the air.

#### 4.2.5. Management of Environmental Exposure Conditions

In the proposed building, several measures have been proposed to manage environmental exposure conditions. In the proposed building, several measures have been proposed to manage environmental exposure conditions. From the solar radiation chart, it was clear that the large windows on north-western and southern – east faces will be provided to maximise the heat gains during winters. Step out solarium gets morning to afternoon sun. Apart from this, avoiding due east and west orientation cuts to excessive heat gain as well as glare.



Great heat losses take place during opening and closing of the doors. Apart from the heat losses, these openings also bring in polluted air and atmospheric germs inside the lobbies. Therefore, air lock lobbies will be provided at every entrance. This involves providing 2 entrance doors separated by a distance of 2.4 to 3 meters. This ensures an air gap between the external air and the inside air of the hospital. This helps in preventing heat losses to outside and also prevents pollution and air borne germs. These air lock lobbies will also be provided with air curtains on the inside of the internal door. This further prevents heat losses. As per NABH recommendation for OTs, the minimum total air exchanges should be 20. Out of these, a minimum of 4 air changes should be fresh air changes. The air face velocity of 25-35 feet per minute (7.6 -10.6 meters per minute) from non-aspirating unidirectional laminar flow diffuser is recommended. Minimum positive pressure of 2.5 Pascal should be maintained in OTs with respect to surrounding areas. This prevent outside air entry into the OT. Laminar floor should be 75-150 mm above to the ground floor level. The temperature should be 21 °C (plus minus 3 °C ) and humidity should be maximum 60%. Central air condition for requisite air changes must be provided. In Neo Natal ICU, temperature should be 26 °C and humidity should be 50-60%.

#### 4.2.6. Building materials

The proposed project has been planned in a manner to achieve environment friendly sustainable development. The construction material to be used will include renewable and non-renewable resources including stones, aggregates, sand, steel, concrete, fly ash mix cement, and clay and fly ash bricks. Aerocon blocks (Autoclaved Aerated Concrete Blocks may also be taken for wall constructions. Wood alternatives will be used in the project with

minimal use of timber for the proposed construction. All floors in public areas of proposed hospital block such as corridors and lobbies will be in granite. This will ensure that there is continuity between the existing additional block and the new proposed block. All staircase steps must be in granite. Special anti-skid edge protection grooving must be provided to prevent any slipping. All windows will be in double pane glazing (6mm + 12mm + 6mm) with argon, xenon or krypton filling in the cavity for thermal and noise insulation. All rooms such as server rooms, which need temperature of 18 °C will also have insulated walls and ceilings to avoid condensation. All the building materials will be procured from reputed manufacturers with test certificates as per BIS specifications. Low VOC and non-toxic paints and adhesives to be used as per LEED standards.

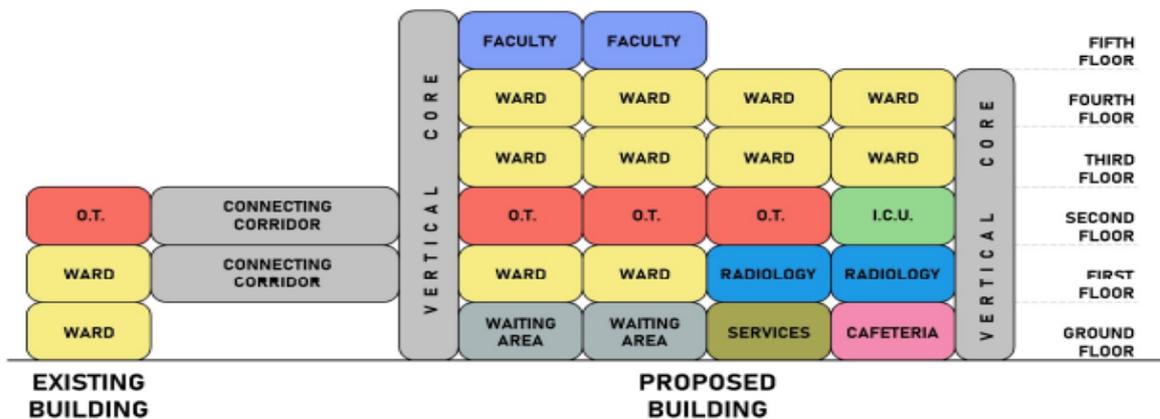
#### 4.2.7. Facilities/services

In the proposed 120 bedded hospital unit, several sustainable features and facilities will be created which will not only create Flood resilient physical infrastructures but also set the precedent for sustainable building designs in the region. There will be several advanced medical facilities would be created to fulfil valley's medical needs. Promotion of water optimization, wastewater treatment and rainwater harvesting for water conservation will also be adopted. Application of dual plumbing and advanced wastewater treatment system would be set up to increase reuse and recycling of water. Apart from these features, application of solar energy for lighting and water heating are also proposed to reduce energy demand of the proposed hospital unit. National and international best practices and codes will also be adopted to provide fire safety and tackle emergency situations and disasters. Necessary facilities viz. parking place, waiting and sitting arrangements for visitors, drinking water points, landscaping and peripheral plantation would also be developed under the proposed project.

#### 4.2.8. Access/circulation arrangements

The linkage proposed at first floor and second floor levels to existing hospital block via connecting corridor. All day linkage is possible on the connecting corridor. Well defined entry and exist gates and circulation arrangement have also been proposed for the visitors and patient vehicles in the hospital. Vehicular access possible through road along bund only.

## Spatial Inter-relationships



### 4.2.9. Communication Facilities/Points/Control Room

Communication system is vital for the functioning of a good hospital. It is proposed that hospital must have a fire command centre at a location on the ground floor. This must have independent access from exterior. This must have the main fire alarm panel with public address system control. The walls of this room must be of minimum 2 hour fire rating. A central data server room is also proposed at a location above the ground floor. It should be above the previous floor levels. Its main purpose will be to house the central hospital server and to organize the data and network flow all over the hospital. The communication room will house the CCTV network and will also have the central telephone exchange. The CCTV panel will also be provided in the security department.

### 4.2.10. HVAC arrangements, Indoor Air Quality (including ventilation; infection control) and Energy Demand

The stale air quality of the hospital is a pressing issue. Ducted fresh air supply with adequate number of air changes per hour is needed to all parts of the hospital to ensure that the air quality remains fresh and bacteria free. In the Bone & Joint hospital, HVAC arrangements, Indoor air quality improvement, and energy related measures are intensively proposed for proposed hospital unit.

It is proposed to provide comfort conditions round the year with the help of economical and efficient air conditioning system in the building. Mechanical Ventilation is proposed in Toilets & services areas. Pressurizations of Staircases, Lift shafts and Lift lobbies is proposed as per NBC-2016. Air conditioning in the healthcare stands out for its complexities and stringent demands on indoor air quality, air flow patterns, cross contamination control, odour control and noise control etc. The hospital air conditioning system also demands more care in energy aspects due to the 24 hour operation.

Variable Air Volume are recommended in the proposed block. These match air supply continuously to cooling and ventilation loads. Ducted and treated fresh air supply will also be provided to all parts of the Hospital as per ASHRAE guidelines. Operation theatres will have a minimum of 20 air changes per hours, out of which minimum 4 air changes must be of fresh air. Positive air pressure of minimum 1 Pascal will be maintained in the OT to prevent entry of any outside air.

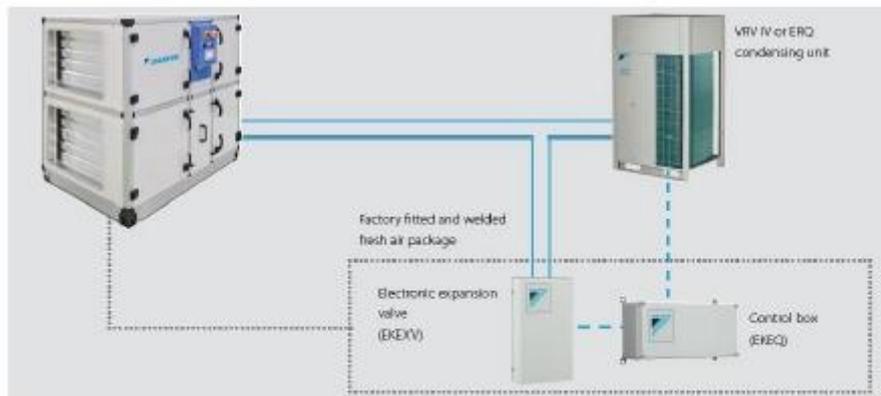
Space	Temp Range °C	Relative Humidity %
<b>Summer &amp; Monsoon</b>		
Operation Theatres	20±1	50-55%
Pre- OP & Post- OP, ICU, CSSD, CT Scan, X-ray etc.	22±1	50-55%
All other areas in hospital	23±1	55% (design value but not controlled)
<b>Winter Heating</b>	<b>21±1</b>	<b>50%</b>

**Note:-** Above Data is considered from ASHRAE Handbook (Health Care), NBC-2016 & ISHRAE-2017

Due to stringent conditions of temperature and humidity in the operation theatres and intensive care units, there is a constant requirement of reheating. Consideration will be given to isolation of piping for various zones to simultaneously provide heating and cooling as required, even for adjacent areas. Operation theatres, intensive care units and other critical areas will have separate heating coil for the same purpose.

- Special air handling units operating at a total static pressure of 130mm WG will be designed to cater to high static pressure requirements due to the HEPA filters.
- The AHU's will be of double skin construction with insulation sandwiched between two layers of metal. AHU will be 'draw through' on coils and 'blow through' on filters. AHUs will have both cooling and reheating coils.
- The blowers used in AHU's will be selected for higher efficiency & noiseless operation. The AHUs are backward curved type since the systems with HEPA filters are subject to variation in static pressure depending on the cleanliness of the filters. The backward curved blowers have flat horsepower curves and are non-overloading type. Also, their static pressure curves are steeper than forward curved blowers so that there is a relatively small change in air volumes for variation in system pressure.
- All OT's and ICU's will have individual air handling units with the provision of start/stop from remote building automation controllers.

- Laminar air flow system (in Client scope/OT vendor scope) designed at  $90 \pm 20$  fpm from the supply plenum will be provided. The dehumidified air shall be discharged within OT from the plenum through multiple terminal HEPA filters (provided by the OT supplier) at approximately 0.5 mps (90 feet per minute) velocity.
- Air will be supplied from ceiling level and it flows down uni-directionally or in a Laminar flow upto the operation table in parallel streams with least or virtually no turbulence, thus preventing contamination.
- The return / exhaust collection points inside the room will be at a lower level (bottom should be at least 150mm above floor) in order to prevent recirculation of return air in space. This helps to keep the contamination levels low & below the breathing zone.



DX MODULAR AHU WITH VRF ODU & DX COMMUNICATION KIT

#### 4.2.11. Acoustics

As per WHO guidelines, the ideal level inside a hospital is 35 dB(A). The crowded roads surrounding the hospital generate peak noise at parking area is about 60dB(A). In order to control the noise, the use of acoustic glass is recommended in the external double skin windows. This will help in controlling the noise within the hospital. Double panel glass with inert gas infill in cavity should will also be used on the facades to reduce the noise levels coming from the surrounding areas.

#### 4.2.12. Water Heating Arrangements

Heating requirement should be met with solar heated water and electrically fired geysers. This will reduce dependence upon conventional fuels. The plant requirements should be diversified Sources so that dependence upon one source can be reduced. The south tilting

roofs of other buildings blocks can also be used to place either the solar photovoltaic panels or solar water heating panels.

#### 4.2.13. Fire Safety, Emergency/Disaster Response Arrangements/Plan

The proposed hospital unit will have a fire command centre. This must have independent access from exterior. This must have the main fire alarm panel with public address system control. It is proposed that minimum width of any staircase in a hospital should not be less than 2000mm and maximum travel distance to the closest staircase should not exceed 30 meters for Hospital buildings. All staircases must be under positive pressurization to resist entry of smoke in these in case of fire. All staircases should lead directly to an open space at the ground floor level. It is also proposed that the minimum clear width of doors in wards with more than 5 patients should be 2 meters clear. As per the NBC, 2016, Smoke detectors will also be provided throughout the old and the new hospital unit. The entire Hospital building (old unit as well as the proposed new unit) must have sprinkler system installed as per the NBC guidelines.

Smoke dampers shall also be provided within supply air ducts and return air ducts at AHU to prevent spread of smoke / fire to the adjoining areas. Smoke dampers shall be motorized and actuated by smoke sensor.

The proposed fire fighting shall be consisting of total static U.G storage tank of 200 Cum, with a provision of fire brigade inlet and suction connections. Separate main pipe lines will emanate from the pump room for internal and external hydrants and sprinkler network and connect to the vertical risers. Vertical wet risers of 100mm dia M.S. pipes will be taken to provide pressurized water to the single outlet hydrant landing valve on each floor as per requirement and then connected commonly to overhead tank. Along with wet riser system, portable fire extinguishers are to be provided at all accessible positions.

#### 4.2.14. Water Supply Arrangements – source, supply, distribution and plumbing systems

As shown in Fig.4.5, Water balance exercise has been done to estimate hospital water demand of proposed block. NBC norms @450 litres per day per bed supply is used to estimate water demand. Several other factors such as visitors, staff population and attendant population are also consider to calculate total water demand. As indicated in the Table 4.4, total water requirement is estimated 206.4 KLD which include fresh water requirement of 153.5 KLD while 52.9 KLD recycled water will be used to satisfy total daily water requirement. Water will be supplied by existing treatment plant operated by Public health engineering department. Dual plumbing system is also proposed in this new building to promote recycling and reuse of treated water.

Table 4.4: Total Water Demand of Proposed Hospital Building Unit

WATER REQUIREMENT							
S. No.	Description	Area (Sqm)	Occupancy	Water Requirement per capita per day (LPCD)	Total Requirement (LPD)	Domestic Water Requirement (LPD)	Flushing Water Requirement (LPD)
1	Total Bed (120 Bed) Proposed		120	450	54000	36000	18000
1.1	Existing Beds		150	450	67500	45000	22500
2	Floating population Proposed		480	15	7200	4800	2400
2.1	Floating population Existing		2000	15	30000	20000	10000
3	Kitchen (LS)				10000	10000	
4	Laundry @ 3 kg per bed & 15 litre per kg Proposed		120	45	5400	5400	
4.1	Laundry @ 3 kg per bed & 15 litre per kg Existing		150	45	13500	13500	
	Sub Total				187600	134700	52900
5	Add 10% for contingencies and unforeseen requirement and back wash requirements etc.				18800	18800	
	<b>Total</b>				<b>206400</b>	<b>153500</b>	<b>52900</b>
6	Assuming 25% of the consumption of domestic water is required for OT and Lab, Drinking etc. (RO Water)				=	38375	LPD
6.1	Total waste water to ETP = Kitchen + Laundry + 75% of RO water				=	57681	LPD
6.2	Capacity of ETP (80% of 6.1)				=	46145	LPD
	<b>Capacity of ETP</b>				<b>=</b>	<b>47</b>	<b>KLD</b>

WATER REQUIREMENT							
S. No.	Description	Area (Sqm)	Occupancy	Water Requirement per capita per day (LPCD)	Total Requirement (LPD)	Domestic Water Requirement (LPD)	Flushing Water Requirement (LPD)
7	Capacity of Sewage Treatment Plant:						
	80% of Domestic Water + 90% of Flushing Water				=	170410	LPD
	Capacity of STP				=	171	KLD
8.	Treated water available after Treatment 90% of STP cap.				=	153369	LPD
	Or Say				=	154	KLD
9	For Garden Irrigation purpose (LS)				=	5000	LPD
	For Garden Irrigation full campus					30000	
	Or Say				=	35	KLD

4.2.15. Sewage and Effluent Management:

In the operational phase of the proposed hospital block, total 171 KLD wastewater will be generated which include 122.8 KLD domestic wastewater and 47.61 KLD flushed wastewater. Considering the wastewater generated, capacity of proposed STP 171 KLD is estimated. Therefore, a Sewage treatment plan for 175 KLD capacity is proposed for this unit.

47 KLD of laundry and laboratory effluent is estimated from this hospital unit. An ETP of 50 KLD to treat this effluent is proposed. It is advisable to treat wastewater with phosphorus and nitrogen removal units and filtration system for maximum use of treated wastewater.

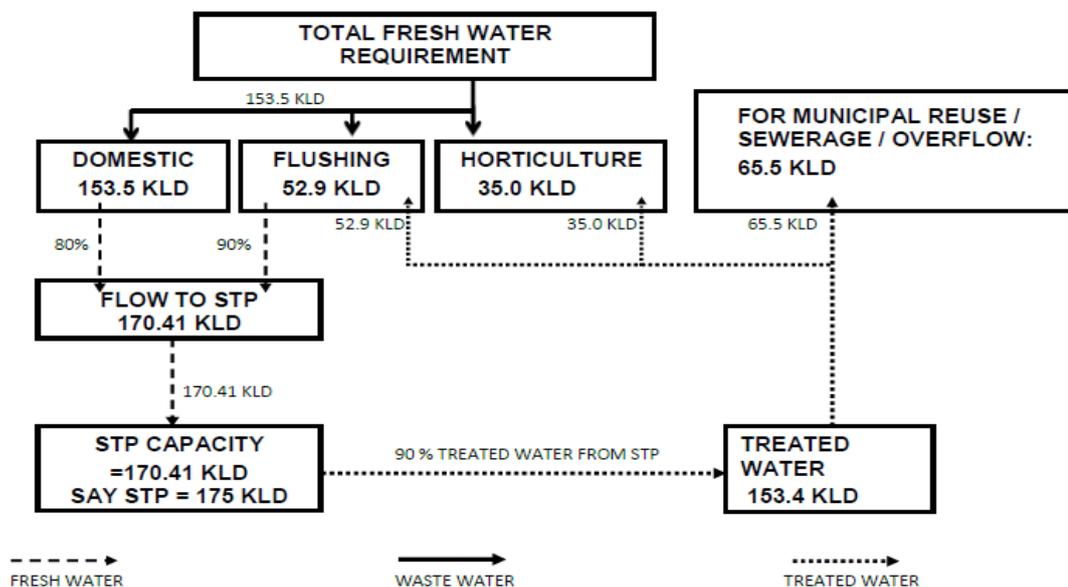


Fig.4.5: Water Balance Chart for Operational Phase of Proposed 120 bedded hospital unit

**Proposal for Treatment of sewage and effluent:**

- Proposed Capacity of Treatment Plan – 175 KLD
- Technology- FAB - process with Ultra- Filtration system
- Treated Water Standard Proposed to promote reuse and recycling of water
  - BOD <5-10 mg/l
  - COD <50 mg/l
  - TSS <20 mg/l

**4.2.16. Solid Waste Management:**

It is expected less than 820 kg of solid waste will be generated from proposed unit which will mostly comprised by organic fraction (40-45%) followed by inert fraction (20-30%) rest beings will be plastics, papers, rags and other components. Estimation of solid waste generation is summarized below in the Table 4.5. Generated solid Waste from the New unit will be managed as per solid waste management rules 2016. Different colour coded bins will be provided to collected organic and recyclable wastes. Efforts will be made to avoid any mixing of solid wastes to bio medical wastes.

Table 4.5: Solid waste Generation at New Block

S.No	Population	Per capita Waste Generation (gm)	Total Solid Waste Generation (Kg)
1	Attendants- 240 No (considered 2 persons per bed)	100 gm	240
2	Non-residential Population (Working Staff) 100 No	100 gm	100
3	Visitors considered 480 per day	50 gm	480
	<b>Total wastes Generation</b>		<b>820 Kg/per day</b>

**4.2.17. Bio-medical Waste Management:**

In the proposed 120 bedded hospital unit total 78 kg of biomedical wastes/day will be generated from 120 beds considering approx. 650 gm wastes per bed per day. In this block also as per the regulatory requirement, biomedical wastes will be managed as per Bio-Medical Waste Management (Amendment) Rules, 2018. Bio Medical Waste Management Rules, 2018 categorises the bio-medical waste generated from the health care facility into four categories based on the segregation pathway and colour code. Various types of bio medical waste are further assigned to each one of the categories viz. Yellow, Red, white, Blue Category and Green Category which are mentioned below and depicted in the Fig.4.4.

### SEGREGATION OF WASTE IN COLOR CODED BAGS

YELLOW BAGS	RED BAGS	WHITE TRANSLUCENT PPC	BLUE MARKING CARDBOARD BOX	GREEN CONTAINER
Anatomical Waste, Soiled Waste, Microbiology & Lab Waste, Discarded Medicines, Cytotoxic Drugs, Soiled Linen & Beddings, Blood Bags and Chemical Solid Waste	Plastic Waste such as catheters, urine bags, syringes (without needles) and vaccutainers with their needles cut	Sharp Waste including metals like Needles, syringes with fixed needles, needles from needle tip cutter or burner, scalpels, blades etc.	Broken or discarded and contaminated glass including medicine vials and ampoules except those contaminated with cytotoxic wastes.	General Waste like paper, kitchen waste, wrappers etc.
				

Fig.4.4: Segregation of Bio-medical waste as per Bio-Medical Waste Management (Amendment) Rules, 2018

An assessment on prevailing biomedical waste management system is required to be done for existing blocks of Bone & Joint hospital. However, all the provisions and best management practices mentioned in that chapter for existing Bone & Joint hospital will be applicable here. A summary of biomedical wastes of existing and proposed hospital block is summarized below in Table 4.6.

Table 4.6: Summary of Bio-medical waste at Bone & Joint Hospital

Particulars	Existing Hospital	For Proposed Unit
No. of beds	150 ( but over loaded as approx. 200 patients attended by hospital)	120
Total Biomedical waste generation per day (Avg.)	300 Kg/day	140 Kg /day
Per capita bio medical waste generation (as per B&J hospital data record)	About 1.5 kg./capita/day	About 1.2 kg /capita/day
Management Practices	As Per Bio-Medical waste Management Rules 2016 & its amendments as applicable	

#### 4.3. Construction activities and inputs

Construction activities will entail:

##### A- Pre- Construction Stage

This involves:

- Design and drawing of specific architectural plans for proposed 120 bedded hospital project and applying for the various permits and NOC from concerned departments and municipal administration of J&K.
- Environmental and Social Impact Assessment for construction and operational phase of the project
- Getting into collaborative agreements with key stakeholders including project manager, architects, quantity surveyors, engineers/contractors (structural, mechanical, electrical), material suppliers, landscapers, and project financiers.

#### B- Demolition Stage

- Total 20119 SQF area will be demolished which is standing on 7600 SQF floor area. Total quantity of Construction and demolition waste to be disposed of is estimated 1988 Cum.
- Demolition and dismantling plan shall be strictly followed.

#### C- Establishment of Site Office Materials, Storage and Handling

With the prior permission of NPCC, the contractor shall construct temporary site offices to run and manage all activities at different phases. This will also include connection of the utility services such as water, electricity which will be crucial for the construction activities.

- **Non-hazardous materials:** Materials to be stored in the site store shall include samples for review / testing by consultants and or inspectors.
- **Hazardous materials:** These shall include paints, oil, grease, vehicle fuel etc. The store for these materials shall be handled, transported and stored as per the regulatory requirements and measures suggested in EMP drafted for construction stage.
- **Bulk construction materials:** These include: sand, cement, stones, cement, quarry chips, steel and timber. It is recommended that the project contractors should plan for material to be delivered in optimum quantities in order to avoid any form of deposit, which will impede site activities, induce safety hazards and create a nuisance to the neighbourhood.

#### D- Site clearance and fencing

The proposed project site shall be fenced to help control right of entry to the site for purposes of safety and security. No disturbance of existing hospital facilities, patients and attendants shall also be ensured by the contractor. Proper enclosures will also aid to reducing the amount of dust, noise and other solid waste that have a potential of getting into and out of the site. Site clearance will include removal of top soil, vegetation and debris.

#### E- Excavations

This involves excavating for the various unit foundation works. The bulk of the excavated material will be carried away from site by the contractor(s) to approved dumpsite in accordance with the C&D waste management Rules 2016.

**F- Civil works activities**

It Includes:

- Masonry, concrete work and related activities
- Superstructure- include construction of support pillars and walls
- Structural reinforcement
- Plumbing and drainage
- Electrical works
- Roofing work
- Other internal installations
- Security feature

**4.4. Construction Materials and Equipment's to be used:****Construction Material**

The details of various construction materials to be used and their tentative source are summarized below:

S. N	Material	Source
1	Soil	Approved local borrow areas/other construction sites
2	Aggregates (Sand in concrete)	Approved local supplier
3	Aggregates (Stone in concrete)	Approved local quarry
4	Cement	Local suppliers
5	Re-bar steel	Local suppliers
6	Structural Steel	Local supplier

**Construction Equipment's**

Most of the major construction equipment used for the construction of building is available locally. List of possible major construction equipment's are summarized below:

- Excavator
- Dumper/Truck

- Tractor
- JCB
- Cranes
- Crawler Crane
- Concrete Mixer
- Bull Dozer
- Generator sets

#### 4.5. Construction Management

Specialized project management team for the construction of the new facilities and for the procurement of medical equipment shall be deployed. Members of the project management team have extensive experience in project and construction management. Project is already awarded to a single principal contractor on a fixed-cost, date-certain basis, and the construction cost have adequate penalties for delay.

The project management team will constantly monitor the progress of work and the contractor has to submit weekly updates and monthly progress reports.

Few areas of focus that are key components in the successful delivery of Design-Build hospital construction project. First, make sure that involved team is well-versed in establishing clear, precise lines of communication. This is vital to the success of any construction project and is one of the biggest benefits of Design-Build hospital construction.

Once lines of communication are set, the project should mobilize. There should be a thorough preconstruction meeting with the authority, stakeholders and all major subcontractors and vendors. Pre-installation meetings on all major building components are also necessary. And since most healthcare construction projects are expansions and renovations, making sure ongoing operations are not disrupted is vitally important.

Design-Build Construction Company must conduct bi-weekly meetings to coordinate construction, monitor progress and maintain accountability. Safety, quality and adherence to plans and documents should be part of every conversation. Remember, if the hospital construction project planned properly in the beginning, the end result should be exactly what everyone is expecting.

#### 4.6. Project Budget, Time Line and Manpower Requirement:

The estimated project cost is Rs.89 Cr which will be constructed in two year period. The workforce required for the project has not been calculated in detail. However, from the records of similar previous project done by NPCC, it is estimated that 50 manpower's would be required depending on the methodology of construction employed. The contractor is required to employ the unskilled and semi-skilled manpower from the local communities as far as possible.

## CHAPTER – 5: POLICY, LEGAL AND REGULATORY FRAMEWORK

### 5.1. Introduction

This chapter deals with the laws, regulations and policies, of Government of India, the State Government and the World Bank, related to environment and social issues. The Government of India procedures on externally aided projects entail that all projects must be prepared and implemented in full compliance with the national legislation, regulations and standards governing protection and management of the cultural and natural heritage, social development, and environmental management. In line with that, the Environment and Social Management Framework prepared for Jhelum and Tawi Flood Recovery Project (JTFRP) includes the National and State level environmental laws and the operational policies of the World Bank. Pertaining to current subproject, some of the Operational Policies and Directive of the World Bank and key national legislations and regulations related to environment that may apply for this project are summarized in this Chapter.

### 5.2. Safeguard Operational Policies and Directive of the World Bank

Safeguard policies are cornerstone of its support to sustainable growth, environment conservation, poverty reduction and shared prosperity. The core objective of these policies is to prevent and mitigate undue harm to people, their environment and cultural assets in the development process. Safeguard policies have often not only increased the effectiveness and development impact of projects and programs supported by the World Bank, but also provided a platform for the participation of stakeholders in project design, thus have been an important instrument for building ownership among local populations, government agencies and partner organizations.

For the present sub project relevant and applicable safeguards policies of the World Bank are reviewed. Out of the several World Bank safeguard policies which were discussed in the ESMF of JTFRP, following policies as highlighted in Table 5.1 will be triggered during project implementation of proposed project:

Table 5. 1: Relevant World Bank Safeguard Policies

World Bank Safeguard Policies	Objective	Applicability	Safeguard Requirements
OP 4.01 Environmental Assessment	The objective of this policy is to ensure that Bank financed projects	The environmental issues will be addressed adequately in advance. An integrated Environmental Screening and Environmental Assessment (EA) with Environmental Management	EAs and mitigation plans required for Proposed Hospital project

World Bank Safeguard Policies	Objective	Applicability	Safeguard Requirements
	are environmentally sound and sustainable.	Plan (EMP) will be developed to manage environmental risks and maximize environmental and social benefits wherever it is applicable	

### 5.3. Environmental Policy and Regulatory Framework of Govt. of India and the State

As per the Government of India procedure on externally added projects and its subprojects also must be prepared and implemented in full compliance with national legislation, regulation and standards governing protection and management of cultural and natural heritage of the country, social development and environmental management. Specific state and local level standards and regulations also apply based on the project location and nature of proposed interventions. Pertaining to current subproject, some of the key national legislations and regulations related to environment that may apply for this project are summarized in Table 5.2.

Table 5. 2: Environmental Policy and Regulatory Framework of Govt. of India and the State that may apply to this Project

Act/ Policy	Objective & Scope of the Act	Implication of Act in proposed sub project	consent/permis sion required	Entities responsible
<b>Environmental</b>				
Environm ental (Protecti on) Act, 1986	To protect and improve the overall environment. Prevention, control, and abatement of environmental pollution. Gives rights central and state government authorities to monitor and test for environmental pollution, and if necessary penalize for infringements.	Applicable- Environment (Protection) Act, popularly known as an umbrella legislation that supplements existing environmental regulations which may be applicable at the time of implementation  Provisions of the Act may applicable on Preservation of air and water quality, Control dust pollution due to quarrying, which might harm the vegetation	Compliance to environmental (Air, Water, Noise) Standards issued under EPR	Construction phase- Contractor/ NPCC  Operational phase- Hospital Administration
Water (Preventio n and Control of Pollution) Act,1974	To control water pollution by controlling discharge of pollutants as per the prescribed standards. Provides for the prevention and control of water pollution and the maintaining or restoring of wholesomeness of water; creates Boards and assigns functions and powers for the prevention and control of water pollution.	Applicable- the Water Act is applicable to Bone & Joint Hospital/new hospital block. Relevant provisions of the act will be applicable during construction and operational phase of the project.	Obtaining Consent to Establish for establishing and Consent to Operate (CTO) for activities causing water pollution from JKPCB	Construction phase- Contractor/ NPCC  Operational phase- Hospital Administration/ operator of the treatment plant

<p>Air (Prevention and Control of Pollution) Act, 1981</p>	<p>To control air pollution by controlling emission of air pollutants as per the prescribed standards. Act provides for prevention, control and abatement of air pollution and establishment of Boards for planning a comprehensive program for this task. Collect and disseminate information relating to air pollution, lay down standards for emission of air pollutants into the atmosphere from industrial plants, automobiles or other sources.</p>	<p>Applicable- Consent to Establish and Consent to Operate (CTO) for activities causing air pollution viz. DG set installation shall be required to obtain from SPCB</p>	<p>Consent to Operate (CTO) for DG set</p>	<p>Construction phase- Contractor/ NPCC  Operational phase- Hospital Administration</p>
<p>The Noise Pollution (Regulation And Control) Rules, 2000</p>	<p>To control noise pollution by controlling noise at sources. Rules provides statutory norms to regulate and control noise levels to prevent their adverse effects on human health and psychological well-being of the people. statutory norms to regulate and control noise levels to prevent their adverse effects on human health and psychological wellbeing of the people</p>	<p>Applicable- involves generation of noise due to operation of DG sets, vehicular movement and use of machinery during construction phase</p>	<p>Compliance with Ambient Noise Standards in accordance to land use of the area</p>	<p>Construction phase- Contractor/ NPCC  Operational phase- Hospital Administration</p>

<p>Solid Waste Management Rules, 2016</p>	<p>Waste generator shall segregate and store the waste generated by them in three separate streams namely biodegradable, non-biodegradable and domestic hazardous wastes in suitable bins and handover segregated wastes to authorised waste pickers or waste collectors as per the direction or notification by the local authorities from time to time. No waste generator shall throw, burn or bury the solid waste generated by him, on streets, open public spaces outside his premises or in the drain or water bodies. All waste generators shall pay such user fee for solid waste management, as specified in the bye-laws of the local bodies.</p>	<p>Applicable-provisions of Solid waste management rules shall be applicable during its segregation, collection, transportation and disposal of solid wastes.</p>	<p>Compliance with SWM rules for its proper management</p>	<p>Construction phase- Contractor/ NPCC  Operational phase- Hospital Administration</p>
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<p>Construction And Demolition Waste Management Rules, 2016</p>	<p>The rules shall apply to every waste resulting from construction, re-modelling, repair and demolition of any civil structure of individual or organization or authority who generates construction and demolition waste such as building materials, debris, rubble. Every waste generator shall prima-facie be responsible for collection, segregation of concrete, soil and others and storage of construction and demolition waste generated, as directed or notified by the concerned local authority in consonance with these rules. (b) The generator shall ensure that other waste (such as solid waste) does not get mixed with this waste and is stored and disposed separately</p>	<p>Applicable-Guidelines in compliance to this act are summarized in Annexure 2</p>	<p>Permission for collection &amp; disposal of Construction And Demolition Waste</p>	<p>Construction phase- Contractor/ NPCC</p>
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<p>Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016.</p>	<p>Protection to the general public against improper handling and disposal of hazardous wastes. Hazardous Waste Management Rules are notified to ensure safe handling, generation, processing, treatment, package, storage, transportation, use reprocessing, collection, conversion, and offering for sale, destruction and disposal of Hazardous Waste.</p>	<p>Applicable- Provisions of act shall be applicable and Authorization from SPCB is to be required for handling and Storing of hazardous waste like waste oil/lubricants.</p>	<p>Consent for handling and Storing of hazardous waste like waste oil/lubricants</p>	<p>Construction phase- Contractor/ NPCC  Operational phase- Hospital Administration</p>
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<p>Manufac ture, Storage and Import of Hazardo us Chemical s Rules, 2000 (as amended )</p>	<p>To provide provisions &amp; necessary precautions to prevent major accidents and limit their consequences to humans and the environment</p>	<p>Applicable- Notifying Competent Authority of storage of hazardous substances like lab chemicals, LPG etc. Occupier shall comply all the directions and procedures with respect to isolated storage of hazardous chemicals, regarding- (i) activities and quantity of isolated storage of a hazardous chemicals listed in schedule 1 and schedule 2. (ii) Notification of major accidents as per Rules 5(1) and 5(2) (iii) Notification of sites as per Rules 7 to 9. (iv) Safety reports in respect of isolated storages as per Rule 10 to 12. (v) Preparation of on-site emergency plans as per Rule 13.</p>	<p>Consent for storage &amp; import of hazardous chemicals</p>	<p>Operational phase- Hospital Administration</p>
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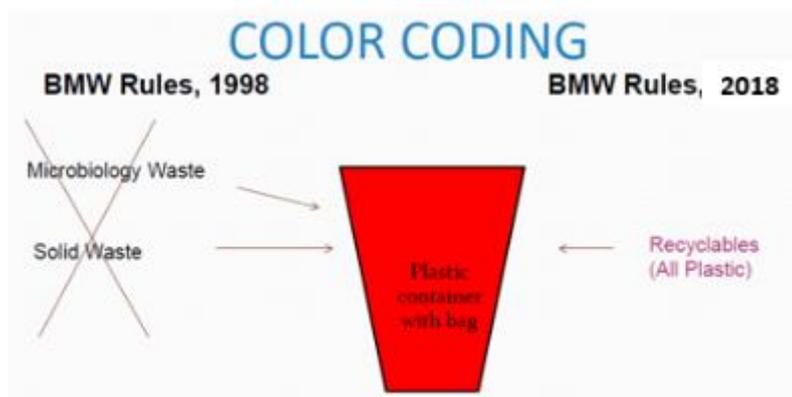
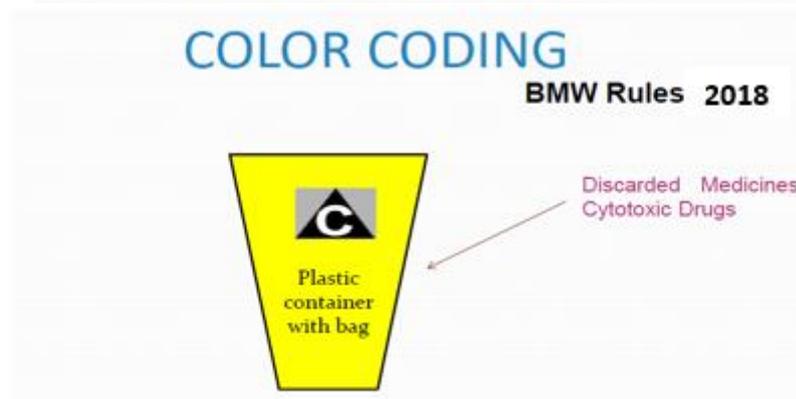
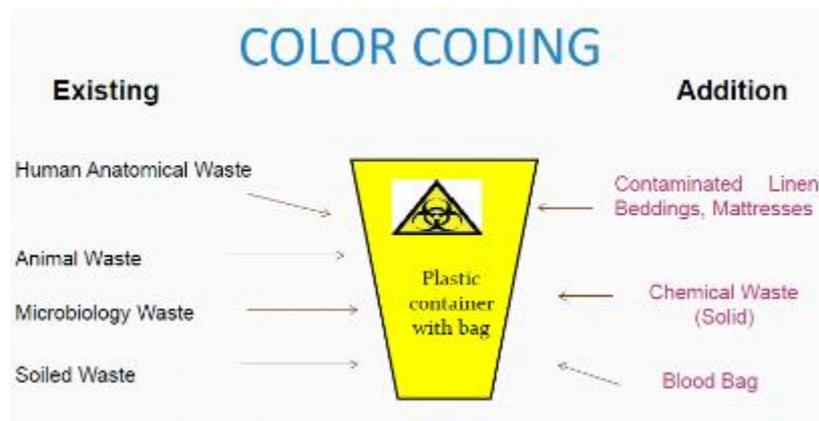
Bio-medical Waste (Management & Handling) Rules, 2016	To improve the collection, segregation, processing, treatment and disposal of these bio-medical wastes in an environmentally sound management thereby, reducing the bio-medical waste generation and its impact on the environment, the Central Government reviewed the existing rule.	Applicable- these rules shall be applicable for proper collection, segregation, processing, treatment and disposal of bio-medical wastes generated during day to day functioning of Bone & Joint Hospital. Details of the rules mention in subsequent section of this chapter.	Compliance with BMW rules for its proper management	Operational phase- Hospital Administration
Central Motor Vehicle Act, 1988 Central Motor Vehicle Rules and (Amendment), 1989	To check vehicular air and noise pollution. Vehicles to be used for construction and other purposes need to meet the standards and certificates prescribed as per the Rules, 1989 to control noise, pollution, etc.	Applicable- All vehicles used at project construction should have of valid 'Pollution under Control' (PUC) Certificates issued as per Central Motor Vehicle Act	Obtaining Pollution under Control' (PUC) Certificates	Construction phase- Contractor/ NPCC  Operational phase- Hospital Administration
Jammu & Kashmir Preservation of Specified Trees Act of 1969 and Rules of 1969	To prevent cutting of specified trees listed in the Act	Applicable- Tree relocation/shifting/cutting permission is required under the proposed project.	Obtaining NOC for relocation/shifting or cutting permission of Chinar Tree located on site	Construction phase- NPCC/Contractor
The J&K Building Operation Control Act 1988	An Act to amend and consolidate the law relating to control of building operations in the State	Applicable- Prior to construction, permission need to be obtained from Srinagar Municipal Corporation	Obtaining Building Permission	Construction phase- NPCC/Contractor

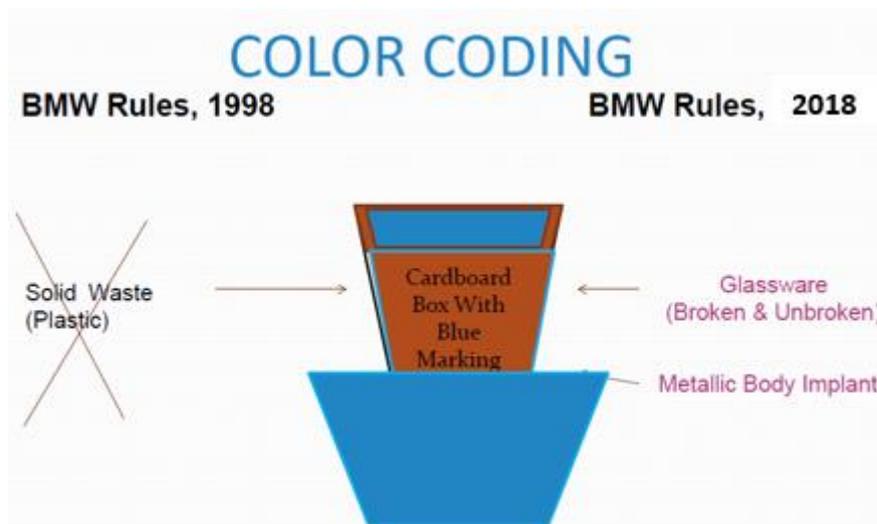
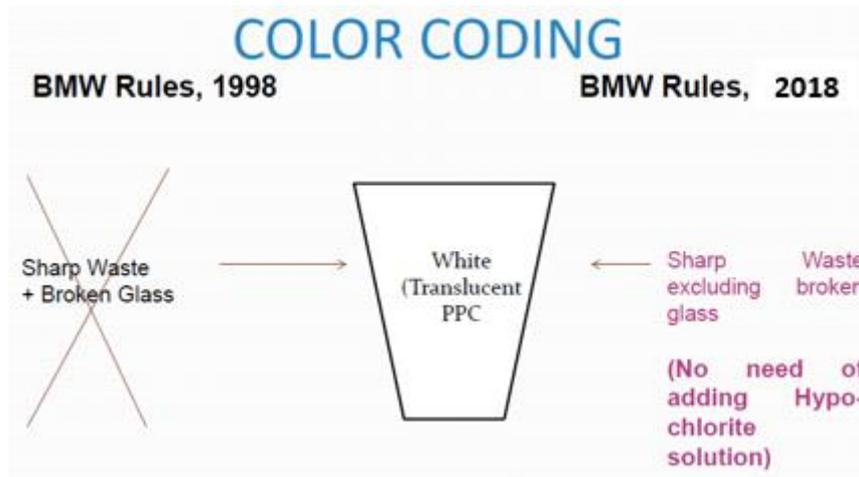
#### 5.4. Bio-Medical Waste Management (Amendment) Rules, 2018

Considering a hospital project, new biomedical waste management rules is summarized in this section for better understanding so proper implementation and compliance of the rule shall be ensured. Some of the important applicable changes have been described as under:

##### a) CHANGES IN COLOR CODING SCHEME FOR BMW :

A drastic change in colour coding has been done with the implementation of new Rules & their subsequent amendments:





b) **Segregation of waste** in colour coded bags has to be follow. The following protocol as per the Bio-Medical Waste Management (Amendment ) Rules, 2018 .

## SEGREGATION OF WASTE IN COLOR CODED BAGS

YELLOW BAGS	RED BAGS	WHITE TRANSLUCENT PPC	BLUE MARKING CARDBOARD BOX	GREEN CONTAINER
Anatomical Waste, Soiled Waste, Microbiology & Lab Waste, Discarded Medicines, Cytotoxic Drugs, Soiled Linen & Beddings, Blood Bags and Chemical Solid Waste	Plastic Waste such as catheters, urine bags, syringes (without needles) and vaccutainers with their needles cut	Sharp Waste including metals like Needles, syringes with fixed needles, needles from needle tip cutter or burner, scalpels, blades etc.	Broken or discarded and contaminated glass including medicine vials and ampoules except those contaminated with cytotoxic wastes.	General Waste like paper, kitchen waste, wrappers etc.
				

The Bone & Joint hospital was visited by the team in Nov '19. An interaction was done with all the stake holders including the Dean, Medical Superintendent, and Deputy MS, Staff nurses, workers and the sanitation staff. While discussing, it was concluded that there is an awareness about the new rules at most of levels but still there are many gaps in full understanding of new rules & their amendments.

### 5.5. List of Statutory Clearances and Authorizations Required

According to World Bank OP 4.01, the Bank screens each proposed project to determine the appropriate extent and type of Environmental Assessment required. It classifies the proposed project into one of four categories, depending on the type, location, sensitivity, scale of the project and the nature and magnitude of its potential environmental impacts. Screening of JTFRP was done at initial stages of the project and it is categorized 'Category A' project (World Bank Category).

The Government of India procedures on externally aided projects entail that all projects must be prepared and implemented in full compliance with the national legislation, regulations and standards governing protection and management of the cultural and natural heritage, social development, and environmental management. It is expected that certain permission, clearances and authorizations need to be obtained from competent authorities during the design, planning and implementation of the Bone & Joint Hospital sub-project. These applicable statutory clearances and authorization/permission/NOC required for Bone & Joint Hospital sub-project are listed in the Table 5.3.

**Table 5.3 List of Permissions (Consents/Authorizations/NOC) Required for 120 Bedded Specialized Orthopaedic unit (including Six Bedded ICU) at Bone & Joint, Hospital, Srinagar (J&K) under JTFRP**

S.No	Permissions (Authorization/ Permission/NOC) Required under Bone & Joint Hospital Project	Applicable Act/Guidelines	Relevant Section of the Act/Rules to obtain Permission	Competent Authority & Contact Details	Applicant	Responsibility to obtain permission	Application Form/Procedure & Documents Required to obtain Authorization/ Permission/NOC
1.	Tree Cutting Permission/ Pruning of Tree Branches	Jammu & Kashmir Preservation of Specified Trees Act, 1969 / Jammu & Kashmir Preservation of Specified Trees Rules, 1969	Section 4 of the Act	J&K Forests Dept. Srinagar  <b>Contact Address:</b> PCCF, Forest Complex, Sheikh Bagh, Near Lal Chowk, Srinagar, J&K – 190001 Phone- 0194-2455027 0194- 2483937	Hospital Administration/ authorized agency	R&B Dept./NPCC	Application for the grant of permit for felling of a specified tree under section 4 should be submitted in the prescribed format mention in Form A. <b>Application FORM –A is provided in Annexure-1</b>  For Further Details: <a href="http://www.jkforest.gov.in/act/Preservation Tree Act with Rules.pdf">http://www.jkforest.gov.in/act/Preservation Tree Act with Rules.pdf</a>
2.	Building Permission	J&K Municipal Corporation Act 2000/ Approval of Building Plans in pursuance to Municipal Building Bye-Laws/ Master Plan 2011	Section 243,244 of the J&K Municipal Corporation Act 2000	Srinagar Municipal Corporation  <b>Contact Address:</b> MA Road, Lal Chowk, Srinagar, J&K - 190001 Phone- 0194 247 0465	Hospital Administration/ authorized agency	R&B Dept./NPCC	Application procedure and Documents required for Permission are provided in <b>Annexure-2</b>  For Further Details: <a href="https://smcsite.org/download/Building%20Permission%20Procedure">https://smcsite.org/download/Building%20Permission%20Procedure</a>

**Table 5.3 List of Permissions (Consents/Authorizations/NOC) Required for 120 Bedded Specialized Orthopaedic unit (including Six Bedded ICU) at Bone & Joint, Hospital, Srinagar (J&K) under JTFRP**

S.No	Permissions (Authorization/ Permission/NOC) Required under Bone & Joint Hospital Project	Applicable Act/Guidelines	Relevant Section of the Act/Rules to obtain Permission	Competent Authority & Contact Details	Applicant	Responsibility to obtain permission	Application Form/Procedure & Documents Required to obtain Authorization/ Permission/NOC
3.	NOC for Fire Safety	The Jammu and Kashmir Fire Force Act, 1967.	-	Govt. of J&K, Directorate of Fire & Emergency Services, J&K Srinagar	Hospital Administration/ authorized agency	R&B Dept./NPCC	Application procedure and Documents required to take NOC are provided in <b>Annexure-3</b>  For Further Details: <a href="https://fireandemergency.jk.gov.in/pdf/FIRE_NOC.pdf">https://fireandemergency.jk.gov.in/pdf/FIRE_NOC.pdf</a>
4.	Authorization for Bio-medical Wastes Management	Bio-Medical Waste Management (Amendment) Rules, 2018	Rule 10 of BMW Rules 2016	J&K State Pollution Control Board.  <b>Contact Address:</b> JKPCB, Parivesh Bhawan, Shiekh-ul-Campus, behind Govt. Silk Factory, Raj Bagh, Srinagar(J&K) Phone- 0194-2311165	Hospital Administration/ authorized agency	R&B Dept./NPCC	Application For Authorisation Or Renewal Of Authorisation is Need To Be Submitted In Form-II of The Rules <b>(See annexure-4)</b> Details- <a href="http://jkspcb.nic.in/WriteReadData/userfiles/file/Act%20and%20Rules/Bio-Medical%20Waste%20Management%20Rules,%202016_.pdf">http://jkspcb.nic.in/WriteReadData/userfiles/file/Act%20and%20Rules/Bio-Medical%20Waste%20Management%20Rules,%202016_.pdf</a>
5.	Pollution Under Control Certificate	Central Motor Vehicle Act 1989/JK	Sub-rule (7) of Central Motor Vehicle Act	Motor Vehicle Department (Transport	Contractor	Contractor/ NPCC	PUC can be obtain from Pollution checking centre

**Table 5.3 List of Permissions (Consents/Authorizations/NOC) Required for 120 Bedded Specialized Orthopaedic unit (including Six Bedded ICU) at Bone & Joint, Hospital, Srinagar (J&K) under JTFRP**

S.No	Permissions (Authorization/ Permission/NOC) Required under Bone & Joint Hospital Project	Applicable Act/Guidelines	Relevant Section of the Act/Rules to obtain Permission	Competent Authority & Contact Details	Applicant	Responsibility to obtain permission	Application Form/Procedure & Documents Required to obtain Authorization/ Permission/NOC
	(Applicable for construction vehicles)	Motor Vehicle Act 1991		Department), Govt. of J&K			established by Motor Vehicle Department of J&K.
6.	Disposal of Construction And Demolition Waste	Construction And Demolition Waste Management Rules,2016	Rule 4 of the C&D Waste Management Rules 2016	Srinagar Municipal Corporation <b>Contact Address:</b> MA Road, Lal Chowk, Srinagar, J&K - 190001 Phone- 0194 247 0465	Contractor	Contractor/ NPCC	1-Duties of the waste generator (for collection, segregation, storage, transport & disposal) are defined in the C&D Waste Management Rules 2016. Also summarized in the EIA report. 2- All the C&D waste should be disposed of at C&D waste Processing & disposal facility developed under the Act by the municipal body. 3- In the absence of C&D waste processing & disposal facility, contractor shall approach to Municipal body for further direction and necessary actions.

**Table 5.3 List of Permissions (Consents/Authorizations/NOC) Required for 120 Bedded Specialized Orthopaedic unit (including Six Bedded ICU) at Bone & Joint, Hospital, Srinagar (J&K) under JTFRP**

S.No	Permissions (Authorization/ Permission/NOC) Required under Bone & Joint Hospital Project	Applicable Act/Guidelines	Relevant Section of the Act/Rules to obtain Permission	Competent Authority & Contact Details	Applicant	Responsibility to obtain permission	Application Form/Procedure & Documents Required to obtain Authorization/ Permission/NOC
7.	Storage, handling and transport of hazardous materials (such as oil/lubricants and lab chemicals and gases)	1-Hazardous and Other Wastes (Management and Trans. boundary Movement) Rules, 2016. 2-Manufacture, Storage and Import of Hazardous Chemicals Rules, 2000 (as amended)	1-Rule 6 (1) of the Hazardous and Other Wastes (Management and Trans. boundary Movement) Rules, 2016.	J&K State Pollution Control Board.  <b>Contact Address:</b> JKPCB, Parivesh Bhawan, Shiekh-ul-Campus, behind Govt. Silk Factory, Raj Bagh, Srinagar(J&K) Phone- 0194-2311165	Hospital Administration/ authorized agency	Contractor/ NPCC	Application For Authorisation is need to be Submitted In Form-I of the Rules ( <b>See annexure-5</b> )  For Further Details: <a href="https://www.jspcb.nic.in/upload/5d6caa61c7ea45b2ce1ca2c699HWMRules2016.pdf">https://www.jspcb.nic.in/upload/5d6caa61c7ea45b2ce1ca2c699HWMRules2016.pdf</a>
8.	Consent to Establish (CTE) & Consent to Operate (CTO) for STP & ETP	1-Water (Prevention and Control of Pollution) Act, 1974 as amended 2-Air (Prevention and Control of Pollution) Act, 1981 as amended	1-Section 25/26 of Water (Prevention and Control of Pollution) Act, 1974 2- Section 21 of Air	J&K State Pollution Control Board.  <b>Contact Address:</b> JKPCB, Parivesh Bhawan, Shiekh-ul-Campus, behind Govt. Silk Factory, Raj Bagh, Srinagar(J&K) Phone- 0194-2311165	Hospital Administration/ authorized agency	Contractor/ NPCC	<i>1-Application form Schedule-I, duly filled in and signed by the Proprietor/authorised representatives (see Annexure 6A)</i> <i>2-Other required documents</i>  <i>(See annexure 6B)</i>  For Further Details:

**Table 5.3 List of Permissions (Consents/Authorizations/NOC) Required for 120 Bedded Specialized Orthopaedic unit (including Six Bedded ICU) at Bone & Joint, Hospital, Srinagar (J&K) under JTFRP**

S.No	Permissions (Authorization/ Permission/NOC) Required under Bone & Joint Hospital Project	Applicable Act/Guidelines	Relevant Section of the Act/Rules to obtain Permission	Competent Authority & Contact Details	Applicant	Responsibility to obtain permission	Application Form/Procedure & Documents Required to obtain Authorization/ Permission/NOC
			(Prevention and Control of Pollution) Act, 1981 as amended				<a href="http://jkspcb.nic.in/Content/ConsentFees.aspx?id=386">http://jkspcb.nic.in/Content/ConsentFees.aspx?id=386</a>
9.	Permission for PHED Water Supply	Jammu and Kashmir Water Resources (Regulation and Management) Act, 2010	under section 8 of the Act	Public Health Engineering Department Kashmir District Srinagar, Jammu and Kashmir 190003. Phone- 099000753.	Hospital Administration/ authorized agency	Contractor/ NPCC	Application Form for PHED for Water Supply Permission /Connection <b>(See Annexure-7)</b> For Further Details: <a href="http://www.phe Kashmir.com/">http://www.phe Kashmir.com/</a> <a href="http://jkpheirrigation.nic.in/act/Water_Resources%20act.pdf">http://jkpheirrigation.nic.in/act/Water_Resources%20act.pdf</a>
10.	NOC for Ground Water Abstraction (In case of limited water supply permission from PHED)	Central Ground water Authority-Guidelines/Criteria for evaluation of proposals/requests for ground water abstraction ,	Exercise of powers under Section 5 of the Environment (Protection) Act, 1986	Jammu Kashmir Water Resources Regulatory Authority  <b>Contact address:</b>	Hospital Administration/ authorized agency	Contractor/ NPCC	Application for permission to abstract groundwater for infrastructure Projects <b>(See Annexure-8)</b>  Online application portal-

Table 5.3 List of Permissions (Consents/Authorizations/NOC) Required for 120 Bedded Specialized Orthopaedic unit (including Six Bedded ICU) at Bone & Joint, Hospital, Srinagar (J&K) under JTFRP

S.No	Permissions (Authorization/ Permission/NOC) Required under Bone & Joint Hospital Project	Applicable Act/Guidelines	Relevant Section of the Act/Rules to obtain Permission	Competent Authority & Contact Details	Applicant	Responsibility to obtain permission	Application Form/Procedure & Documents Required to obtain Authorization/ Permission/NOC
				Syed Chowk, Brein Nishat, Srinagar - 191121  Phone Number- 0194 - 2461829,			<a href="http://cgwa-noc.gov.in/LandingPage/index.htm">http://cgwa-noc.gov.in/LandingPage/index.htm</a>  For Further Details: <a href="http://cgwa-noc.gov.in/LandingPage/Guidlines/1-EvaluationofProposalsRequestsforGroundWaterAbstraction1.pdf">http://cgwa-noc.gov.in/LandingPage/Guidlines/1-EvaluationofProposalsRequestsforGroundWaterAbstraction1.pdf</a>
11	Compliance of Employee/Labor Act related to service and their welfare measure as per the provisions of government of India	1-Minimum Wages Act 1948, 2-Contract Labour (Regulation & Abolition) Act 1970 3-Inter-State Migrant Workmen (Regulation of Employment & Conditions of Services) Act 1979	-	Chief Labour Commissioner/Chief Inspector of Inspection of Building and Construction  <b>Contact Address:</b> Office of Labour Commissioner Near General Bus Stand, Batamaloo,	Contractor	Contractor/ NPCC	It is the duty of the Contractor to do compliance of Employee/Labour Acts related to service and their welfare measure as per the provisions of government of India/State Govt.

**Table 5.3 List of Permissions (Consents/Authorizations/NOC) Required for 120 Bedded Specialized Orthopaedic unit (including Six Bedded ICU) at Bone & Joint, Hospital, Srinagar (J&K) under JTFRP**

S.No	Permissions (Authorization/ Permission/NOC) Required under Bone & Joint Hospital Project	Applicable Act/Guidelines	Relevant Section of the Act/Rules to obtain Permission	Competent Authority & Contact Details	Applicant	Responsibility to obtain permission	Application Form/Procedure & Documents Required to obtain Authorization/ Permission/NOC
		4-The Building and other construction workers (Regulation and Employment of Service) Act, 1996 5- The Building and other construction workers Welfare Cess Act 1996		Srinagar-190009 Phone: 0194-2472524-(S)			

## CHAPTER – 6: POTENTIAL ENVIRONMENTAL IMPACTS

### 6.1. Potential Environmental Impacts

Based on the baseline environmental features of the project area and the proposed engineering works under Bone and Joints project, this section assesses the impacts of the proposed activities on various environmental attributes of the project area. The assessment has been done for nature, types and magnitude of the potential impacts likely to be caused by various project activities which may affect various environmental components. A wide variety of direct and indirect impacts have been identified for the project life cycle to understand the risks and impacts associated with the activities to be performed during preconstruction/design phase, construction phase and operational phase of the Bone & Joint Hospital project.

Based on the Potential Interactions between project activities and environmental component over all impacts are divided in three phases

- Impacts during designing and preconstruction phase
- Impacts during Construction Phase
- Impacts during Operational phase

### 6.2. Impacts during designing and pre-construction phase

Impacts/issues were identified during designing and pre construction phase of the project are summarized below in Table 6.1

Table 6. 1: Impacts during designing and Preconstruction Phase

Activities During designing and preconstruction phase	impacts
Location of the Project Site	Inundation and loss of resources created under the project during future flood event (if any ) as project site is located at the bank of flood channel

Architectural and structural Designing of Proposed hospital block	If not properly designed, it may enhance the environmental foot prints of the project, reduce sustainability and efficiency
Consents, Permits, clearances, No Objection Certificate (NOCs)	Failure to obtain necessary consents, Permits, NOCs, etc. may result to design revisions and/or stoppage of works
Sources of Materials	Material from unauthorized/illegal sources may disrupt natural environment. Construction quality may also be affected by using substandard materials
Shifting of utilities viz. (electric lines, poles, telephone lines, water pipes and DG set area	Disruption of essential and emergency services.

### 6.3. Impacts due to Construction and Operation of the Project

For the construction and operational phase of the project, several activities and pollution sources as depicted in Fig. 6.1 were identified which may have the potential impacts on the environmental components during the construction and operation phase of the project. These activities and probable potential environmental impacts on different environmental components are discussed in the following sections:



### Construction phase

- Demolition of structures & Cutting of Chinar Trees
- Traffic movement & its circulation in and around the hospital campus
- Air pollution due to movement/operation of construction equipment's
- Fugitive emissions from construction material loading and unloading
- Spillage of oil, chemicals and hazardous wastes from storage area
- Soil contamination & Disposal of debris
- Discharge of wastewater from labour camps
- Ambient Air and Noise pollution due to operation of DG sets
- Noise/Vibration due to demolition Excavation Mixing, casting, cutting and movement of machinery



### Operational phase

- Biomedical waste generation from hospital
- Solid waste and hazardous waste generation from hospital
- Wastewater generation (sewage/laundry waste)
- Sewage sludge generation from STP
- Release of odour gases from STP
- Ambient air and noise pollution due to operation of DG sets
- Spillage of oil, chemicals & hazardous wastes from storage area

Fig.6.1: Possible sources/activities of pollution during construction and Operational Phase of the Project

#### 6.3.1. Land Environment (Land Use/Land Cover/Soil)

##### Construction phase

Demolition of existing structures located on the proposed hospital site will be done as a first phase of construction activity. However, there will be no change on land cover which remain under built-up area category after construction of proposed project.

During the construction phase, soil erosion and loss top soil will be susceptible to erosion to some extent due to site clearance activities. The scale of site clearance activities would be limited to construction footprints of Bone & Joint Hospital.

General construction waste generation at proposed Bone & Joint block site will comprise of surplus or off-specification materials and solid wastes generated by the construction workforce. A small proportion of the waste generated during demolition and construction phase will be hazardous and may include used oil from DG sets and construction machineries, hydraulic fluids, waste fuel, grease and waste oil containing rags.

##### Operational Phase

The operational phase of the Project will have limited impacts on soil in form of waste and waste water generation and soil contamination due to accidental spillages/ leakages of chemical and improper disposal of hazardous and biomedical wastes. In the operational phase of the sewage and effluent discharged from laundry and kitchen waste water will be treated in proposed STP (175 KLD capacity) and ETP (47 KLD capacity). Apart from this, 300 kg of Bio-medical waste will be generated daily from this newly constructed block. If this waste improperly managed, it could create adverse impacts on land, soil and surrounding environment.

Summary of proposed project impact on Land Environment is mentioned in Table 6.3.

Table 6. 2: Impact on Land Environment due to Proposed Project

Impact	Land Environment				
Impact Nature	Negative		Positive	Neutral	
Impact Type	Direct		Indirect	Induced	
Impact Duration	Temporary	Short term	Long term	Permanent	
Impact Extent	Local	Regional	National	International	
Impact Scale	Limited to Project Site near Bone & Joint Hospital New block area				
Frequency	Construction & Operational phase				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered minor				

### 6.3.2. Water Environment

#### Impact on water, including its usage, sources and quality-

##### Construction Phase

Water will be required for civil works during the construction of the foundation for both buildings and utility structures, dust prevention, curing etc. and for consumption and use by workers. It is advisable to use recycled water, if available nearby or to use river water (after permission) for construction purpose. For labour camp it is estimated that 4.5 KLD water will be required to supply at labour camp considering 90 LPCD for peak labour force of 50

persons. For tanker water supply of labour camp from PHED or other authorized source will be ensured by the Contractor during construction phase.

Proposed project is not going to use ground water for construction activities, thus there will not be any impact envisaged on ground water resources.

### Operational Phase

For the proper integration of infrastructures created under the proposed project, water demand and infrastructure required for water storage and supply is estimated for old and new building jointly. Total fresh water demand water is estimated 153.5 KLD which will be met through PHED water supply. Apart from this, 52.9 KLD water will be required for flushing and 35 KLD will require for horticulture. Total 46.1 KLD wastewater will also be generated from laundry and kitchen. There will be potential chances for pollution of surface and groundwater resources resulting from improper management of sewage and wastewater generated during construction and operation phase of the project.

Improper handling and management of solid and biomedical wastes may lead to contamination of surface water source during rains.

### Impact on Drainage

No major impact on drainage will be envisaged during construction and operational phase of proposed new block. However, during construction phase, there may be slightly disturbance in drainage pattern due to excavation and stock piling near the drainage or drain which can be easily managed by proper planning and applying best construction practices. Summary of proposed project impact on Water Environment is mentioned in Table 6.4.

Table 6. 3: Impact on Water Environment due to Proposed Project

Impact	<i>Impact on Water Environment</i>				
Impact Nature	Negative		Positive	Neutral	
Impact Type	Direct		Indirect	Induced	
Impact Duration	Temporary	Short term	Long term	Permanent	
Impact Extent	Local	Regional	National	International	
Impact Scale	Limited to Bone & Joint Hospital Area				
Frequency	Construction & Operational phase				
Impact Magnitude	Positive	Negligible	Small	Medium	Large

Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered minor				

### 6.3.3. Air Environment

#### Impact on Air quality

##### Construction Phase

During the demolition and construction of proposed hospital block, generation of dust, fugitive and exhaust gases may trigger the air pollution. Certain amount of dust and gaseous emissions will generate during the construction phase from excavation and construction equipment's. The dust and fugitive emissions from construction material loading and unloading areas are likely to remain highly localised and confined to the Project area, but would require adequate mitigation measures to prevent their spread to existing hospital block and outside the project area.

Pollutants of primary concern include particulate matters i.e. PM<sub>10</sub> and PM<sub>2.5</sub>. Generation of exhaust gases (NO<sub>x</sub>, CO) is likely due to movement and operation of heavy machinery and operation of DG set for construction. Although the impact will be much localized, it can spread downwind direction depending upon the wind speeds. Increase in air pollution level from mobile and stationary sources during construction phase will be short-term impact on the air quality which is not expected to be significant.

##### Operational phase

Stack Emission from DG sets will be the prime source of air pollution during operational phase. Vehicular emission from the vehicles approaching new hospital block may also impact the air quality. Apart from this, odour may also be released if STP malfunction and improper handling and storage of solid/biomedical waste will be done.

Summary of proposed project impact on air environment is mentioned in Table 6.5.

Table 6. 4: Impact on Air Environment due to Proposed Project

Impact	<i>Impact on Air Environment</i>		
Impact Nature	Negative	Positive	Neutral
Impact Type	Direct	Indirect	Induced

Impact Duration	Temporary	Short term	Long term	Permanent	
Impact Extent	Local	Regional	National	International	
Impact Scale	Limited to Bone & Joint Hospital Area				
Frequency	Construction & Operational Phase				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered minor				

#### 6.3.4. Impact on Noise Level

##### Construction Phase

Proposed 120 bedded hospital block is to be constructed within the existing premises of Bone & Joint Hospital which make it very sensitive and susceptible to noise pollution. Noise generated during demolition and construction phase which may hinder communication among staff, causing annoyance, irritation and can also impact patients' ability to rest, heal and recover. During the construction phase of proposed Bone & Joint Hospital Block, the major sources of noise and vibration would be excavation, drilling, cutting, mixing, casting, operation of DG sets and material movements. These primary noise generating activities will be uniformly distributed over the entire construction period. Construction activities are anticipated to produce noise levels in the range of 70-75 dB(A). However, during deep excavation and drilling it may go up to 80 dB(A) and this will occur only when all the equipment operates together and simultaneously.

As per regulatory requirements, threshold noise level around the sensitive areas like hospitals should not be more than 50 dB(A) in day time and at night 40 dB(A). For the construction site, maximum noise levels should be limited to 75 dB(A) Leq (5 min.)

The workers in general are likely to be exposed to an equivalent noise level of 70 to 80 dB (A) in an 8-hour shift, for which all statutory precautions should be taken into consideration. However, careful planning of machinery selection, operations, shielding and scheduling of operations can reduce these levels.

##### Noise attenuation during construction phase

It is expected that operation of construction equipment's will generate noise levels between 70-80 dB(A). The sound pressure level generated from the noise sources decreases with

increasing distance from the source due to wave divergence. Noise attenuation with respect to distance in all the direction over horizontal distance have been estimated by using SOUND PLAN 8.1.

### Model Input/Consideration

It is expected that operation of construction equipment's will generate noise levels between 70-80 dB(A). In the model 5 major noise sources which generally use in construction were selected and noise pressure levels of these sources considered as model input are summarized below:

**Model Input –Noise Source**

Noise Source	Height of Source	Noise dB (A)	No.
Excavator	2.0 m	69.6	1
Crane Mounted Auger	1.5 m	79.4	1
Water Pump	1.0 m	80.0	1
Generator for Power supply	1.0 m	70.0	1
Truck	1.5 m	80.0	1

### Model Output

For the estimation of dispersion of noise in the ambient air, model SOUND PLAN 8.1 is used. In the present case, noise Impact predicted for scenario, where 5 major sources of noise will work simultaneously then what will be the Noise Impacts on nearby hospital buildings and residential areas. Apart from this, noise impact were also predicted at nearest hospital building for the scenario where at the time of construction source of noise shifted vertically from ground floor to the higher floor (G+5).

Considering model output summarized in Table 6.6 and Fig.6.2, Noise level is expected to be received 60-65 dB(A) at nearest hospital building site. As per regulatory requirements, threshold noise level around the sensitive areas like hospitals should not be more than 50 dB(A) in day time. Therefore, it can be easily achieved by providing 3 m heighted barriers between construction site and operational hospital block. Regular maintenance of equipment's, machinery and construction vehicles will also be ensured to reduce the noise.

It can be also concluded that expected noise impact will be short term and minor in nature where Noise levels can be:

- Without Barrier it was 60-65 dB(A)
- With Barrier 2 m height: 55-60 dB(A) at Nearest hospital Building
- With Barrier of 3m height: 45-50 dB(A) at Nearest hospital Building

Therefore, Noise barrier metal sheet (GI) of 3 m height at least required as barrier having noise absorption loss 9 dB (A) & Transmission Loss 30 dB(A) – GI sheet 3 mm.

Table 6.6- Noise attenuation from Point of Generation (Proposed Bone & Joint Hospital Construction Site) to certain distance

Source Location	Noise attenuation at nearest hospital Building dB (A) Without barrier	Noise attenuation at nearest hospital Building dB (A) With barrier of 3 m height- having noise absorption loss 9 dB(A) & Transmission Loss 30 dB(A)
Ground Floor	60-65	45-50
G+1	60-65	45-50
G+2	57-59	43-48
G+3	52-55	40-45
G+4	47-50	<40
G+5	42-50	<40

Fig.6.2: Noise attenuation from Point of Generation (Proposed Bone & Joint Hospital Construction Site) to certain distances



### Operational Phase

- Noise from DG sets is only source of noise pollution during operational phase.
- Vehicular emission from the vehicles approaching new hospital block.
- Noise from pumps/blower at the proposed STP Noise from laundry operation

Summary of proposed project impact on noise levels is mentioned in Table 6.7.

Table 6. 7: Impact on ambient Noise due to Proposed Project

Impact	<i>Impact on ambient Noise</i>				
Impact Nature	Negative		Positive	Neutral	
Impact Type	Direct		Indirect	Induced	
Impact Duration	Temporary	Short term	Long term	Permanent	
Impact Extent	Local	Regional	National	International	
Impact Scale	Limited to Bone & Joint Hospital Area				
Frequency	Construction & Operational Phase				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered minor				

#### 6.3.5. Biological Environment

##### Impact on terrestrial flora and fauna

##### Construction Phase

Proposed Bone & Joint hospital block site is a located within a confined area and there is no ecologically sensitive areas like national parks or wildlife sanctuaries and reserved forests located nearby. However, at the construction site, 4 Chinar trees are exist which will try to be relocated or de-rooted with prior permission of forests department. As far as aquatic flora and fauna is concerned, there will not be any impact envisaged due to proposed

project. Following are the impacts that may arise on Terrestrial Flora and Fauna due to proposed Bone & Joint hospital project;

- Relocation/shifting/cutting of 4 Chinar Tree located at Construction Site
- Apart from Chinar trees, there are 8 small local shrubs also exist which require cutting
- Vegetal cover loss at the time of dumping of debris and construction wastes
- Noise disturbances of native fauna during construction activities

### Operational Phase

During the operation phase, landscaping and plantation will be developed and maintained at the hospital, which will enhance flora and fauna at the site and has marginal positive impact on the biological environment. Summary of proposed project impact on Biological Environment is mentioned in Table 6.8.

Table 6. 8 Impact on Biological Environment due to Proposed Project

Impact	<i>Impact on Terrestrial Flora and Fauna</i>				
Impact Nature	Negative		Positive	Neutral	
Impact Type	Direct		Indirect	Induced	
Impact Duration	Temporary	Short term	Long term	Permanent	
Impact Extent	Local	Regional	National	International	
Impact Scale	Limited to Bone & Joint Hospital Area				
Frequency	Construction & Operational Phase				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered minor				

#### 6.3.6. Other construction stage impacts

##### Impact on properties & utilities

Proposed new block will be constructed at extreme back side of the Hospital which is adjacent to Dhoodh Ganga canal (flood canal) and opposite to the existing IPD block of the hospital. In the existing situation, there are four existing old buildings viz. PG hostel, Nurses

hostel, residents and MS quarter situated at the site which will be demolished to provide space for new block. Other than the buildings, there are four Chinar Trees also exist on the proposed site which will try to relocate/cut down with prior permission of State Forests Dept. There are three defunct electric and light poles are also located at site which will be dismantled with prior permission of concerned department. An underground water supply tank of 50 KL capacity is also existed near PG hostel which will only be dismantled after giving suitable alternative with prior permission of Hospital administration. During construction, there are some small utility structures like poles and water line may require shifting and alternative arrangements. Prior permission should also be ensured by contractor from Hospital administration and other associated departments to start demolition and construction activities without disrupting any associated service.

### **Impact on permanent or temporary use of spaces and facilities**

Due construction of proposed block, existing 4 buildings will be demolished to provide space for new building. Apart from this, temporary material storage sites and labour camp would also be constructed during the constructional phase of the project. There is only one approach road is available to get access in the hospital campus for patients and visitors, hence use the same approach road in day time is not advisable. Therefore an alternate approach road would better and feasible option. Use of alternative road should only be done with prior permission of concerned authorities and hospital administration.

### **Occupational Health and safety issues during construction phase**

The engagement with various construction activities will involve a range of occupational health and safety risks and hazards mainly for the contractors and workers who are involved in the demolition and construction works. Major occupational health and safety issues viz. falls (from heights); collapse of uncompleted structure, electric shock, hearing loss, injuries due to failure to use proper personal protective equipment etc. cannot be ignored and should be taken in to account for proper management to ensure complete safety of workers. The scale of construction activities would be limited to only a section of the project footprint area where construction activities will be undertaken but utmost care should also be taken to prevent any safety and health hazards to patients, visitors and doctors.

### **Occupational Health and safety issues during operation phase**

Inadequate Bio-Medical waste management may cause several issues occupation health and safety issues to the workers and staff dealing with bio-medical wastes. Environmental pollution, unpleasant smell, growth and multiplication of vectors like insects, rodents and worms and may lead to the transmission of diseases like typhoid, cholera, hepatitis and AIDS through injuries from contaminated syringes and needles.

The Bio Medical Waste scattered in and around the hospitals invites flies, insects, rodents, cats and dogs that are responsible for the spread of communication disease. Dealing workers or rag pickers sorting out the garbage are always at a risk of getting tetanus and HIV infections. The recycling of disposable syringes, needles, IV sets and other article like glass bottles without proper sterilization are responsible for Hepatitis, HIV, and other viral diseases.

### **Disruption/inconvenience to hospital services during construction phase**

Proposed site is located within the confined area of existing hospital thus there may be some disruption/inconvenience to hospital services such as

- Shifting and transfer of electric wires and connections ( by giving alternate arrangement)
- Dismantling of underground water tank may temporarily affect water supply
- Excavation and digging of exiting surface/paved area for laying of pipes
- Noise pollution
- Unwanted entry of people/labours in hospital area
- Inconvenience due to alternate route arrangements

### **Disruption/inconvenience to traffic/pedestrian movement during construction phase**

Hospital complex is located adjacent to residential colonies and commercial activities. However, proposed construction site is within the confined area but during material transport and haphazard parking of construction vehicles possibility of traffic congestion and pedestrian movement on the nearby roads cannot be ruled out. The scale of construction activities and use of machinery and vehicles is limited but alternative access for construction vehicles and construction timings should be planned in advance for better management.

### **Disposal of excess excavated earth and waste**

Total 20119 sq. feet area will be demolished which is standing on 7600 seq. feet floor area. Total quantity of construction and demolition waste to be disposed of is estimated 1988 Cum. An underground tank and old septic tanks will also require dismantling with prior permission. Majority of dismantled/demolished waste will require proper reuse or disposed of properly. Debris and excavated earth from other construction activities if not reused or managed properly it may flow into the surface water bodies or form mud puddles in the area. It can also harm to plant and vegetation and affect the drainage.

### **Establishment of labour camps**

There would be a small labour camp for max. 50 labours will be establish on the private land owned by Contractor (shown in Fig.). This site is almost 4 Km away from the construction site. Establishment of labour camp may have following impacts on environment:

- Discharge of wastewater
- Littering and sanitation issues
- Health and hygiene at the labour camp site
- Generation of solid wastes
- Security concerns at labour camp



Fig.6.2: Site of the Proposed Labour Camp

### 6.3.7. Other Operational Stage Issues/Impacts

Some of the major issues in the operational phase of the Bone & Joint hospital would may be due to

- Improper collection, transportation, storage and disposal of Biomedical wastes, hazardous/radioactive and general wastes (solid waste)

- Health and hygiene issues and odour from bio medical waste and solid waste collection points including temporary storage areas and STP sites
- Storage of flammables viz. HSD, LPG, other labs chemicals
- Risk of damages due to fire, flood, natural disaster and other emergency situations

#### 6.3.8. Opportunities for enhancement of Positive Impacts and Reduce the Environmental Footprints

There are several opportunities were identified to enhance the positive impacts and various alternatives, technologies considered to avoid or minimize impacts. Various environmental measures were also considered to ensure optimum use of natural and manmade resources in sustainable manner with minimal depletion, degradation and destruction of environment. Under the proposed Bone & Joint hospital project, following opportunities were identified for enhancement of Positive Impacts and reduce the environmental footprints of the project:

Provisions for sustainable building design

Minimize the demand on non-renewable resources

Maximize the utilization efficiency of non-renewable resources

Maximize the reuse, recycling and utilization of renewable resources

Uses minimum energy to power itself; uses efficient equipment to meet its lightening, air-conditioning, and other needs

Optimization of Water use & Adoption of Recycling and Reuse of wastewater

Use of alternative building material

Indoor Air Quality for Human Safety and Comfort

Effective Controls on Building Management Systems & Disaster Management

## CHAPTER-7: ANALYSIS OF ALTERNATIVES

### 7.1. With” and “Without project" Scenario

Proposed Project will be the extension of Govt. Bone & Joint Hospital, Srinagar which was exclusively established for orthopaedic cases and surgeries. Lot of damages was reported during 2014 flood event in the absence of flood resilient infrastructure and proper planning. Thus, it has been decided by the authorities to construct an additional 120 bedded building with the funding support of World Bank under JTFR project. Proposed Bone & Joint hospital block will ease the increasing pressure and demand for improved facilities, including the needs of present and future and to create a more resilient infrastructure. The proposed project will not only provide advance medical treatment facilities in orthopaedic cases and surgeries but also provide employment opportunities both during construction and operational phase of the project which ultimately enhance socio-economic status.

With the No Project Scenario, the state will not only lose the investment but also not be able to meet increasing demand of improved medical facilities. Apart from this, there is also absolute need for resilient infrastructure for this hospital to combat future flood incident if any. This opportunity will also be lost if proposed project will not be implemented.

### 7.2. Alternative Analysis with respect to Geographical Location

Proposed project is extension block of existing Bone & Joint hospital which could only be constructed within the Bone & Joint hospital campus. Thus, no alternative location is applicable.

### 7.3. Alternative Analysis with respect Green vs. Conventional Building Design

Proposed Bone and Joint hospital building is propose to be develop on green building concept. Project proponent will also try to take green building rating for this extension block of Bone & Joint hospital.

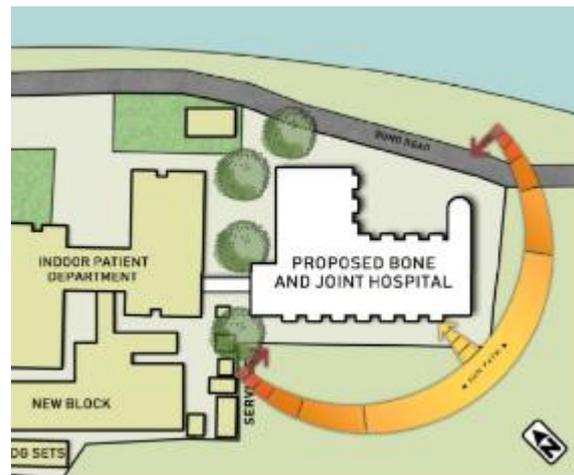
Green Building is one which utilizes fewer water, optimizes energy efficiency, conserves natural resources, generates less waste and provides healthier space for occupants as compared to conventional buildings. If we will compare the conventional buildings with green buildings then these are more energy efficient, have lower functioning and maintenance costs, provide improved comfort and wellbeing for occupants, have lower risk possible and reduce harmful impact on the atmosphere. Green buildings use key assets like energy, water, materials, and land more economically than conventional buildings, thus reducing the widespread impact created upon environment by conventional construction.

Conventional buildings don't integrate these efficient strategies to decrease the impact upon environment. So sometimes, the conventional methods of design and construction leads to utilization of natural resources, increased wastage, increased operational and maintenance costs and increased overall environmental foot prints. Looking to several benefits over conventional building designs, proposed project is considered to develop on green building designs. Details of proposed consideration are summarized below:

### Features proposed for Bone & Joint hospital -Green Building Designs:

Creation of environment friendly and energy efficient buildings is increasingly becoming imperative considering the relentless expansion of cities. The increasing urban expansion has placed tremendous pressure on the natural resources. Significant public buildings of national importance such as Bone & Joint Hospital must set an example to people by adopting sustainable building principals. Therefore, an integrated approach to sustainable building design have been adopted. Code and standards defined by IGBC, Indian Society of Heating, Refrigeration and Air-conditioning Engineers (ISHRAE), and American Society of Heating, Refrigeration and Air-conditioning Engineers (ASHRAE) are proposed to be adopted for new building.

In the proposed building, several measures have been proposed to manage environmental exposure conditions. From the solar radiation chart, it was clear that the large windows on north-western and southern –east faces will be provided to maximise the heat gains during winters. Step out solarium gets morning to afternoon sun. Apart from this, avoiding due east and west orientation cuts to excessive hear gain as well as glare.



- To economize on the use of energy, following main systems are proposed to be adopted:
- Adequate design to limit the losses in transmission and distribution system.
- Use of energy efficient devices like light sources such as LED.
- Use of insulation on roof top to reduce air-conditioning load.
- Use of capacitors at load centres to improve voltage and power factor to reduce
- Distributional losses and also to avoid penalty by state electricity authority.
- All high efficiency motors will be used in the building.
- High COP VRF System.
- Solar Energy will be used for part Electricity generation approximately 2 -3% for green

Building

- Provision of luminaries in various areas of the building will be designed to achieve the illumination levels as per relevant standards and site requirement. In order to reduce the carbon foot print and to reduce annual energy consumption of buildings, Grid Interactive (on Grid) solar photo voltaic (SPV) power plant shall be proposed on the roof of the building (PV plant without batteries).
- Minimum 10% of (Electrical load) shall be provided as solar panel. Hence 70 KW Solar panels shall be provided shall be placed and distributed on terrace and other areas as per space Available on site.
- HVAC services will have following features
  - Individual and quickly responding temperature control for each area
  - Draft-free air distribution & air cleanliness
  - Toilet room exhaust
  - Ventilation (makeup) air supply
  - Humidity control
  - Acceptable noise level
  - Separate AHU's for different zones to avoid mixing of air
  - Human Comfort
  - Energy Conservation
- High COP Air Cooled VRF system with Inverter controlled Twin Rotary Compressor / Scroll Compressors.
- Energy Efficient Motors (IE3 Class Efficiency) for modular AHU's and for normal ventilation fan motors
- Energy Efficient Motors (IE2 Class Efficiency) for ventilation fans.
- Highly efficient fans for Air Handling units and ventilation fans.
- The junction of the glass panel with the frame will be sealed with silicon sealant to prevent any outlets for heat.
- Roof & Wall insulation, Buffer spaces on the exposed walls (reduced energy consumption)
- Skylights, Solariums (Stress Relieving Spaces) & outdoor view for connectivity with nature (view of the canal) (Sill 3ft, window height 4ft)
- Healing garden/ terrace
- Ergonomic furniture with prescribed circulation space

Bone & Joint Hospital is extremely busy building. The peak population of Bone & Joint Hospital in a two hour peak time period will be around 2000. The entrance doors of the Hospital open several times in a minute. Great heat losses take place during opening and closing of the doors. Apart from the heat losses, these openings also bring in polluted air and atmospheric germs inside the lobbies. Therefore, air lock lobbies will be provided at every entrance. This involves providing 2 entrance doors separated by a distance of 2.4 to 3 meters. This ensures an air gap between the external air and the inside air of the hospital. This helps in preventing heat losses

to outside and also prevents pollution and air borne germs. These air lock lobbies will also be provided with air curtains on the inside of the internal door.

- It is also recommended to separate the staircase from the corridor by a 230mm thick wall and a fire check door. This also helps in preventing warm air leakages from the corridor into the stairwell and helps in reducing heating requirements.
- The entire south sloping roof can be used for solar photovoltaic panels. The roof angle as per the drawings is 25 degrees to horizontal. This gives an area of approximately 400 sqm. This entire area can be used for solar photovoltaic panels for electricity generation. Assuming the prevalent thumb rule of 1 kW per 8 sqm, the entire roof can produce 50 kW of electricity. This is a substantial amount and can reduce the burden on the conventional energy systems.
- Energy Efficient Lighting, Electrical and HVAC systems will also be proposed for Bone & Joint Hospital. LED's are the most energy efficient lighting option available.
- To further reduce the energy consumption, smart building systems such as automated building controls should be used. These light controls can be timed to switch off certain lights in the corridors, lobbies and lift waiting areas at off peak hours to reduce energy consumption.
- Exterior lighting fixtures should have inbuilt photosensors which allows them to turn off automatically when the daylight levels are sufficient.
- The Fresh Air Ventilation Requirements to maintain the Indoor Air Quality (IAQ) is as per the ASHRAE Handbook (Health Care) & ISHRAE-2017
- AIR CONDITIONING FOR OTs AND ICUs
  - Due to stringent conditions of temperature and humidity in the operation theatres and intensive care units, there is a constant requirement of re – heating. Consideration will be given to isolation of piping for various zones to simultaneously provide heating and cooling as required, even for adjacent areas. Operation theatres, intensive care units and other critical areas will have separate heating coil for the same purpose.
  - Special air handling units operating at a total static pressure of 130mm WG will be designed to cater to high static pressure requirements due to the HEPA filters.
  - The AHU's will be of double skin construction with insulation sandwiched between two layers of metal. AHU's will be 'draw through' on coils and 'blow through' on filters. AHUs will have both cooling and reheating coils.
- Solar water heating is also proposed for new block. Low flow flushes in WC's and washbasins with auto sensors must be installed all toilets. Flow rates for fixtures will be benchmarked as per requirements of USGBC/IGBC-LEED Rating system. This will result in water savings to a tune of approx. 20%.
- STP treated water will be recycled for flushing WC's, and horticulture. Rainwater harvesting will also be proposed.

#### 7.4. Alternative Building Material

The proposed project has been planned in a manner to achieve environment friendly sustainable development. The construction material to be used will include renewable and non-renewable resources including stones, aggregates, sand, steel, concrete, fly ash mix cement, and clay and fly ash bricks. Aerocon blocks (Autoclaved Aerated Concrete Blocks) may also be taken for wall constructions. Wood alternatives will be used in the project with minimal use of timber for the proposed construction.

The materials will be procured from reputed manufacturers with test certificates as per BIS specifications. Low VOC and non-toxic paints and adhesives to be used as per LEED standards. List of alternative building materials for green buildings is summarized in Table 7.1.

Table 7. 1: Alternative building materials for Green building

S.No	Material	Conventional Material	Green & Alternative Building Materials
1-	Window and openings	Aluminium Panelled plain glasses	Insulated Glass (IG units)
2-	Lighting and fixtures	Tube lights & CFLs	Low watt LED tube lights & bulbs
3-	Plumbing Fixtures	Conventional Fixtures	Green water saving fixtures
4-	Flooring	Vitrified & Glazed Tiles , China Mosaic	PVC Flooring ,
5-	Doors	Pine Wood	Engineering Wood
6-	Paints	Plastic VOC	Plastic Non VOC
7-	Bricks	Clay Bricks	Fly-ash Bricks
8-	Cement	OPC	PPC

#### 7.5. Option analysis for sewage treatment/effluent treatment technologies

To assess the most suitable wastewater treatment technology for Bone & Joint Hospital various sewage/wastewater treatment technologies have been reviewed for their merits and demerits. There are many technologies in today's practice to treat the sewage aerobically or anaerobically or in combination. The conventional sewage treatment technologies such as Activated Sludge Process (ASP), Waste Stabilization pond (WSP), Upflow Anaerobic Sludge Blanket (UASB) Reactor etc., are commonly adopted in sewerage system to treat wastewater up to secondary level as per the effluent standards. There are a number of newer treatment technologies that have come into practice in recent times and they do merit attention in their own way. Treatment Technologies such as Sequencing Batch Reactor(SBR) and Moving Bed Biofilm Reactor (MBBR)/ Fluidized Aerobic Bioreactor have been approved under several government schemes due to their advantages such as less requirement of land, high effluent quality etc.

Study conducted by CPCB on Cost Comparison for various technologies for sewage treatment plant and Assessment of Technology options for Sewage Treatment plant reveals that Land requirement for FAB, MBR and SBR plant is least among all treatment process whereas energy requirement is highest. Treated effluent quality with respect to BOD, COD, SS, Coliform reduction is better in SBR and MBR plant among other treatment technologies. Detailed cost comparison for various technologies for sewage treatment plant done by CPCB is summarized in the Table 7.2.

Table 7.2: Cost Comparison for various technologies for sewage treatment plant

S.No	Assessment Parameters	Treatment Technologies					
		ASP	MBBR/ FAB	SBR	UASB+EA	MBR	WSP
1	Performance after secondary treatment						
A	Effluent BOD (mg/l)	<20	<30	<10	<20	<5	<40
B	Effluent SS (mg/l)	<30	<30	<10	<30	<5	<100
C	TN removal %	10-20	10-20	70-80	10-20	70-80	10-20
2	Performance after Tertiary treatment						
A	Effluent BOD (mg/l)	<10	<10	<10	<10	<10	<10
B	Effluent SS (mg/l)	<5	<5	<5	<5	<5	<5
3	Avg. Capital Cost (lacs/MLD) Include tertiary treatment	108	108	115	108	300	63
4	Area demand (m <sup>2</sup> /MLD)	1000	550	550	1100	450	6100
5	Yearly Power Cost (Lacs/MLD)	4.07	4.90	3.37	2.75	6.65	0.49
6	Total O&M Cost (Lacs/MLD) upto Secondary Treatment	353	372	288	290	>300	116

Source: CPCB, Govt. of India

### Recommendation for the Proposed Project:

Looking to degree of treatment required, considering Capital and O&M cost, availability of limited land at the project site, SBR technology will be most suited treatment option for wastewater treatment for the proposed Block and also having superiority in TN and TP among others. However, in the design report FAB technology is adopted for treatment of

wastewater which is also a feasible option but removal of total nitrogen and total phosphorous will be limited despite of laundry wastewater contains high concentration of both the chemicals..

## CHAPTER – 8: CONSULTATION WITH STAKEHOLDERS

### 8.1. Introduction

Stakeholder engagement is a key element of project planning, development and implementation. Effective stakeholder engagement assists good design, builds relationships with local communities, and reduces the potential for delays through the early identification of risks and issues. Public Works (R&B) Department. Govt. of J&K, NPCC Ltd. and Hospital Administration are committed to a transparent and respectful dialogue with stakeholders throughout the life of the Project. The engagement approach for the Project includes a range of activities designed to consult stakeholders, using methods which take into account the varied interests that stakeholders may have in the Project as well as their location, language, culture, their access to information and the different opportunities to participate.

The Project's approach to stakeholder engagement includes making best efforts to ensure stakeholders are provided with adequate, timely and culturally appropriate information about the proposed Bone & Joint Hospital Project. Opportunities for stakeholders were also provided to ask questions, make comments and suggestions and raise any concerns that they may have.

However, Due to COVID -19, the consultations were limited to one to one discussion following the guidelines of social distancing. The external and internal stakeholders were informed about subproject development objectives and components. They were requested to give their perception on the anticipated positive and negative impacts of the project and also their suggestions. Consultation was conducted in the month of June 2020 with help of local team on ground with help of domain experts over phone and virtual meeting.

Stakeholder consultation was conducted by the subject area experts on 5<sup>th</sup>-8<sup>th</sup> November 2019 and in the month of June 2020. During the initial visit, meeting with stakeholder departments were conducted to understand and communicate them about their roles and responsibilities for success of this project. Their views and suggestions were also recorded. The list of required data was shared with each concerned stakeholder departments. A walk through with the concerned department members and staff were also conducted at existing hospital blocks and at the site where an additional hospital block is proposed.

During consultation process, several urban, architectural, environmental and social issues and prevailing practices of hospital system were noted. Apart from this, vulnerable environmental and social components are identified that which may be affected by the proposed sub project. Efforts were also made to identify the larger public issues that may be arise on existing hospital utilities and services during construction of proposed hospital block.

## 8.2. Stakeholders Consultation

During the site visit, introductory meeting was held on 5<sup>th</sup> November 2019 and June 2020 with the clients, contractor, Hospital Administration. Other concerned stakeholder departments who are directly and indirectly linked in facilitating smooth functioning of hospital services were consulted with the help of local R&b and NPCC officials. After introductory meeting concerned department were approached for data required to prepare environmental assessment report. A detail list of required data was also shared with all the departments. However, limited information and data was received till the finalization of this report. During the reconnaissance visit, following (as shown in Table 8.1) are the stakeholder departments were approached for data collection and their suggestions:

Table 8. 1: Details of Stakeholders Consultation

Stakeholder Department/Concerned Individual	Key Point of discussion
<b>Public Works (Road and Building) Department, Govt. of J&amp;K</b>	R&B department was approached for necessary and reasonable support to collect secondary data and issuing data requisition letter to concerned department. Plan of demolition and support required was also discussed. Project related all the data/information/reports including DPR, detailed drawing designs were also requested by subject area experts of GSIPM.
<b>NPCC Ltd. , Principal Agency</b>	NPCC was approached for necessary and reasonable support to collect secondary data and drawing designs of the project.
<b>World Bank officials/SPMU</b>	Discussion with the World Bank officials were mainly on their expectations and requirements in EA report. Help of local SPMU office was also requested by the consultant in speedy collection of required secondary data and information from concerned department.
<b>Wani Infra (Contractor)</b>	Discussion on demolition and site clearing was discussed during the visit. Status of project report drawing, designs were also discussed for timely start of work. General environmental considerations were also discussed.
<b>Bone &amp; Joint Hospital administration</b>	A brief overview of the Hospital campus and the Hospital facilities was given by the Hospital Administration -During the visit to the existing Hospital Blocks, an overview of the planning and facilities of the existing clinical and support areas were taken with the Hospital administration

Stakeholder Department/Concerned Individual	Key Point of discussion
	A detailed list of data including Bio-medical waste was shared and discussed with Hospital administration.
<b>Public Health Engineering Department</b>	Information related to water demand and supply were discussed with concerned PHED officials and data related to Water sources, consumption Per day (KL), supply & storage arrangements and exiting system used for recycling of water were requested from PHED department.

#### Key Issues Raised in Stakeholders Consultations

Date and Place of Meetings	Type and Number of Stakeholders	Issues discussed	Views and Suggestions received
Date: 22 <sup>th</sup> June, 2020 Place: Bone & Joint Hospital, Srinagar	Medical staff, attendants to patients and patients	Delay in implementation of project	Timeline should be fixed for project implementation.
		Access to existing and new facilities (which will be constructed under this project) will be difficult for patients.	Both facilities (existing and new) should be integrated through single and safe access.
		Increase in infrastructure is required in the existing facility.	Construction of new additional block must consider population growth.
		Basic facilities like toilets, waiting and resting areas for attendants, food and drinking water supply are not available to fulfill the numbers of visitors.	In new hospital building, basic facilities shall be provided for the visitors.
		Noise pollution during construction period	Proper fencing and covering the construction site to minimize the possible impacts
		Separate entry and services for physically disabled persons.	Proper arrangement for registration of patients and priority in providing services to physically disabled persons.
		Parking facility and traffic movement inside the hospital is problem for staff, patients and community.	Parking layout and traffic movement plan for hospital area need to prepare and implement. Separate entry & exit for construction vehicle need to provide.

		The canteen facility is inadequate and unhygienic.	The Canteen facility need to improve within increase capacity the premises.
		Un-employment in local community is high	The local people (labour) should be given priority in labour work and petty jobs during construction
		Construction waste generation and chances of accidents during project implementation	Preparation of Waste management plan and getting it approved prior to sub-project implementation

### Stakeholder's Engagement Plan

The objective of this engagement plan is to ensure continuous engagement of local community and other relevant stakeholders during the planning and implementation of the subproject. The project authorities (PMU) will be responsible for communications regarding the subproject development to all the stakeholders. This stakeholder's engagement plan includes continuous consultation and engagement activities to address the issues and concerns of the stakeholders, as well as regular disclosure of project related information throughout the subproject life cycle. The communication methods and information for disclosure identified in Table 20 below are not exclusive; the PMU may choose to disclose more information upon request by stakeholders.

Table: Stakeholder Engagement Plan

Addressed Stakeholders	Communication method	Information to be disclosed	Timeframe
Hospital Administration	Information boards with contact number/mail and personal visits to administrative officer and staff.	<ul style="list-style-type: none"> <li>Grievance mechanism,</li> <li>design &amp; scheduling of work,</li> <li>local support for approvals and clearance,</li> <li>timeline of construction.</li> </ul>	<ul style="list-style-type: none"> <li>Prior to construction</li> <li>During project implementation</li> <li>weekly update on grievances</li> <li>monthly update on progress.</li> </ul>
Working staff (Doctors, Nurses, Security, Technicians & auxiliary workers).	Information boards with contact number and personal visits to staff.	<ul style="list-style-type: none"> <li>Grievance mechanism,</li> <li>design integration with existing facility,</li> <li>timeline of construction</li> </ul>	<ul style="list-style-type: none"> <li>Prior to construction</li> <li>During project implementation weekly update on grievances.</li> </ul>
Patients & Attendants	Information board, mass media, internet, regular consultation during construction stage, documents on request.	<ul style="list-style-type: none"> <li>Grievance mechanism</li> <li>timeline of construction</li> </ul>	<ul style="list-style-type: none"> <li>Prior to construction</li> <li>Once every week during project implementation and on grievance as and when required.</li> </ul>

Addressed Stakeholders	Communication method	Information to be disclosed	Timeframe
Ward and Municipality Authority	Meetings, telephone, e-mail, information boards in the office buildings	<ul style="list-style-type: none"> <li>• Detailed project information</li> <li>• approvals and clearances required, emergency services.</li> </ul>	<ul style="list-style-type: none"> <li>• Prior to construction</li> <li>• During project implementation, if required</li> </ul>
Residents of nearby areas	Information boards with details of subproject activity, regular consultation during construction stage.	Contact details of NPCC for GRM, grievance mechanism, timeline of construction, basic details of subproject.	<ul style="list-style-type: none"> <li>• Prior to construction</li> <li>• During project implementation update on grievances on requirement/on complaints.</li> </ul>
Regional Public/Community	Information board, mass media, internet, documents on request in local news paper		
Construction Workers	Information boards and meetings in construction camp	<ul style="list-style-type: none"> <li>• Health and safety requirements of project</li> <li>• vacancies</li> <li>• workers protection requirements</li> <li>• workers' grievance mechanism</li> </ul>	<ul style="list-style-type: none"> <li>• Prior to construction</li> <li>• updates during construction.</li> </ul>



PHOTOS: GLIMPSE OF INITIAL STAKEHOLDERS MEETINGS & SITE VISIT

## CHAPTER 9. ENVIRONMENTAL MANAGEMENT PLAN

### 4.1 Environmental Management Plan

In order to address the impacts predicted in the earlier chapter, mitigation measures are discussed in this chapter and an Environmental Management Plan (EMP) is recommended. The Environmental Management Plan (EMP) is required to minimize impact of adverse environmental impacts by implementing suggested mitigation measures with suggested timelines and responsibilities during construction and operational phase of the proposed Bone & Joint Hospital project. The EMP also identifies the role of various agencies in the implementation of these measures. Since the site is not an ecologically or environmentally sensitive area, no major environmental issues are anticipated. However, utmost care would be required as proposed work will be done within the existing hospital area which may affect the patient health care and convenience. The critical issues mainly noise and air pollution during construction phase and issues pertaining to improper management of biomedical waste and discharge of wastewater need to be taken care.

The EMP covers management program for mitigation measures suggested to counter likely impact from construction and operation phases of the proposed project activities. Monitoring measures are also suggested for effective implementation of the mitigation measures. As shown in the Fig. 9.1, proposed EMP would have four major elements viz. Commitment and Policy, Planning, Implementation and Monitoring & evaluation.

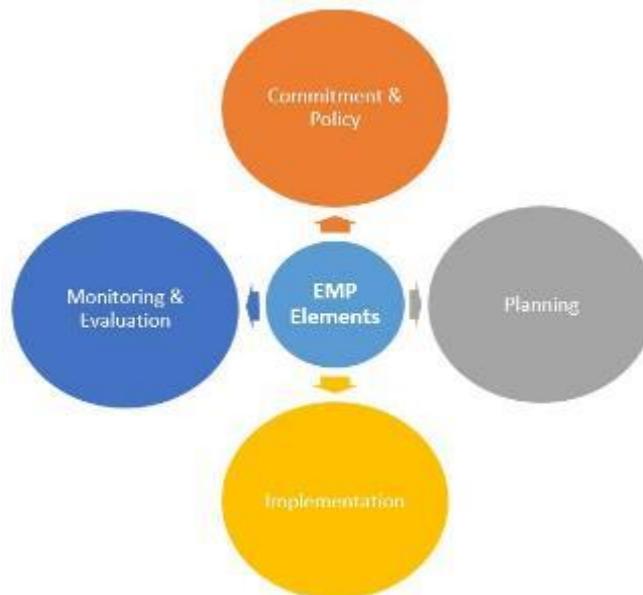


Fig.9.1: Element of Environment Management Plan

**A- Commitment Policy-** Project Proponent will strive to provide and implement the Environmental Management Plan.

**B- Planning-** This includes identification of environmental impacts, legal requirements and setting environmental objectives. Various components of planning for the proposed Project will include following subjections

#### **Organization, Roles and Responsibilities**

**Role of Public Works (R&B) Department** - R&B will have ultimate responsibility for implementing the provisions of EMP especially during construction stage of the Project. This role will include the ongoing management of environmental impacts, monitoring of contractor performance as well as development of mechanisms for dealing with environmental problems. R&B will also ensure that the activities of its sub-contractors are conducted in accordance with 'good practice' measures, implementation of which will be required through contractual documentation. In order to facilitate this, and to demonstrate commitment to the EMP, R&B /Contractor will conduct regular internal site inspections, the results of which will be documented.

**Role of Contractors-** R&B Management will be responsible for the performance of all its contractors and ensuring that all commitments in the EIA are translated into contractors' requirements and that these requirements are implemented to the full intent and extent of R&B commitment.

Contractors will be responsible for implementation of, or adherence to, all the mitigation measures outlined in the EMP.

#### **Inspection and monitoring and Audit**

Inspection and monitoring of the environmental impacts of the Project activities will increase the effectiveness of EMP. Through the process of inspection and auditing, R&B will ensure that the conditions stipulated in Prior Environmental Clearance(s), Consent for Establishment, Consent to Operate, other approvals are complied with.

#### **Monitoring, Reporting and Documentation**

R&B will hire an external agency to conduct monitoring for air emissions and wastewater quality. It will also ensure record keeping system of commitments is implemented including on compliance of the requirements specified in EMP.

## EMP Review & Amendments

The EMP would be reviewed periodically to update it addressing any changes in the organization, process or regulatory requirements

### C- Implementation

This comprises of resources available for the project, accountability of contractors, documentation of measures to be taken. It is proposed to create Environment Management Cell under Facility Manager for effective implementation of EMP.

### Monitoring & Evaluation

This include monitoring corrective actions and record keeping both by contractor and project proponent.

#### 4.2 EMP for Design and Preconstruction Phase

Table 9.1 provide environmental management plan to be followed up during Design and Pre-construction phases of the proposed Bone & Joint Hospital project.

#### 4.3 EMP for Construction Phase

Table 9.2 provide environmental management plan to be followed up construction phase of the proposed Bone & Joint Hospital project.

#### 4.4 EMP for Operational Phase

Table 9.3 provide environmental management plan to be followed up during operational phases of the proposed project.

Table 9.1:EMP for Design and Preconstruction Phase

S. No	Aspects	Impacts	Mitigation Measures	Monitoring/ Action	Responsibility	Frequency of Monitoring/ inspection/ audit
1.	Location of the Project Site	Inundation and loss of resources created under the project during future flood event in Dhoodh Ganga Canal	Structural (physically engineered interventions), shifting of critical utilities and emergency requirements on higher floors. Stilt construction, tree planting along boundary wall and storm water management plan is proposed to mitigate and reduce the impact.  Several other measures such as control of water source and reconstruction of the defense/bund to the Jhelum river along with desilting at upstream stretch of the river is being carried out by the Irrigation & Flood Control Department to reduce the impacts of future flood, if any	Review of Project Designs	R&B /Design Consultant	PIU/PMU
2.	Design of proposed hospital block	If not properly designed, it may Enhance the Environmental foot prints of the project, Source sustainability and efficiency.	Sustainable design practices were adhered as per the norms of National Building Codes. Green Building and Energy conservation measures are adopted in the proposed building as per IGBC and Energy Conservation Building Code (ECBC) 2017 of the Bureau of Energy to reduce the environmental foot prints of the project. <b>Detailed list of Issues identified and suggestions made for rectification during Design phase of the Project</b> are given in Annexure-9.	Review of Project Designs	R&B /Design Consultant	PIU/PMU

Table 9.1:EMP for Design and Preconstruction Phase

S. No	Aspects	Impacts	Mitigation Measures	Monitoring/ Action	Responsibility	Frequency of Monitoring/ inspection/ audit
3.	Consents, Permits, clearances, No Objection Certificates (NOCs)	Failure to obtain necessary consents, Permits, NOCs, etc. can result to design revisions and/or stoppage of works	<ul style="list-style-type: none"> <li>- All necessary consents, permits, clearance, NOCs, etc. prior to start of demolition and civil works.</li> <li>- Necessary Approvals for construction to be obtained by contractor is in place before start of construction</li> <li>- Compliance of consents, permits, clearance, NOCs, etc.</li> <li>- Obtained all Design drawings and documents if necessary</li> </ul>	Status of Clearances and NOCs	R&B /Contractor	R&B /PIU
3,	Sources of Materials	Material from unauthorized/illegal sources may disrupt natural environment.  Construction quality may also be affected by using substandard materials	Construction materials only from Government approved source with prior approval of PIU.  Permissions in place prior to approval contractor to submit to PIU on a monthly basis documentation on material obtained from each source for the project.	Review and Checking of Material source and quality Checking	Contractor	R&B /PIU
4.	Shifting of utilities viz. (tanks, electric lines, poles, telephone	Disruption of essential and emergency services	During construction by any chance, any utility (electric poles, telephone lines, water pipes etc.) require shifting, prior permission & assistance shall be obtained from regional offices of Electricity, Telecommunications, and Water works dept. Alternate	Progress Review	Contractor	R&B

Table 9.1:EMP for Design and Preconstruction Phase

S. No	Aspects	Impacts	Mitigation Measures	Monitoring/ Action	Responsibility	Frequency of Monitoring/ inspection/ audit
	lines, water pipes and DG set area etc.)		arrangement shall be made of ground water tank which require dismantling with prior permission of Hospital Administration.			

Table 9.2: EMP for Construction phase

Table 9.2:EMP for Construction phase						
S. No	Aspects	Impacts	Mitigation Measures	Monitoring/ Action	Responsibility	Frequency of Monitoring/ inspection/ audit
1.	Land Acquisition	No land acquisition is involved in this proposed				
2.	<b>Demolition, Site Clearing &amp; Preparation</b>					
	Demolition Activity	Impacts on ambient air and noise, traffic circulation and on existing utilities. Health and safety issues during demolition	<ul style="list-style-type: none"> <li>- The contractor shall provide suitable barricading up to the height of adjacent buildings not less than 4 meters which will help to prevent dust and noise emission</li> <li>- Make provision of periodic water sprinkling and covering to prevent wind erosion (fugitive dust generation)</li> <li>- Make provision of temporary perimeter sediment barrier (such as berms, silt fence or sandbag barriers) to prevent spread of C&amp;D material</li> <li>- Use of proper Personal Protective Equipment (PPE) such as earmuffs will mitigate any adverse impact of the noise</li> <li>- In case of complaints of higher noise levels and uncomfortable received from the inhabitants of nearby settlements or by the patients, possibility of putting noise barriers near to the receptor need to be considered</li> <li>- Disposal of Construction and demolition wastes should be done as per Construction</li> </ul>	Review of implementation of mitigation measures	Contractor	R&B & Construction contractor on monthly basis

Table 9.2:EMP for Construction phase

S. No	Aspects	Impacts	Mitigation Measures	Monitoring/ Action	Responsibility	Frequency of Monitoring/ inspection/ audit
			and Demolition Waste Management Rules, 2016. A separate Demolition and Dismantling Plan is already prepared for proposed project and shall be referred for details.			
	Topography and Drainage	Change of topography and disturbance to drainage pattern	<ul style="list-style-type: none"> <li>- Disturbance to land surface contours to be kept to minimum.</li> <li>- Maintaining natural drainage pattern.</li> <li>- Adequate drains and slopes to be laid across the proposed expansion Project</li> <li>- prior to start of excavation work to ensure adequate cross drainage for quick evacuation of catchment water;</li> <li>- All necessary measures will be taken while working close to cross drainage channels to prevent earthwork, stonework, materials and appendage as well as the method of operation from impeding cross-drainage at existing drainage systems such as natural drains and River</li> <li>- Construction footprint to be well defined and construction work to be carried out within the footprints only</li> </ul>	Review of implementation of mitigation measures	Contractor	R&B & Construction contractor on monthly basis

Table 9.2:EMP for Construction phase

S. No	Aspects	Impacts	Mitigation Measures	Monitoring/ Action	Responsibility	Frequency of Monitoring/ inspection/ audit
	Land use, vegetation and landscaping	<ul style="list-style-type: none"> <li>- Land use will change open land to contracted area</li> <li>- Relocation/shifting /cutting of a Chinar Tree</li> </ul>	<ul style="list-style-type: none"> <li>- Vegetation clearance or tree cutting should be restricted to the project activity area</li> <li>- Existing 4 Chinar trees located at construction site shall be relocated or de-rooted with prior permission of forests department</li> <li>- Dumping and disposal of construction wastes should be done as per C&amp;D waste Management Rules 2016</li> <li>- to avoid habitat and vegetative cover loss</li> <li>- Follow up overall architectural and landscaping designs</li> </ul>	Review of implementation of mitigation measures	Contractor	R&B & Construction contractor on monthly basis
3.	<b>Establishment of Labour Camp</b>					
	Social Issue	Conflict of cultural and regional bias	<ul style="list-style-type: none"> <li>- Maximum number of unskilled labours to be employed from local areas having their residences in the nearby areas;</li> <li>- Establishment of labour camps by construction contractor will be outside the project site.</li> <li>- The camps will be managed by construction contractor Campsite activities to be monitored.</li> </ul>	Review of implementation of mitigation measures	Contractor	R&B & Construction contractor on monthly basis
	Health risks	Potential sanitation and hygiene issues due to unplanned waste dumping and disposal	<ul style="list-style-type: none"> <li>- the contractor will be required to ensure provision of basic amenities of drinking water, adequate number of toilets/mobile or portable toilets, wash rooms, sanitation and cleanliness, lighting, availability of provisions and groceries and recreational facilities, at the labour camp site provision of septic tanks to treat wastewater discharged from labour camp</li> </ul>	Review of implementation of mitigation measures	Contractor	R&B & Construction contractor on monthly basis

Table 9.2:EMP for Construction phase

S. No	Aspects	Impacts	Mitigation Measures	Monitoring/ Action	Responsibility	Frequency of Monitoring/ inspection/ audit
		Chances of spread of Sexually transmittable diseases	<ul style="list-style-type: none"> <li>- Garbage bins must be provided in the camps and shall be emptied and disposed off in a hygienic manner</li> <li>- Awareness programmes on HIV/AIDS Malaria, Tuberculosis</li> <li>- The workforce shall also be sensitized about the general health issues</li> <li>- General guidelines for Standard Operating Procedures (SOPs) and guidelines for Construction Sites for COVID-19 Outbreak mentioned in Annex. 10 should be followed.</li> </ul>			
3.	Construction activity					
	Concrete Mixing Plant	<ul style="list-style-type: none"> <li>- Dust emission</li> <li>- Noise emission</li> <li>- Surface runoff</li> </ul>	<ul style="list-style-type: none"> <li>-Stock piling shall be carried out at designated place located away from drainage or drain.</li> <li>-Make provision of periodic water sprinkling and covering to prevent wind erosion (fugitive dust generation)</li> <li>-Make provision of temporary perimeter sediment barrier (such as berms, silt fence or sandbag barriers) to prevent spread of construction material.</li> <li>-Dust Suppression measures such as sprinkling of water (to moist the dust prone area/construction site) will be taken at regular intervals to control fugitive dust emissions during construction activities.</li> </ul>	Review of implementation of mitigation measures	Contractor	R&B & Construction contractor on monthly basis

Table 9.2:EMP for Construction phase

S. No	Aspects	Impacts	Mitigation Measures	Monitoring/ Action	Responsibility	Frequency of Monitoring/ inspection/ audit
			-Temporary barrier around the batching plant to minimise spread of dust and noise;			
	Other Construction activities/issues					
	Air Quality	<ul style="list-style-type: none"> <li>- Emissions from Construction Equipment, DG Set and vehicles Movement</li> <li>- Dust Generation during earthworks</li> <li>- Fugitive dust generation due to wind from Stock Piling of earth/sand or other loose construction material</li> </ul>	<ul style="list-style-type: none"> <li>-All vehicles used at project shall have of valid 'Pollution under Control' (PUC) Certificates.</li> <li>-Dust Suppression measures such as Sprinkling of water (to moist the dust prone area/construction site) will be taken at regular intervals to control fugitive dust emissions during construction activities.</li> <li>-Stock piling shall be carried out at designated place located away from drainage or drain.</li> <li>-Make provision of periodic water sprinkling and covering of trucks/dumper by tarpaulin sheets to prevent windblown dust (fugitive dust generation)</li> <li>-It is to be ensured that construction equipment are properly maintained to minimise smoke in the exhaust emissions</li> <li>-Make provision of temporary perimeter sediment barrier (such as berms, silt fence or sandbag barriers) to prevent spread of construction material</li> <li>-Diesel generators meant for emergency power supply to be optimally operated and regularly maintained so as to ensure that emissions from fuel combustion remain at design levels.</li> <li>-</li> <li>-Stack height to DG Sets will be provided as per CPCB</li> </ul>	<p>Review of implementation of mitigation measures</p> <p>Arrange Ambient Air Quality monitoring at three locations outside the premises for PM10, PM2.5, SO2, NO2, CO as per monitoring plan</p>	Contractor	R&B & Construction contractor on daily basis

Table 9.2:EMP for Construction phase

S. No	Aspects	Impacts	Mitigation Measures	Monitoring/ Action	Responsibility	Frequency of Monitoring/ inspection/ audit
			<p>guidelines Stack height for DG sets will be provided as per CPCB Guidelines (<b>Stack height above roof =0.2VKVA</b>)</p> <p>-</p> <p>-Paints, polishes, building fittings and flooring material to be procured carefully to ensure that these have low VOC generation potential</p> <p>-Machinery to be turned off when not in use</p> <p>-Monitoring of the exhaust gases and noise levels will be carried out by an NABL/MoEFCC accredited Environmental Monitoring agency during the construction phase. Results shall be compared with the regulatory standards/ threshold limits as mentioned in annexure-8</p>			
	Surface Water Quality	Sewage Generated by workers Surface runoff to downstream area	<p>- No cleaning, washing or maintenance activity shall be undertaken in park and near any water body. All equipment and vehicle shall be services in its designated workshops only.</p> <p>- Proper water and sanitation (mobile toilets with anaerobic treatment facility) facilities will be provided to the construction labours at construction sites.</p> <p>- Proper collection and disposal of wastes will be ensured. All waste shall be managed complying with Construction and Demolition Waste Management Rules, 2016 &amp; Solid Waste Management Rules 2016 and guidelines annexure-2 to this report.</p>	<p>Review of implementation of mitigation measures</p> <p>Periodic water quality</p>	Contractor	R&B & Construction contractor on daily basis

Table 9.2:EMP for Construction phase

S. No	Aspects	Impacts	Mitigation Measures	Monitoring/ Action	Responsibility	Frequency of Monitoring/ inspection/ audit
			<ul style="list-style-type: none"> <li>- All debris waste shall be reused in at site itself to the extent feasible before outside disposal.</li> <li>- Proper passage channel should be provided(if needed)</li> <li>- Waste and construction activities shall be managed such that no waste material slips away to existing drainage</li> </ul>	monitoring for surface water/ ground water/drinking water as per monitoring plan		
	Water availability and drainage	<ul style="list-style-type: none"> <li>-Increased water demand</li> <li>-Water wastage</li> <li>Drainage Blockage</li> </ul>	<ul style="list-style-type: none"> <li>- Construction labour deputed onsite shall be sensitised about water conservation and encouraged for optimal use of water</li> <li>- Regular inspection for identification of water leakages and preventing wastage of water from water supply tankers</li> <li>- Optimum use of water during sprinkling on roads for dust settlement, washing of vehicles, concrete mixing for foundation etc.</li> <li>- Waste and construction activities shall be managed so that Stock piling shall be carried out at designated place located away from drainage or drain.</li> <li>- Proper Slope gradient and screened channels shall be provided for storm water and drainage management.</li> <li>- Recycling/reusing to the extent possible.</li> </ul>	Review of implementation of mitigation measures	Contractor	R&B & Construction contractor on daily basis

Table 9.2:EMP for Construction phase

S. No	Aspects	Impacts	Mitigation Measures	Monitoring/ Action	Responsibility	Frequency of Monitoring/ inspection/ audit
	Land & Soil	Loss of top soil, Soil contamination Disposal of debris	<ul style="list-style-type: none"> <li>- Areas for top soil utilization should be identified before start of construction activities and excavated top soil shall be utilized for plantations and landscaping within the project site</li> <li>- Disposal of Construction and demolition wastes should be done as per Construction and Demolition Waste Management Rules, 2016 (applicable provision of C&amp;D waste Rules and guidelines is summarized in annexure 2). Debris generated due to the excavation shall be suitably reused in the proposed construction to the maximum extent feasible and with technical approval from the Project Manager. Following Measures shall be considered for better debris management</li> <li>- The sub-grade of the existing pavement may be used as embankment filling material.</li> <li>- The existing sub base material may be recycled as sub base of any haul road or access road.</li> <li>- The Contractor shall identify disposal sites with help of concern authority. This location will be checked on site and accordingly approved prior to any disposal of waste materials.</li> <li>- No fuels / lubricants shall be stored in the park area. Any oils/lubricants storage shall be made outside the park on hard concreted surface sloping towards a small spillage collection pit. Any bitumen waste shall be disposed as per rules.</li> </ul>	Review of implementation of mitigation measures	Contractor	R&B & Construction contractor on daily

Table 9.2:EMP for Construction phase

S. No	Aspects	Impacts	Mitigation Measures	Monitoring/ Action	Responsibility	Frequency of Monitoring/ inspection/ audit
			<ul style="list-style-type: none"> <li>- Construction vehicles should be well maintained with periodic check of probable leak points to avoid any oil spillage.</li> <li>- All arrangement for transportation during construction including provision, maintenance, dismantling and clearing debris will be considered incidental to the works and will be planned and implemented by the Contactor.</li> <li>- Debris generated from other construction activities shall be disposed such that it does not flow into the surface water bodies or form mud puddles in the area. No debris will be staged on the road or culvert/bridges locations.</li> </ul>			
	Solid Waste & Hazardous Waste	Unhygienic issue, littering of solid wastes Waste oil from machinery	<ul style="list-style-type: none"> <li>- Construction contractor shall ensure daily collection and periodic (weekly) disposal of construction waste generated debris, concrete, metal cuttings wastes, waste/used oil etc.</li> <li>- During servicing/repair of equipment or vehicles, a suitable drip tray shall be used to prevent oil/grease spills onto the soil, especially in case of emergency repairs</li> <li>- The municipal waste from the labour camp will only be routed through proper collection and handover to local municipal body for further disposal</li> <li>- Littering should be strictly prohibited and labours trained towards the same</li> </ul>	Review of implementation of mitigation measures	Contractor	R&B & Construction contractor on daily

Table 9.2:EMP for Construction phase

S. No	Aspects	Impacts	Mitigation Measures	Monitoring/ Action	Responsibility	Frequency of Monitoring/ inspection/ audit
			<ul style="list-style-type: none"> <li>- Solid wastes will be managed as per the Solid Waste Management Rules, 2016</li> <li>- Municipal domestic waste generated at site to be segregated onsite and recyclables sold off to vendors</li> <li>- Ensure hazardous waste is properly labelled, stored onsite at a location provided with impervious surface, shed and secondary containment system as per in accordance to Hazardous and Other Waste (Management and Trans boundary Movement) Rules, 2016;</li> </ul>			
	Traffic Congestion and Parking issues & inconvenience to hospital services	Create traffic and parking issue and hospital during material transport and movement of vehicles involved during construction inconvenience to hospital services and utilities	<ul style="list-style-type: none"> <li>- Traffic/parking management Plan will be prepared by the Contractor and approved by the Project Manager/Supervision consultant prior to commencement to works</li> <li>Alternate route and entry/exit timings shall be explored to reduce inconvenience</li> <li>- To avoid disruption and inconvenience to public , visitors and patients during constructional phase of the project, control measures shall contain separate entry and parking of construction vehicles and visitors vehicles, ambulance, traffic safety arrangements, ensure proper signs, temporary barriers and flagman to ensure smooth traffic and Parking management</li> </ul>	Review of implementation of traffic /parking management & mitigation measures	Contractor	R&B & Construction contractor on daily basis

Table 9.2:EMP for Construction phase

S. No	Aspects	Impacts	Mitigation Measures	Monitoring/ Action	Responsibility	Frequency of Monitoring/ inspection/ audit
	Safety	Issues related to safety of visitors and patients during construction	- To avoid inconvenience and ensure safety of general public, visitors and patients during constructional phase of the project several control measures shall be taken viz. separate entry, ensure proper signage, temporary danger tape and flagmen to prevent unwanted labour entry to exposed construction works and to warn public for their safety	Review of safety measures	Contractor	R&B & Construction contractor on daily basis
	Utility Services	Impact on utility services during construction phase	- There is no major public utility exist on the construction site except a DG set area and an over ground tank. DG sets shall be shifted (by giving alternative) or guard with the permission of Hospital administration prior to start construction activities without disrupting any associated service. - Over ground tank which is currently being used as storage of water for fire emergency shall be dismantled prior to work execution and alternative arrangement shall be ensured by the contractor. - During construction by any chance, any utility (electric poles, telephone lines, water pipes etc.) require shifting, prior permission & assistance will be obtained from regional offices of Electricity, Telecommunications, and Water works dept.	Review of mitigation measure and alternative arrangement	Contractor	R&B & Construction contractor on daily basis till then permanent arrangement not been ensured
	Ambient Noise and Vibration	Noise pollution	-Noisy equipment if any will be provided in separate enclosures  -Use of rubber padding underneath high noise and vibration generating machines	Review of implementation of mitigation measures	Contractor	R&B & Construction contractor on daily

Table 9.2:EMP for Construction phase

S. No	Aspects	Impacts	Mitigation Measures	Monitoring/ Action	Responsibility	Frequency of Monitoring/ inspection/ audit
			<ul style="list-style-type: none"> <li>-Regular maintenance of inverters and transformers and other equipment to be used</li> <li>-Use of proper Personal Protective Equipment (PPE) such as earmuffs will mitigate any adverse impact of the noise</li> <li>-Periodic monitoring of noise near to the sources of generation to ensure compliance with design specification</li> <li>-In case of complaints of higher noise levels and uncomfortable received from the inhabitants of nearby settlements or by the patients, possibility of putting noise barriers near to the receptor need to be considered.</li> </ul>	Noise monitoring as per monitoring plan		
viii.	Energy	Utilisation of non-renewable resources Energy efficiency	<ul style="list-style-type: none"> <li>-All buildings to be constructed with up-to date standards for energy efficient design; Provision of renewable energy to be used wherever possible</li> <li>-Adoption of measures such as low embedded energy building materials passive heating and ventilation systems, site layout and building orientation to minimise energy requirement</li> <li>-Proper ventilation system to be provided to all part of the building Energy Conservation Building Code to be followed</li> </ul>	Review of implementation of mitigation measures	Contractor	R&B & Construction contractor on daily

Table 9.2:EMP for Construction phase

S. No	Aspects	Impacts	Mitigation Measures	Monitoring/ Action	Responsibility	Frequency of Monitoring/ inspection/ audit
ix.	Socio-economic aspects	<ul style="list-style-type: none"> <li>• Labour influx</li> <li>• Occupational and Community Health and safety</li> <li>• Livelihood &amp; Economic &amp; Employment</li> </ul>	<ul style="list-style-type: none"> <li>- The proponent should put in place a contractor management plan and labour management plan to incorporate aspects such as contractor selection and evaluation, labour compliance with respect to the legal specifications and ensuring good labour working conditions, timely payment of wages and other benefits etc.</li> <li>- As part of the contract agreements, the contractor will be required to ensure provision of basic amenities of drinking water, adequate number of toilets, wash rooms, sanitation and cleanliness, lighting, availability of provisions and groceries and recreational facilities, at the labour camp site</li> <li>- The proponent should develop a systematic monitoring and auditing mechanism for monitoring the contractors and sub-contractors in terms of resources, migrant workers, child labour and forced labour, health and safety, payment of wages etc.</li> <li>- Establish a grievance redressal mechanism in place, to allow for the employees and workers to report any concern or grievance related to work activities.</li> <li>- Checking of structural integrity and equipment before undertaking work</li> <li>- Use of PPEs and fall protection equipment</li> </ul>	Review of implementation of mitigation measures	Contractor	R&B & Construction contractor on daily

Table 9.2:EMP for Construction phase

S. No	Aspects	Impacts	Mitigation Measures	Monitoring/ Action	Responsibility	Frequency of Monitoring/ inspection/ audit
			<ul style="list-style-type: none"> <li>- JCB/Cranes and other lifting equipment are operated by trained and authorised persons;</li> <li>- Lifting operations are carried out with proper plans and with equipment of adequate capacity</li>   <li>- The proponent should develop a systematic monitoring and auditing mechanism for monitoring the contractors and sub-contractors in terms of resources, migrant workers, child labour and forced labour, health and safety, payment of wages etc.</li>   <li>- Excavated areas should be temporarily fenced to avoid access of outsiders. Security is to be deputed 24 x 7 to restrict entry of unauthorized personnel;</li> <li>- The sourcing of local labour and staff wherever possible should be made obligatory for the sub-contractors and in all major procurement activities</li> </ul>			
x.	Demobilisation	Demobilisation of construction materials and equipment's	<ul style="list-style-type: none"> <li>- To prepare site restoration prior to demobilization</li> <li>- Remove all demobilisation waste from the construction site and dispose of non-hazardous civil waste in low lying area within the site, while any hazardous waste is to be disposed as the requirement of pollution control board</li> </ul>	Review of implementation of mitigation measures	Contractor	R&B & Construction contractor on daily basis
xi.	Commissioning of the Project	Environmental Pollution	- Commissioning to be done only after implementation of all the recommended measures as specified in the Project design and conditions	Review of implementation of	Contractor	R&B & Construction

Table 9.2:EMP for Construction phase

S. No	Aspects	Impacts	Mitigation Measures	Monitoring/ Action	Responsibility	Frequency of Monitoring/ inspection/ audit
			- Obtain permit like CTO (Consent to Operate) prior to the project commissioning from SPCB (by applying for it at least 90 days in advance of project commissioning	mitigation measures		contractor on daily basis

Table 9.3: EMP for Operation &amp; Maintenance Phase

Table 9.3: EMP for Operation & Maintenance Phase						
S. No	Aspects	Impacts	Mitigation Measures	Monitoring/ Action	Responsibility	Frequency of Monitoring/ inspection/ audit
	Water Demand for hospital and utilities requirement	Water requirement for various uses	<ul style="list-style-type: none"> <li>- New Bone and Joint hospital block will use of PHE water supply to fulfil the fresh water demand</li> <li>- The proposed project to be designed for higher water efficiency through a careful combination of design and water saving technology</li> <li>- Design of Low flow toilets, like urinals flushing capacity should to be kept around 6 litres per use to conserve water</li> <li>- Infrared sensors to be installed in urinals to control wastage of water Provision of rainwater harvesting</li> <li>- Majority of the non-drinking water (flushing, landscaping etc.) requirement will be done through usage of recycled water for the project during operations</li> <li>- Dual plumbing system has been planned to further reduce fresh water usage</li> </ul>	Review of status of implementation suggested for mitigations	Concerned Dept. of Bone & Joint Hospital	Quarterly monitoring

Table 9.3: EMP for Operation &amp; Maintenance Phase

S. No	Aspects	Impacts	Mitigation Measures	Monitoring/ Action	Responsibility	Frequency of Monitoring/ inspection/ audit
2.	Wastewater generation & disposal	Issues related Sewage and laundry wastewater management	<ul style="list-style-type: none"> <li>- STP and ETP is proposed for treatment of total sewage and effluent discharged from propose as well as old blocks of Bone &amp; Joint hospital.</li> <li>- The sewerage system will be designed for connecting to the STP. No wastewater discharge on open land will be practiced and all wastewater outlets will be connected to the STP for treatment and reuse</li> <li>- Treated effluent quality monitoring will be carried out to ensure reuse/ discharge wastewater compliance requirements.</li> <li>- Accidental discharge of biomedical and solid waste shall be prevented by application of regulatory requirements mentioned in waste management rules.</li> </ul>	<p>Review of status of implementation suggested for mitigations</p> <p>Periodic Water and waste water monitoring as suggested in monitoring plan</p>	Concerned Dept. of Bone & Joint Hospital	<p>Annual renewable of CTO</p> <p>Quarterly monitoring of Water and wastewater</p>

Table 9.3: EMP for Operation & Maintenance Phase						
S. No	Aspects	Impacts	Mitigation Measures	Monitoring/ Action	Responsibility	Frequency of Monitoring/ inspection/ audit
3.	Air Emission from DG set	Air Pollution	<ul style="list-style-type: none"> <li>- The DG set will have to be regularly maintained to match emissions with design output.</li> <li>- Stack height for DG sets will be provided as per CPCB Guidelines (<b>Stack height above roof =0.2vKVA</b>)</li> <li>- Development of landscaping and plantation</li> </ul>	<p>Review of status of implementation suggested for mitigations</p> <p>Periodic Air monitoring as suggested in monitoring plan</p>	Concerned Dept. of Bone & Joint Hospital	Quarterly monitoring

Table 9.3: EMP for Operation & Maintenance Phase						
S. No	Aspects	Impacts	Mitigation Measures	Monitoring/ Action	Responsibility	Frequency of Monitoring/ inspection/ audit
4.	Bio medical, Solid Waste and Hazardous waste Generation & management	Issues related to Bio medical, Solid Waste and Hazardous waste Generation & Management	<ul style="list-style-type: none"> <li>- Biomedical waste shall be managed accordance to Biomedical Waste Management Rules 2016. Details measures and standard practices are discussed in relevant section of this report.</li> <li>- Pneumatic tube collection of BMW shall be used for proper handing of waste.</li> <li>- Solid waste shall be managed accordance to Solid Waste Management Rules 2016</li> <li>- Employees should be continue educated on segregation of waste with demarcated bins for recyclables and perishables placed in common areas</li> <li>- Hazardous wastes should be kept isolated place away from active working zone</li> <li>- Consent to Operate should be obtained from Pollution Control Board for hazardous waste handling and conditions should be strictly complied with in line with ongoing operational buildings</li> <li>- Ensure hazardous waste is properly labelled, stored onsite at a location provided with impervious surface, shed and secondary containment system as per in accordance to Hazardous and Other Waste (Management and Trans boundary Movement) Rules, 2016 (HW Rules, 2016)</li> </ul>	Review of status of implementation suggested for mitigations	Concerned Dept. of Bone & Joint Hospital	Daily Inspection and record checking and compliance to conditions as per Rules and regulations

5.	Heath, Hygiene and Odour Problem	Issues related to heath, hygiene and Odour from waste collection points including temporary storage areas and STP & ETP sites	<p>-Bio-medical waste should be collected on daily basis from each ward of the hospital at a fixed interval of time. There can be multiple collections from wards during the day. Health Care Facility shall ensure collection, transportation, treatment and disposal of bio-medical waste as per BMW Rules, 2018.</p> <p>-Healthcare facility shall also ensure designated central waste collection room situated within its premises for storage of bio-medical waste, till the waste is picked and transported for treatment and disposal at CBWTF.</p> <p><b>STP &amp; ETP operator shall ensure:</b></p> <p>-Proper functioning of all STP &amp; ETP units including digestion of sludge unit and dewatering unit of STP &amp; ETP</p> <p>-Tree plantation and landscaping along the periphery of the STP/ETP site to prevent spread of bad odour</p> <p>-Accumulated sludge and solid waste to be cleared within 24 hours</p> <p>Regular clearance of sludge and solid waste to minimize odor nuisance</p> <p>Spraying of herbicides like Maple and Gtech on accumulated sludge/solid to reduce odour.</p> <p>Details measures and standard practices for Heath, Hygiene and Odour from waste collection points including temporary storage areas and STP sites are discussed in relevant section of this report.</p>	Review of status of implementation suggested for mitigations	Concerned Dept. of Bone & Joint Hospital /STP operator	Daily Inspection and record checking and compliance to conditions as per Rules and regulations
5.	Storage of flammables	Storage of flammables viz. LPG, other lab	Proper marking to be made for identification of locations of flammable sand chemical storages;	Review of status of implementation	Concerned Dept. of Bone & Joint Hospital	Daily Inspection

Table 9.3: EMP for Operation &amp; Maintenance Phase

S. No	Aspects	Impacts	Mitigation Measures	Monitoring/ Action	Responsibility	Frequency of Monitoring/ inspection/ audit
	and Chemicals	gases and Chemicals	<p>Proper system for collection and disposal of chemicals and flammable items</p> <p>Follow up of all the required safety measures (working guideline, use of personal protective equipment like gloves, helmets, ear muffs, safety belts for any repair and maintenance work within the proposed facility</p> <p>For safety of people occupying the building, regulations concerning fire safety to be followed. Some of the requirements are-</p> <ul style="list-style-type: none"> <li>- Installation of fire extinguishers all over the building</li> <li>- Provision of water hydrants in operative conditions</li> <li>- Emergency exit; Proper labelling of exit and place of the protective system installation; Conducting mock drills</li> <li>- Trained personnel to use the fire control systems</li> <li>- Display of emergency evacuation maps in each floor</li> </ul>	suggested for mitigations		<p>and record checking</p> <p>Compliance to conditions as per Rules and regulations</p>

Table 9.3: EMP for Operation &amp; Maintenance Phase

S. No	Aspects	Impacts	Mitigation Measures	Monitoring/ Action	Responsibility	Frequency of Monitoring/ inspection/ audit
7.	Disaster Management	Risk of damages due to fire, flood, natural disaster and other emergency situations	<ul style="list-style-type: none"> <li>- During operation phase, potential risks will be mainly related to accidental fire from leaks of flammable materials like LPG and HSD storage.</li> <li>- Ensure adequate Fire Fighting system established onsite prior to commissioning of the Project as per the Fire Fighting Plan covering following aspects: Fire Prevention Measure and System Fire Detection &amp; alarm System Fire Fighting System and devices</li> <li>- Natural disasters and related risks shall be managed by design improvements and standard practices mentioned in DMP.</li> <li>- Responsibilities of Emergency Response Co-ordination Team members to be provided in the DMP</li> </ul>	Review of status of implementation suggested for mitigations	Concerned Dept. of Bone & Joint Hospital	Once Month

## 9.5. Technical Details of Mitigation Measures proposed under Environment Management Plan of Proposed Hospital Project

### 9.5.1. Storm Water Management- Operational action plan for Storm Water Management

#### *Storm water collection system*

Rain water and melted snow from roof top, paved and unpaved area will be collect by storm water drainage system. Landscaped areas where necessary will be drained through 150mm dia perforated pipes running 250mm below the surface at 1 in 200 slopes. Perimeter drainage channels will be provided where necessary. Concealed drain with Gully Pit will be provide along the periphery. Most of the storm water produced on site will be harvested for ground water recharge.

#### *Best management practices for storm water management at Bone & Joint, Hospital*

- Regular inspection and cleaning of storm drains
- Execution of oil spill response plans, particularly for fuel and oil storage areas
- To avoid ponding, slope gradient should be toward storm water drain
- Cover waste storage areas
- Avoid application of pesticides and herbicides before wet season
- Conducting routine inspections to ensure cleanliness
- Provision of slit traps in storm water drains
- Provide biological cover on loose soil wherever possible

#### **Rainwater Harvesting**

The storm water disposal system for the hospital premises will be self-sufficient to avoid any collection/stagnation and flooding of water. The amount of storm water run-off depends upon many factors such as intensity and duration of precipitation/snow, characteristics of the tributary area and the time required for such flow to reach the drains. In the proposed hospital building, Storm water from various blocks shall be connected to adjacent drain by a pipe through catch basins. It is estimated that total 1 No. of recharge pit of 20 cum capacity would be require and feasible for rainwater harvesting.

Design of the recharge pit is depicted in Figure 9.2 of recharge pits are normally excavated pits, which are sufficiently deep to penetrate the low permeability layers overlying the unconfined aquifers. These pits are similar to recharge basins in principle, with the only difference being that they are deeper and have restricted bottom area.

Design specifications of the rain water harvesting plan for Bone & Joint hospital are as follows:

- The roof will have smooth, hard and dense surface which is less likely to be Damaged allowing release of material into the water. Roof painting has been avoided since most paints contain toxic substances and may peel off.
- All gutter ends will be fitted with a wire mesh screen and a first flush device would be installed. Most of the debris carried by the water from the rooftop like leaves, plastic bags and paper pieces will get arrested by the mesh at the terrace outlet and to prevent contamination by ensuring that the runoff from the first 10-20 minutes of rainfall is flushed off.
- No sewage or wastewater would be admitted into the system.
- No wastewater from areas likely to have oil, grease, or other pollutants has been connected to the system

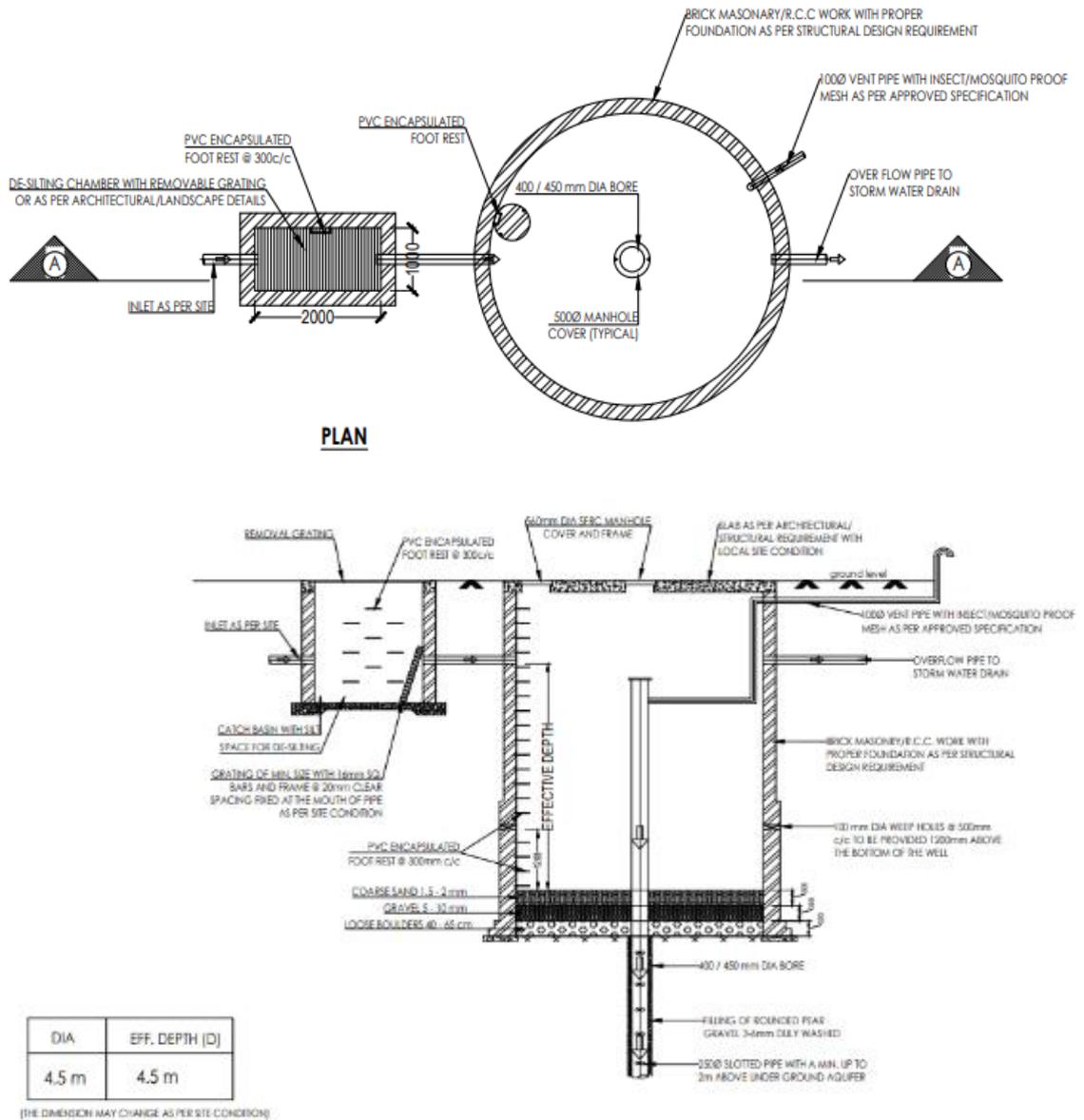


Fig. 9.2- Design Details of Rainwater Harvesting pit proposed under Bone & Joint Hospital Project  
(Plan & Section)

### 9.5.2. Solid Waste Management Plan

#### Construction Phase

During construction phase small amount of solid wastes will be generated from labour camps consisting of food waste, plastic, glass, aluminium cans and waste paper etc. this waste will be collected as per the provision of Solid Waste Management Rules 2016 and Construction contractor shall ensure daily collection of Solid wastes and periodic (weekly) disposal of construction waste generated debris, concrete, metal cuttings wastes, waste/used oil etc.

The municipal waste from the labour camp will only be routed through proper collection and handover to local municipal body for further disposal. Apart from this, littering should be strictly prohibited and labours trained towards the same.

#### During Operation

The proposed Hospital block will generate solid waste in form of food waste from kitchen/ canteen and other general waste. The waste will be generated from the hospital area about 820 Kg of Municipal waste which will be collected, transported and disposed of as per Solid Waste Management Rules 2016. The generated Solid Waste (MSW) will be finally collected and disposed by Srinagar Municipal Corporation. No indiscriminate disposal of garbage should be allowed within the complex. A proper waste collection system will be implemented in Bone & Joint Hospital Complex and waste will be segregated at source. To facilitate this, a multi-bin system will be provided and for each ward, floor to floor garbage collection system will be adopted.

General waste generated from the healthcare facility must be disposed of in accordance with the provisions of Solid Waste Management Rules, 2016 and following are the guidelines which shall be adopted Solid waste management from Bone & Joint Hospital.

- Health care facilities (HCFs) must ensure that the general solid waste generated from the facility is segregated and collected in a separate bins filled in with non-chlorinated bags and shall not be mixed up with the BMW generated in the facility. Requirements of HCFs in management of solid waste are given below;
- Collect segregate waste in two separate streams namely bio-degradable waste and dry-waste. Green bins shall be provided for bio-degradable wastes and blue bin for dry wastes. Colour coded bins may be either painted or labelled with particular colour.
- Plastic sheets provided inside the bins shall be of minimum 50mm thick as required under plastic waste management Rules, 2016. In case of bio-degradable waste collection bins, it is recommended to use compostable plastic bags of any thickness.

- Waste collected in bins shall be handed over to authorised waste pickers or waste collectors as per the direction or notification by the local authorities from time to time;
- Hospital will set-up on-site compost plants as far as possible.
- Used sanitary waste like diapers, sanitary pads etc. generated from hospitals should preferably be wrapped in the pouches provided by the manufacturers or brand owners of these products or in a suitable wrapping material and disposed along with soiled waste (yellow c) category waste for incineration.
- To store horticulture waste and garden waste generated from his premises separately in their own premises and dispose of as per the directions of the local body (local authorities) from time to time.
- General waste shall not be throw or burnt on streets, open public spaces outside the premises or in the drain or water bodies.
- HCFs shall pay user fee for solid waste management, as may be specified in the byelaws of the local body.
- HCFs shall handover segregated waste to authorized waste collector or agency as specified by the local body. Guidelines for Implementation of Bio-medical Waste Management Rules by Healthcare Facilities.
- General waste should not be stored in central waste storage area meant for Bio Medical Waste generated for the facility, but is stored separately, till it is handed over to authorised waste picker of local bodies
- Any BMW generated should not be mixed with the general waste. To ensure the same, health care facilities have to train all the staff of HCF to segregate general wastes and they shall also caution or advise the visitors in HCFs to follow the same.
- General waste should not be stored in central waste storage area meant for Bio Medical Waste generated for the facility, but is stored separately, till it is handed over to authorised waste picker of local bodies
- Any BMW generated should not be mixed with the general waste. To ensure the same, health care facilities have to train all the staff of HCF to segregate general wastes and they shall also caution or advise the visitors in HCFs to follow the same.

### 9.5.3. Green Belt and Plantation

Greenbelt development is the most efficient mitigation measure for control/prevention for air pollution & noise pollution. In addition to augmenting green cover and adding to the aesthetic beauty of the surrounding, greenbelt development checks the soil erosion, provides noise abatement and helps in prevention of carryover of the particulate matter beyond the plant premises. Thus, an effective greenbelt cover serves for barricading the potential pollution parameters within the plant premises. Green belt/plantation with the following objectives is also envisaged to be developed for the proposed project:

- Reduce air pollution.
- Attenuate noise generated
- Reduce the effect of fire and explosion
- Improve the general environment and aesthetics of the area
- Provide suitable habitat for fauna
- Control soil erosion

As per the CPCB guidelines 33 % area of total project area is earmarked for development of Green Belt. However, in the present case, it will be difficult to achieve this but it is proposed to develop new landscaping and Approx. 200 trees shall be planted as Green belt which will developed all along the project boundary with spacing of 2m between the trees. Drawing for green belt and plantation development is given as annexure-3. Public land and parks located adjacent to hospital shall also be taken for green cover development and after permission from land owner agency, suitable plant species will be planted.

#### **Guidelines for Green Belt and Plantation**

It was decided to retain the existing vegetation along the boundary. In addition more trees will be plant according to the landscape plan. Thus, the landscaping and plantation programme within the project site will improve the aesthetic quality of the project site as well as of the surrounding environment. The general consideration involved while proposing the green area plan are:

- Broad leaf trees growing above 10 m in height should be planted along the approach roads and project boundary Plantation of trees should be undertaken in appropriate encircling rows.
- Generally local/indigenous fast growing trees, evergreen habit, large crown volume and shrubs should be planted.
- The trees should be protected by plantation of shrub species to avoid browsing by animals and human activities.
- Placement of Iron tree guards should be provided to save the plant saplings.

#### **Landscape and plantation management (during operational Phase)**

- Sufficient number of trees will be planted inside the campus. Mostly native with less water consuming species will be planted.
- Open spaces should be covered with grass.
- No bare open space should be allowed to left as it may lead to soil erosion.
- Proper care should be taken to maintain the trees and plants.



**Species Suitable For Plantation**

Common Name	Botanical Name
Walnut (Akharot)	<i>Juglans regia.</i>
Chinar	<i>Platanus orientalis</i>
Robinia	<i>Robinia pseudoacacia</i>
Toon	<i>Toona ciliata</i>
Brimji	<i>Celtis caucasica</i>
Himalayan blue pine(Kai)	<i>Pinus wallichiana Jacks.</i>
Himalayan poplar(Panjeeb/ Parim phras)	<i>Populus ciliata Wal</i>
White Mulberry(Tul)	<i>Morus alba Linn</i>
Himalayan Silver Fir(Badul, kauch-badul)	<i>Pinus spectabilis D.Don.</i>
Western Himalayan Silver Fir(Badul)	<i>Abies pindrow Royle</i>
Chestnut(Handun)	<i>Pavia indica Wall.</i>
Italian Poplar(Kashur phras)	<i>Populus nigra Linn</i>
Kashmiri Cypress(Sarva)	<i>Cupressus torulosa D. Don.</i>

#### 9.5.4. Sewage and Wastewater Collection, Treatment and Disposal plan

##### Construction phase

The major source of wastewater will be from the labour usage at the construction site and labour camp which will be sent to septic tanks/soak pits. Use of onsite treatment (septic tank, etc.) and disposal of sewage, thereby minimizing the impacts of wastewater discharge from labour camp.

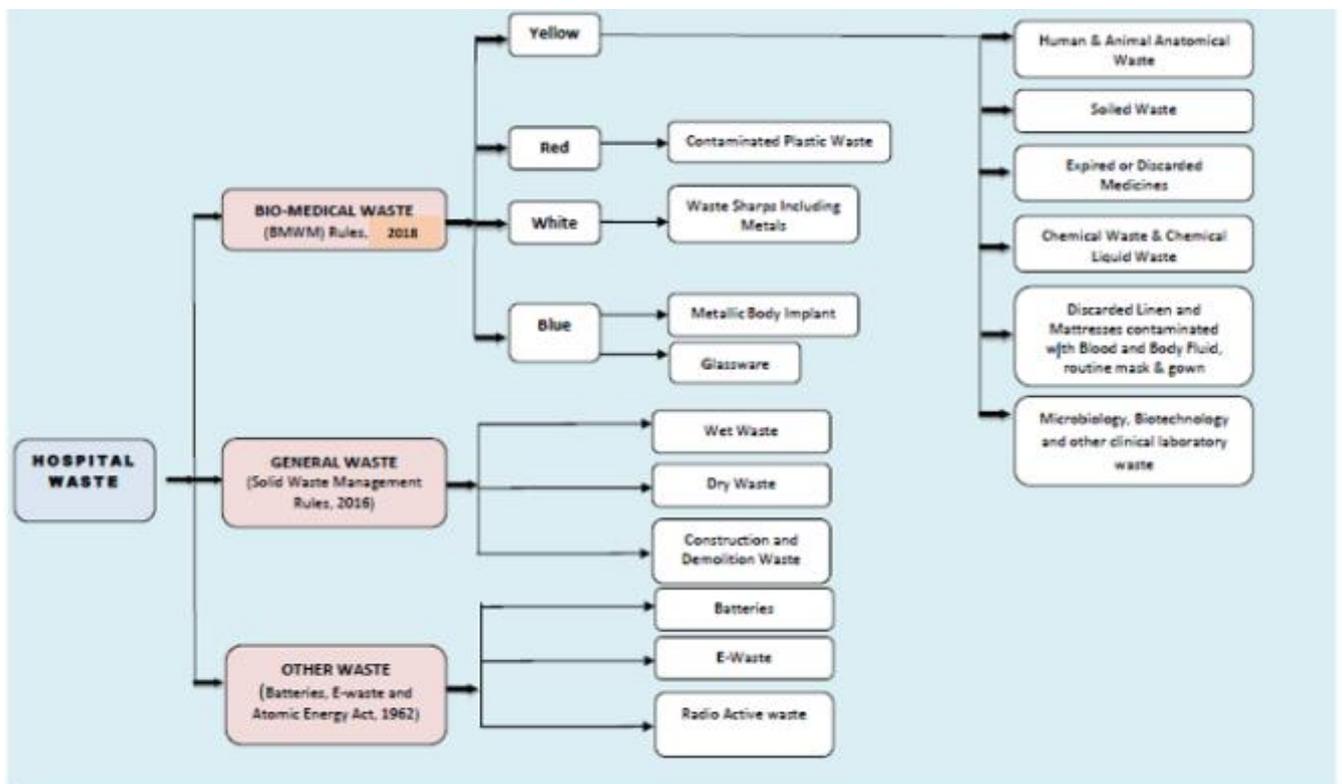
##### Operational Phase

Sewage treatment is a process of removing contaminants from sewage water to produce liquid and solids suitable for discharge to the environment or for reuse. Sewage treatment includes physical, chemical and biological treatments to remove these contaminants.

In the operational phase of the proposed hospital block, total 171 KLD wastewater will be generated which include 122.8 KLD domestic wastewater and 47.61 KLD flushed wastewater. Considering the wastewater generated, capacity of proposed STP 171 KLD is estimated. Therefore, a Sewage treatment plan for 175 KLD capacity is proposed for this unit. 47 KLD of laundry and laboratory effluent is estimated from this hospital unit. An ETP of 50 KLD to treat this effluent is proposed. It is advisable to treat wastewater with phosphorus and nitrogen removal units and filtration system for maximum use of treated wastewater.

### 9.5.5. Biomedical Waste Collection, Handling and Disposal Plan

Bio-medical waste means any waste, which is generated during the diagnosis, treatment or immunization of human beings or animals or research activities pertaining thereto or in the production or testing of biological or in health camps. Bio-Medical waste includes all the waste generated from the Health Care Facility which can have any adverse effect to the health of a person or to the environment in general if not disposed properly. All such waste which can adversely harm the environment or health of a person is considered as infectious and such waste has to be managed as per BMW Rules, 2018. As shown in the figure 9.4. Hospital wastes can be divided in three types of wastes which should be managed as per applicable waste management rules.



Source: CPCB 2018

Fig. 9.4 Categorization & Classification of Wastes in Health Care Facilities

In the proposed block of Bone & Joint Hospital, total 140 kg of biomedical wastes/day will be generated from 120 new beds and approx. 300 kg biomedical waste is being generated daily from old hospital building. Like the existing hospital system, all the biomedical wastes from proposed block would be collected as per the provisions of the Biomedical waste management rules 2016 and given to Common Bio medical waste treatment & disposal facility namely Kashmir Health care system which is operating from Lassipora, Pulwama about 40 Km from the Bone & Joint Hospital . Pneumatic tube system is also proposed for proper handling of BMW in the proposed project.

### Mitigation Measures regarding Bio Medical Waste Management for Existing & Proposed Hospital:

The following are recommendations to be implemented in the existing block to improve / update its BMW management. The updated system shall then be adopted by the expanded hospital & get synergized for obtaining regulatory approvals for the increased capacity.

- (i) **Segregation of waste** in colour coded bags has to done as per the New rules, 2016 & their subsequent amendments.
- (ii) **Mitigation Measures related to Pending Regulatory compliances subsequent to enactment of Bio-Medical Waste Management (Amendment ) Rules.**

- **No chlorinated plastic bag, gloves and blood bag will be used as Bio-Medical Waste Management (Amendment) Rules, 2018).** The hospital should identify such suppliers who can provide non-chlorinated bags, gloves, blood bags etc for the present as well expanded capacity.
- **Establish bar-code based software system**

A bar code based software system for collection, transportation and handling of BMW is should be ensured at earliest. The hospital should take steps for its implementation for old as well expanded blocks together. The establishment of such software based collection system shall also help in reducing the chance of any pilferage during handling of waste from generation to its final disposal in addition to reducing the handling time of waste and making it very efficient as well reducing the exposure time of people with waste

- **Display waste management monthly record on the hospital website**
- **Every occupier/operator to upload the annual returns on its website**  
The Bone & Joint Hospital should set up its own website very soon. Subsequent to the setting up of this web site, it will be possible for hospital to upload its monthly data as well annual reports as per regulatory requirements. The same web site shall be used by hospital for its expanded capacity.
- **The hospital shall obtain authorization under BMW Rules, consent under Air Act & Water Act for the expanded capacity**  
Presently, the hospital has authorization for the present capacity but consents under Water & Air act are still to be obtained from SPCB. The hospital should obtain consents under Water & Air Act(s) from SPCB & then plan to get the revised authorization & consents for the expanded hospital after complying with the above mentioned points.

#### (iii) Mitigation Measures related to BMW segregation

- Regular training of staff nurses & workers for BMW segregation.
- Creating awareness for segregation by putting segregation posters at all appropriate places.
- Provision of adequate no of bins at all places.

- Proper supervision by the BMW committee and follow up for segregation.
- Use of black coloured bags be discontinued with immediate effect & use only bags as per color coding scheme.

**(iv) Mitigation Measures related to BMW Management Committee**

The same committee shall work for the existing hospital and then for the expanded hospital. The committee should be assigned the following functions:

- To oversee the overall BMW management of hospital
- To organise the training programs for BMW handling & disposal in the hospital.
- To ensure the Immunization of Health workers with Tetanus and Hepatitis-B vaccine
- To inspect the common BMW facility from time to time
- To inspect the segregation of BMW within the hospital complex
- To ensure the adequate & proper use of PPEs
- To foresee the overall requirement of BMW bins, bags, PPEs and other infrastructure
- To coordinate for setting up hospital website as well Bar coded software based collection system
- To get the monthly data as well annual reports uploaded on hospital web site
- To coordinate the Health check-up of all staff nurses /workers involved in BMW handling

**(v) Mitigation Measures related to Health Check of Staff nurses & workers**

The hospital should do the following for existing hospital & then continue to do it for expanded capacity:

- Set up a committee of hospital doctors for health check-up of staff nurses & workers. If required, the doctors from other nearby Govt. hospitals can be involved.
- A proper format of various tests be prepared
- A fixed schedule of check-up (preferably half yearly) be decided
- A proper record of all staff examined be maintained
- The records be scrutinised regularly to find any adverse impact on health of any nurse & staff handling BMW
- In addition, all the staff nurses & health workers be immunized with Tetanus and Hepatitis-B vaccine on regular basis as per the guidelines of these injections.

**(vi) Mitigation Measures related to BMW Management Trainings**

- The hospital should get 2 or 3 senior doctors & nurses fully trained in all aspects of BMW management (These persons can preferably be a part of the BMW committee) and they become the master trainers.
- A monthly training program be organised by these master trainers in such a way that all nurses / workers involved in the BMW management of hospital get a chance to be trained / re-trained once in every six months
- Proper record of such trainings be maintained

- The persons having been trained be evaluated for their understanding at their working stations by the BMW committee from time to time
- BMW management be part of assessment of performance evaluation of such employees

**(vii) Mitigation Measures related to BMW infrastructure, materials etc.**

- Provide new & adequate no of trollies for the existing block as well for expanded capacity. The bad conditioned trolleys can be a big risk while transporting waste from various wards to storage point due to any spillage or overturning or any accident
- Provide adequate no of bins at all the wards /points at appropriate places
- Provide bins of adequate size at appropriate places. Too much over size or undersize of bins should be avoided. Unlike, in the present system, when all the bins for whole of hospital are of same size of 60 litres
- Provide adequate no of needle blasters, preferably one per nursing station.

**(viii) Mitigation Measures related to Personal Protective Equipment (PPEs)**

The following points are suggested for the existing hospital as well the expanded capacity:

- Procurement of adequate no of PPEs like gloves, masks, head covers, gum boots etc
- Proper training of all staff about the hazards for not using the protective measures
- Proper training of all staff about the use of PPEs
- Regular inspection by the BMW committee / hospital administration
- Rewards to the employees following full protocol in use of PPEs.

**(ix) Mitigation Measures related to Common Collection Point (Waste Storage Room)**

- Till the construction of new waste storage room in the new block, the present waste storage room be immediately attended for proper ventilation as well secured shutter / lock up be provided in order to avoid any unwanted person /animal coming in contact with waste
- The area outside the waste storage room be cleaned of any unwanted debris or other items
- In addition, this area should be fenced / secured to avoid the entry of any rag pickers / animals in that area
- The area outside the waste storage room (which is again common area for expanded capacity of hospital) be cleaned and improved with pucca (Hard) floorings since it is infested with rats & other rodents who are likely to interfere with waste and can spread the diseases.

**(x) Mitigation Measures related to Liquid Waste Management**

- The hospital authorities should make arrangements for treatment of all liquid wastes (with Sodium hypo chlorite) before it is allowed to be mixed with drain water for its further treatment in STP for the present set up & then for the expanded capacity.

**(xi) Mitigation Measures related to Health Safety Measures**

- The open area outside of waste storage room should be cleared of all waste lying over it ( including syringes , needles etc. )
- The placing of bins containing waste at few places in very near to patient beds should be reviewed and be placed at secluded locations in wards.
- The small bins being used for storing BMW on sister's trolley must have proper cover.
- Covers must be provided to all bins containing waste.
- No BMW bins be placed in urinals / toilets being used by patients / attendants.
- Waste storage room needs to be immediately made ready with proper ventilation & locking arrangement, since this can be misused by rag pickers /stray animals
- Sufficient no of BMW bins be provided at all places. Preferably, there should be one set of bins per nursing station in each ward.
- The area outside the storage room need proper cleaning since a some BMW is scattered there and a proper PCC platform since presently, it is infested with rats /rodents, who can carry the waste to other places.
- The isolation (HIV Infected patients) ward should be totally isolated and entry should be highly restricted. The waste from this ward shall be handled with special care & properly recorded.
- The entry in neo-natology ward should be highly restricted and the waste of this ward should be stored in a secluded & safe place.

**(xii) Mitigation Measures related to Record Keeping**

- The record keeping of hospital need to be improved as detailed below. The improved records to be implemented for the expanded capacity.
- Presently, a cumulative quantity of total waste produced from whole of the hospital is found out & entered in the register with total no of bags /day. This record needs to be collected ward wise along with bags and then added to arrive at the total quantity of waste /bags/day. This needs to be done for existing block and then expanded block to be included in the same.
- The records of BMW trainings to be maintained for the existing block & then expanded block to be merged with it
- The records of health check-ups of staff nurses /workers to be maintained for existing blocks & then expanded block to be merged with it.
- Dead Foetus below viability period shall be considered anatomical waste. Medical officer to issue MTP certificate before disposal to CBWTF and a proper record of the same be maintained

- A proper record of authorisation and consents (both air & water) obtained from SPCB be maintained now for the present block & then again get it for the expanded hospital.
- Separate record of Isolation ward (HIV) waste should be maintained
- Separate records of major accidents should be maintained
- The records of annual returns of at least last 3 years filed with SPCB should be kept in a proper file for comparison of various components of waste & other issues
- The records of BMW committee meetings to be maintained regularly for the existing block & then including the expanded block
- Separate records of expired drugs /discarded medicines be maintained

#### 9.5.6. Mitigation Measures related other Wastes

##### Management of Radioactive Wastes

The Atomic Energy Regulatory Board (AERB) has been mandated by the Central Government, as the Competent Authority as per Atomic Energy (safe Disposal of Radioactive Wastes) Rules, 1987 notified under the Atomic Energy Act 1962. It exercises regulatory control over nuclear installations and the use of radioactive substances and radiation generating plants outside such installations. AERB also empowered to perform the functions as stipulated under sections 10(1) (powers of entry) and 11(1) (powers to take samples) of Environmental (Protection) Act, 1986 and Rule 12 (agency to which information on excess discharge of pollutants to be given) of the Environmental (Protection) Amendment Rules, 1987 with respect to radioactive substances.

As per provisions of Atomic Energy (safe Disposal of Radioactive Wastes) Rules, 1987, no person shall dispose of radioactive waste (a) unless he has obtained an authorization from the competent authority under these rules; (b) in any manner other than in accordance with the terms and conditions specified in the authorization issued under these rules; (c) in any location different from those specified in the authorization; and (d) in quantities exceeding those specified in the authorization.

Health Care Facilities generating radionuclides waste from treatment of Cancer patients and end-of-life equipment containing radio radionuclides shall obtain authorization from AERB for its disposal. As per the policy of AERB, radionuclides wastes are required to be re-exported back to the manufacturer. It was recommended that such generators shall ensure arrangement with manufacturer at the time of purchase of such equipment. Waste disposal facilities of AERB are regulated by Waste Disposal Agency (Division) of AERB.

## Management of Used Batteries

As per the provisions under Batteries (Management & Handling) Rules, 2001, used lead acid batteries generated from health care facilities (HCFs) should be sold/auctioned/sent only to the authorised dealers, designated collection centres or authorised recyclers or any authorised agency. In no case the used batteries be handed over to an unauthorised person. Hospital having purchased more than 100 batteries should maintain records of number of batteries purchased, and number of used batteries sent to registered recyclers/authorised dealers/designated collection centres/any other agency as per Form-VIII of Batteries Rules, 2001 and the returns shall be filed half yearly i.e. by 30th June and 31st December of every year to the concerned State Pollution Control board.

## Management of E-Wastes

As per provisions under E-Waste (Management) Rules, 2016, as amended every generators of end of life electrical and electronic equipment (EEE) listed under Schedule-I are required to ensure that such E-Waste is sent to an authorized E-Waste dismantling or recycling facility or an authorised collection centre of the Producer of EEE or through designated take back service providers of Producers or registered Producer Responsibility Organization (PRO) of a Producer. E-waste can be auctioned only to authorised E-Waste Recyclers/ Dismantlers/ PRO of a Producer. Records of E-Waste transfer/sale should be maintained records in Form -2 for verification of the SPCBs/PCCs and Annual returns as per Form-3 of E-Waste (Management) Rules, 2016, as amended should be submitted to SPCBs/PCCs by June 30th of every year. E-Waste generated from hospital equipment not listed in Schedule-I should also be sold/transferred to only the authorized E-Waste Recyclers/Dismantlers.

### 9.5.7. Heath, Hygiene and Odour control plan from waste collection including temporary storage areas and STP sites

Following are the precautions and measures should be adopted to maintain the health hygiene and control odour from waste collection including temporary storage areas and STP/ETP sites.

### Heath, Hygiene and Odour control plan from waste collection including temporary storage areas-

Bio-medical waste should be collected on daily basis from each ward of the hospital at a fixed interval of time. There can be multiple collections from wards during the day.

- HCF should ensure collection, transportation, treatment and disposal of bio-medical waste as per BMWM Rules, 2018 and HCF should also ensure disposal of human

anatomical waste, animal anatomical waste, soiled waste and biotechnology waste within 48 hours

- Collection times should be fixed and appropriate to the quantity of waste produced in each area of the health-care facility.
- General waste should not be collected at the same time or in the same trolley in which bio-medical waste is collected.
- Collection should be daily for most wastes, with collection timed to match the pattern of waste generation during the day. For example, in an IPD ward where the morning routine begins with the changing of dressings, infectious waste could be collected mid-morning to prevent soiled bandages remaining in the area for longer than necessary
- Bio-medical waste bags and sharps containers should be filled to no more than three quarters full. Once this level is reached, they should be sealed ready for collection
- Interim storage of bio medical waste is discouraged in the wards / different departments of HCF.
- If waste is needed to be stored on interim basis in the departments it must be stored in the dirty utility/sections.
- No waste should be stored in patient care area and procedures areas such as Operation Theatre. All infectious waste should be immediately removed from such areas.
- In absence of dirty utilities/ sections such BMW must be stored in designated place away from patient and visitor traffic or low traffic area
- In house transportation of Bio Medical Waste from site of waste generation/ interim storage to central waste collection centre, within the premises of the hospital must be done in closed trolleys / containers preferably fitted with wheels for easy manoeuvrability.

### Central Waste Collection Room for Bio-medical Waste

Each Healthcare facility should ensure that there is a designated central waste collection room situated within its premises for storage of bio-medical waste, till the waste is picked and transported for treatment and disposal at CBWTF. Such room should be under the responsibility of a designated person and should be under lock & key. The following points may be considered for construction of central waste collection room

- The location of central waste collection room must be away from the public/ visitors access.
- The space allocation for this room must be as per the quantity of waste generated from the hospital.
- The planned space must be sufficient so as to store at least two days generation of waste.

- Central waste collection room must be roofed and manned and should be under lock and key under the responsibility of designated person.
- The entrance of this centre must be accessible through a concrete ramp for easy transportation of waste collection trolleys.
- Flooring should be of tiles or any other glazed material with slope so as to ease the cleaning of the area.
- Exhaust fans should be provided in the waste collection room for ventilation.
- It is to be ensured by the health care facility that such central storage room is safety inspected for potential fire hazard and based on such inspection preventive measure has to be taken by the health care facility like installation of fire extinguisher, smoke detector etc.
- There should also be provision for water supply adjacent to central waste storage area for cleaning and washing of this station and the containers. The drainage from the storage and washing area should be routed to the Effluent Treatment Plant.
- Sign boards indicating relevant details such as contact person and the telephone number should be provided.
- The entrance of this station must be labelled with "Entry for Authorized Personal Only" and Logo of Bio Medical Waste Hazard.
- It is to be ensured that no general waste is stored in the central waste collection area

#### Odour Control Plan for STP/ETP

- Ensure proper functioning of all the units of STP/ETP for digestion of sludge and ensure adequate functioning of dewatering units for efficient functioning of system
- Tree plantation and landscaping along the periphery of the STP/ETP sites to prevent spread of bad odour
- Accumulated sludge and solid waste to be cleared within 24 hours
- Regular clearance of sludge and solid waste to minimize odor nuisance.
- Spraying of herbicides like Maple and Gtech on accumulated sludge/solid to reduce odour.

#### 9.5.8. Occupational Health and Safety Issues and Its Management

##### Construction Phase

There is a chance of adverse effect on the workers at site during construction as some of the activities involve risk and occupational health hazard, which can be minimised by taking the following mitigation measures during construction.

- The construction works generates respirable dusts, so in some cases the workers must use mask.
- If handling of hazardous chemicals required at any stages of construction the workers must use the hand gloves.
- The workers must be provided with earplugs and earmuffs for any job, which will generate excessive noise.

- As the workers will have to work at height, they must be trained and caution about the possible danger.
- While working at height the tools and other heavy materials can fall down causing accidents, so the adequate PPE like helmets, safety shoes must be made available to the workers.
- The workers must use safety goggles during gas cutting or welding.
- Proper training and awareness programme can be carried out so that the worker can understand the risk involved in any construction process and also the importance of use of personal protective equipment's.
- The electrical equipment's and fittings to be used must be having ISI mark to avoid short-circuiting.
- There must be adequate fire fighting arrangements during both construction and operation stages.

### Sanitation and Healthcare at Workers Camps

The following measures will be taken to ensure health aspects of workers.

- The contractor shall install adequate lavatories and baths at the construction camp.
- The contractor shall treat the waste in package type treatment system at the worker colony and construction yard.
- All organic waste generated at construction yard and worker camp should be composted in trench
- Periodic health check-ups of construction workers should be organized
- Adequate provision of water supply should be made at workers
- The living space at workers camp should meet the norms of Indian Labour Law.

### Operational Phase

It is the responsibility of the in charge of the healthcare facility to ensure the occupational safety of the healthcare workers and other staff involved in handling of Bio medical waste in the healthcare facility.

As per Bio Medical Waste Management Rules, 2016 occupational safety of the staff has to be ensured in following methods:

1. Providing adequate and appropriate Personal Protective Equipment (PPE) to the staff handling Bio Medical Waste. Use of PPE while handling of Bio Medical Waste must be encouraged and must be monitored regularly to ensure occupational safety of staff. Personal Protective Equipment (PPE) includes:
  - Heavy Duty Gloves (Workman's Gloves)
  - Gum Boots or safety shoes for waste collectors
  - Face mask
  - Head Cap
  - Splash Proof Gowns or aprons etc.

- Disposal gloves for waste handlers
2. Conducting health check-up of all the employees at the time of induction and also at least once in a year.
  3. Ensuring that all the staff of the health care facility involved in handling of BMW is immunized at least against the Hepatitis B and Tetanus.
  4. Taking remedial steps in accordance to any accident occurred, leading to any harm to the employee, during the handling of Bio medical waste

#### 9.5.9. Energy Conservation Measures to be adopted in the Proposed Bone & Joint Hospital Block

As per Energy Conservation Building Code (ECBC) 2017 of the Bureau of Energy, energy conservation measures would be adopted in the proposed block. Use of Solar photovoltaic panels on the south façade will be used in the proposed block. Use of Solar water heating panels will also be used for supply of hot water.

It is recommended to use energy efficient lighting in the hospital. LED's are the most energy efficient lighting option available. As a comparison, a 100 Watt bulb gives 1600 lumens of light. A 23 Watt CFL gives 1400 lumens and LED tube light (28 watt T5) gives about 2600 lumens. Therefore, it is recommended that the general lighting in the Hospital must be LED fixtures. These consume much less energy and therefore reduce the energy consumption of the building.

To further reduce the energy consumption, smart building systems such as automated building controls should be used. These light controls can be timed to switch off certain lights in the corridors, lobbies and lift waiting areas at off peak hours to reduce energy consumption. The lighting controls can also be occupancy sensing to increase or decrease the amount of lighting in a space based upon the presence or absence of people in the area. These can also be automated to adjust in intensity based upon the daylight levels available in the space.

Exterior lighting fixtures should have inbuilt photosensors which allows them to turn off automatically when the daylight levels are sufficient.

For the Old Block of Bone & Joint Hospital which is using aluminium wiring must be replaced with copper wiring.

In the proposed block, VAV (Variable Air Volume) are recommended. These match air supply continuously to cooling and ventilation loads. These provide good efficiency in HVAC design. All AHU's must be planned with VFD's (Variable Frequency Drives) for fan speed adjustments. Ducted and treated fresh air supply must be provided to all parts of the Hospital as per ASHRAE guidelines.

### 9.5.10. Alternative Building Materials

The proposed project has been planned in a manner to achieve environment friendly sustainable development. The construction material to be used will include renewable and non-renewable resources including stones, aggregates, sand, steel, concrete, fly ash mix cement, and clay and fly ash bricks. Aerocon blocks (Autoclaved Aerated Concrete Blocks may also be taken for wall constructions. Wood alternatives will be used in the project with minimal use of timber for the proposed construction.

The materials will be procured from reputed manufacturers with test certificates as per BIS specifications. Low VOC and non-toxic paints and adhesives to be used as per LEED standards. List of alternative building materials for green buildings is summarized in Table 9.4.

Table 9.4: Alternative building materials for Green building

S.No	Material	Conventional Material	Green & Alternative Building Materials
1-	Window and openings	Aluminium Panelled plain glasses	Insulated Glass (IG units)
2-	Lighting and fixtures	Tube lights & CFLs	Low watt LED tube lights & bulbs
3-	Plumbing Fixtures	Conventional Fixtures	Green water saving fixtures
4-	Flooring	Vitrified & Glazed Tiles , China Mosaic	PVC Flooring ,
5-	Doors	Pine Wood	Engineering Wood
6-	Paints	Plastic VOC	Plastic Non VOC
7-	Bricks	Clay Bricks	Fly-ash Bricks
8-	Cement	OPC	PPC

### 9.5.11. Parking Area, Traffic movement and Decongestion Plan

In accordance with the NBC codes, parking space has been estimated and major shortfall recorded. Looking to the land constrain within the campus, only 740 sq.m area is designated for parking which can only accommodate 37 Cars. Considering the total floor area that will be used for future development of existing hospital, total 556 number of car parking would be required that demands more than 11120 Sq.m area. It is recommended that looking to the high demand of parking space, multi-level parking should be built near to Bone and Joint Hospital which will ease the existing traffic circulation and parking issues.

## Mitigation Measures for Parking and Traffic Management

- This shortfall in the public parking spaces needs to be met by providing offsite parking and construction of new multi-level car parking. It must be noted that the parking requirements are likely to increase in future. The hospital site is limited in size and it cannot accommodate increase in the parking area. Dedicated shuttle minibuses (with low boarding steps for patients) or dedicated taxis/ autos need to connect this offsite parking area with the hospital premises. The reduction in parking spaces will reduce noise and air pollution on the site.
- Currently the parking is chaotic due to lack of well-defined parking bays. The parking bays needs to be defined by paints or dividers. These must be enforced strongly by the parking attendants for discipline and avoiding traffic jams.
- Parking should only be allowed at designated parking areas and at the main entry gate parking should be prohibited to avoid any congestion.
- No parking should be allowed on place designated for ambulances. Existing Emergency access routes will be maintained to permit emergency vehicles to attend the premises at all times.
- Over speeding and careless driving of vehicles causes danger to the patients, attendants and other pedestrians. Therefore, speed retarding pavers and speed breakers for speed control are recommended.
- Well defined entry and exit points will be provided for safe route to the visitors/patients.
- To avoid disruption and inconvenience to hospital services during constructional phase of the project, control measures shall contain details of temporary diversions of traffic, separate entry and parking of construction vehicles and visitors vehicles and ambulance, traffic safety arrangements, ensure proper signs, temporary barriers and/or danger tape and flagmen to prevent unwanted labour entry to the hospital and to exposed construction work to warn the public and ensure smooth traffic flow and safety of the hospital visitors.

### 9.5.12. Fire-fighting plan and facilities

The fire protection system for the proposed Hospital complex building is to be designed as per the provisions of National Building Code - 2005 and taking consent from local administration including fire service authority. The following provisions will be made available as required in the building which, it is expected, would provide a reasonable degree of protection from fire hazards and at the same time satisfy the local fire authority, if any:

- Wet risers with hose reels at each floor
- Yard hydrants on the periphery of the building
- Manual call alarm system on each floor
- Automatic fire detection & alarm system
- Public Address and Communication System
- Good Housekeeping & Maintenance and training of staff

### Hydrant System

Hydrant system will be provided at each floor and also on the periphery of the building (Yard hydrants). The water supply to hydrants would be by means of wet riser piping system connected to the static storage in the underground reservoir through a set of automatic pumps installed in the pump room. The system is also fitted with inlet connection (fire brigade breaching inlet) at ground level for charging with water by pumping from the fire service appliances and an air release valve at roof level to release trapped air. The Fire Hose Cabinets would be placed at conspicuous locations preferably near staircase and lift lobby, ensuring that no part on the floor is more than 30 m away from it.

### Automatic Sprinkler System

The entire building except electric substation and plant room is to be provided with automatic sprinkler system. The system will be designed as per IS: 15105 – design and Installation of fixed automatic sprinkler Fire Extinguishing system/NFPA 13 – standard for the Installation of Sprinkler System. Sprinkler system shall incorporate an alarm system also. The Sprinkler Annunciation Panel located in the fire control room will indicate the operation of the sprinklers on the particular floor with an audio visual alarm.

### Fire Pumping System

Water sumps are provided in the pump room in the underground reservoir so that always Immersed suction is available for the pumps. The pumps are designed to cater for the Flow and pressure requirement at any point of the fire fighting system. The system will comprise of following pumps:

- Electric Fire Hydrant pump
- Electric Sprinkler pump
- Electric Jockey Pump
- Diesel Standby pump

### Portable Fire Extinguishers

ISI marked portable fire extinguishers of specified type and capacities shall be provided at all levels including all the hospital wards, electric substations, meter rooms and lift machine rooms etc. as per the provisions of IS : 2190 – 1979.

### Fire alarm

- Fire Alarm will be acknowledged by main fire control panel at Security Control Room
- Security Supervisor will inform the main Security Control Room, Safety Officer and send Security Guards along with Fire Extinguishers to the location of fire
- Security Supervisor attending call at Security Control Room will obtain following information from the caller
  - a). Caller's name
  - (b) Location of fire
  - (c) Type of fire

Security Supervisor will also inform relevant safety personnel responsible for making call to Fire Brigade to deal with the problem.

### Action Plan during Evacuation

Whenever there is a fire alarm, the supervisor, on duty in security/ fire Control room will make announcement regarding the incident directing People and personnel to take the proper course of action.

For Engineering Staff during Fire Evacuation Drill-

- Ensure un-interrupted power supply and make sure that inverters and emergency lights are functional
- Ensure smoke extractors are on AUTO;
- Make sure that there is sufficient quantity of water in UG tank and Oh fire tanks
- Ensure that the main sprinkler/ hydrant and diesel pumps are functional and that there is sufficient water pressure in fire line to deal with the situation;
- Ensure the clarity of announcement voice and that the emergency and exit signs are glowing
- Monitor the D.G. Sets and ensure that tripping does not happen, when the fire pumps

### For Security Staff during Fire Evacuation Drill

- Security Supervisor will take over Security Control Room operation
- He will sound alarm and make announcement for evacuation, if required
- Security staff will ensure that each elevator is grounded. They must also help in the safe removal of trapped passenger(s), if any;
- Ensure that security guards deployed at main staircases, ramps for fast and safe evacuation;
- Open the exit doors for easy movements of occupants and ensure that all the doors are kept fully opened;
- Ensure that no crowd is gathered near the door and area has to be kept free from all the obstacles at that time
- Ensure that nobody is permitted to re-enter through the exit doors for any reasons, so that ejecting people are not obstructed

- A search team having a torch should look for unconscious people/ burnt/ disabled/ old/ children/ injured and keep informing the rescue party and
- Depute security guards as per requirement, such as one security guard for receiving fire brigade and ensure that fire tender route is FREE

## 9.6. Environmental Monitoring

Monitoring is an important tool in establishing the success or failure of a project with regard to compliance to environmental safeguards. The purpose of the monitoring programme is to ensure that the intended environmental measures are achieved and result in desired benefits to the target population. To ensure proper implementation of the Environment Monitoring Plan. It is essential that an effective monitoring programme is designed and carried out.

The broad objectives of the environment monitoring plan designed for Bone & Joint Hospital project are summarized below:

- To monitor impacts on the surrounding environment and the effectiveness of mitigation measures during the construction and operation.
- To ensure that the environmental control systems installed at the plant are operating satisfactorily.
- To suggest ongoing improvements in management plan, if required, for subsequent effective monitoring
- To satisfy the requirements of environmental regulatory framework and community obligations

### 9.6.1. Framework for Monitoring and Evaluation

The project authority will be responsible for carrying out monitoring and evaluation. Internal monitoring will be carried out by the R&B L. This will help monitor project activities closely. Regular monitoring by undertaking site visits will help identify potential difficulties and problems faced in the project implementation and subsequently help take timely corrective measures including deviations, if needed.

Total project implementation period is considered 2 years and for the post project monitoring 3 years are taken. Monitoring will start as soon as the project implementation begins, PMC officials if any and local representatives are appointed / nominated at site for implementation of EMP. Components of monitoring will include performance monitoring i.e., physical progress of the work and impact monitoring and external evaluation. Indicators that would be monitored related to performance as per monitoring plan. However, if during the project implementation some other indicators are found relevant then those shall be included. NGO with appropriate expertise will be hired for external evaluation of EMP

implementation or proposed design components. The monitoring will also provide feedback on community concerns, grievances and requests. Monitoring will focus on and ensure the following:

- Verification that there are no outstanding or unresolved issues with respect to the project
- Information campaign, discrimination and consultation with affected people,
- Effective operation of the Grievance Redress Committees detailing out number of complaints received and those resolved; reasons for not being able to resolve the grievance and status of unresolved grievances.

### 9.6.2. Institutional Arrangements for implementation and Safeguards Monitoring

Following are and institutional arrangement and their responsibilities have been decided up for implementation and Safeguards Monitoring of the project:

Institutional agency/Individual	Roles and responsibilities
<b>Project Management Unit</b>	The PMU will be responsible for: <ul style="list-style-type: none"> <li>- Overall project management and reporting.</li> <li>- Coordination with PIUs and line departments in approval of designs, assisting the PIUs in preparation of: DPRs, bidding documents, tendering schedules, etc.</li> <li>- Quality Assurance through third party audits.</li> <li>- Maintaining MIS and Quarterly reporting</li> <li>- Progress reporting, financial management, monitoring and reporting.</li> <li>- Implementation of Components</li> <li>- Ensuring compliance with agreed implementation procedures and other Bank</li> <li>- Grievance redress.</li> </ul>
<b>Project Implementation Units (PIU)</b>	<ul style="list-style-type: none"> <li>- Monitoring of Specific sub-project activities planned and carried out by Implementing Agencies (IA)</li> <li>- Preparation of Detailed Project Reports including technical designs, surveys and investigations, etc.</li> <li>- Tendering, bid evaluation, contract award, contract management, etc.</li> <li>- Financial Management and safeguards compliance.</li> <li>- Progress and expense reporting to the PMU.</li> <li>- Coordination with line departments for design, implementation, and hand-over arrangements.</li> <li>- Grievance redress</li> </ul>
<b>Project Implementation Agency (PIA)/ Contractor</b>	<ul style="list-style-type: none"> <li>- Project implementation at the ground as per the Drawing/designs/DPR of the sub project</li> <li>- Designate an Environmental Safeguard Specialist within team to ensure implementation of EMP</li> <li>- Submit monthly EMP compliance report to PIU &amp; PMU</li> </ul>
<b>Third Party Evaluation agency/NGO</b>	<ul style="list-style-type: none"> <li>- External Evaluation of implementation of EMP – Evaluation needs to done carried out by an independent agency engaged by R&amp;B /PIU</li> </ul>

## 9.7. Environmental Monitoring Plan & Schedule

To evaluate the effectiveness of environmental management programme, regular monitoring of the important environmental parameters will be taken up. Environmental Monitoring Plan, schedule, duration and parameters to be monitored are shown in Table 9.5 and Table 9.6.

Table 9.5: Environmental Monitoring Plan –Pre Construction and Construction Phase

Type of Monitoring	Parameters	Frequency	Responsibility	Monitoring Location
<b>Pre-Construction Phase</b>				
Emergency Response Plan	Preparation for Emergency Plan for situations such as Medical emergency, terrorist attack, Bomb threats Accidents, , Flash floods or inundation Earthquake Handling Flammable of Substances	Prepare during Design Stage and implement through the construction phase	Concerned officials of R&B	Project Site
Training Plan	Preparation of training plan for aspects such as health and safety fire, emergency evacuation, communication with external agencies	Prepare during Design Stage and implement through the construction phase	Concerned officials of R&B	Project Site
<b>Construction Phase</b>				
Air Quality	PM <sub>10</sub> , PM <sub>2.5</sub> , SO <sub>2</sub> , NO <sub>2</sub> , CO	Once in Six Month	Contractor through third party NABL accredited lab	3 locations in and around construction site
Dust generation	Adequacy of dust suppression techniques	Daily	Contractor	At Construction site
Noise	Ambient and occupational exposure	Once in a Six Month	Contractor	3 location including hospital premises

Type of Monitoring	Parameters	Frequency	Responsibility	Monitoring Location
Water Quality	Drinking water parameters as per IS 10500:2012	Six Monthly	Contractor through third party NABL accredited lab	3 Samples- Drinking water, Surface water and ground water one sample each
Waste generation	Record of C&D wastes, solid waste, Hazardous waste, if any	Daily	Contractor	Construction site and labor camp
Drainage	Check clogging of drains, ensure no logging of water, ensure contours levels are restored	Monthly	Contractor	Construction site
Sanitation and Hygiene	General Cleanliness, Periodic removal of garbage, inspection of toilets and other	Weekly	Contractor	Construction site and labor camp
Health	General health check-up, identification of water logged areas having disease vector carrier like mosquitos	Monthly	Contractor	Project site and labour camp
Occupational Health and safety	Usage of PPEs,	Daily	Contractor	Project Site
Security	General Security Prevent unwanted access to site, night security	Daily	Contractor	Project Site/storage area
Traffic & Parking management	Ensure traffic & Parking management plan	Daily	Contractor	Project Site, parking area and access road

Type of Monitoring	Parameters	Frequency	Responsibility	Monitoring Location
Photography and record keeping of construction progress	Match implementation schedule, ensure record keeping of materials and photography of construction update	Weekly	Contractor	Project Site

Table 9.6: Environmental Monitoring Plan-Operational Phase

Type of Monitoring	Parameters	Frequency	Responsibility	Monitoring Location
Ambient Air Quality monitoring	PM <sub>10</sub> , PM <sub>2.5</sub> , SO <sub>2</sub> , NO <sub>2</sub> , CO	Once in six months (for 3 years)	Project proponent through third party NABL accredited lab	3 locations in and around Bone & Joint Hospital site
Stack emission monitoring (DG set)	PM, SO <sub>2</sub> , HC, NO <sub>2</sub> , CO	Once in six months (for 3 years)	Project proponent through third party NABL accredited lab	For DG sets emission from 2 Sets
Indoor Air Quality Monitoring	Temp, Humidity, PM <sub>2.5</sub> , CO, radon, Bio-aerosols for bacteriological & fungi monitoring	Once in six months (for 3 years)	Project proponent through third party NABL accredited lab	Inside hospital 4 sites, General ward, Emergency ward, ICU, & canteen
Noise	Ambient and occupational exposure	Once in six months (for 3 years)	Project proponent through third party NABL accredited lab	3 locations in and around Bone & Joint Hospital site

Type of Monitoring	Parameters	Frequency	Responsibility	Monitoring Location
Water Quality & treated wastewater quality	<ul style="list-style-type: none"> <li>• Drinking water parameters as per IS 10500:2012</li> <li>• For Wastewater pH, BOD, COD, TSS, Oil &amp; Grease and coliform.</li> </ul>	Quarterly (for 3 years)	Project proponent through third party NABL accredited lab	<ul style="list-style-type: none"> <li>• Drinking water, Surface water and ground water one sample each (3 No.)</li> <li>• Inlet and outlet of treatment plant one sample each (2 No)</li> </ul>
Bio-medical/Solid/Hazardous Waste	Record keeping and management of Biomedical waste, C&D wastes, solid waste, Hazardous waste, and wastewater	Daily	By project proponent as per regulatory requirements	At Bone & Joint Hospital
Storm water drains	Check clogging of drains, ensure no storm water drain should not have untreated wastewater	Monthly	By project proponent/hospital administration	At Bone & Joint Hospital
Sanitation and Hygiene	General Cleanliness, Periodic removal of garbage, inspection of toilets etc.	Weekly	By project proponent/hospital administration	At Bone & Joint Hospital
Health	General health check-up, identification of water logged areas	Monthly	By project proponent/hospital administration	At Bone & Joint Hospital

Type of Monitoring	Parameters	Frequency	Responsibility	Monitoring Location
	having disease vector carrier like mosquitos			
Landscaping	Park and greenery development	Six monthly	By project proponent/hospital administration	At Bone & Joint hospital
Occupational Health and safety	Usage of PPEs, Alarm system, Fire fighting system,	Daily inspection , Quarterly mock drills	By project proponent/hospital administration	At Bone & Joint hospital
Emergency Response Plan	Fire preventive measures, Signage, Fire Alarm, Fire Fighting Systems, evacuation plan, for situations emergency, terrorist attack, Bomb threats Accidents, , Flash floods or inundation, Earthquake	Once in 6 months, Quarterly mock drill (to be checked)	By project proponent/hospital administration	At Bone & Joint hospital

### 9.8. Grievance Redressal Mechanism Cell (GRC)

An Integrated Grievance Redressal Mechanism (IGRM) shall be established, with necessary officials and systems, at subproject levels. Grievances if any, may be submitted through various mediums, including in person, in written form to a noted address, through direct calls to concerned officials, and online. All local contact information and options for complaint submission will be available on site on local information boards. The project will have a communication strategy focusing on efficient and effective usage of print and electronic media, bill boards, posters, wall writing, and adoption of any other method suiting local context, logistics, human and financial resources. The project however will have a project level Grievance Redressal Cell (GRC) to address the grievances of the stakeholders

related to project implementation and project impacts if any. A sample grievance registration form is given in annexure 4.

### Members of GRC

As suggested by PMU, JTFRP/ R&B L, members listed below will be part of the GRC constituted for Local, District and Regional level for JTFR Project.

Local Level	<ul style="list-style-type: none"> <li>• Tehsildar/Naib Tehsildar (Chairman)</li> <li>• Concerned engineer/Representative from PMU, JTFRP (Member Secretary)</li> <li>• Site Engineer/Representative of PIU</li> <li>• Ward Member/Halqa Panchayat member</li> <li>• Women representative (Retired officer/Academician/Development professional)</li> <li>• A representative of SC/ST community or from elected Panchayat</li> </ul>
District Level	<ul style="list-style-type: none"> <li>• District Collector</li> <li>• Director /Head PIU</li> <li>• Nodal Officer of the Project Component in PMU, JTFRP</li> <li>• Social Safeguard Specialist, PMU, JTFRP (Member Secretary)</li> <li>• Ward Member/Halqa Panchayat member</li> <li>• Women representative (Retired officer/Academician/Development professional)</li> <li>• A representative of SC/ST community or from elected Panchayat</li> </ul>
Divisional Level	<ul style="list-style-type: none"> <li>• Divisional Commissioner (Chairman)</li> <li>• CEO, JKERA/JTFRP</li> <li>• HOD of line Departments (PIU)</li> <li>• Director Technical (PMU/JTFRP) (Member Secretary)</li> <li>• A representative, one each from backward classes &amp; Economically Backward classes and SC/ST welfare board/dept.</li> <li>• Concern Revenue Officer of Area (not below the rank of ACR/SDM)</li> <li>• A senior representative of Disaster Management Dept.</li> <li>• Ward Member/Halqa Panchayat member</li> <li>• Women representative (Retired officer/Academician/Development professional)</li> <li>• A representative from PAPs</li> </ul>

Source: PMU, JTFRP/ R&B

**Functions of the Cell:** The local GRC will conduct a meeting in the first week of every month to hear the grievances (if any) from the stakeholders. All the complaints will be forwarded to the concerned department/officials within 15 days from the date of receiving the complaints. The issues will be resolved/addressed by concerned officials within 45 days from the receipt of the complaints. All the grievances received shall be discussed at appropriate level of GRC for the necessary action.

### 9.9. Information Disclosure

The EA Summary will be translated into local language and shared on the web site of R&B L/stakeholders. Through public meetings, attempts would be made to ensure that vulnerable groups understand the process of project preparation and their needs are addressed in the best manner possible.

### 9.10. Capacity Building and Technical Support

Project implementing agency/R&B L project staff and hospital administration will require training in the management of environment and social safeguards issues. The training program is to be coordinated and anchored by the R&B with support from agencies/individuals experienced in safeguard aspects for developing courses on conducting training programs. The course contents will focus on EIA/EMP and safeguards reporting and biomedical waste management. Proposed training and capacity building plan is give in Table 9.7.

Table 9.7: Capacity Strengthening Plan

MODULES	CONTENT	DURATION
Environmental Assessment-EIA/EMP and safeguards reporting	<ul style="list-style-type: none"> <li>• Environmental Regulations &amp; Safeguard Policies</li> <li>• EIA &amp; EMP</li> <li>• Implementation and safeguards Monitoring and Reporting as per standard protocols and best management practices</li> </ul>	<p>Full day class room training.</p> <p>Half a day field training.</p>
Capacity Building on implementation of <b>Bio-Medical Waste Management (Amendment) Rules, 2018</b>	<ul style="list-style-type: none"> <li>• Understanding and application of Bio-Medical Waste Management (Amendment ) Rules, 2018</li> <li>• Understanding of duties of occupiers &amp; operators</li> <li>• Biomedical waste collection, in house transportation &amp; Handing over to Common Biomedical waste treatment facility (CBMWTF)</li> <li>• Barcoding &amp; Record keeping</li> <li>• Management of General Wastes</li> <li>• Management of radioactive/hazardous wastes</li> <li>• Do's and Don't for Health care facility</li> </ul>	<p>Two full days class room training.</p> <p>One day field training.</p>

### 9.11. Environment Reporting Plan and Schedule

The contractor will submit compliance report to above management and monitoring requirements to PMU every month. The monitoring results of the different environmental components will be analyzed and compiled quarterly during the construction phase and every six months during the operation phase. The report will also list the project activities along with the environmental mitigation measures and will evaluate the efficacy of the Environmental Management Plan. Safeguard monitoring report format is given in annexure 5. Check list use to assess EMP implementation (used by Contractor at field) is provided in annexure 6 while Environmental Monitoring Report format is given in annexure 7.

### 9.12. Emergency Procedures/ Corrective Measures

Corrective measures will be adopted if the review of the monitoring report reveals that the environmental management plan is inadequate or has not been implemented properly. A detailed review will be carried out by the interdisciplinary team of experts for assessing the gaps in the EMP and the addressal of EMP. A corrective action plan will be worked out for the environmental component and a rigorous follow up of environmental monitoring plan will be carried out.

### 9.13. EMP Budget- for the Implementation of Safeguard Mitigation Measures

The budget for the implementation of various mitigation measures is an important aspect of the safeguard management activities of the project. Table 9.8, outlines the budget which is estimated **Rs. 79.34 Lacs** for implementation of the safeguard mitigation measures based on the proposed actions.

Table 9.8: Budget for EMP implementation

Sr No.	Description	Particulars of EMP Cost				
		Quantity	Unit	Rate (Rs.)	Amount (Rs.)	Remarks
1	<b>Sprinkling of water For Dust Control</b>					
A	Sprinkling of water For Dust Control at all the construction points including sites of material storage at every 2hr interval as dust suppression measures during	520	KL	1000	520000	Considering 5 tanks (1KL capacity) per week for 24 months' construction period

Sr No.	Description	Particulars of EMP Cost				
		Quantity	Unit	Rate (Rs.)	Amount (Rs.)	Remarks
	construction activities. Rate include labour cost, transportation, materials, equipment's and works required to execute the job.					
2	<b>Development of Material Storage Sites 2 in. No.</b>					
A	Separate storage areas with three side covering with temporary barricading of 2 m Hight is provided for course and fine aggregate material to minimize dust expansion. Land of material storage (base of storage sites) sites shall be protected with high thickness plastic sheets. Loose course and fine aggregate Material should also be covered by high thickness plastic sheets to prevent dust expansion. Rate include labour cost, transportation, materials, equipment's and works required to execute the job during entire construction period	2.0	No.	100000	2,00,000	Market Rate
3	<b>Provision of Sanitation facilities at Labour camp</b>					
	A-Water Supply Considering 90 LPCD for 50 labours	3285	KL	500	1638000	Considering 90 LPCD for 50 labours for 24 months construction period
	B-Solid wastes management by providing bins of 100	10	No.	1500	15000	Market Rate

Sr No.	Description	Particulars of EMP Cost				
		Quantity	Unit	Rate (Rs.)	Amount (Rs.)	Remarks
	Litres capacity at 15 points					
	C-Mobile Toilet with anaerobic treatment facility (10 seated) for 24 months on rental basis	24	month	10000	240000	Market Rate
	D-Wastewater Management-Septic/Soak Pit	-	-	LS	100000	LS
	E-- Health Check-up and Medicines	-	-	LS	50000	LS
<b>4</b>	<b>Security and Parking Management during construction</b>					
	A- appointment of two marshals for 24 months	48	Month	10000	480000	-
	B-Diversion materials & Safety Signage cost	LS	-	-	100000	-
<b>5</b>	<b>Noise Control Measures by Providing barriers or sheets</b>					
A	Noise Control Measures by providing acoustic barriers or sheets that to be used at high noise producing construction activities such as cutting of stones, drilling etc.	100.0	Sheets	3000.00	300000	Market Rate
<b>6</b>	<b>Provision of PPEs (Personal Protective Equipment) i.e. Helmet, Mask, gum boots, gloves, Ear plugs etc.), first-aid kits and safety signage's (to be used during construction and operational phase)</b>					
	<b>A- Providing 100 Sets of PPEs (Personal Protective Equipment) i.e. Helmet, Mask, gum boots, gloves, Ear plugs etc),</b>	100	No.	4000	400000	Market Rate
	<b>B- 10 Sets fo First Aid kits for 25 People that includes following items Kit Includes:  (10) Alcohol Wipes (1) Scissors (1) Tweezers (1) First Aid Guide</b>	10	No.	10000	100000	Market Rate

Sr No.	Description	Particulars of EMP Cost				
		Quantity	Unit	Rate (Rs.)	Amount (Rs.)	Remarks
	(4) Nitrile Exam Gloves (1) Triangular Sling/Bandage, 40" x 40" x 56" (1) Cold Compress, 4" x 5" (1) Conforming Gauze Roll, 4" x 5 m (6) Gauze Dressing Pads, 4" x 4" (1) First Aid Tape, ½" x 5m (60) Plastic Bandages, 1" x 3" (2) Sunscreen Lotion Packets, SPF 30 (2) Trauma Pad, 5" x 9" (5) 2 Eyewash, 1oz, with 2 Eye Pads and 2 Strips (1) CPR Mask with One Way Valve (1) Burn Dressing, 4" x 4" (6) Hand Sanitizer Packets, 0.9g (4) Insect Sting Relief Wipes (10) First Aid/Burn Cream Packets, 0.9g (10) Triple Antibiotic Ointment Packets					
	<b>C- Safety Signage 10 in No. to use for construction sites, diversion and for other safety message-</b> Manufacturing, supplying and fixing retro reflective sign boards made up 2 mm thick aluminium sheet, face to be fully covered with high intensity encapsulated type heat activated retro reflective sheeting conforming to type - IV	10	No	10000	100000	Market Rate

Sr No.	Description	Particulars of EMP Cost				
		Quantity	Unit	Rate (Rs.)	Amount (Rs.)	Remarks
	of ASTM-D 4956-01 in blue and silver white or other colour combination including subject matter, message (bi-lingual), symbols and borders etc. as per IRC ; 67:2001, pasted on substrate by an adhesive backing which shall be activated by applying heat and pressure conforming to class -2 of ASTM-D-4956-01 and fixing the same in following sizes at suitable sites or decided by the Engineer-in charge					
7	<b>Environment Monitoring</b>					
	A- Ambient Air Quality - PM <sub>10</sub> , PM <sub>2.5</sub> , SO <sub>2</sub> , NO <sub>2</sub> , CO	12 (Construction Phase)	No.	5000	60000	Unit rates based on CPCB notified Charges for sampling and Analysis & Prevailing Market Rates
		18 (Operational Phase)	No.	5000	90000	
	B -Water Quality Monitoring - Parameters as per IS 10500;2012	12 (Construction Phase)	No.	7200	86400	
		36 (Operational Phase)	No.	7200	259200	
	• C-Wastewater/treated water Monitoring- pH, BOD, COD, TSS, Oil & Grease and coliform	24 (Operational Phase)	No.	2200	52800	Unit rates based on CPCB notified Charges for sampling and Analysis & Prevailing Market Rates
	D- Noise Monitoring (24 Hr)	12 (Construction Phase)	No.	1200	14400	
		18 (Operational Phase)	No.	1200	21600	

Sr No.	Description	Particulars of EMP Cost				
		Quantity	Unit	Rate (Rs.)	Amount (Rs.)	Remarks
	<b>E-Indoor Air Quality Monitoring-</b> Temp, Humidity, PM2.5, CO, radon, Bio-aerosols for bacteriological & fungi monitoring	24 (Operational Phase)	No.	5800	139200	
	<b>F-Stack Emission from DG sets-</b> PM, SO <sub>2</sub> , HC, NO <sub>2</sub> , CO	- 12 (Operational Phase)	No.	3000	36000	
<b>8</b>	<b>Training &amp; Capacity Building</b>					
A	Training & Capacity Building on EIA/EMP, Reporting and Monitoring	LS	-	-	10,00,000/-	
<b>9</b>	Relocation/cutting of Chinar Trees from the Site and development of green belt/plantation of trees along the periphery including protection measures & watering etc.	500 trees	-	1000	5,00,000/-	Market Rate
<b>10</b>	Purchase of Mechanical Composting Machine	LS			Cost included in DPR	
<b>11</b>	Cost of STP/ETP				Cost included in DPR	
<b>12</b>	Construction of rainwater harvesting units				Cost included in DPR	
<b>13</b>	<b>External Evaluation of EMP Implementation</b>					

Sr No.	Description	Particulars of EMP Cost				
		Quantity	Unit	Rate (Rs.)	Amount (Rs.)	Remarks
	External Evaluation of implementation of EMP – Evaluation needs to done carried out by an independent agency engaged by R&B /PIU	LS	-	-	10,00,000/-	ToR for evaluation will be prepared by the subject expert. Cost of ToR preparation is considered Rs. 1,00000/. Apart from above cost, Rs. 9 lacs will also be estimated for external evaluation of EMP implementation
15	Other operation and maintenance related expenditure including cleaning of sludge tanks, cleaning of rainwater harvesting units, odour control measures, landscaping maintenance etc.	LS			9,00,000/-	Considering @Rs.300000 per annum for 3 years
<b>Grand Total of EMP Cost:</b>					<b>Rs. 79,34,600/- (Rs.79.34 Lacs)</b>	
<b>Grand Total (in Words): Rupees Seventy Nine Lacs Thirty Four Thousand Six Hundred Only</b>						

**Note-** Period for operational phase is considered 3 Years only, post 3 years, it should be carried by project proponent /Hospital Administration.

### 9.14. EMP Implementation Timeline

The timeline of the EMP implementation is presented in the Table 9.9 given below. The overall implementation of the EMP would require two years considering construction period. However, post project monitoring will be done for next three years.

Table 9.9: Timeline of the ESMP

Activity	Year 1				Year 2				Year-3-5		
	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Year 3	Year 4	Year 5
Disclosure and dissemination of the EMP	■										
Disbursement of EMP budget	■										
Formation of EMP implementation unit	■										
Capacity Building of the Implementation Team		■									
Implementation of measures suggested in EMP during entire construction Period			■	■	■	■	■				
External Evaluation									■		
Post Project Monitoring									■	■	■

### 9.15. Risk and Disaster Management Plan

A disaster is a natural or man-made hazard resulting in an event of substantial extent causing significant physical damage or destruction, loss of life, or drastic change to the environment. A disaster can be extensively defined as any tragic event stemming from events such as earthquakes, floods, catastrophic accidents, fires, or explosions. It is a phenomenon that disasters can cause damage to life, property and destroy the economic, social and cultural life of people. Disasters in general, can broadly be grouped under three categories viz. (i) Water and Climate related (ii) Geology / Geomorphology related and (iii) Accident related.

The proposed project site is located at Srinagar near Jhelum River. On project site, accident related disasters from fire, oil spills, and chemical induced and vehicular / operational accidents are quite possible. In the context of the proposed project it thus becomes imperative to identify the type, pattern and the potential severity of the hazards, which can cause loss of life, damage to property and environment, and to assess the vulnerability and risks there from with a view to outlining an appropriate response mechanism. Therefore, the Disaster Management Plan is required to encompass all the administrative and operational programmes and responses to reduce the risk of emergencies of hazardous events likely to occur at any point of time during construction and operational phases of the project.

### 9.15.1. Identification of Risks and Hazards

Risk is the “the combination of the frequency, or probability of occurrence, and consequence of a specified hazardous event”. Where frequency of exposure is an issue then duration of exposure is also considered. Risk is the level to which a hazard poses a threat to life, limb or property. This will vary from a minor laceration to a permanent disability, an illness or death.

The purpose of Hazard Identification and Risk Assessment is to identify all the significant hazards, which may occur during the construction phase, and to rank them according to their severity. Having ranked the risks by severity the measures shall be introduced to mitigate the effects of that risk.

For the proposed hospital project, hazards/emergencies are classified as

- A. Construction hazard
- B. Natural hazard
- C. Man-made hazard.

#### A. Construction Hazard

During the construction time, good construction practice and safety requirement will be enforced by the contractor at the site. The construction manager will be the coordinator for the emergency management. Depending on the severity of the injury/ disaster, outside medical help will be obtained. Before commencement of the work, the hospital facilities around the vicinity will be identified and the address and phone numbers must be available with the contractor as well as the construction manager. Proper measures will be taken to ensure safety at heights. Fencing/railing will be provided at construction openings to prevent physical injuries and fall of construction workers.

#### B. Natural Hazard

During natural hazards viz. Flood, earthquake etc. emergency plan to be implemented with the help and guidance from the district collector. Disaster Management committee will also be responsible for disaster mitigation and disaster recovery at local level. Several preventive and design measures are proposed to reduce the impacts of future natural hazard, if any.

#### C. Manmade / Operational Hazard

During the operational phase, project proponent and maintenance staff becomes the coordinator for the emergency activity and the emergency cell will be acting in accordance with the disaster management plan (DMP). Key to the management of any such disaster is minimise the life threats and reduce the loss in terms of assets, if a disaster happens.

### 9.15.2.Risks and Hazards Identified For Proposed Bone & Joint Hospital Project

The risks and hazards anticipated in for the proposed Bone & Joint Hospital Project during construction and operational phase are given below:

- Hazardous pertaining to fires in buildings
- Fire in diesel storage areas, garbage storage areas and disposal areas
- Natural disasters viz., earthquakes, floods etc
- Bomb threats
  
- Safety hazards that lead to worker accidents and injuries
- Incomplete drawings and poorly defined scope
- Unknown site conditions
- Poorly written contracts
- Unexpected increases in material costs
- Labor shortages
- Damage or theft to equipment and tools
- Natural disasters
- Issues with subcontractors and suppliers
- Availability of building materials
- Poor project management

Construction stage risks and hazards (other than the natural hazards and building fire) will be managed and mitigated through measures suggested in EMP for occupational health and safety. Apart from this, detailed disaster management plan and actions are proposed in DMP to tackle hazards pertaining to fires, natural disasters viz., earthquakes, floods etc. and Bomb threats.

### 9.15.3.Emergency Preparedness

Emergency preparedness which include specific preparatory actions and measures to reduce the probable hazard risks and proper implementation of Disaster Management Plan. Following are actions proposed for Bone & Joint Hospital project:

#### Emergency Action Response Committee

To ensure coordinated action, an Emergency Action Committee shall be constituted. An Emergency evacuation plan based on local needs and facilities available shall be prepared. The broad content of plan shall include following:

- Demarcation of the areas to be evacuated with priorities,
- Safe area and shelters,
- Security of property left behind in the evacuated areas,
- Functions and responsibilities of various members, and Setting up of joint control action

## Communication System

An efficient communication system is absolutely essential for the success of any disaster management plan. This has to be worked out in consultation with local authorities involving police, fire department and hospital department considering the following points:

- Identify the relevant officials and institutions to be involved for the first, second and third level of information;
- Preparation of the telephone directory of these officials and making available to all concerned;
- Allotment of toll free number to a central communication centre;
- Provide wireless communication tools to safety and security and communication officers;
- Empowering central communication centre with latest communication equipment and tools.

## Setting up of Emergency Infrastructure

To enable the key persons to implement the DMP, the following infrastructure will require to be set up

- Site map with escape routes and safe assembly points marked on it. Site layouts have to be put up at key areas where assembly is to be done. These points could vary depending upon the atmospheric stability and location and intensity of the emergency.
- With the onset of emergency, all non-essential workers (those workers not assigned emergency duty) shall evacuate the area and report to the specified emergency assembly point.

## Emergency Control Centre

An Emergency Control Centre (ECC) is the primary area from where emergencies are handled. The Main Control Centre, or any structure on the site, at sufficient distance from the affected area, and that is designed to withstand overpressure and radiation stress should be designated as the ECC. An ECC should contain various items as listed:

### For communication

- Siren, or other suitable alarm system
- Public address system
- Intercom sets
- External phone sets
- Telephone directory
- Company Telephone Directory

- List of Important phone numbers required in emergency like Ambulance, Police etc.
- Intrinsically safe Mobile phones

#### Document for ready reference

- Site Plan Layout plan, assembly points marked and location of siren,
- safety/fire system shown (Display)
- Stock list of fire extinguisher
- Fire-water system and additional sources of water
- Emergency Response Plan
- Copy of First Aid
- List of employees their addresses and phone numbers.
- Site plan

All equipment should be regularly inspected and tested for adequacy. Personnel should be trained in the use of the same, where special training is required. Records of the same are to be maintained.

#### 9.15.4. Disaster Management Plan

Emergency and disaster prevention through good design, operation, maintenance and inspection are essential to reduce the probability of occurrence and consequential effect of such eventualities in the proposed Bone & Joint Hospital . Disaster is an unexpected event due to sudden failure of the system, external threats, internal disturbances, flood, earthquakes, fire and accidents. The overall objective of the Emergency Response Plan and DMP is to make use of the combine resources at the site and outside services to achieve the following:-

- Localize the emergency
- Minimize effects on property and people
- Effective rescue and medical treatment
- Evacuation

Details of Disaster management plan for each identified hazard are summarized in subsequent sections.

##### 9.15.4.1. Emergency/Disaster Management Plan for Fire Hazard

The fire protection system for the proposed Hospital complex building is to be designed as per the provisions of National Building Code – 2005/2018 and taking consent from local administration including fire service authority.

The following provisions will be made available as required in the building which, it is expected, would provide a reasonable degree of protection from fire hazards and at the same time satisfy the local fire authority, if any:

- Wet risers with hose reels at each floor
- Yard hydrants on the periphery of the building
- Manual call alarm system on each floor
- Automatic fire detection & alarm system
- Public Address and Communication System
- Good Housekeeping & Maintenance and training of staff

### **Hydrant System**

Hydrant system will be provided at each floor and also on the periphery of the building (Yard hydrants). The water supply to hydrants would be by means of wet riser piping system connected to the static storage in the underground reservoir through a set of automatic pumps installed in the pump room. The system is also fitted with inlet connection (fire brigade breaching inlet) at ground level for charging with water by pumping from the fire service appliances and an air release valve at roof level to release trapped air. The Fire Hose Cabinets would be placed at conspicuous locations preferably near staircase and lift lobby, ensuring that no part on the floor is more than 30 m away from it.

### **Automatic Sprinkler System**

The entire building except electric substation and plant room is to be provided with automatic sprinkler system. The system will be designed as per IS: 15105 – design and Installation of fixed automatic sprinkler Fire Extinguishing system/NFPA 13 – standard for the Installation of Sprinkler System. Sprinkler system shall incorporate an alarm system also. The Sprinkler Annunciation Panel located in the fire control room will indicate the operation of the sprinklers on the particular floor with an audio visual alarm.

### **Fire Pumping System**

Water sumps are provided in the pump room in the underground reservoir so that always Immersed suction is available for the pumps. The pumps are designed to cater for the Flow and pressure requirement at any point of the fire fighting system. The system will comprise of following pumps:

- Electric Fire Hydrant pump
- Electric Sprinkler pump
- Electric Jockey Pump
- Diesel Standby pump

### **Portable Fire Extinguishers**

ISI marked portable fire extinguishers of specified type and capacities shall be provided at all levels including all the hospital wards, electric substations, meter rooms and lift machine rooms etc. as per the provisions of IS : 2190 – 1979.

### Fire alarm

- Fire Alarm will be acknowledged by main fire control panel at Security Control Room
- Security Supervisor will inform the main Security Control Room, Safety Officer and send Security Guards along with Fire Extinguishers to the location of fire
- Security Supervisor attending call at Security Control Room will obtain following information from the caller
  - a). Caller's name
  - (b) Location of fire
  - (c) Type of fire

Security Supervisor will also inform relevant safety personnel responsible for making call to Fire Brigade to deal with the problem.

### Action Plan during Evacuation

Whenever there is a fire alarm, the supervisor, on duty in security/ fire Control room will make announcement regarding the incident directing People and personnel to take the proper course of action.

For Engineering Staff during Fire Evacuation Drill-

- Ensure un-interrupted power supply and make sure that inverters and emergency lights are functional
- Ensure smoke extractors are on AUTO;
- Make sure that there is sufficient quantity of water in UG tank and Oh fire tanks
- Ensure that the main sprinkler/ hydrant and diesel pumps are functional and that there is sufficient water pressure in fire line to deal with the situation;
- Ensure the clarity of announcement voice and that the emergency and exit signs are glowing
- Monitor the D.G. Sets and ensure that tripping does not happen, when the fire pumps

### For Security Staff during Fire Evacuation Drill

- Security Supervisor will take over Security Control Room operation
- He will sound alarm and make announcement for evacuation, if required
- Security staff will ensure that each elevator is grounded. They must also help in the safe removal of trapped passenger(s), if any;
- Ensure that security guards deployed at main staircases, ramps for fast and safe evacuation;

- Open the exit doors for easy movements of occupants and ensure that all the doors are kept fully opened;
- Ensure that no crowd is gathered near the door and area has to be kept free from all the obstacles at that time
- Ensure that nobody is permitted to re-enter through the exit doors for any reasons, so that ejecting people are not obstructed
- A search team having a torch should look for unconscious people/ burnt/ disabled/ old/ children/ injured and keep informing the rescue party and
- A rescue party having two persons with a stretcher should be employed in case of presence of any casualty/ unconsciousness/ helpless person, to bring them out to the fire refuse area promptly
- Depute security guards as per requirement, such as one security guard for receiving fire brigade and ensure that fire tender route is FREE

### Do's & Don'ts in Case of Fire

Proper display of a tabulated list which broadly indicates Do's and Don'ts for everybody to assist in combating fire.

Do's in Case of Fire	Don'ts in Case of Fire
<p>When you notice a fire, raise alarm "Fire" at the top of your voice. Activate the break unit</p> <p>Fire-fighting team should approach the scene as soon as possible</p> <p>As far as possible, try to attract others attention on your way to the scene of fire</p> <p>Try to put off small fire with the nearest appropriate type of fire extinguishers</p> <p>CO2 fire extinguisher for electrical fire, water type extinguisher for general fire and foam type extinguisher for liquid fires;</p> <p>As others rush to the scene, inform them about the type of fire and fire extinguisher to be used</p> <p>Do arrange to switch off the supply in case of electrical fire;</p> <p>Use staircase only to reach refuge area/ ground floor</p> <p>Use maximum exits for evacuation;</p>	<p>Don't run in panic</p> <p>Don't take undue risk</p> <p>Don't tamper with any machinery during fire- fighting</p> <p>Don't use water on oil and electrical fire</p> <p>Don't flood the affected area with water unless required</p> <p>Don't use lift/ elevator and escalators;</p> <p>Don't crowd the scene of fire</p> <p>Don't continue to use LPG cylinder for cooking etc. in near vicinity</p> <p>Do not speak anything to Media, direct them to head of operations</p> <p>Do not walk, keep low and escape in a crawling posture</p>

Do's in Case of Fire	Don'ts in Case of Fire
In case of injury, rush the victims to nearest hospital; Use torches/ emergency lights; and In smoke filled place, put wet handkerchief on your mouth for easy breathing.	

**Precautions/ Fire Prevention Measures to be followed:**

- Keep all fire-fighting appliances clear from any obstruction
- Don't store anything in fire escape route, staircase and fire refuse area, entrance and exit door should not be locked/ bolted
- Good housekeeping, periodical maintenance of electrical equipment's
- Keep total load below the design capacity
- Don't store inflammable material, gas cylinder in large quantity
- Put- off all lighted cigarette, match-stick, candle, lamp or any naked light, before leaving the place
- Switch off all electrical equipment's and gas cylinder, when not in use
- Don't store any material up to ceiling height and material should be stored three feet away from electrical points
- Don't use sub-standard material/ equipment's and get installed fixtures and fittings from qualified licensed technician only.

**9.15.4.2. Flood Emergency Response Plan**

In the devastating floods of 2014, the water level reaches on ground floor up to 2-3 feet at some portion of B&J hospital causing loss to infrastructure and services. Flooding can either damage hospital facilities directly or disrupt access to them. Damage may be direct costs such as losses in infrastructure, expensive medical equipment, hospital furniture, lifeline installations and medical supplies. Indirect costs are unforeseen expenses after emergencies such as increased risk of outbreaks due to loss of laboratory and diagnostic support.

**Preventive Measures & Emergency Response**

Primary Preventive Measures	Structural (physically engineered interventions), shifting of critical utilities and emergency requirements from basement
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	to above floors, tree planting, control of water source and reconstruction of the defense/bund to Dhoodh Ganga Canal
<b>Secondary Preventive Measures</b>	Flood forecasting, warning system, moving belongings and assets, Evacuation shelters and temporary and mobile structures, maintaining critical health services
<b>Tertiary Preventive Measures</b>	Include ensuring clean water and food supplies, close relationship with another agency (military, fire and rescue, police, water organizations, human resources)

### Emergency Response

- Integration with district and local authorities National/state disaster management authority
- While evacuation, use of lift or elevator will be prohibited
- Electrical supply will be cut to the area, which is flooded
- Portable pumps will be in- ready condition to pump out water from the lower areas
- Station duty officer will be continuously briefed about the situation
- During working hours, the Disaster Management Officer and during off working hours duty officers will personally supervise the disaster management

### Details of Multi Method Flood Mitigation Strategy for Bone & Joint Hospital based on Best Practices:

- Hospital must be designed and built to prevent potential disruption of function caused by flooding
- Floods can also cause damage to the equipment or drugs. Previously, hospital design focused on the optimum use of space to prepare the most effective interaction and action among difference department. Thus, heavy equipment such as the telephone lines, electric generators, heavy medical equipment and medical supply storage are usually placed in basement. Therefore, when occur flooding, emergency response is interrupted immediately. Several measures can prevent this damage, such as regular inspections of the drainage system and sewage system, relocating the important medical equipment to above grade and convenient maintenance of the equipment to keep it in best working order. In proposed hospital, medical equipment, ICU, transformer, emergency generator, Oxygen supply equipment's and electrical room must be relocated above grade.

- Features Administration also needs to be considered in preparation for the floods. This includes preparation and training is not limited the emergency staff only, but also involves the management of hospital staff. Besides, the effective communication through top-down management is needed. This ensures the flood information flow can be channelled properly. Effective communications from other parties that cooperated with hospitals to help flood victims are also required
- The information chain in communication system should be monitored every moment. Effective human resource management is important to ensure that the hospital staff is required during flooding sufficient to ensure continuity of operation. The list of contact numbers of hospital staff should be updated.
- Increasing the number of patients caused the beds care inadequate. Sufficient number of critical care beds must be available for the transfer of patients from disaster impacted hospitals or mass casualties.
- Hospitals often rely on electric generators during electric supply disruption. However, inadequate fuel supply and cause an electric generator are not operating. Therefore, adequate the fuel supply should be available during disaster and the fuel storage is needed
- Hospital should be ensuring that they can prepare water and food for the first 72 hours of the flood.
- Hospital should be having backup equipment to support their communication such as radios, battery-run speakerphones and walkie-talkie.
- The main reasons for evacuation are the presence of water in building and loss of power. Critical patients should be transferred to other hospital for further treatment.
- Rafts and boats should be used as alternative method for patient evacuation. Same also with supplies such as fuel, food and water were brought to hospital.

#### 9.15.4.3. Earthquake

Project impact area comes under seismic zone-IV, the probability of occurrence of earthquake in future is not ruled out. In the case earthquake occur, following management plan will be adopted.

- Structural design of the building will follow guidelines of IS 1893 (Part 1) :2002 Criteria for Earthquake Resistant Design of Structures: Part 1 General provisions and Buildings.
- Suitable seismic coefficients in vertical and horizontal directions during designing of structures.
- On getting the message of earthquake, main gate guard shall announce the nature of emergency through Public Address system and order for evacuation of entire area.
- Protect yourself by staying under the rental of an inner door, in the corner of a room, under a table or even under a bed.
- The Power & Utility In-charge shall carryout the following activities:

- If emergency is declared, isolate the power supply from all the lines & shut down the whole power system.
- In the event of power shutdown, ensure that all non-essential loads are cutoff from UPS power supply so that emergency UPS power is available for emergency lighting and emergency systems.

#### 9.15.4.4. Bomb Threats & Evacuation Plan

In case of any Call of Threat:

- Check the details of the caller or informer (was the person male/ female, tone on the phone etc.);
- Check if the call was made from nearby or from far off place (local / STD call) with help of Caller ID facility in the telephone instrument;
- Inform the station duty officer who will inform higher officials; and
- Inform the police/bomb squad/experts for further action.

**Evacuation Procedure:** The floor/ area for which, the threat has been received will be evacuated in an orderly and organized manner. Under no circumstances panic has to be allowed. For evacuation priority would be given to patient, female employees, disabled persons followed by visitors and staff.

**Budgetary provision of DMP-** The main cost for creating necessary infrastructure as Fire fighting including related equipment, water tanks etc. are covered in the project cost..

## ANNEXURES

Annexure-1-Environmental Data Sheet & Sub Project Screening Form  
Construction of New Extension Block at Bone & Joint Hospital Srinagar

**A. Environmental Screening**

**Part a: General Information**

1. Location of the sub-project	Government Bone and Joint hospital, Barzulla, Srinagar, India.
• Name of Sub-Project	Design, Construction and AMC of 120 Bedded Specialized Orthopedic Units Including Six Bedded ICU in Bone & Joint Hospital in Srinagar, India
• Name of the State	Jammu And Kashmir
• District	Srinagar
• Block	Srinagar
• Village	Barzulla
<b>2. Implementing Agency Details (Sub-project level)</b>	
• Name of the Department/Agency	PW(R&B) Department, Government of Jammu & Kashmir
• Name of the designated contact person	Chief Engineer , PW(R&B) Department, Government of Jammu & Kashmir
• Designation	Chief Engineer , PW(R&B) Department, Government of Jammu & Kashmir,
• Contact Number	-
• E-mail Id	-

**Part b: Environment Screening**

Question	Yes / No	Details
1. Is the sub-project located in whole or part within a distance of 1 km from the nearest edge of any of the following e Environmentally sensitive areas?		
a. Biosphere Reserve	No	-
b. National Park	No	Dachigam National Park is 25 km away from the sub-project site

c. Wildlife/Bird Sanctuary	No	
d. Game Reserve	No	
e. Tiger Reserve/Elephant Reserve	No	There is no Tiger Reserve/Elephant Reserve in the State
f. Wetland	No	Hokersar wetland is 10 Kms far from sub-project site
g. Natural Lake	No	Dal lake is 9 Kms far from subproject site
h. Swamps/Mudflats	No	
i. World Heritage Sites	No	
j. Archaeological monuments/sites under ASI's central/state list)	No	
k. Reservoirs/Dams	No	
<b>2. Is the sub-project located in whole or part within a radius of 500 m from the following features?</b>		
a. Reserved/Protected Forest	No	
Migratory Route of Wild Animals/Birds	No	
c. Area with threatened/rare/ endangered fauna (outside protected areas)	No	
d. Area with threatened/rare/ endangered flora (outside protected areas)	No	
e. Habitat of migratory birds (outside protected areas)	No	

f. Historic Places (not listed under ASI – central or state list)	No	-Shrine of Hazrat Sheikh Abdul Qadir Jeelani (RA) is located in the buffer area which is few Kms away from sub-project site. -Hanuman Temple is located 3 Kms away from sub-project site.
g. Regionally Important Religious Places	No	Shrine of Hazrat Sheikh Abdul Qadir Jeelani (RA) is located in the buffer area which is few Kms away from sub-project site. -Hanuman Temple is located 3 Kms away from sub-project site.
h. Public Water Supply Areas from Rivers/Surface Water Bodies/ Ground Water Sources	yes	Bone & Joint Hospital Project site is located adjacent to Dhooth Ganga Canal (flood channel)
<b>3. Information related to sub-project impacts: Will the construction, operation or decommissioning of this sub-project cause changes to or has impacts on the following?</b>		
1. Land Use	No	Proposed sub-project site is located with the confined complex of Bone & Joint Hospital. Thus no, land use change envisage due to proposed project.
2. Water	Yes	There would be very minor impacts on water resource and quality will be envisage by the proposed project during construction and operational phase of the project which will be taken care through effective implementation of EMP. Water Demand will be taken care by PHED. No heavy ground water abstraction is proposed under the project.
3. Air	Yes	Proposed activities has no significant impact on Air environment, however Construction activity is likely to increase the dust and noise levels temporary which will be taken care through effective implementation of EMP and specific fugitive and gaseous air pollution control measures.

**Will the construction, operation or decommissioning of this sub-project produce, cause or release any of the following?**

<p>4. Solid waste</p>	<p>Yes</p>	<p>Small quantum of solid waste will be generated during construction and operational phase of the project which will be managed by effective implementation of SWM Rule 2016. Apart from this, due to demolition of existing buildings located on site, C&amp;D waste also will be managed through C&amp;D waste management Rules 2016. As present project is an extension of existing hospital facility for extra 120 beds. Therefore, biomedical waste generation would certainly be there. Specific measures will be suggested in EMP for collection, segregation and disposal of biomedical wastes as per Bio-Medical Waste Management (Amendment) Rules, 2018. Currently Biomedical waste disposal had been out sourced to M/s Kashmir Health Care System at Lassipora, Pulwama and general solid waste disposal is carried out by Srinagar Municipal Corporation (SMC).</p>
<p>5. Noise/ vibration/ light/ heat energy/ electromagnetic radiation</p>	<p>Yes (only noise and vibration)</p>	<p>During the construction phase of Proposed Bone &amp; Joint Hospital Block, the major sources of noise pollution are vehicles transporting the construction material to the construction yard and the noise generating activities at the yard itself. Mixing, casting and material movement are primary noise generating activities in the yard and will be uniformly distributed over the entire construction period. Construction activities are anticipated to produce noise levels in the range of 80 - 95 dB(A). The construction equipment will have high noise levels, which can affect the personnel operating the machines. Use of proper Personal Protective Equipment (PPE), Noise barriers, rubber padding and separate enclosures will mitigate any adverse impact of the noise generated by such equipment.</p>

		It shall be reduced by oiling and greasing. Proper mitigation measures like use of Personal Protection Equipment (PPE) by workers etc shall be ensured. Noise barriers will be erected to restrict noise so that patients are not affected in the other blocks of the hospital.
6. Accidents	No	Subproject is a small building construction project. Thus, there may not be any chance of accident. Further safeguards and precautions viz. work area demarcation, placing of signage and safety barriers, and controlled access would be taken. Use of Personal Protection Equipment (PPE) by workers and staff will also be ensured to reduce the chance of any accident.
<b>Other</b>		
7. Are there any areas around the project location which are used by protected, important or sensitive species of fauna or flora e.g. for breeding, nesting, foraging, resting, overwintering, migration, which could be affected by the sub-project?	No	Proposed Bone & Joint Hospital site is a located within a confined area and there is no ecologically sensitive areas like national parks or wildlife sanctuaries and reserved forests located nearby. however, 4 Chinar trees located on site which will try to be relocated/de-rooted with prior permission of forests department.
8. Any other impacts?	No	

**Part d: Result/outcome of Environmental Screening Exercise**

1	No EIA Required	NO
2	EIA Required	Yes (considering as Category A sub-project)

3	Regulatory Clearance Required	<ul style="list-style-type: none"> <li>- Building Permission</li> <li>- Tree Cutting/ Relocation Permission</li> <li>- Authorisation from J&amp;KPCB for biomedical collection, handling and disposal</li> <li>- Disposal of Construction And Demolition Wastes</li> <li>- Pollution Under Control Certificate for relevant construction Machinery and equipment's</li> <li>- Storage, handling and transport of hazardous materials</li> <li>- Discharges from Labor Camp</li> <li>- construction &amp; operation of Sewage Treatment Plant/ETP</li> <li>- Compliance of Employee/Labour Acts related to service and their welfare measure as per the provisions of government of India</li> </ul>
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## Annexure-2-Guidelines for Construction and Demolition Waste Management (as per Demolition Waste Management Rules, 2016)

- (i) Every waste generator shall segregate construction and demolition waste and deposit at collection centre or handover it to the authorized processing facilities
- (ii) Waste generator shall ensure that there is no littering or deposition of waste so as to prevent obstruction to the traffic or the public or drains.
- (iii) Large generators (who generate more than 20 tons or more in one day or 300 tons per project in a month) shall submit waste management plan and get appropriate approvals from the local authority before starting construction or demolition or remodelling work,
- (iv) Large generators shall have Environmental Management Plan to address the likely environmental issues from construction, demolition, storage, transportation process and disposal / reuse of C & D Waste.
- (v) Large generators shall segregate the waste into four streams such as concrete, soil, steel, wood and plastics, bricks and mortar,
- (vi) Large generators shall pay relevant charges for collection, transportation, processing and disposal as notified by the concerned authorities;
- (vii) Segregate and store the waste generated in three separate streams namely bio-degradable, non biodegradable and domestic hazardous wastes in suitable bins and handover segregated wastes to authorized waste pickers or waste collectors as per the direction or notification by the local authorities from time to time;
- (viii) Wrap securely the used sanitary waste like diapers, sanitary pads etc., in the pouches provided by the manufacturers or brand owners of these products or in a suitable wrapping material as instructed by the local authorities and shall place the same in the bin meant for dry waste or non-bio-degradable waste;
- (ix) Store separately construction and demolition waste, as and when generated, in his own premises and shall dispose off as per the Construction and Demolition Waste Management Rules, 2016; and
- (x) Store horticulture waste and garden waste generated from his premises separately at site and dispose of as per the directions of the local body from time to time.
- (xi) No waste generator shall throw, burn or burry the solid waste generated by him, on streets, open public spaces outside his premises or in the drain or water bodies.
- (xii) All waste generators shall pay such user fee for solid waste management, as specified in the bye-laws of the local bodies.
- (xiii) No person shall organize an event or gathering of more than one hundred persons at any unlicensed place without intimating the local body, at least three working days in advance and such person or the organizer of such events shall ensure segregation of waste at source and handing over of segregated waste to waste collector or agency as specified by the local body.

Annexure-3-Green Belt & Plantation Plan (Drawing)



### Annexure 4: Sample Grievance Registration Form

The \_\_\_\_\_ Project welcomes complaints, suggestions, queries, and comments regarding project implementation. We encourage persons with grievance to provide their name and contact information to enable us to get in touch with you for clarification and feedback.

Should you choose to include your personal details but want that information to remain confidential, please inform us by writing/typing \*(CONFIDENTIAL)\* above your name.

<b>Date</b>	<b>Place of registration</b>	<b>Project Town</b>			
		<b>Project:</b>			
<b>Contact information/personal details</b>					
<b>Name</b>		<b>Gender</b>	* Male * Female	<b>Age</b>	
<b>Home address</b>					
<b>Place</b>					
<b>Phone no.</b>					
<b>E-mail</b>					
<b>Complaint/suggestion/comment/question</b> Please provide the details (who, what, where, and how) of your grievance below:					
If included as attachment/note/letter, please tick here:					
<b>How do you want us to reach you for feedback or update on your comment/grievance?</b>					

#### FOR OFFICIAL USE ONLY

<b>Registered by:</b> (Name of official registering grievance)
<b>Mode of communication:</b> Note/letter E-mail Verbal/telephonic
<b>Reviewed by:</b> (Names/positions of officials reviewing grievance)
<b>Action taken:</b>

## Annexure-5-Safeguard Monitoring Report Format

### 1- Project Overview & Progress

Project Number & Title		
Safeguard Category	Environment	Construction stage
		Operational Stage
Reporting Period		
Last Report Date		
Key Sub project activities since last report		
Project Progress	Contract Awarding Date	
	Progress of Work (% physical Completion)	
	Status of Safeguard Approvals / Permits / Consents 1. 2. 3. (add/delete numbers)	
Report Prepared By		

### 2- Safeguard Implementation Arrangement (Existing/Revised)

Institutional Arrangement	
Role & Responsibilities	Contractor PIU PMU Internal & External Monitoring agency (if any) Construction Supervision

### 3- Environmental Performance Monitoring

#### I- Status of Compliance of EMP implementation (mitigation measures)

Table-Compliance with EMP Requirements (Environmental Performance)

EMP Requirements	Compliance Status (Yes, No, Partial)	Comment or Reasons for Non-Compliance	Issues for Further Action
<p><b>Example-Air Pollution Control</b> all vehicles used at project shall have of valid 'Pollution under Control' (PUC) Certificates. Dust Suppression measures such as Sprinkling of water (to moist the dust prone area/construction site) will be taken at regular intervals to control fugitive dust emissions during construction activities. Stock piling shall be carried out at designated place located away from drainage or drain. Make provision of periodic water sprinkling and covering of trucks/dumper by tarpaulin sheets to prevent wind erosion (fugitive dust generation) It is to be ensured that construction equipment are properly maintained to minimise smoke in the exhaust emissions</p> <p>Make provision of temporary perimeter sediment barrier (such as berms, silt fence or sandbag barriers) to prevent spread of construction material Diesel generators meant for emergency power supply to be optimally operated and regularly maintained so as to ensure that emissions from fuel combustion remain at design levels. Also to ensure stack height of 3 m above the roof level of the shed meant for diesel generators to meet the stack height requirement specified by CPCB Paints, polishes, building fittings and flooring material to be procured carefully to ensure that these have low VOC generation potential</p> <p>Machinery to be turned off when not in use</p>			

Monitoring of the exhaust gases and noise levels will be carried out by an NABL/MoEFCC accredited Environmental Monitoring agency			
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**II- Health & Safety**

Provide narrative of occupational and community health and safety issues that occurred during the reporting period. Any accident involving injury or death of workers or community members must be reported.

**III- Issues for further Action**

Issue	Required Action	Responsibility and Timing	Resolution
List of EMP measures or activities not completed (from previous table)			

**4- Environment Effect Monitoring**

**Monitoring plan-**

Present the environment effect monitoring plan as defined in the EMP or the updated monitoring plan. Describe the environment effect monitoring activities in the reporting period, including number of monitoring, number of samples, etc.

Table: Environment Effect Monitoring Results

Location	Parameter	Date	Monitoring Value	Regulatory/threshold limits
				As mentioned in Annexure-10

**Assessment**

Compare monitoring results with baseline conditions (if baseline data is available) and relevant government standards in qualitative terms. Additional explanatory comments should be provided as necessary. Possible reasons for non-compliance should be identified

**5- Public consultation, Information Disclosure, Capability Building**

Describe public consultation activities during the reporting period. Confirm compliance with consultation plan defined in the EMP. Present planned consultation activities in next reporting period.

- Field Visits (sites visited, dates, persons met)
- Public Consultations and meetings (Date; time; location; agenda; number of participants disaggregated by sex and ethnic group, not including project staff; Issues raised by participants and how these were addressed by the project team)
- Training (Nature of training, number of participants disaggregated by gender and ethnicity, date, location, etc.)
- Press/Media Releases
- Material development/production (e.g., brochure, leaflet, posters)
- Information disclosure

#### **6- Grievance Redressal Mechanism**

Describe mechanisms established to address and redress public complaints and grievances related to social and environment safeguards. Summarize grievances received, if any, and measures implemented to redress them.}

- Number of new grievances, if any, since last monitoring period
- Number of grievances resolved
- Number of outstanding grievances

#### **7- Conclusion**

Highlight important results from the implementation of EMP; recommendations to improve EMP, implementation, and monitoring; key activities planned in next reporting period

#### **8- Attachments**

- Consents / permits
- Monitoring data (water quality, air quality, etc.)
- Inspection checklists
- Photographs
- Others

### Annexure-6-Construction Site Checklist for EMP Monitoring

Project Name:

Contractor:

Filled by:

S.No	Action/Activities	Status (Yes/No)	Additional Measures required as per EMP	Remarks
1.	EHS supervisor appointed by contractor and available on site			
2.	Site management plan (spoils, safety, material, schedule, equipment etc.,) prepared			
3.	Is material sourcing being done from authorized sources?			
4.	Traffic/Parking management plan prepared			
5.	Air and Dust under control plan is in place			
6.	PUC of construction vehicle checked			
7.	Excavated soil properly placed within minimum space			
8.	Construction area is confined; no traffic/pedestrian entry observed			
9.	Surplus soil/debris/waste is disposed without delay as per provisions mentioned in EMP			
10.	Tarpaulins used to cover sand & other loose material when transported by vehicles After unloading , wheels & undercarriage of vehicles cleaned prior to leaving the site			
11.	Noise Control Measures taken			
12.	Drainage & Storm Water Management measures are in place			
13.	Hazardous waste viz. lubricant/Oil management is being done by EMP measures			
14.	Any discharge of wastewater from construction site/labour camp?			
15.	Is there any oil spillages/leakages?			

S.No	Action/Activities	Status (Yes/No)	Additional Measures required as per EMP	Remarks
16.	No pipes disturbed/removed during excavation			
17.	No chance finds encountered during excavation			
18.	Work is planned in consultation with Hospital administration			
19.	Work at a stretch is completed within a day (excavation, pipe laying & backfilling)			
20.	Pipe trenches are not kept open unduly			
21.	alternative route provided & public is informed, information board provided			
22.	Pedestrian access to hospital is not blocked due to construction			
23.	No public/unauthorized entry observed in work site			
24.	safety measures (barricades, security) in place at work sites in residential areas			
25.	Prior public information provided about the work, schedule and disturbances			
26.	Caution/warning board provided on site Guards with red flag provided			
27.	Workers using appropriate PPE (boots, masks, gloves, helmets, ear muffs etc)			
28.	Workers conducting or near heavy noise work is provided with ear muffs			
29.	Is contractor following standard & safe construction practices?			
30.	First aid facilities are available on site			
31.	Drinking water provided at the site			
32.	Toilet facility provided at the site Separate toilet facility is provided for women workers			
33.	Workers camps are maintained cleanly Adequate toilet & bath facilities provided			

S.No	Action/Activities	Status (Yes/No)	Additional Measures required as per EMP	Remarks
34.	Contractor employed local workers as far as possible			
35.	Workers camp set up with the permission of PIU Adequate housing provided Sufficient water provided for drinking/washing/bath			

Filled By:

Checked By:

## Annexure-7-Environmental Monitoring Report Format

MONITORING PLAN							
Phase	What  (Is the parameter to be monitored?)	Where  (Is the parameter to be monitored?)	How  (Is the parameter to be monitored?)	When  (Define the frequency / or continuous?)	Why  (Is the parameter being monitored?)	Cost  (if not included in project budget)	Who  (Is responsible for monitoring?)
During activity preparation							
During activity implementation							
During activity supervision							

## Annexure-8-Regulatory Standards & Threshold Limits

### 1- National Ambient Air Quality Standards- CPCB 2009 (For parameters proposed for monitoring)

S.No.	Pollutant	Time Weighted Average	Concentration in Ambient Air	
			Industrial, Residential, Rural and Other Area	Ecologically Sensitive Area (notified by Central Government)
1	Sulphur Dioxide (SO <sub>2</sub> ), µg/m <sup>3</sup>	Annual* 24 hours**	50 80	20 80
2	Nitrogen Dioxide (NO <sub>2</sub> ), µg/m <sup>3</sup>	Annual* 24 hours**	40 80	30 80
3	Particulate Matter (size less than 10 µm) or PM <sub>10</sub> µg/m <sup>3</sup>	Annual* 24 hours**	60 100	60 100
4	Particulate Matter (size less than 2.5 µm) or PM <sub>2.5</sub> µg/m <sup>3</sup>	Annual* 24 hours**	40 60	40 60
5	Carbon Monoxide (CO) µg/m <sup>3</sup>	8 hours* 1 hour**	02 04	02 04

### 2- Ambient Noise Standards- as per Noise Pollution (Regulation & Control ) Rules 2000

Area code	Category of area/zone	Limits in dB(A) leq*	
		Day time	Night time
(A)	Industrial area	75	70
(B)	Commercial area	65	55
(C)	Residential area	55	45
(D)	Silence zones	50	40

\*dB(A) Leq denotes the time weighted average of the level of sound in decibels on scale A which is relatable to human hearing. Source: Central Pollution Control Board, India

### 3- Emission limits for new diesel engine

Emission limits for new diesel engine up to 800 kW for generator set (Genset) application

Power Category	Emission Limits (g/kW-hr)			Smoke Limit (light absorption coefficient, m <sup>-1</sup> )
	NO <sub>x</sub> +HC	CO	PM	
Upto 19 KW	≤ 7.5	≤ 3.5	≤ 0.3	≤ 0.7
More than 19 KW upto 75 KW	≤ 4.7	≤ 3.5	≤ 0.3	≤ 0.7
More than 75 KW upto 800 KW	≤ 4.0	≤ 3.5	≤ 0.2	≤ 0.7

Emission limits for new diesel engine for > 800 kW for generator set (Genset) application

Parameters	PM (mg/Nm <sup>3</sup> )	SO <sub>2</sub> (mg/Nm <sup>3</sup> )	NO <sub>x</sub> as NO <sub>2</sub> (ppmv)	CO (mg/Nm <sup>3</sup> )	NMHC (as C) (mg/Nm <sup>3</sup> )
Method References	IS 11255(Part1):1999	IS 11255(Part2):1999	IS 11255 (Part7):2005	IS 13270:1999	IS 5182(part21):2001
Emission Norms ( >800 K W)	75	--	710	150 mg/Nm <sup>3</sup>	100 mg/Nm <sup>3</sup>

### 4- CPCB Guidelines for DG Set Noise- under EPA 1986

Noise Limit for Generator Sets run with Diesel

Noise limit for diesel generator sets (upto 1000 KVA) manufactured on or after the 1st January, 2005 The maximum permissible sound pressure level for new diesel generator (DG) sets with rated capacity upto 1000 KVA, manufactured on or after the 1st January, 2005 shall be 75 dB(A) at 1 metre from the enclosure surface. The diesel generator sets should be provided with integral acoustic enclosure at the manufacturing stage itself.

**5- STP Effluent Discharge Standards** (MoEFCC under Environment (Protection) Amendment Rules, 2017- For State of J&K

S.No	Parameter	Standard
	pH	6.5-9.0
	BOD	30 mg/l
	TSS	<100 mg/l
	Faecal Coliforms	< 1000 MPN/100 ml

6-Drinking Water Standards – IS 10500:2012 and WHO Drinking water quality (4th Edition)

S. No	Parameters	Drinking water specification IS 10500:2012		WHO Drinking water quality (4th Edition)
		Requirement (Acceptable limit)	Permissible limit in the absence of alternate source	Guideline value
A	<b>Physico-chemical Parameters</b>			
1.	pH (pH Scale)	6.5 – 8.5	No relaxation	-
2.	Electrical Conductivity (µmho/cm)	-	-	-
3.	TDS (mg/L)	500	2000	-
4.	True Color (Hazen Scale)	5	15	-
5.	Turbidity (NTU)	1	5	-
6.	TSS (mg/L)	-	-	-
7.	BOD <sup>5</sup> at 20 °C (mg/L)	-	-	-
8.	COD (mg/L)	-	-	-
9.	Dissolved Oxygen (mg/L)	-	-	-
10.	Total Hardness (mg/L)	200	600	-
11.	Calcium Hardness (mg/L)	-	-	-
12.	Magnesium Hardness (mg/L)	-	-	-
13.	Calcium (mg/L)	-	-	-
14.	Magnesium (mg/L)	-	-	-
15.	Total Alkalinity (mg/L)	200	600	-
16.	Sodium (mg/L)	-	-	50
17.	Sulphate (mg/L)	200	400	-
18.	Sulphide (mg/L)	0.05	No relaxation	-

S. No	Parameters	Drinking water specification IS 10500:2012		WHO Drinking water quality (4th Edition)
		Requirement (Acceptable limit)	Permissible limit in the absence of alternate source	Guideline value
19.	Sulphite (mg/L)	-	-	-
20.	Orthophosphate (mg/L)	-	-	-
21.	Total Phosphorus (mg/L)	-	-	-
22.	Nitrate (mg/L)	45	No relaxation	50
23.	Ammonical Nitrogen (mg/L)	0.5	No relaxation	-
24.	Free Ammonia (mg/L)	-	-	-
25.	Total Nitrogen (mg/L)	-	-	
26.	Fluoride (mg/L)	1.0	1.5	1.5
27.	Chloride (mg/L)	250	1000	-
<b>Bacteriological Parameters</b>				
28.	Total Coliform (MPN/100 ml)	Shall not be detectable in 100 mL		
29.	Faecal Coliform (MPN/100 ml)	Shall not be detectable in 100 mL		
<b>Heavy Metals</b>				
30.	Iron (mg/L)	0.3	No relaxation	-
31.	Zinc (mg/L)	5	15	
32.	Copper (mg/L)	0.05	1.5	2.0
33.	Arsenic (mg/L)	0.01	0.05	0.01
34.	Lead (mg/L)	0.01	No relaxation	0.01
35.	Nickel (mg/L)	0.02	No relaxation	-
36.	Boron (mg/L)	0.5	1.0	2.4
37.	Manganese (mg/L)	0.1	0.3	-
38.	Mercury (mg/L)	0.001	No relaxation	0.006

S. No	Parameters	Drinking water specification IS 10500:2012		WHO Drinking water quality (4th Edition)
		Requirement (Acceptable limit)	Permissible limit in the absence of alternate source	Guideline value
39.	Chromium (Hexavalent) (mg/L)	0.05	No relaxation	0.05

Annexure 9- Design Stage Impacts identified & Improved during Planning

Comments Matrix (Drawing 01 - Ground Floor Plan)

S. No.	Observation / Gap Identified by Review Architect appointed under EA Report	Recommendation/suggestion made by Review Architect
1	<p><b>Entry / Reception</b> Reception is located very close to Entry - Possibility of patients crowding the reception and obstructing Entry. - Waiting Area is not visible from Reception counter, creating lack of security.</p>	Reception Counter should be relocated to a central location in the waiting Lobby away from the Entry. So the crowding can be reduced and security be maintained.
2	<p><b>Plumbing / Drainage Shafts</b> - Construction of shaft is not possible due to intersecting structural members (Beam). - Shaft size is less than 600x600 mm, where the beam itself is of 600 mm width.</p>	Shaft should be located on either side of the Beam, so it does not obstruct the structural member.
3	<p><b>Plumbing / Drainage Shafts</b> - Shaft size is 750x1000 mm, with a 600mm service door. The sizes are too less for drainage and manhole as well as servicing. - Drainage shaft servicing doors are opening in the Waiting Lobby, Physiotherapy &amp; Cafeteria Service Counter, which is unhygienic. - Also, it as opening inside the toilets on upper floors, which is not acceptable as it will block the toilet when maintenance is being carried out.</p>	<p>- Size of the shafts should be increased to at least 1500x2000 mm. - Servicing doors should be relocated to different direction to avoid unhygienic condition.</p>
4	<p><b>Shafts in Skylights</b> - Drainage will be inefficient, as some shafts are located more than 12m away from the building exterior. - Shafts in skylights are hampering movement in ground floor &amp; should be removed. - Shafts till 1st Floor are not clearly shown in Ground Floor Plan.</p>	
5	<p><b>Hospital Ramp</b> Turning Radius is sharp and can be inefficient for moving Hospital Beds / Stretcher.</p>	The turn can be extended away from columns to provide clear space for turning.
6	<p><b>Staircase / Lift Lobby</b> - Staircase door and Lift Lobby door are opening facing each other, again obstructing movement. - 2 Lifts are located diagonally opposite which</p>	<p>-Lift lobby door should be shifted so it does not face the staircase door. -2 Lifts should be placed close to each other for better servicing.</p>

S. No.	Observation / Gap Identified by Review Architect appointed under EA Report	Recommendation/suggestion made by Review Architect
	creates inefficient maintenance. - 3000x1200 mm shaft located next to lift for no specific purpose.	
7	<b>Toilets</b> - No. of toilets provided is very less for public use. - Door width for Male & Female toilet is 840mm and 1000mm, which is less. And Shafts are placed next to door which is not aesthetically good. - Both are not visually screened from the corridor. - Handicapped Toilet Door width is also less.	Toilet should be redesigned. For aesthetical improvement, only screen wall created in the toilet and layout of toilets changed. However, following points needs to be incorporated: 1- Number of toilets should be based on design population load confirming NBC norms. Please recheck the number of toilets. 2- As per the standard norms, main Door of toilets should be at least 1000 mm for male and female toilets and 1200 mm minimum for handicapped toilets.

### Comments Matrix (02-First Floor Plan)

S. No.	Observation / Gap Identified	Recommendation by Review Architect (if any)
1	<b>Fire Safety</b> - Travel distance from female ward bed to ramp exit is more than 45m which is more than permissible Fire Norms. - Radiology department has a dead end which is not acceptable.	Additional Fire Staircase should be provided or the current one relocated.
2	<b>CT Scan</b> Machine installation will not be possible on the first floor.	Check with installation company.
3	<b>X-Ray room</b> Change room is accessed from the corridor, instead of X-Ray room. This would be inappropriate for the patients.	Change room should be accessible from inside the X-Ray room.
4	<b>Ward</b> - Nursing Station is not located centrally. The beds on the end will not be visible from the counters, which is not preferred in case there are any emergencies with the patients. - Pantry also is located on the end of the	Ward should be redesigned or CC Monitor should be provided.

S. No.	Observation / Gap Identified	Recommendation by Review Architect (if any)
	passage and will be inconvenient for the patients on the other side of the ward. In-case this is staff pantry, then patients' pantry is not specified.	
5	<b>Ward Toilet</b> - It is located above the Waiting lobby on Ground Floor. In case of any fault in water supply or drainage, the seepage will be visible in the public Waiting Lobby which is unhygienic. Same for 3rd and 4th Floor Toilets which are above I.C.U. Lobby on 2nd Floor. - The size of shaft provided is insufficient for the no. of WCs, Basins and Bathrooms provided. (refer Ground Floor 2B) - Proper ventilation is not possible for handicapped toilet.	- Size of the drainage plumbing shafts should be increased to at least 1500x2000 mm so that technician can stand in the shaft & work on the pipes..
6	<b>Isolation Bed</b> - No toilet is proposed for Isolation bed in Ward area.	Toilet should be provided
7	<b>Glazed Enclosed Balcony</b> - The structure is 3000mm cantilevered, which is not recommended in Earthquake zone 4 building.	Only 1200mm is allowed or structural member should be provided from ground level.

### Comments Matrix (03- Second Floor Plan)

S. No.	Observation / Gap Identified by Review Architect appointed under EA Report	Recommendation/suggestion made by Review Architect appointed under EA Report (if any)
1	<b>DU Room</b> - All waste from the DU Room will be taken out through the ICU, which is unhygienic.	Du room can be interchanged with CU room so the waste can directly be sent out through lock area.
2	<b>Pre Operative / Post Operative</b> - No toilet proposed in Pre Operative Room - similar to ICU, DU room waste will be taken out through the Pre/Post Operative Rooms.	- Toilet should be provided. - DU room should be accessible from the corridor to take out waste.
3	<b>O.T. Complex</b> Dirty corridor required for disposal of bio medical waste from O.T.	-
4	<b>Private room Balcony</b> - 1 common balcony is proposed for both private rooms. Not recommended for privacy.	

### Comments Matrix (04- Third Floor Plan)

S. No.	Observation / Gap Identified by Review Architect appointed under EA Report	Recommendation/suggestion made by Review Architect appointed under EA Report (if any)
1	<p><b>Fire Safety</b></p> <ul style="list-style-type: none"> <li>- Travel distance from female ward bed to ramp exit is more than 45m which is more than permissible Fire Norms.</li> <li>- Radiology department has a dead end which is not acceptable.</li> </ul>	Additional Fire Staircase should be provided or the current one relocated.
2	<p><b>Ward</b></p> <ul style="list-style-type: none"> <li>- Nursing Station is not located centrally. The beds on the end will not be visible from the counters, which is not preferred in case there are any emergencies with the patients.</li> <li>- Pantry also is located on the end of the passage and will be inconvenient for the patients on the other side of the ward. In case this is staff pantry, then patients' pantry is not specified.</li> </ul>	Ward should be redesigned or CC Monitor should be provided.
3	<p><b>Ward Toilet</b></p> <ul style="list-style-type: none"> <li>- It is located above the Waiting lobby on Ground Floor. In case of any fault in water supply or drainage, the seepage will be visible in the public Waiting Lobby which is unhygienic.</li> <li>- Same for 3rd and 4th Floor Toilets which are above I.C.U. Lobby on 2nd Floor.</li> <li>- The size of shaft provided is insufficient for the no. of WCs, Basins and Bathrooms provided. (refer Ground Floor 2B)</li> <li>- Proper ventilation is not possible for handicapped toilet.</li> </ul>	<ul style="list-style-type: none"> <li>- Refer to General Note 2.</li> <li>- Size of the drainage plumbing shafts should be increased to at least 1500x2000 mm so that technician can stand in the shaft &amp; work on the pipes.</li> </ul>
4	<p><b>Isolation Bed</b></p> <ul style="list-style-type: none"> <li>- No toilet is proposed for Isolation bed in Ward area.</li> </ul>	Toilet should be provided
5	<p><b>Glazed Enclosed Balcony</b></p> <ul style="list-style-type: none"> <li>- The structure is 3000mm cantilevered, which is not recommended in Earthquake zone 4 building.</li> </ul>	Only 1200mm is allowed or structural member should be provided from ground level.

### Comments Matrix (05- Fourth Floor Plan)

S. No.	Observation / Gap Identified by Review Architect appointed under EA Report	Recommendation/suggestion made by Review Architect appointed under EA Report (if any)
1	<p><b>Fire Safety</b></p> <ul style="list-style-type: none"> <li>- Travel distance from female ward bed to ramp exit is more than 45m which is more than permissible Fire Norms.</li> <li>- Radiology department has a dead end which is not acceptable.</li> </ul>	Additional Fire Staircase should be provided or the current one relocated.
2	<p><b>Ward</b></p> <ul style="list-style-type: none"> <li>- Nursing Station is not located centrally. The beds on the end will not be visible from the counters, which is not preferred in case there are any emergencies with the patients.</li> <li>- Pantry also is located on the end of the passage and will be inconvenient for the patients on the other side of the ward. In case this is staff pantry, then patients' pantry is not specified.</li> </ul>	Ward should be redesigned or CC Monitor should be provided.
3	<p><b>Ward Toilet</b></p> <ul style="list-style-type: none"> <li>- It is located above the Waiting lobby on Ground Floor. In case of any fault in water supply or drainage, the seepage will be visible in the public Waiting Lobby which is unhygienic.</li> <li>- Same for 3rd and 4th Floor Toilets which are above I.C.U. Lobby on 2nd Floor.</li> <li>- The size of shaft provided is insufficient for the no. of WCs, Basins and Bathrooms provided. (refer Ground Floor 2B)</li> <li>- Proper ventilation is not possible for handicapped toilet.</li> </ul>	<ul style="list-style-type: none"> <li>- Refer to General Note 2.</li> <li>- Size of the drainage plumbing shafts should be increased to at least 1500x2000 mm so that technician can stand in the shaft &amp; work on the pipes..</li> </ul>
4	<p><b>Isolation Bed</b></p> <ul style="list-style-type: none"> <li>- No toilet is proposed for Isolation bed in Ward area.</li> </ul>	Toilet should be provided
5	<p><b>Glazed Enclosed Balcony</b></p> <ul style="list-style-type: none"> <li>- The structure is 3000mm cantilevered, which is not recommended in Earthquake zone 4 building.</li> </ul>	Only 1200mm is allowed or structural member should be provided from ground level.

### Comments and Suggestions on Master Plan

S.No	Features of Master Plan	Recommendation if any
1.	Location of STP & ETP	Location of STP & ETP should be planned at proper location. Proposed location is located front side of existing hospital near parking area which may create following issues: 1- Hindrance of existing services and access to the existing hospital during construction of STP/ETP 2- Parking issues 3- Transfer of piping of old buildings from backside to proposed STP/ETP location or needs pumping
2.	Location of Proposed BMW storage room	Location of BMW storage room is proposed just opposite to existing hospital building. It comes in front of old OT complex. As per CPCB guidelines, it should be located away from the public access. Please have a relook on the proposed location of BMW storage room that may be shifted at backside of existing hospital building or may be constructed by demolish some old structure back side & constructed waste storage room.
3.	Electric Sub-Station & HVAC plant is also not in proper location.	If possible try to accommodate some other side. Heat loss factor should also be taken into account if HVAC plant located far away from the site
4.	Route and Access and parking	Access to Hospital with 5.5 meter road with footpath is too less. Considering the land constrains, removing some structure, road width can be increased. Planned parking is sufficient as per local bylaws norms but as per NBC norms these are not sufficient., following are the other suggestions

		<ul style="list-style-type: none"> <li>1- Allow limited parking inside the hospital premises (only for staff, ambulance, patient vehicles)</li> <li>2- Development of Multilevel car parking near hospital</li> <li>3- Develop public transport facilities to B&amp;J hospital</li> </ul>
5.	Sewer & Storm water Management	As per site some areas are create water logging so take care as per slope of site.

Note- Dimensions of STP/ETP, and waste storage units are not finalised and yet to be submitted by design architect. Thus location and feasibility of these units will assessed before submission of Final EIA/EMP report.

## Annexure 10-SOPs and Guidelines for Construction Sites for COVID-19 Outbreak!

A new Standard Operating Procedure is issued amidst the current phase of the pandemic for 'local transmission and limited community transmission. This SOP is applicable to the current phase of COVID-19 pandemic in India (local transmission and limited community transmission). For construction sector, NAREDCO, under the guidance of Ministry of Health and Family Welfare (MoHFW), Ministry of Housing and Urban Affairs (MoHUA) and Govt. of India, has defined the Standard Operating Procedures (SOPs) and guidelines to ensure safety of construction site workers.

### **General guidelines for Standard Operating Procedures (SOPs) and guidelines for Construction Sites for COVID-19 Outbreak**

The guidelines have been divided into three sections namely, applicable for all, for workers, and for materials, tools, machinery, vehicles etc.

#### **Guidelines Applicable for all**

- All Protocol including Emergency Response will be laid out. Identity Cards will be issued to everyone entering the site area. Periodic tailgate sessions will be arranged to review site protocols in view of highly dynamic scenarios ensuring social distancing norms.
- Mandatory Thermal Scanning of everyone entering and exiting a construction site will be done for fever with thermal scanners.
- Provision for hand wash & sanitizer (touch free recommended) will be made at all entry and exit points and common areas (including at distant locations like higher floors). Everyone will be required to wash & sanitize his/her hands before entering the site. Same procedure to be followed after exiting the premise.
- Everyone entering the site area should mandatorily wear a face mask.
- Hand gloves should be used by the workers who are handling material coming from outside
- There will be a strict ban on Gutka, Tambaku, Paan etc. on site and spitting shall be strictly prohibited.
- Food should be consumed at designated areas only ensuring social distancing.
- Post lunch, waste should be disposed of by individuals in designated bins and the area should remain clean.
- Entire construction sites including site office, labour camp, canteens, pathways, toilets, entry / exit gates will be disinfected on a daily basis.
- Housekeeping team should be provided with necessary equipment.
- There will be a total ban on non-essential visitors at sites.
- Hospitals/clinics in the nearby area, which are authorized to treat COVID-19 patients, should be identified and list should be available at Site all the time.

- A doctor will be present periodically (at least once a week) at site on allotted time for any medical assistance.
- Appropriate signage at construction site spelling out safety practices in the language which is understood by all.
- For any confusion, clarification and update, everyone should approach designated authority or rely on an authentic source.

General guidelines applicable to all			
	Thermal Scanning		Hand wash & sanitizer
	Face mask		Hand gloves
	Food with social distancing		Santising construction site
	No non-essential visitors		Periodical presence of doctor
	Identification of Hospital/clinics in the nearby area, which are authorized to treat COVID-19		
	Do not believe on rumours and don't spread them		

#### Guidelines for workers

- On day 0, before resuming the work on sites post lockdown period, mandatory medical check-up will be arranged for all workers.
- The workers coming from outside should observe home-quarantine for at least 14 days as per the guidelines issued by MoHFW.
- Only medically fit workers will be deployed at site and medical assistance will be arranged for unfit workers.
- A unique photo identity card with serial number will be issued to all the workers and their family members staying at site.
- All the essential items will be made available to them at site only. If necessary, they can go out wearing face masks, after informing the supervisor.

- No outside worker will be allowed to stay at site without following proper procedure and instructions.
- Start time on site will be staggered to avoid congestion at the entry gates.
- As in most cases, workers reside at the Sites, hence no travel arrangements are required for them.
- The workers staying outside (which are always nearby) should reach the site either by walking or by their individual mode of transport (bicycle, two-wheeler etc.).
- During attendance, training and other sessions, social distancing guidelines will be followed along with provision of no-touch attendance.
- All workers may be advised to take care of their own health and look out for respiratory symptoms/fever and, if feeling unwell, should leave the workplace immediately after informing their reporting officers.
- They should observe home-quarantine as per the guidelines issued by MoHFW and should immediately inform the nearest health centre.
- Workers should not shake hands when greeting others and while working on the site.
- Mandatorily wear face masks while working on site. While not wearing masks, cover your mouth and nose with tissues if you cough/sneeze or do so in the crook of your arm at your elbow.
- Avoid large gatherings or meetings. Maintain at least 1 metre (3 feet) distance from persons, especially with those having flu-like symptoms, during interaction.
- Not more than 2/4 persons (depending on size) should be allowed to travel in lifts or hoists.
- Use of the staircase for climbing should be encouraged.
- Workers should clean hands frequently by washing them with soap and water for at least 40 seconds.
- Workers should not share their belongings like food, water bottles, utensils, mobile phones etc. with others.
- The utensils should be washed properly post use at designated places.
- Post work, workers should change their clothes before leaving the site and clothing should not be shook out.
- Avoid touching your eyes, nose, or mouth with unwashed hands.

Guidelines for Workers			
	A unique photo identity card		Start time on site to be staggered to avoid congestion
	Criteria for travel arrangements		Provision of no-touch attendance
	Abide by health guidelines		Avoid hand shake
	Avoid large gatherings or meetings		Frequent hand washing
	Change of clothes post-work Avoid touching your eyes, nose, or mouth		
	No share of belongings		

Guidelines for Material, Tools, Machinery, Vehicles etc.

- At all points of time, easy access to parking should be ensured since public transit is limited.
- All vehicles and machinery entering the premises should be disinfected by spray mandatorily.
- All construction material arriving at site should be left idle for 3 days before use to ensure safe usage.
- Non-touch garbage bins with biodegradable garbage bags should be installed for waste collection at all common access areas.
- Wipe down interiors and door handles of machines or construction vehicles, the handles of equipment and tools that are shared, with disinfectant prior to use.

## Guidelines for Material, Tools, Machinery, Vehicles etc.

	Limited public transit		Vehicle entering should be disinfected
	All construction material arriving at site should be left idle for few days		
	Non-touch garbage bins with biodegradable garbage bag should be installed for waste collection		
	Wipe down interiors and door handle of machines or construction vehicles		

### Conclusion

Apart from guidelines of Standard Operating Procedures a Site Safety Representative (SSR) will be deployed at every site, to ensure the safety guideline is followed. Necessary training will be given in advance to Supervisors and SSRs, so that they can train the workers further.

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