Initial Environmental Examination

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IND: Assam Urban Infrastructure Investment Program — Tranche 2

Package Number: AUIIP/PR-2/DIB/DR/02 (Construction of DTP Drain Outfall, Secondary Drains, and Allied Works in Dibrugarh)

Prepared by Guwahati Development Department & Urban Development Department, State Government of Assam for the Asian Development Bank.

CURRENCY EQUIVALENTS

(as of 28 August 2017)

Currency unit – Indian Rupee (₹)
₹1.00 = $0.01566
$1.00 = ₹64.8615

ABBREVIATIONS

ADB	-	Asian Development Bank
APCB	-	Assam Pollution Control Board
BRT	-	bus rapid transit
CFE	-	Consent for Establishment
CFO	-	Consent for Operation
CPCB	-	Central Pollution Control Board
CTO	-	Consent to Operate
DMB	-	Dibrugarh Municipal Board
DMSC	-	Design, management and supervision consultants
DTP	-	Dibrugarh Town Protection
EARF	-	environmental assessment and review framework
EIA	-	environmental impact assessment
EMP	-	environmental management plan
GRC	-	Grievance Redress Committee
GRM	-	grievance redress mechanism
IEE	-	initial environmental examination
MFF	-	multitranche financing facility
PIU	-	project implementation unit
PMU	-	project management unit
SCMU	-	Safeguards Compliance and Monitoring Unit
SPS	-	Safeguard Policy Statement
ULB	-	Urban Local Body
UDD	-	Urban Development Department

WEIGHTS AND MEASURES

cm	–	centimeter
dbA	–	decibels
ha	–	hectare
kg	–	kilogram
km	–	kilometer
L	–	liter
M	–	meter
m^2	–	square meter
mg/l	–	milligrams per liter
ml	–	milliliter
mm	–	millimeter
sq. km.	–	square kilometers
sq. m.	–	square meters
$\mu g/m^3$	–	micrograms per cubic meter

NOTES

(i) The fiscal year (FY) of the Government of India and its agencies ends on 31 March. FY before a calendar year denotes the year in which the fiscal year ends, e.g., FY2017 ends on 31 March 2017.

(ii) In this report, "$" refers to US dollars.

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APPENDICES

EXECUTIVE SUMMARY

1. The Assam Urban Infrastructure Investment Program (Program) is a key urban infrastructure initiative of the State Government of Assam, and aims to improve the urban environment and quality of life in the cities of Guwahati and Dibrugarh through the delivery of improved water supply, sanitation, solid waste management (SWM), drainage infrastructure, and a sustainable urban transport system such as a bus rapid transit (BRT) corridor. The Program uses a multitranche financing facility (MFF) modality and to be implemented over a 6-year period from 2012 to 2017. Investments under the MFF will be delivered in two tranches. For Guwahati these included water supply, sewerage, and transportation while for Dibrugarh included drainage, solid waste management and basic services for the poor were identified.

2. The major outputs of the Program include: (i) for Guwahati, improved water supply, sanitation, and urban transport through a BRT corridor; and (ii) for Dibrugarh, improved drainage, and comprehensive SWM.

3. The State Government of Assam's Guwahati Development Department is the executing agency. A state-level project management unit (PMU), headed by a full-time Project Director (PD), established as the Implementing Agency, which will be in-charge of overall execution and technical supervision, monitoring, and financial control of all activities under the project. project implementation units (PIUs) dedicated exclusively to the project would be set up in Guwahati and Dibrugarh. The PIUs will be headed by a senior technical officer and assisted by qualified and experienced officers seconded from ULBs, finance and other line departments. The PIUs will be responsible for the day-to-day activities of project implementation in the field and will be under the direct administrative control of the PMU.

4. The PMU will have Safeguards Compliance and Monitoring Unit (PMU SCMU) to ensure mitigation of negative environmental and social impacts due to the subproject, if any. The PMU SCMU will have an Environmental Safeguards Officer (PMU SO). The PMU assisted by the Design, Management and Supervision Consultants (DMSC). The PIUs will each have an Environment Officer and Resettlement Officer who will be responsible for implementation of the environmental management plan (EMP) and the resettlement plan respectively. An Environment Specialist as part of the DMSC team is to assist the PIUs in updating the IEE during detailed design stage and monitoring of the subproject's EMP during the construction stage. ADB will review and approve all final IEEs prior to contract award.

5. ADB requires the consideration of environmental issues in all aspects of its operations, and the requirements for environmental assessment are described in ADB's Safeguard Policy Statement (SPS), 2009. According to the SPS, environmental assessment is required for all subprojects under an MFF modality.

6. This IEE has been prepared for Dibrugarh Drainage Improvement Subproject which covers (i) remodelling & channelization of Dibrugarh Town Protection (DTP) drain from chainage 9515 m to 27822 m using Geo mattress, (ii) sluice gates at chainage 27822 m of DTP Drain, (iii) construction of new proposed box covered drains at Zone-I, Zone-II, and Zone-III, of Dibrugarh Municipal Board (DMB) area, Major Drain - 11.806 km, Secondary Drain - 3.570 km, Total Drain Length - 15.376 km, and (iv) construction, remodeling, channelization, desilting, etc. of secondary & tertiary drains of DMB. Construction work is likely to commence in 2017 and will be completed in approximately 36 months.

7. The drainage improvement subproject will benefit the citizens of Dibrugarh in the following

ways: (i) improved environment, living condition, and public health in Dibrugarh; (ii) reduced household healthcare cost due to flooding and water logging problems; (iii) reduced man-days lost due to water logging and flooding; (iv) reduced temporary resettlement cost due to flooding; (v) reduced annual cost of protection measures from flooding; (vi) reduced annual agricultural loss; and (vii) reduced road maintenance cost.

8. The subproject is not anticipated to have significant environmental impacts. Subproject facilities are located in existing drainage structures and ROW within a built up urban environment. There are no protected areas, wetlands, mangroves, or estuaries. Trees, vegetation, animals in the subproject sites are those commonly found in built-up areas.

9. The environmental impacts of the subproject were assessed and documented in this IEE. Potential negative impacts are likely to occur during construction and operation of the improved infrastructure while no impacts are anticipated as being due to the subproject design or location. During the construction phase, impacts will mainly arise from: (i) need to dispose significant quantities of waste soil/ drainage silt; and (ii) disturbance of residents, businesses, traffic and important buildings by the construction work, (iii) felling of few trees will be required for the said project. These are common impacts of construction in urban areas, and well-developed methods for their mitigation exist and are considered standard practices. Mitigation measures have been developed to reduce all negative impacts to acceptable levels. These were discussed with the design engineers, and as a result, some measures have already been included in the designs of the infrastructure and reflected in the EMP.

10. Impacts during operation will be limited to routine maintenance disturbances which include excavation works, drainage cleaning within the dense areas of Dibrugarh. Once the system is operating, most facilities will operate with routine maintenance, which should not affect the environment. The drainage network will need to be repaired from time to time, but environmental impacts will be much less than those of the construction period as the work will be infrequent, affecting small areas only.

11. An EMP is included as part of this IEE which includes: (i) mitigation measures for environmental impacts during implementation, (ii) environmental monitoring program, and the responsible entities for mitigation, monitoring, and reporting; (iii) public consultation and information disclosure; (iv) grievance redress mechanism; and (v) implementation arrangements. Mitigation measures have been developed to reduce all negative impacts to levels considered to be safe to the environment and public health and safety. A number of impacts and their significance have already been reduced by amending the designs and selecting alternate alignments.

12. Mitigation will be assured by a program of environmental monitoring to be conducted during construction stages. The environmental monitoring program will ensure that all measures are implemented, and will determine whether the environment is protected as intended. It will include observations on- and off-site, document checks, and interviews with workers and beneficiaries. Any requirements for remedial action will be reported to ADB on a semi-annual basis.

13. The stakeholders were involved in developing the IEE through discussions on site and public consultation after which views expressed were incorporated into the IEE and the planning and development of the subproject. For the benefit of the community, the summary IEE will be translated in Assamese and made available at: (i) ULB office; (ii) District Magistrate Office; (iii) PMU; and (iv) PIUs. Hard copies of the IEE will be kept in public locations accessible to citizens as a means to disclose the document and at the same time creating wider public awareness.

Electronic version of the IEE will be placed in the official website of the PMU/State Government and the official website of ADB after approval of the IEE by Government and ADB. The PMU will issue Notification on the locality-wise start date of implementation of the subproject. The notice will be issued by the PMU in local newspapers one month ahead of the implementation works. Copies of the IEE will be kept in the PMU and PIU offices and will be distributed to any person willing to consult the IEE.

14. Therefore, the proposed subproject is unlikely to cause significant adverse impacts. The potential adverse impacts that are associated with design, construction, and operation can be mitigated to standard levels without difficulty through proper engineering design and the incorporation or application of recommended mitigation measures and procedures.

15. Based on the findings of the IEE, the classification of the Subproject as Category B is confirmed, and no further special study or detailed environmental impact assessment needs to be undertaken to comply with ADB SPS (2009).

I. INTRODUCTION

A. Background

1. The Assam Urban Infrastructure Investment Program (Program) is a key urban infrastructure initiative of the State Government of Assam, and aims to improve the urban environment and quality of life in the cities of Guwahati and Dibrugarh through the delivery of improved water supply, sanitation, solid waste management (SWM), drainage infrastructure, and a sustainable urban transport system such as a Bus Rapid Transit (BRT) corridor. The Program uses a multitranche financing facility (MFF) modality and to be implemented over a 6-year period from 2012 to 2017. Investments under the MFF will be delivered in two tranches. For Guwahati these included water supply, sewerage, and transportation while for Dibrugarh included drainage, solid waste management and basic services for the poor were identified. Geographical location of Assam is shown in **Figure 1** below. **Figure 2** shows the Dibrugarh city map.

2. The major outputs of the Program include: (i) for Guwahati, improved water supply, sanitation, and urban transport through a BRT corridor; and (ii) for Dibrugarh, improved drainage, and comprehensive SWM.

3. ADB requires the consideration of environmental issues in all aspects of its operations, and the requirements for environmental assessment are described in ADB's Safeguard Policy Statement (SPS, 2009).

4. The subproject is classified as Category B. This initial environmental examination (IEE) has been prepared for Dibrugarh Drainage Improvement Subproject which covers (i) remodelling & channelization of DTP drain from chainage 9515 m to 27822 m using Geo mattress, (ii) sluice gates at chainage 27822 m of DTP Drain, (iii) construction of new proposed box covered drains at Zone-I, Zone-II, and Zone-III, of Dibrugarh Municipal Board (DMB) area, Major Drain - 11.806 km, Secondary Drain - 3.570 km, Total Drain Length - 15.376 km, and (iv) construction, remodeling, channelization, desilting etc. of secondary & tertiary drains of DMB area.

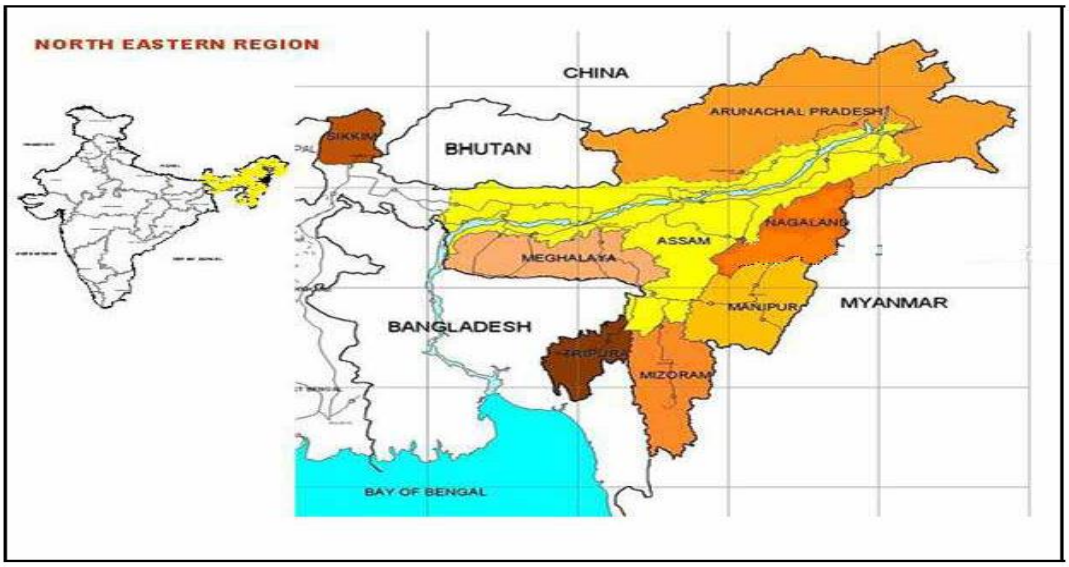


Figure 1: Geographical Location of Assam in North East Region

Figure 2: Dibrugarh City Map

B. Environmental Compliance Requirements

1. ADB Safeguard Policy Statement, 2009

5. ADB requires the consideration of environmental issues in all aspects of its operations, and the requirements for environmental assessment are described in ADB SPS, 2009. This states that ADB requires environmental assessment of all project loans, program loans, sector loans, sector development program loans, and loans involving financial intermediaries, and private sector loans.

6. **Screening and Categorization.** The nature of the environmental assessment required for a project depends on the significance of its environmental impacts, which are related to the type and location of the project, the sensitivity, scale, nature and magnitude of its potential impacts, and the availability of cost-effective mitigation measures. Projects are screened for their expected environmental impacts are assigned to one of the following four categories:

(i) **Category A.** Projects could have significant adverse environmental impacts. An EIA is required to address significant impacts;

(ii) **Category B.** Projects could have some adverse environmental impacts, but of lesser degree or significance than those in category A. An IEE is required to determine whether significant environmental impacts warranting an EIA are likely. If an EIA is not needed, the IEE is regarded as the final environmental assessment report;

(iii) **Category C.** Projects are unlikely to have adverse environmental impacts. No EIA or IEE is required, although environmental implications are reviewed; and

(iv) **Category FI.** Projects involve a credit line through a financial intermediary or an equity investment in a financial intermediary. The financial intermediary must apply an environmental management system, unless all Projects will result in insignificant impacts.

7. **Environmental Management Plan.** An environmental management plan (EMP) which addresses the potential impacts and risks identified by the environmental assessment shall be prepared. The level of detail and complexity of the EMP and the priority of the identified measures and actions will be commensurate with the subproject's impact and risks.

8. **Public Disclosure.** ADB will post the following safeguard documents on its website so affected people, other stakeholders, and the general public can provide meaningful inputs into the subproject design and implementation:

(i) Final or updated IEE upon receipt; and
(ii) Environmental Monitoring Reports submitted by PMU during subproject implementation upon receipt.

9. The above is to meet the requirements of ADB's Public Communication Policy 2011.

C. Government of India and Assam Requirements

10. The implementation of the subprojects will be governed by Government of India and State Government of Assam environmental acts, rules, regulations, and standards. These regulations impose restrictions on the activities to minimize/mitigate likely impacts on the environment. It is the responsibility of the project executing and implementing agencies to ensure subprojects are consistent with the legal framework, whether national, state or municipal/local. In addition, subprojects shall also be consistent with ADB SPS. The following legislations are applicable to the subproject:

(i) Environmental (Protection) Act of 1986, its rules and amendments;
(ii) Environmental Impact Assessment (EIA) Notification of 2006;
(iii) Water (Prevention and Control of Pollution) Act of 1974, its Rules, and amendments;
(iv) Air (Prevention and Control of Pollution) Act of 1981, its Rules and amendments;
(v) Central Pollution Control Board (CPCB) Environmental Standards;
(vi) Construction & Demolition Waste Management Rules, 2016;
(vi) Wildlife (Protection) Act of 1972, its Rules and amendments;
(vii) Indian Forest Act of 1927;
(viii) Forest (Conservation) Act of 1980, its Rules and amendments;
(ix) Assam Forest Regulation of 1891;
(x) Assam Forest Policy of 2004;
(xi) Guidelines for Diversion of Forest Lands for Non-Forest Purpose under the Forest (Conservation) Act of 1980;
(xii) Ancient Monuments and Archaeological Sites and Remains Rules of 1959; and
(xiii) Land Acquisition, Rehabilitation and Resettlement Act, 2013

11. Key standards include those related to drinking water quality, air quality, effluent discharge, and protected areas. Compliance is required in all stages of the subproject including design, construction, and operation and maintenance.

12. The Government of India laws cover the occupational health and safety of employees working only in factories and mines. However, the Constitution of India has provisions to ensure that the health and well-being of all employees are protected and the State has the duty to ensure protection. For this subproject, the mitigation measures were based on the World Bank Environmental, Health, and Safety (EHS) Guidelines.

D. Environmental Assessment Requirements

13. The Government of India's EIA Notification of 2006 requires environmental clearance for certain defined activities/projects. This Notification classifies the projects/activities that require environmental clearance into 'A' and 'B' categories depending on the impact potential and/or scale of subproject. For both category projects, prior environmental clearance is mandatory before any construction work, or preparation of land except for securing the land, is started. The subproject components are not listed in the EIA Notification of 2006 "Schedule of Projects Requiring Prior Environmental Clearance" thus environmental clearance is not required. However, for all the quarry and mining activities environment clearance certificate is required.

E. National Legal Requirements

14. **Water (Prevention and Control of Pollution) Act of 1974, Rules of 1975, and amendments.** Any component of the Subproject having potential to generate sewage or trade effluent will come under the purview of the Water (Prevention and Control of Pollution) Act of 1974, Rules of 1975, and amendments. Such projects have to obtain Consent for Establishment (CFE) under Section 25 of the Act from Assam Pollution Control Board (APCB) before starting implementation and Consent to Operate (CTO) before commissioning. The Water Act also requires the occupier of such subprojects to take measures for abating the possible pollution of receiving water bodies. The subproject does not require CFE and CTO from APCB.

15. **Air (Prevention and Control of Pollution) Act of 1981, Rules of 1982 and amendments.** The subprojects having potential to emit air pollutants into the atmosphere have to obtain CFE under Section 21 of the Air (Prevention and Control of Pollution) Act of 1981 from APCB before starting implementation and CTO before commissioning the subproject. The occupier of the subproject/facility has the responsibility to adopt necessary air pollution control measures for abating air pollution. The following require CFE and CTO from APCB: (i) diesel generators; and (ii) hot mix plants, wet mix plants, stone crushers etc, if installed for construction. Emissions shall comply with standards notified by the CPCB. **Appendix 1** provides applicable standards for air quality and noise levels.

16. **Forest Legislations.** State Government of Assam makes rules under the Indian Forest Act to regulate activities like cutting of trees and removal of forest produce; clearing or breaking up of land for cultivation or any other purpose; and for protection and management of any portion of protected forest. Cutting of trees in non-forest land, irrespective of land ownership, also requires permission from the State Forest and Environment Department. Afforestation to the extent of three trees per each tree felled is mandatory. The sub projects sites are located in urban/semi urban areas and will not encroach on any reserve forest/protected area thus forest clearance is not required. There is requirement of felling of about 75 trees (51 nos. along DTP drain outfall and 24 nos. along secondary drain) for construction of drain, accordingly permission needs to be obtained from the state forest and environment department before implementation of the project work.

17. **Ancient Monuments and Archaeological Sites and Remains Rules, of 1959.** The Rules designate areas within a radius of 100 meters (m) and 300 m from the "protected property" as "protected area" and "controlled area" respectively. Protected property includes the site, remains, and monuments protected by Archaeological Survey of India or the State Department of Archaeology. For the subproject, there are no Archaeologically Protected Areas within Dibrugarh.

18. **Land Acquisition, Rehabilitation and Resettlement Act, 2013.** The Act shall come into force on January 1, 2014 as notified by the Central Government. The Act will replace the Land Acquisition Act, 1894, a nearly 120-year-old law enacted during British rule and lays emphasis on Rehabilitation & Resettlement in cases of land acquisition. Private land acquisition is guided by the provisions and procedures under this Act. Before the acquisition of any land, the Government is required to consult the concerned Panchayat or Municipal Corporation and carry out a Social Impact Assessment in consultation with them. The Act provides a transparent process for land acquisition for industrialization, development of essential infrastructural facilities and urbanization by giving adequate financial compensation to the affected people. For the subproject, minor land acquisition may be required since most of the drainage alignment is located within Government ROW. Land related components and temporary and permanent impacts are discussed in Rehabilitation and Resettlement plan.

II. DESCRIPTION OF SUBPROJECT

A. Need for the Subproject

19. Before 1956, the rain water in Dibrugarh town used to drain through several small drains into the River Bramhaputra. The river, being braided in nature, keeps shifting its bank. To protect the town, the 8.62-km DTP dyke was constructed in 1955. The construction of the DTP dyke closed all the drainage channels resulting in rainwater inundation in the town and its adjoining areas. In order to resolve the drainage issues, a 22.4-km long drainage channel was constructed from Jalan Nagar (now Paltan Bazar) to drain into River Bramhaputra. However, the huge sediment load of the river resulted in increase in the bed level and has worsened the drainage scene. At present, Dibrugarh town is 1.5 m below the bed level of Bramhaputra. Due to non-maintenance of the drain, the bed has risen by 1 m from the original bed level.

20. Now the present drain with a length of 32.053 km has its outfall at the River Sessa. In between, the drain passes a scenic wetland known as Larua Jamira *beel*[1]. But the catchment is contributing a lot of silt deposit on the bed making it shallow, incapable, and contributing in the problem of flooding in the town. Calculation of drainage capacity (Reference Table 2 below shows drainage capacity) of the existing drain and its comparison with the computed peak discharge has revealed that existing size is not at all adequate to carry the peak discharge {Reference DPR Dibrugarh Town Protection (DTP) secondary drain and Project Implementation and Urban Management Improvement in the North Easter Region – Package A, Draft DPR Improvement of DTP drain, Dibrugarh, Asian Development Bank TA 4799- IND (2009)}.

21. It is also noted that the drain receives sewage flows through secondary drain from a major part of the town which contributes a large fraction of sludge deposits. Over time, the drain also became a dumping ground for the municipal solid waste. Due to encroachment by the residents along the drain, and construction of narrow culverts at numerous road crossing its cross section has become restricted which has aggravated the problem of flooding. The local authorities have not been able to respond to these challenges and as a result, a major part of the town population has been experiencing severe and recurrent flooding.

[1] A *beel* is term for a pond (wetland) with static water (as opposed to moving water in rivers and canals- typically called *khaals*), in the Ganges – Brahmaputra flood plains of West Bengal and Assam. The term owes its origins to the word of the same pronunciation meaning "pond" in the Bengali and Assamese languages.

22. The DTP drain was constructed more than 50 years old. The bed is covered with deposition of silt, varying from 1m to 2m within the town and up to 1m beyond the town i.e. up to 17.5 km of the drain length. The discharge capacity of the drain is 9.60 cumec at the starting point and 20.69 cumec at end point. The area through which the drain runs have alluvium soil which favors vegetation growth. The vegetation growth covers a width of about 2 m on both side of the drain with thick water hyacinth in between. This water hyacinth has deep roots from 0.3 m to 0.62 m blocking the free flow. When the water level goes down, the weeds and water hyacinth affects the waterway reducing the discharge drastically and increases siltation.

23. Summary of Problems. In short these problems can be summarized as:

(i) Flooding during storm of low laying/inadequate drain urban pocket.
(ii) Silting and weeding of drain;
(iii) Partial/haphazard construction of laterals and sub drains;
(iv) Flow of sewage & disposal of solid waste into the drains;
(v) Polythene bag disposal and blockage of drains & culverts;
(vi) Lack of adequate maintenance of drain channel and associated structure;
(vii) Incomplete drainage system and non-proper out fall;
(viii) Dumping of construction spoils and other materials into the drain;
(ix) Inadequate cross-sections;
(x) Missing links in various drain cleaning equipment's; and
(xi) Non availability of latest drain cleaning equipment.

24. All the above factors influenced the DTP drain and the drainage problem cropped up making the picturesque town frequented by flood causing environmental adverse impacts and unhygienic conditions besides bringing misery to the residents of Dibrugarh.

25. Salient feature of the original DTP drain is as follows.

Table 1: Salient Feature of original DTP drain

S. No.	Particulars	Features
01	Length	22.4 km
02	Lined portion (brick lining)	3676 meter
03	Side slope	1.1
04	Bed width	Ranging from 5.2 m to 18.25 m
05	Longitudinal gradient	1: 4000
06	Depth of drain originally given	Ranging from 1.83 m to 2.13 m

(Source: DPR for Dibrugarh Drainage system)

26. As per survey, present capacity of drain within package part is as below.

Table 2: Capacity of DTP drain

Chainage (m)	Existing Capacity (cumecs[2])
9515 to 9575 (confluence of Rajabetha Drain)	105.50
9575 (confluence of Rajabetha Drain) to 20224	142.97
20224 to 27855	61.11

[2] Cumecs- Cubic meter per second

27. Details of the secondary and tertiary drains in DMB area is shown in **Table 3A to 3C** below. Drains are divided into 3 working zones.

Table 3A: Detail of Drainage Zone-I

S. No.	Name of Drain	Location of Proposed Drain	Length (m)	Chainage (m)	Proposed Section Size (m)	Type of Drain
1	L-1	AMC Road Drain	900	0 to 107	1.0 x 0.8	Covered Drain
				107 to 398.5	1.3 x 1.2	
				398.5 to 900	1.6 x 1.5	
2	L-2	Paltan Bazar Road Drain	335	0 to 97	1.2 x 0.8	Covered Drain
				97 to 335	1.3 x 1.2	
3	L-3	K.G. Gogoi Path Drain	850	0 to 379	1.6 x 1.5	Covered Drain
				379 to 850	2.1 x 2.0	
4	L-4	Polo Ground to Ch-1080 Drain	549	0 to 238	1.0 x 0.8	Covered Drain
				238 to 549	1.4 x 1.3	
5	L-5	Red Cross Road Drain	357	0 to 115	1.0 x 0.8	Covered Drain
				115 to 357	1.3 x1.3	
6	L-6	Jail Road Drain	478	0 to 229	1.2 x 1.0	Covered Drain
				229 to 478	1.3 x 1.2	
7	L-7	Police Reserve-I Drain	158	0 to158	0.9 x 0.5	Covered Drain
8	L-8	Police Reserve-II Drain	166	0 to 40	0.7 x 0.5	Covered Drain
				0 to 166	0.8 x 0.7	
9	L-9	Police Reserve-III Drain	20	0 to 20	0.4 x 0.3	Covered Drain
10	L-10	K.C. Gogoi Path to Jail Road Drain	500	0 to 338	1.3 x 1.1	Covered Drain
				338 to 500	1.5 x 1.4	
11	L-11	BorPukhuri Road Drain	266	0 to 266	0.9 x 0.6	Covered Drain
12	L-12	BorPukhuri to Police Reserve Road Drain	620	0 to 169	1.0 x 0.6	Covered Drain
				169 to 253	1.5 x 1.4	
				253 to 620	2.1 x1.9	
13	L-13	HoruPukhuri Road Drain	152	0 to 152	2.0 x1.7	Covered Drain
14	L-19	Jalukpara Road Drain	120	0 to 120	1.0 x 0.7	Covered Drain
15	L-20	Kalibari Road Drain	107	0 to 107	0.7 x 0.7	Covered Drain

Table 3B: Detail of Drainage Zone-II

S. No.	Name of Drain	Location of Proposed Drain	Length (m)	Chainage (m)	Proposed Section Size (m)	Type of Drain
1	L-14	Pathan Patti Road Drain	620	0 to 333	1.2 x 1	Covered Drain
				333 to 620	1.5 x 1.3	

S. No.	Name of Drain	Location of Proposed Drain	Length (m)	Chainage (m)	Proposed Section Size (m)	Type of Drain
2	L-15	ChiringChapori Road Drain	2340	0 to 532	1.8 x 1.5	Covered Drain
				532 to 993	2.0 x 1.9	
				993 to 1458	2.2 x 2.1	
				1458 to 1916	2.3 x2.3	
				1916 to 2340	2.4 x 2.4	
3	L-18	Santipara to Bashbari Road Drain	870	0 to 357	1.2 x 1.1	Covered Drain
				357 to 870	1.3 x 1.3	

Table 3C: Drainage Zone-III

S. No.	Name of Drain	Location of Proposed Drain	Length	Chainage (m)	Proposed Section size (m)	Type of Drain
1	L-16	Dr. LeelaGogoi Path Drain	660m	0 to 660	1.7 x 1.6	Covered Drain
2	L-17	Mancotta Road to Rajabheta Drain	1724m	0 to 446	1.6 x 1.5	Covered Drain
				446 to 918	2.4 x2.3	
				918 to 1314	2.5 x 2.4	
				1314 to 1724	2.5 x 2.5	

28. Present status of the drain is shown in **Appendix 2** photo illustration.

B. Description of the Subproject

29. After analysis of all available data and field observation it is noted that, providing requisite section of drain, to have gravity flow throughout the length has specific problem of encroachment of properties in the water way of the drain.

30. For first phase of improvement of DTP drain from change 0.0 to 9.5 km has been taken up under Tranche I funding. Now under Tranche II rest of the part of DTP drain will be considered for re-modelling & channelization.

31. **DTP drain (ch-9515 m to 27882 m):** The section is designed with earthen trapezoidal section beyond the chainage 9515 m and have the velocity above the critical velocity the scour will take place damaging the design slope and scouring the bed. As such the bank and bed are to be protected from scour. It has been planned to protect the bank and bed with geo fabric materials. The bank will be protected with geo mattress and bed will be protected with gabions filled with sand filled geo bags. The design of required thickness of geo mattress and gabions with sand filled geo-bags- to be laid on bank and bed respectively is designed as per Pilarczyk's, 1990 and IS 14262: 1995. The depth of scour is calculated taking six reaches separately and adopting the maximum one.

32. **Provision of Sluice Gate at ch-27882 m of DTP drain**: At chainage 27882 m there is a sluice of inadequate capacity. This sluice is to be reconstructed for required capacity. When the Brahmaputra is flowing full at design flood level of 104.53 m at Spur no. V near Old DC Court, the backwater affect will be at the sluice with a flood level of 97.50 m. With this consideration and

keeping in mind that the beel is full and the drain is also flowing full the sluice is designed. The type of sluice proposed is two numbers of radial automatic sluice.

33. **Construction of Secondary drains. Drains are divided into 3 working zones.** These are shown in Tables 3A to 3C, **Appendix 3** shows design drawing of drain and sluice gate**.**

C. Implementation Schedule

34. Construction work is likely to commence in 2016 and will be completed in approximately within 36 months.

D. Subproject Benefits

35. The subproject significantly improves the environmental and living conditions and public health in Dibrugarh. In addition, the economic benefits considered due to the proposed subproject are: (i) reduction of household healthcare cost due to flooding and water logging problems; (ii) reduction in man days lost due to water logging and flooding; (iii) reduction in temporary resettlement cost due to flooding; (iv) reduction in annual cost of protection measures from flooding; (v) reduction in annual agricultural loss; and (vi) reduction in road maintenance cost. Project location map is shown in **Figure 3.** Secondary drainage network map is shown in **Figure 4.**

Figure 3: Key Plan for DTP and Secondary Drain Dibrugarh

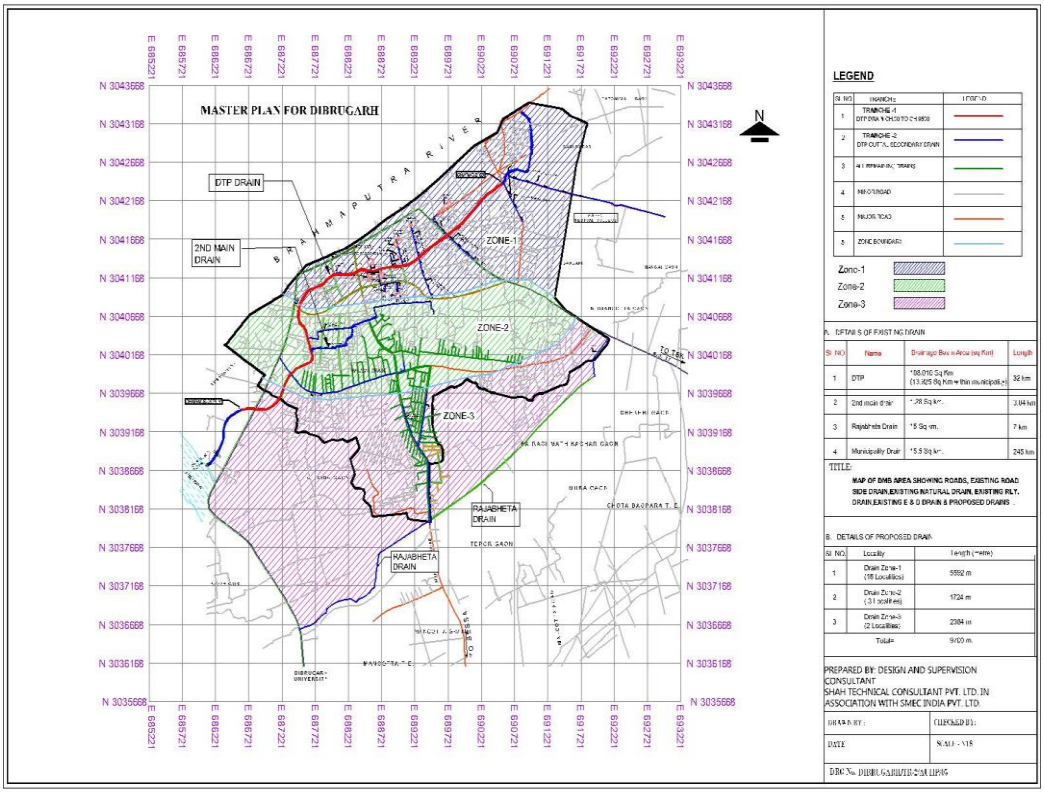


Figure 4: Network Drawing for Secondary Drain

III. DESCRIPTION OF THE ENVIRONMENT

A. Physical Features

1. Location

36. Dibrugarh lies along the southern bank of the Brahmaputra River, falling on 27.26^{0}N latitude and 94.35^{0}E longitude. Dibrugarh is linked with rest of India through the National Highway 37 (NH-37). The town is situated at 104 m above the mean sea level. The physical characteristic of the district is constituted by a variety of elements such as flood plain, *beels* and swamps, occasional highlands and foothills of the Barail Range. The gradient of the district is from south-east to north-west.

37. The area may be divided into three distinct physiographic zones stretching parallel to the Brahmaputra River. These are: (i) the active floodplain and 'charland', (ii) the middle plain; and (iii) the southern foothills. The highly meandered course of the Burhi Dhing here has left cut off as many as 40 wetlands in the form of ox-bow lakes and swamps. The foothill zone on the other hand consists of isolated hillocks interspersed with plain embankment extending into the Naga

Hills. The high grounds of this zone composed mostly lateritic soils are covered by tea gardens or dense forests.

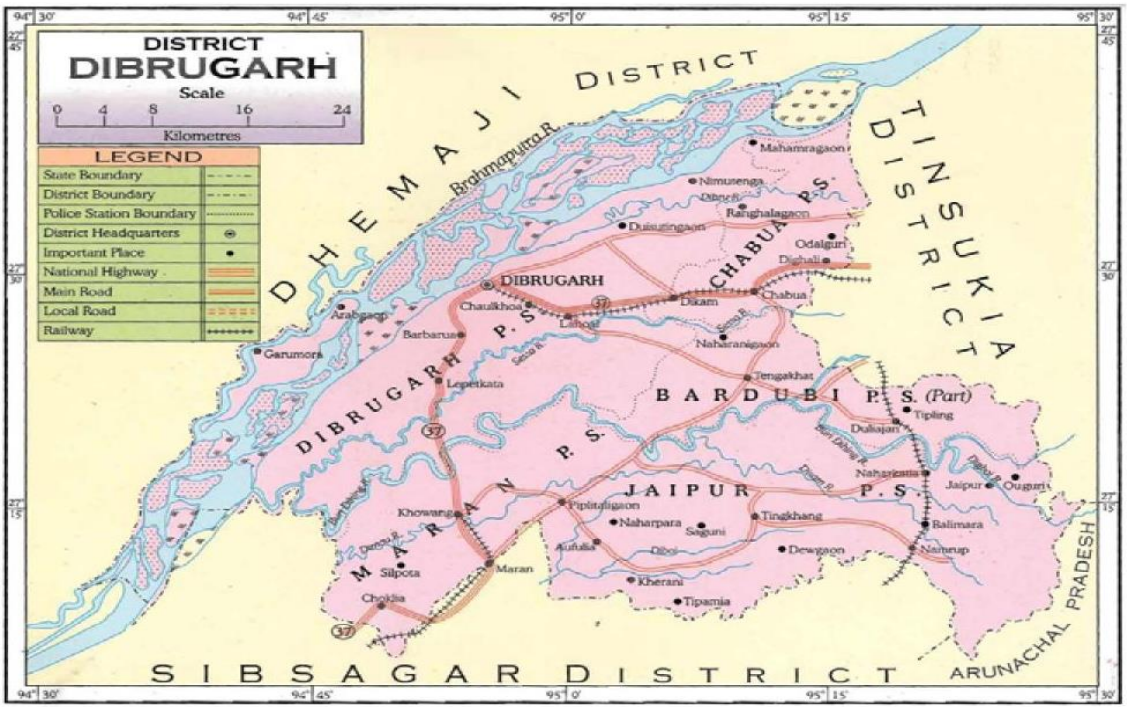


Figure 5: Dibrugarh District map

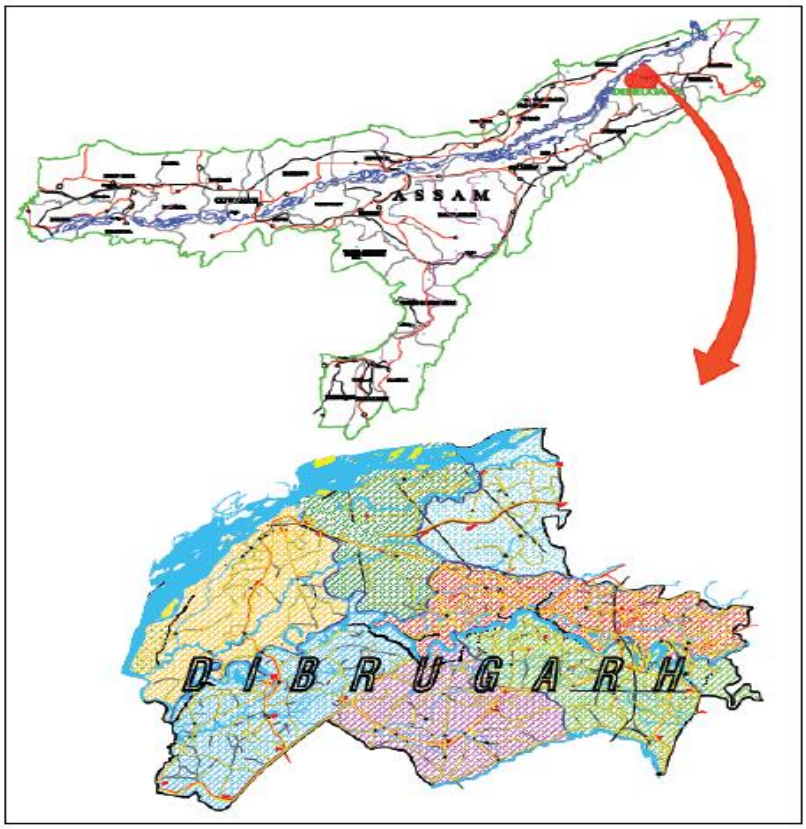


Figure 6: Geographical Location of Dibrugarh

2. Climate

38. Dibrugarh experiences subtropical monsoon climate with mild winter, warm and humid summer. The winter is from November to February, summer is from March to May and monsoon is from June to October. Rainfall in the town is frequent but for short span. The average annual rainfall is around 2400 mm over 172 rainy days in a year. The average annual temperature in Dibrugarh is 23.9^{0}C while the temperature varies between 7° to 35°C. The average humidity of the region is 74%. Winds are of moderate velocity, from the south-to-south–east direction for most of the time. Month wise average climatic condition of Dibrugarh town in shown in **Table 4.**

Table 4: Month Wise Average Climate Data of Dibrugarh

Climate Data for Dibrugarh													
Month	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**
Record high °C (°F)	28.4 (83.1)	30.6 (87.1)	34.3 (93.7)	35.7 (96.3)	36.4 (97.5)	37.6 (99.7)	36.5 (97.7)	36.6 (97.9)	38.0 (100.4)	35.4 (95.7)	32.3 (90.1)	29.5 (85.1)	38 (100.4)
Average high °C (°F)	22.7 (72.9)	23.9 (75)	26.6 (79.9)	27.9 (82.2)	29.5 (85.1)	30.9 (87.6)	31.0 (87.8)	31.6 (88.9)	30.7 (87.3)	29.6 (85.3)	27.1 (80.8)	24.1 (75.4)	27.97 (82.35)
Average low °C (°F)	9.2 (48.6)	12.3 (54.1)	15.7 (60.3)	18.7 (65.7)	21.8 (71.2)	24.0 (75.2)	24.6 (76.3)	24.8 (76.6)	23.8 (74.8)	20.6 (69.1)	14.7 (58.5)	9.9 (49.8)	18.34 (65.02)
Record low °C (°F)	0.8 (33.4)	5.2 (41.4)	7.9 (46.2)	12.6 (54.7)	14.2 (57.6)	19.5(67.1)	20.4 (68.7)	20.9 (69.6)	19.7 (67.5)	13.1 (55.6)	6.3 (43.3)	4.0 (39.2)	0.8 (33.4)
Rainfall mm (inches)	31.4 (1.236)	79.6 (3.134)	108.5 (4.272)	217.9 (8.579)	315.4 (12.417)	421.7 (16.602)	521.6 (20.535)	437.4 (17.22)	331.9 (13.067)	140.3 (5.524)	24.8 (0.976)	17.7 (0.697)	2,648.2 (104.259)
Avg. rainy days	5.4	9.2	11.9	16.8	17.4	21.3	25.4	20.7	18.5	10.3	3.9	3.4	164.2
% humidity	80	74	68	75	76	81	85	82	85	83	81	82	79.3

Source: Dibrugarh, From Wikipedia, the free encyclopedia

3. Flood status

39. The rainfall pattern of the town is of variable nature. Sometimes the maximum rainfall occurs within the monsoon. It may also occur as isolated or after a continuous lesser intensity of rainfall. Heavy rainfall lashes the town in every monsoon. At present the drainage system is not working efficiently, the town is frequently flooded with the overland runoff produce by such rainfall. A critical situation occurred in 1998 in which whole town was flooded. **Table 5** shows the status in 1998 and days of flooding of the town. **Figure 7** shows flood prone area of Dibrugarh.

Table 5: Flooding Data

Aspect	Data	Remarks
Days of Flooding	10 days	August 1998 where the entire city was under knee deep or waist deep water
Days of Flooding	8 days	July,2001
Days of Flooding	12 days	August and September 2002
Days of Flooding	9 days	August,2004

Days of Flooding	12 days	July, 2007
Days of Flooding	15 days	August and September 2002
Days of Flooding	14 days	July,2012

Source: DMB

Figure 7: Flood Prone Areas of Dibrugarh Municipal Board

4. Geology

40. The Brahmaputra Valley in this district is of a nature of a “ramp valley” developed during the simultaneous upheavals of the Himalayas on the north and northeast and the Patkai ranges on the south and southeast. Thick group of sedimentary rocks between Eocene and Pleistocene are exposed mainly along the foot hills bordering the southern boundary of this district. Thick alluvial deposits belonging to sub-recent and recent periods covered the eastern part of the district and the valley of the Brahmaputra River.

5. Seismicity

41. The entire North Eastern Region has been placed in the severe-most zone (Zone V) of the seismic hazard map of India published by Bureau of Indian Standard (BIS). Earthquakes are generally shallow but some intermediate focus events have also occurred. The earthquake in 1950 led to major alteration of the course of Brahmaputra River and resulting in the erosion of a large chunk Dibrugarh.

6. Soils

42. The soils of Dibrugarh are the products of the fluvial processes of the Brahmaputra River and its tributaries. The plains are composed of new and old alluvium. The new alluvium varying mostly from clayey to sandy loam in texture and is slightly acidic in reaction with its pH value varies from 5.5 to 9.0. The old alluvium on the other hand occurs in the upper and middle parts of the valleys and is more acidic in nature. It occurs in Joypur, Tipling, Kheremia and Tengakhat mouzas in the form of terrace deposits. These deposits contain alternating beds of pebbles, gravel or boulder with loose sand and clays. The soil is mainly of alluvial origin consisting of sand and

clay in varying proportions. The soil supports extensively the growth of tea and rice.

7. Surface waters

43. The Brahmaputra River within Assam is almost 700 km. long with more than 100 tributaries. Brahmaputra, the major natural feature in Dibrugarh, has a total length of 95 km and average width of around 10 km in Dibrugarh. After the 1950 great earthquake, Dibru River which was the main tributary to Brahmaputra was merged with its master stream. Now, Maijan stream, a tributary of the former Dibru has also become a tributary to Brahmaputra. Other tributaries include (i) Buri Dihing River flowing from almost east to west through Dibrugarh; (ii) Digboi, Tingrai, Tipling, Telpani, Deherang and Sessa in the north bank; and (iii) Tipam and Disam in the south bank.

44. The Assam Pollution Control Board (APCB), under the National Water Quality Monitoring Program and Monitoring of Indian National Aquatic Resources, carries out continuous water quality monitoring. For this purpose the APCB has identified ten monitoring points along Brahmaputra River. Currently data is available from the chemical analysis done by the Central Pollution Control Board (CPCB). Chemical analysis of the surface water of the river Brahmaputra shows that the surface water quality of the river is fairly good in Dibrugarh. All the parameters are within permissible limit. The River water sample analyses report is shown in **Table 6.**

Table 6: Brahmaputra River Water Quality at Dibrugarh (Location Brahmaputra River Maijan, Dibrugarh)

Parameters	Value	Tolerance Limits for Inland Surface Water
pH	7.2	8.0
Temperature (Degree cent)	19	-
Conductivity (µmho/cm)	146	-
Turbidity (NTU)	8.2	-
DO	8.00	Min 4.00
T-Hardness as $CaCO_3$	64.00	-
Calcium as Ca	46.00	-
Magnesium as Mg	18.00	-
Chloride as Cl	8.00	600.0
Sulphate as SO_4	14.6	400.0
Nitrate as NO_3	0.5	50.0
Fluoride As F	0.1	1.5
Total Dissolved Solids	98.0	1500.0
BOD	1.2	3.0
COD	4.4	-
TOTAL Kjeldal Nitrogen	1.7	-
Ammonia Nitrogen	0.2	-
Sodium	4.5	-
Total fixed Solid	28.0	-
Total suspended solid	14.0	-
Phosphorus	5.0	-
Boron	0.0	-
Potassium	0.8	-
Percent Sodium	0.0	-
SAR	0.1	-
P-Alkalinity	0.0	-
Total Alkalinity	82.0	-
Total Coliform (MPN/100 ml)	2700	5000

Parameters	Value	Tolerance Limits for Inland Surface Water
Fecal Coliform (MPN/100 ml)	Nil	-

All values in mg/l unless stated otherwise
Date of sample collection: 04.04.2013
Source: Assam Pollution Control Board

8. Groundwater quality

45. The depth of the groundwater table in Dibrugarh in both pre-monsoon and post-monsoon seasons range between 2 to 6 m with net seasonal fluctuations ranging between 1 to m. Groundwater monitoring in Dibrugarh is carried out by the APCB. The analysis of ground water quality (in terms of physical characteristics, mineral constituents, toxic metals and organic load) at various stations in and around the Dibrugarh Master Plan Area (DMPA) indicates that parameters being monitored are within the prescribed limits. The groundwater quality indicates that it is suitable both for drinking and irrigation purposes.

9. Ambient air quality

46. The ambient air quality has been monitored by Assam Pollution Control Board within Dibrugarh for particulate matter less than 10 micron (PM_{10}) suspended particulate matters (SPM), sulfur dioxide (SO_2) and nitrogen oxides (NOx) levels. Ambient air quality at all the monitoring stations is within the permissible limits. The analysis report of ambient air quality is given below.

Table 7: Ambient Air Quality of Dibrugarh

Date of Monitoring	SO_2 µgm/m^3	NOx µgm/m^3	PM_{10} µgm/m^3	SPM µgm/m^3
04.01.13	6.50	13.75	95.50	161
08.01.13	5.50	13.00	41.00	134
11.01.13	6.00	14.00	51.50	133
16.01.13	6.00	13.25	80.00	210
19.01.13	7.25	14.30	39.50	166
29.01.13	6.75	15.50	12.20	188
14.02.13	6.00	16.50	82.00	143.5
16.02.13	6.25	18.00	118.50	190
22.0.13	7.25	16.50	76.00	126
05.03.13	8.00	14.50	171.00	295
08.03.13	6.50	17.00	196.00	297
12.03.13	9.00	17.25	206.00	377
25.04.13	5.00	14.25	50.00	116
27.04.13	5.75	13.25	37.00	109
30.04.13	6.50	17.00	59.00	133
Limit as per CPCB Norm	**80.00**	**80.00**	**100.00**	

Source: Assam Pollution Control Board, 2014

10. Ambient noise levels

47. The day and nighttime noise level measurement was carried out by APCB. Result shows

that in residential zone the level is slightly higher side (particularly during night). However in commercial and silence zone the noise level is comparatively high. The noise level analysis report is given below.

Table 8: Ambient Noise Level at Dibrugarh

Date of Monitoring	Location	Noise Level in Leq dBA		Limit as per Noise Pollution(Regulation and Control)Rules 2000 Leq dBA	
		Day	Night	Day	Night
29.10.13	C-Goli (Residential)	50	46	55	45
29.10.13	H.S.Road Commercial	68	67	65	55
29.10.13	College, Hospital	54	47	50	40

Source: Assam Pollution Control Board, 2014

B. Ecological Features

1. Protected Areas and Reserve Forests

48. The Dibru-Saikhowa National Park in Dibrugarh (located about 50 km from the subproject site) is a priority protected area also considered under the Biodiversity Conservation Priority Project (BCPP) and has an area of 340 square kilometers (sq km). Dihing Patkai Wildlife Sanctuary which has an area of around 111 sq km is also present but both the national park and the sanctuary are a far distance from the subproject site, and do not trigger the any specific government environmental rules. No impacts to these protected areas will occur.

49. There are five reserved forests existing in Dibrugarh district and all of them are more than 10 km away from the site. Details on name and extent of the each reserved forest are given in **Table 9**. No impacts to these areas will occur due to project activity.

Table 9: Reserved Forests in Dibrugarh

S. No.	Name of Reserved Forest	Area (sq km)
1.	Dihingmukh	47.27
2.	Jakai	18.47
3.	Jaypur	84.61
4.	Namdang	18.57
5.	Telpani	13.31

Source: District Forest Office

2. Wetlands

50. There are no Ramsar wetlands or notified wetlands in the Dibrugarh district. However, Dibrugarh district has a large number of low-lying areas and some of them have developed into lakes and water bodies. Larger water bodies are popularly known as *beels*. None of these water bodies is ecologically sensitive and mostly serve as backyard fishing ponds to the residents in rural areas. There are around 40 large water bodies (*beels*) existing within the district. **Table 10** gives description of the *beels*. No wetlands are located within project influence area.

Table 10: Wetlands in Dibrugarh

S. No.	Location	Wetland	Name
1.	Larua	12	Bhangamukh, Morisuti, Rongabeel I, Kutuha Bor beel, Kawaimari beel, Garudhoria,
			Alichiga, Chahjan, Larua, Ronga beel II, Chapara beel, Nowjan
2.	Lengri	6	Mer beel, Chenimari, Hakoi beel, Desang beel, Garuhara, Choichiga beel
3.	Tengakhat	5	Bhereki beel, Ghulong, Nalani beel, Bali beel, Dhoni beel
4.	Kheremia	5	Bhereki beel, Ghulong, Nalani beel, Bali beel, Dhoni beel
5.	Sassani	5	Mer beel, Godha beel, Singi beel, Disam, Gola Disang
6.	Joypur	3	Lakhutipota beel, Longhari beel, Kaliapain beel
7.	Mancotta	2	Bor beel, Bahuguwa
8.	Moran	1	Jaliyani beel
9.	Bogdung	1	Sarujan

3. Flora and Fauna

51. Flora and fauna in the subproject alignment are those commonly found in urban and built-up areas. There are no recorded endangered or critical species in the area. **Table 11** shows the number and type of trees need to be fell for construction of drains.

Table 11: Number and Type of Trees within Drain Alignment to be Felled

S. No.	Local Name of the Tree	Nos. of Trees
DTP Drain		
1	Borgosh	6
2	Bhatgila	20
3	Shisa Tree	9
4	Peepal Tree	3
5	Mango	7
6	Bogori	6
TOTAL		**51**
Secondary Drain		
1	Borgosh	2
2	Bhatgila	11
3	Mango	3
4	Peepal Tree	2
5	Bogori	2
6	Shisa Tree	4
TOTAL		24

52. Process initiated for getting tree felling permission. Identification and detail information of tree has been provided by Forest Department after joint verification with Dibrugarh Municipal Board (DMB). Now money will be transferred to forest dept. for felling of the tree. Until date permit is not received.

C. Economic Development

1. Existing land use

53. Residential land use accounts for nearly two-thirds of the presently developed area. The public and semi-public functions including the institutional uses, account for another 15% highlighting the significance of Dibrugarh as an administrative, health care and educational destination in Assam. The land use pattern reflects the relative inadequacy of land for various uses. Land under commercial and industrial use is relatively low, industrial activities are almost

non-existent. The city also suffers from lack of recreational area, although landform of the city and its suitability as a place of tourist attraction will justify a claim for higher proportion of land under recreation. A key consideration that would guide future development within the DMPA is the fact that about 20% of this area is under tea estates.

54. Land use pattern within Dibrugarh Municipal Planning Area beyond the master plan are as per the **Table 12** below.

Table 12: Area as per Land Use Pattern

Zone No.	Pattern	Area (ha)	Total area (ha)
I	Residential	127.83	796.11
	Commercial / Public & semi public	102.31	
	Industrial	0.00	
	Paddy field	101.37	
	Tea estate	464.58	
II	Residential	90.81	158.15
	Commercial /public & semi public	60.93	
	Industrial	4.04	
	Paddy field	2.36	
III	Residential	61.15	85.46
	Commercial	24.30	
IV	Residential	29.13	61.51
	Commercial /public & semi public	13.88	
	Paddy field	18.49	
V	Residential	32.77	74.99
	Commercial /public & semi public	42.22	
VI	Residential	199.73	215.80
	Commercial /public & semi public	16.07	
VII	Residential	1085.41	1858.19
	Commercial / Public & semi public	162.09	
	Tea estate	229.38	
	Paddy field	303.11	
	Industrial	48.03	
	Govt. Land	7.41	
	Extra	20.59	
VIII	Commercial / Public & semi public	232.99	638.36
	Government land	9.39	
	Paddy field	395.97	
IX	Tea estate	1774.01	6912.44
	Village	1070.03	
	Paddy field	2997.05	
	Low lying	1071.34	
	Total Area		**10801.04**

55. Outfall part of the DTP drain is located mostly outside the city and passing through vacant, scrubland.

2. Industry

56. Dibrugarh has the world's largest area covered by tea gardens. Tea processing industries are significant in the district. Within the planning area, there are around five tea factories. Among the other industries, there are some rice, sawmills and other light manufacturing industries.

57. The region is also rich in natural oil. The oldest running oil refinery in the world is situated in Digboi. The entire district has many oil and natural gas rigs owned by the Oil India Limited and Oil and Natural Gas Commission.

3. Trade and Commerce

58. Dibrugarh is the second most important commercial town in upper Assam after Tinsukia. Most of the trading activities related to packaging and distribution of tea within the country and abroad. Although there are a number of commercial establishment existing in the heart of the town but there is no organized market within the planning area. As per the draft master plan, there are around 9,000 commercial establishments in and around Dibrugarh town. Socio-economic surveys conducted in the town show a major chunk of the population engaged in trade, commerce, and office work.

4. Physical infrastructure

59. **Water Supply.** Dibrugarh town, until date, does not have a potable water supply system. Ring wells and tube wells are the only sources of water supply. Since the water table is very high throughout the year, the residents receive water from shallow depths (less than 3 m). Consultations with the communities and discussions indicate that boiling of water prior to consumption is a common and prevalent practice. The level of awareness, as observed during the consultations and site visits, on the need for a potable water supply was negligible.

60. **Sewerage and Sanitation.** There is no sewerage system at Dibrugarh town and a major portion of the town does not have an access to proper sanitation facilities. The wastes are discharged either by individual septic tanks or directly into drains and water bodies, thereby polluting the water sources to the city. Groundwater quality surveyed within the densely populated areas of the DMB, indicate contamination especially in Naharkhatia. Copper is evident at Chopori, HS Road and Lahol, while zinc is also higher than the BIS drinking water standards: 10500 at Lahol. Further, pollution of these sources, largely due to lack of organized sanitation facilities is evident from the high nitrate levels in the water samples tested in the inhabited areas, especially the slums.

61. **Solid Waste Management.** The daily waste generated in Dibrugarh is about 50 Metric Ton. The main waste generating sources are household, institutional, hospitals, marketplace and industries. As on date, only 40-50% of the total waste is collected. The main generators of the solid waste are the five markets in the city. It accounts for almost 50% of the total solid waste generated. There is one slaughterhouse at Kalibari, which also generates biodegradable waste. These wastes are dumped along with solid waste on the streets. Dibrugarh Municipality has six tractors tailors, one tripper truck for collection of waste. The wastes collected are dumped on the riverbank at Maijan area. The Dibrugarh Municipality also has one cesspool cleaner of 3000 Lt.

62. **Drainage.** Dibrugarh, located on the south bank of river Dibru, a tributary of the river Brahmaputra, is vulnerable to recurrent flooding. Huge sediment load of Brahmaputra has resulted in continuous deposition of silt in the bed, which has raised its level significantly. This has worsened the drainage system as water level of Brahmaputra has risen considerably. At present, the level of Dibrugarh town is 1.5m below the bed level of Brahmaputra.

63. **Transportation System**. Dibrugarh is located on the major corridors of movement in Assam. Being a second largest town in Assam after Guwahati it is a center of major political,

administrative, cultural and commercial activities. Dibrugarh is situated on the Assam-Dibrugarh-Tinsukhia (NH-37). The surface communication with the rest of the country is only by NH-37, which connects Dibrugarh with Sibsagar, Guwahati and other towns of Assam. Some major district roads also connect Dibrugarh with other parts of the State.

64. The primary road network of Dibrugarh town comprises of regional links such as Tarun Ram Phukar Road, Mancotta Road, Navin Ch. Bordoloi Road, AT road as well as other roads like Circuit House Road, Boroloi road, Cantonment Road. The total length of road network is about 82 km long in the town. NH-37 passes through the town and is the lifeline for traffic movement. There is no distinct hierarchy of roads. About 50% of the road length is revealed to have RoW of 5m and 30% of the road length has more than or equal to 7 m RoW. High congestion is seen in some of the traffic nodes due to improper road geometry.

D. Social and Cultural Resources

1. Population

65. The DMB area (town core of the DMPA) has seen rapid increase in the population since its inception. During the time of the setting up of the town by the British in 1873, Dibrugarh had a population of about 3,870 persons. **Table 13** shows the population projection until 2041 for DMB and DMPA respectively.

Table 13: Population Projection for DMB and DMPA

		2001	2011	2021	2031	2041
Entity	**Area sq.km**	**Population**				
DMB	15.5	137,879	166,258	199,578	234,550	269,870
Outside DMB		52,542	60,529	82,963	99,965	117,503
Total DMPA	66.1	190,421	226,787	282,541	334,515	387,373

66. According to the 2011 census Dibrugarh district has a population of 1,327,748. The district has a population density of 393 inhabitants per square kilometer (1,020 /sq mi). Its population growth rate over the decade 2001-2011 was 12.04%. Dibrugarh has a sex ratio of 952 females for every 1000 males, and a literacy rate of 76.22%.

67. As of the 2011 India census, Dibrugarh city had a population of 154,019. Males constituted 54% of the population and females 46%. The sex ratio of Dibrugarh city was 925 per 1000 males. Total literates in Dibrugarh city are 113,822, of which 60,782 are males and 53,040 are females. Therefore, the average literacy rate of Dibrugarh is 89.5%, which is higher than the national average literacy rate.

2. Social Characteristics

68. The town social characteristics have been studied with respect to place of birth, age structure, caste religion and social groups. The Socio Economic Survey (SES) results show that more than 95% of the persons are from Dibrugarh and 3.73% from other parts of Assam.

69. The people residing in Dibrugarh town are predominantly Hindus (86.39 %), followed by Muslims (10%). In terms of caste and tribes, 50 % of the population belongs to general category followed by 31.81 % in the scheduled caste and 3.61 % in scheduled tribe and other backward classes forming 14.46% of the population.

70. Social characteristics of population in the planning area are observed to be homogenous between those within municipal limits and outside municipal limits. The overall literacy rate in Dibrugarh town is 89.22 percent. As per the 2001 census about 123,016 persons are literate in Dibrugarh Urban area. The female literacy in the urban area is 87.6 percent and the male literacy stands at 90.6 percent.

3. Poverty Levels

71. The percent of households below poverty level is observed to be 3.3% in Dibrugarh town. Social conditions of this population is further analyzed and found that: (i) only 14% of population below poverty line has access to drinking water supply; and (ii) only 22% of those below poverty line have the facility for sewage disposal.

72. There are 19 slums existing in Dibrugarh with a population of around 27% of the population of Dibrugarh municipal area lives in slum according to 2011 census.

IV. ANTICIPATED IMPACTS AND MITIGATION MEASURES

73. This section of the IEE reviews possible subproject-related impacts, in order to identify issues requiring further attention and screen out issues of no relevance. The ADB SPS (2009) requires that impacts and risks will be analyzed during pre-construction, construction, and operational stages in the context of the subproject's area of influence. As defined previously, the primary impacts from this subproject will result from (i) drainage network; (ii) main routes/intersections, which will be traversed by construction vehicles; and (iii) quarries and borrow pits as sources of construction materials. The secondary impact areas are: (i) entire Dibrugarh area outside of the delineated primary impact area; and (ii) entire Dibrugarh district in terms of over-all environmental improvement.

74. The ADB Rapid Environmental Assessment Checklist for Urban Development was used to screen the drainage subproject for environmental impacts and to determine the scope of the IEE investigation. The completed Checklist is found in **Appendix 4.** All the proposed subproject components will interact physically with the environment.

75. In the case of this subproject the following are observed: (i) most of the individual elements are relatively small and involve straightforward construction and operation, so impacts will be mainly localized and not greatly significant; (ii) most of the predicted impacts are associated with the construction process, and are produced because that process is invasive, involving excavation and earth movements; and (iii) partly being located in the built -up area of Dibrugarh town, will not cause direct impact on biodiversity values except felling of 75 trees. The subproject will require limited private land acquisition, for which a separate Resettlement Plan was prepared.

A. Pre -construction – Location and Design

76. **Location.** Location impacts include on-site biophysical array and encroachment/impact either directly or indirectly on adjacent environments. It also includes the impacts on the people who might lose their homes or livelihoods due to the subproject activities. The subproject components are proposed primarily within the ROW of the existing drainage. However, limited private land acquisition is required. The subproject will require limited private land acquisition, for which a separate Resettlement Plan was prepared.

77. **Design of the Proposed Components.** The urban area of Dibrugarh town is very flat, the general slope being provided in the DTP drain is 1:4000. Therefore, for an efficient flow, lined drain is a must with the concept of maximum conveyance, which will lead to a wider channel. For the design of natural drains, the most important parameter is the peak discharge, which is dependent on intensity duration relationship. As information on discharge is not available for Dibrugarh, rainfall based approach has been adopted. The peak discharge computed by rational method has been used for design purpose. Due consideration has been given to the issue of future expansion of the town in selecting the value of relevant model parameters. Environmental considerations were discussed with specialists responsible for the engineering aspects, and as a result some measures such as covering of drain to prevent disposal of solid waste into the drains have already been included in the designs of the infrastructure.

B. Construction Impacts

78. Construction and operation are the two activities in which the subproject interacts physically with the environment. Construction impacts are associated with site cleaning, disposal of dredged sludge, earth works, physical construction related materials movements and works, machinery, vehicles, and workers health and safety. It also includes the erosion, dust, noise, traffic congestion and waste production associated with the construction activities.

79. Although construction of the subproject components involves quite simple techniques of civil work, the invasive nature of excavation and the subproject sites in the built-up areas of Dibrugarh may result in temporary, short-term impacts to the environment and sensitive receptors such as residents, businesses, and the community in general. Physical impacts will be reduced by the method of working and scheduling of work, whereby the subproject components will be (i) constructed by small teams working at a time; and (iii) any excavation done near sensitive area like school, religious places and house will be protected as per standard norms[3].

80. **Sources of Materials.** Significant amount of gravel, sand, and cement will be required for this subproject. The construction contractor will be required to:

(i) Use material sources permitted by government;
(ii) Verify suitability of all material sources and obtain approval of DMSC; and
(iii) Submit to DMSC on a monthly basis documentation of sources of materials.

81. **Air Quality.** It is most certain that work will be conducted during dry season, so there is potential for generation of dust from the excavation of dry soil, backfilling, and transportation to disposal, and from the import and storage of large quantities of aggregates and other construction material. Therefore, it is important that this large quantity of soil/sludge will be handled and disposed of without causing further impacts on air quality, which already shows presence of high levels of particulate matter in the town. Emissions from construction vehicles, equipment, and machinery used for excavation and construction will induce impacts on the air quality in the construction sites. Anticipated impacts include dusts and increase in concentration of vehicle-related pollutants such as carbon monoxide, sulfur oxides, particulate matter, nitrous oxides, and hydrocarbons) but temporary and during construction activities only. To mitigate the impacts, construction contractors will be required to:

[3] Occupational Health and Safety of employees working only in factories and mines have been specifically covered in Government of India laws. However, the Constitution of India has provisions to ensure that the health and well-being of all employees are protected and the State has the duty to ensure protection. For this subproject, the mitigation measures were based on the World Bank Environmental, Health, and Safety (EHS) Guidelines.

(i) Prevent/minimize dust generation by removing the waste soil immediately from the site;
(ii) Construction material, particularly sand/gravel for trench bedding, shall be brought as and when required; minimize on-site storage;
(iii) Consult with DMSC on the designated areas for stockpiling of clay, soils, gravel, and other construction materials;
(iv) Damp down exposed dry sludge and any stockpiled on site by spraying with water when necessary during dry weather;
(v) Use tarpaulins to cover sand and other loose material when transported by trucks; and
(vi) Fit all heavy equipment and machinery with air pollution control devices, which are operating correctly.

82. **Surface Water Quality**. Dibrugarh receives high intensity rains during monsoons and there are a number of natural and man-made drainage channels criss-crossing the town. Runoff from the excavated areas and material and waste soil stocks likely to contain silt, and this silt runoff will deteriorate the water bodies. This impact will however be considered only during rainy season. Cleaning/desilting of the drains will produce sludge which needs to be disposed of properly. These potential impacts are temporary and short-term duration only and to ensure these are mitigated, construction contractor will be required to:

(i) Avoid excavation activities during monsoon. Ensure that works complete before onset of monsoon;
(ii) Minimize on-site storage of waste soil/desilted sludge/other materials;
(iii) Use of Desilted sludge (after chemical testing) in construction of landfill site;
(iv) Avoid stockpiling of earth/dry sludge fill especially during the monsoon season unless covered by tarpaulins or plastic sheets;
(v) Prioritize re-use of excess spoils and materials in the construction works. If spoils will be disposed, consult with DMSC on designated disposal areas;
(vi) Place storage areas for fuels and lubricants away from any drainage leading to water bodies;
(vii) Dispose any wastes generated by construction activities in designated sites; and
(viii) Conduct surface water quality inspection according to the Environmental Management Plan (EMP).

83. **Noise Levels.** Construction works will be on settlements/residences, along and near schools, and areas with small-scale businesses. The sensitive receptors are the general population in these areas. Increase in noise level may be caused by excavation equipment, and the transportation of equipment, materials, and people. Impact is negative, short-term, and reversible by mitigation measures. The construction contractor will be required to:

(i) Plan activities in consultation with DMSC so that activities with the greatest potential to generate noise are conducted during periods of the day which will result in least disturbance;
(ii) Require horns not be used unless it is necessary to warn other road users or animals of the vehicle's approach;
(iii) Minimize noise from construction equipment by using vehicle silencers, fitting jackhammers with noise-reducing mufflers, and portable street barriers the sound impact to surrounding sensitive receptor; and
(iv) Maintain maximum sound levels not exceeding 80 decibels (dbA) when measured

at a distance of 10 m or more from the vehicle/s.

84. **Existing Infrastructure and Facilities.** Desilting works can damage existing infrastructure located if any near the drain. It is therefore important that construction contractors will be required to:

(i) Obtain from DMSC the list of affected utilities and operators; and
(ii) Prepare a contingency plan to include actions to be done in case of unintentional interruption of services.

85. **Landscape and Aesthetics.** The construction works will produce excavated sludge, excess construction materials, and solid waste such as removed concrete, wood, trees and plants, packaging materials, empty containers, spoils, oils, lubricants, and other similar items. Improper disposal may further affect topography, water quality, soil quality and sensitive areas. These impacts are negative but short-term and reversible by mitigation measures. The construction contractor will be required to:

(i) Prepare and implement Waste Management List;
(ii) Avoid stockpiling of excavated drain sludge;
(iii) Coordinate with DMB for beneficial uses of drain sludge or immediately dispose to designated areas;
(iv) Plan to use drain sludge after desilting, testing of quality and use for development of landfill site;
(v) Testing of sludge is required in case of any disposal or utilization;
(vi) Recover used oil and lubricants and reuse or remove from the sites;
(vii) Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas;
(viii) Remove all wreckage, rubbish, or temporary structures which are no longer required; and
(ix) Request DMSC to report in writing that the necessary environmental restoration work has been adequately performed before acceptance of work.

86. As per design it is estimated that about 1172 cum of drainage sludge needs to be dispose. Detail of the sludge/ silt generation from work is given in **Appendix 5.**

87. **Accessibility.** All activities are located in the urban settlement areas. Hauling of construction materials and operation of equipment on-site can cause traffic problems. Potential impact is negative but short term and reversible by mitigation measures. The construction contractor will be required to:

(i) Plan transportation routes so that heavy vehicles do not use narrow local roads, except in the immediate vicinity of delivery sites;
(ii) Schedule transport and hauling activities during non-peak hours;
(iii) Locate entry and exit points in areas where there is low potential for traffic congestion;
(iv) Keep the site free from all unnecessary obstructions;
(v) Drive vehicles in a considerate manner;
(vi) Coordinate with Dibrugarh Traffic Department for temporary road diversions and with for provision of traffic aids if transportation activities cannot be avoided during peak hours;
(vii) Notify affected sensitive receptors by providing sign boards informing nature and

duration of construction works and contact numbers for concerns/complaints;
(viii) Provide planks in cases where access to shops and businesses is disrupted by desilting activities; and
(ix) Expedite construction works in front of shops and businesses to minimize any access disturbances.

88. **Terrestrial flora and fauna**. Preliminary survey shows that there will be requirement of felling of about 75 numbers of trees. Detail of tree felling is shown in **Table 11.**

89. Compensatory afforestation by plantation of about 225 trees (at the ratio of 1:3) again tree felling will be considered as mitigation measures.

90. **Social and Cultural Resources.** There is no risk of construction work/ desilting in the town discovering material of historical or archaeological importance. The construction contractor will be required to:

(i) Plan activities in consultation with DMSC so that construction and desilting works are conducted during periods of the day which will result in least disturbance;
(ii) Expedite construction works in temple areas to minimize any access disturbances;
(iii) Keep the temple areas free from all unnecessary obstructions; and
(iv) Notify affected sensitive receptors by providing sign boards informing nature and duration of construction works and contact numbers for concerns/complaints.

91. **Socio-Economic – Income.** The subproject components will be located more or less in government-owned land with minimum private land acquisition. Construction works will impede the access of residents to specific site in limited cases. The potential impacts are negative and moderate but short-term and temporary. The construction contractor will be required to:

(i) Leave spaces for access between mounds of silt;
(ii) Provide walkways and metal sheets where required to maintain access across for people and vehicles;
(iii) Increase workforce in front of critical areas such as institutions, place of worship, business establishment, hospitals, and schools;
(iv) Consult businesses and institutions regarding operating hours and factoring this in work schedules; and
(v) Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints.

92. **Socio-Economic – Employment.** Manpower will be required during the construction stage. This can result to generation of contractual employment and increase in local revenue. Thus potential impact is positive and long-term. The construction contractor will be required to:

(i) Employ majority of the labor force, or to the maximum extent, local persons within the 2-km immediate area if manpower is available; and
(ii) If available, secure construction materials from local market.

93. **Occupational Health and Safety.** Workers need to be mindful of the occupational hazards which can arise from excavation works particularly desilting operation. Potential impacts are negative and long-term but reversible by mitigation measures. World Bank Environmental, Health, and Safety (EHS) Guidelines - EHS Guidelines for water & sanitation will be followed (http://www.ifc.org/wps/wcm/connect/e22c050048855ae0875cd76a6515bb18/Final%2B-

%2BWater%2Band%2BSanitation.pdf?MOD=AJPERE). The construction contractor will be required to:

(i) Develop and implement site-specific Health and Safety (H&S) Plan[4] which will include measures such as: (a) excluding public from the site; (b) ensuring all workers are provided with and use Personal Protective Equipment particularly helmet, gumboot, hand gloves and nose mask; (c) H&S Training for all site personnel; (d) documented procedures to be followed for all site activities; and (e) documentation of work-related accidents;
(ii) Ensure that qualified first aid can be provided at all times. Equipped first-aid stations shall be easily accessible throughout the site;
(iii) Provide medical insurance coverage for workers;
(iv) Secure all installations from unauthorized intrusion and accident risks;
(v) Provide supplies of potable drinking water;
(vi) Provide clean eating areas where workers are not exposed to hazardous or noxious substances;
(vii) Provide H&S orientation training to all new workers to ensure that they are apprised of the basic site rules of work at the site, personal protective protection, and preventing injuring to fellow workers;
(viii) Provide visitor orientation if visitors to the site can gain access to areas where hazardous conditions or substances may be present. Ensure also that visitor/s do not enter hazard areas unescorted;
(ix) Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas;
(x) Ensure moving equipment is outfitted with audible back-up alarms;
(xi) Mark and provide sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal. Signage shall be in accordance with international standards and be well known to, and easily understood by workers, visitors, and the general public as appropriate; and
(xii) Disallow worker exposure to noise level greater than 85 dBA for duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively.

94. **Work Camps.** Operation of work camps can cause temporary air and noise pollution from machine operation, water pollution from storage and use of fuels, oils, solvents, and lubricants. Potential impacts are negative but short-term and reversible by mitigation measures. Consultation with respective design engineers revealed that it is unlikely that work camps are required for this subproject. In the case that it will be needed, the construction contractor will be required to:

(i) Consult with DMSC before locating subproject offices, sheds, and construction plants;
(ii) Minimize removal of vegetation and disallow cutting of trees;
(iii) Provide water and sanitation facilities for employees;
(iv) Prohibit employees from cutting of trees for firewood;
(v) Train employees in the storage and handling of materials which can potentially cause soil contamination;
(vi) Recover used oil and lubricants and reuse or remove from the site;
(vii) Manage solid waste according to the following preference hierarchy: reuse,

[4] For this subproject, the Construction Contractor may follow the World Bank EHS Guidelines

recycling and disposal to designated areas;
(viii) Remove all wreckage, rubbish, or temporary structures which are no longer required; and
(ix) Request DMSC to report in writing that the camp has been vacated and restored to pre-project conditions before acceptance of work.

95. **Community Health and Safety.** Hazards posed to the public, specifically in high pedestrian areas may include traffic accidents and vehicle collision with pedestrians. In most of the cases location of project sites at isolated area, hence health and safety risk to community is the minimum. Potential impact is negative but short-term and reversible by mitigation measures. The construction contractor will be required to:

(i) Plan routes to avoid times of peak-pedestrian activities;
(ii) Liaise with DMSC in identifying risk areas on route cards/maps;
(iii) Maintain regularly the vehicles and use of manufacturer-approved Parts to minimize potentially serious accidents caused by equipment malfunction or premature failure;
(iv) Provide road signs and flag persons to warn of dangerous conditions, in case of location near the road; and
(v) Provide protective fencing around open trenches, and cover any open trench with metal planks during non-construction hours.

96. **Social and Cultural Resources.** For this subproject, excavation/ desilting will occur at specific isolated location, so it could be that there is a low risk of such impacts. Nevertheless, the construction contractor will be required to:

(i) Stop work immediately to allow further investigation if any finds are suspected;
(ii) Inform DMSC if a find is suspected, and take any action they require ensuring its removal or protection in situ; and
(iii) Request DMSC or any authorized person with archaeological/historical field training to observe excavation.

C. Operation and Maintenance (O&M) impacts

97. The drainage network will require maintenance, as silt inevitably collects in areas of low flow over time. Any repairs or maintenance work can be conducted without ecological impacts as there is no significant flora and fauna within the immediate vicinity of the subproject sites.

98. **Economic Development.** Although drainage maintenance could result in shops losing some business if the work means that access is difficult for customers, any losses will be small and short-lived and will probably be at the level of normal business fluctuations. It should therefore not be necessary to compensate for such losses. Nevertheless DMB will:

(i) Inform all residents, businesses and sensitive receptors about the nature and duration of any work well in advance so that they can make preparations if necessary; and
(ii) Plan the work to avoid traffic disruption as far as possible, and road diversions can be organized if necessary.

99. Maintenance works could cause some temporary disruption of activities at locations such

as schools, hospitals, temples, etc, so the same precautions as employed during the construction period should be adopted. DMB will:

(i) Complete work in these areas quickly; and
(ii) Consult municipal authorities, custodians of important buildings, cultural and tourism authorities and local communities in advance of the work to identify and address key issues, and avoid working at sensitive times, such as religious and cultural festivals.

D. Cumulative Impact Assessment

100. The cumulative impact assessment (CIA) examined the interaction between the subproject's residual effects (i.e., those effects that remain after mitigation measures have been applied) and those associated with other past, existing and reasonably foreseeable future projects or activities. The subproject's potential cumulative effects were considered with respect to Valued Components (VCs) in the categories of environmental and socio-economic in the following areas:

(i) Of any potential residual subproject effects that may occur incrementally over time;
(ii) Consideration of other known relevant projects or activities within the specified study area boundaries, even if not directly related to the subproject;
(iii) Potential overlapping impacts that may occur due to other developments, even if not directly related to the proposed subproject; and
(iv) Future developments that is reasonably foreseeable and sufficiently certain to proceed.

101. The subproject IEE has identified the VCs as air quality, water (surface and groundwater) quality, noise, traffic management, social-economic and socio-community, and human health. There are no foreseeable projects that will overlap with the subproject. The spatial boundary of the subproject is the area along the alignment and the existing ROWs. The temporal boundary can be considered as the whole DMPA.

102. Air quality effects will occur during construction. Consequently, although emissions of common air contaminants (CAC) and fugitive dust may be elevated in proximity to active work sites, this impact will be short-term and localized to the immediate vicinity of the alignment. greenhouse gas (GHG) emissions may increase as a result of the subproject activities (i.e., vehicle and equipment operation, concrete production, disposal of excavated material, landfilling of residual wastes). Given the subproject's relatively minor contribution to CAC and GHG emissions during construction, the overall significance rating of both these potential residual effects is considered to be negligible.

103. During construction noise levels in the immediate proximity of most work sites are expected to increase. The duration of this exposure will be relatively brief. This exposure represents a temporary, localized, adverse residual effect of low to moderate significance for affected receptors. While building damage due to ground vibrations is unlikely, there may be annoyance to spatially located receptors during construction. Noise levels associated with the subproject activities will be largely imperceptible as the drainage network is located in relatively small sites within the town proper.

104. Land use/traffic management concerns will occur spatially during construction. During construction, site-specific mitigation measures will be implemented to address temporary disruptions to land use and access in the vicinity of the alignment such as road and sidewalk

closures, traffic delays and detours, parking modifications, and increased volumes of construction–related traffic. There should be improved traffic movement along the alignment once construction is completed. Since the subproject will be built in developed land and existing drainage, it will not conflict with existing or planned land use. However, following improvement in infrastructures and services, added residential developments, commercial and business facilities and increased densities are expected to develop and enhance the subproject area. This can be considered a long-term cumulative benefit of the subproject, as living conditions would be improved.

105. Adverse impacts such as localized disruption of vehicle traffic and pedestrian movements in areas along the alignment, and elevated particulate matter emissions in proximity to work sites, elevated noise and vibration levels and visual impacts will occur during construction. These short-term effects will be mitigated by providing alternate travel routes or alternating traffic movements and, where possible, access to businesses, schools and residences. However, upon completion of construction the socio-community will benefit from improved water supply system. This is considered a long-term cumulative benefit.

106. The subproject, when considered with other projects in the same watershed, may result in cumulative impacts to surface and groundwater quality from increased surface impermeability and resultant runoff. The construction activities could result in increased erosion from exposed soil areas. However, it is reasonably assumed that new construction associated with future projects will be required to meet national, state, and local construction and operation standards at least as rigorous as those required at present. Therefore, the potential for cumulative impacts to water quality and soils is deemed to be less than significant.

107. No adverse residual effects to human health will occur as a result of subproject construction or operation. While exposure to elevated noise levels and fugitive dust and CAC emissions will occur in proximity to subproject work sites during construction, due to their short-term, localized nature, these effects are expected to be minor and insignificant with no measurable effects on human health.

V. INSTITUTIONAL ARRANGEMENTS AND RESPONSIBILITY

A. Implementation Arrangements

108. The State Government of Assam's Guwahati Development Department will be the executing agency. A state-level PMU, headed by a full-time Project Director, will be established as the implementing agency which will be in-charge of overall execution and technical supervision, monitoring, and financial control of all activities under the project.

109. Project Implementation Units (PIUs) dedicated exclusively to the project would be set up in Guwahati and Dibrugarh. The PIUs will be headed by a senior technical officer and assisted by qualified and experienced officers seconded from ULBs, finance and other line departments. The PIU in Guwahati will have synergies and a coordination mechanism with the PIUs for Jawaharlal Nehru National Urban Renewal Mission (JNNURM) and Japan International Cooperation Agency (JICA) projects. In particular, for the Dibrugarh subproject, the PIU in Dibrugarh will be responsible for the day-to-day activities of subproject implementation in the field and will be under the direct administrative control of the PMU.

110. The PMU will have a Safeguards Compliance and Monitoring Unit (PMU SCMU) to

ensure mitigation of any environmental and social impacts due to the subproject. The PMU SCMU will have a Safeguards Officer (PMU SO) who will have the following responsibilities:

(i) prepare the REA checklist, to draft the EIA/IEE and to disclose the approved EIA/IEE in the website
(ii) ensure that Environmental Clearance, Consent to Establishment and Consent to Operate and other certificates, as required, are obtained in time from appropriate authorities and to ensure compliances with conditions imposed.
(iii) ensure incorporation of the EMP, environmental mitigation and monitoring measures into the contract documents
(iv) monitor disclosure and public consultation arranged by DMSC during IEE process and to ensure that comments are reflected in the IEE report
(v) ensure disclosure of information throughout the duration of the subproject through suitable visual means and publications
(vi) provide necessary input for grievance redress
(vii) approve contractor's proposed locations for construction work camps, storage areas, hauling roads, lay-down areas, and disposal areas for solid and hazardous wastes on recommendations of DMSC
(viii) guide the Contractor for drawing up of Site EMP and to approve the same
(ix) induct the Contractor for taking up the construction following environmental and social safeguards
(x) facilitate scheduled monitoring during implementation of the project.
(xi) carry out regular onsite monitoring and guide the Contractor to adopt the required site management standard.
(xii) ensure the required health and safety measures at work sites
(xiii) obtain in time and to review the monthly monitoring report of the Contractors
(xiv) prepare 6-monthly monitoring and EMP implementation report, including the status of project compliance, statutory clearances and relevant loan covenants, and submit the approved 6-monthly report to ADB and seek permission to disclose the same in the investment program website
(xv) prepare monitoring report on post-construction activities by the contractors as specified in the EMP

111. PMU will be supported by the design and monitoring supervision consultant (DMSC). An environment specialist will be engaged under the DMSC with the following responsibilities: (i) address environmental safeguards issues; (ii) overall implement of the environmental assessment and review framework (EARF); (iii) monitor physical and on-physical activities under the project; (iv) overall monitor implementation of EMPs; (v) guide the PIUs as and when necessary; (vi) review and finalize all reports in consultation with the PMU SO; (vii) provide project management support, (viii) assure the technical quality of design and construction, (ix) prepare environmental assessment reports; and (iv) provide advice on policy reforms; (x) central role in ensuring capacity building on environmental management of the PMU, contractors, and line departments through capacity development support and training; and (xi) endorse/submit periodic monitoring reports[5] received from the hired NGOs in Guwahati and Dibrugarh to the PMU PD, who will then submit these to ADB.

[5] The monitoring report will focus on the progress of implementation of the IEE and EARF issues encountered and measures adopted, follow-up actions required, if any, as well as the status of compliance with subproject selection criteria, and relevant loan covenants.

112. The PIUs will each have an Environment Officer and Resettlement Officer who will be responsible for implementation of the EMP in each EIA/IEE and the resettlement plan/IPP respectively. Both officers will undertake surveys and record their observations throughout the construction period to ensure that safeguards and mitigation measures are provided as intended. Both will be responsible for (i) implementing and monitoring safeguards compliance activities, public relations activities, gender mainstreaming activities and community participation activities; (ii) obtaining statutory clearances and obtaining NOCs from government agencies /other entities and entering into agreements with them for use of their land; and (iii) coordinating for obtaining ROW clearances with related State and National agencies.

113. In particular, the environment specialist under DMSC will ensure (i) contractors will revise/update the draft IEEs after finalization of the design; (ii) field implementation of EMPs; (iii) oversee implementing and monitoring safeguards compliance activities, public relations activities, gender mainstreaming activities and community participation activities; (iv) field monitoring at least fortnightly and advice contractor for additional/rectification of mitigation measures as per ground condition. **Figure 8** shows the implementation arrangement for environment and resettlement safeguards.

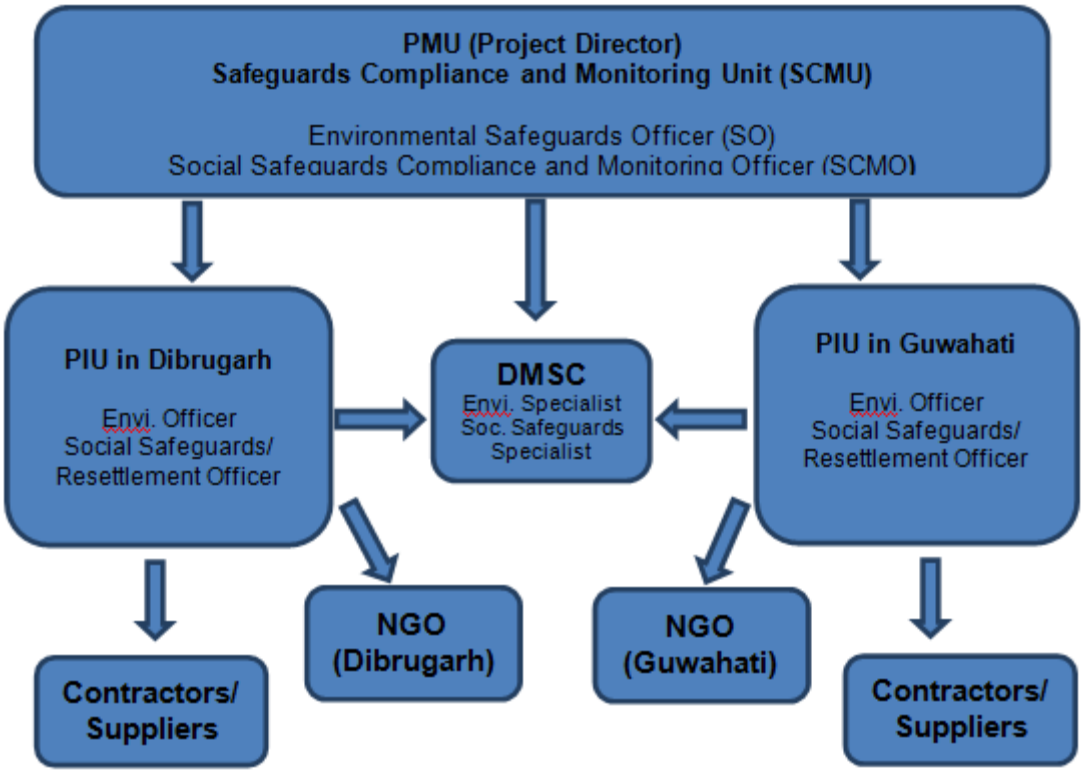


Figure 8: Safeguards Institutional Arrangement

B. Monitoring and Reporting

114. The PMU will monitor and measure the progress of EMP implementation. The monitoring activities will be corresponding with the Project's risks and impacts and will be identified in the IEEs for the subprojects. In addition to recording information of the work, deviation of work components from original scope, the PMU and PIUs will undertake site inspections and document

review to verify compliance with the EMP and progress toward the final outcome.

115. DMSC will submit monthly monitoring and implementation reports to PIU, who will take follow-up actions, if necessary. PIU will submit the quarterly monitoring and implementation reports to PMU who will then submit to the PD. The PMU will submit semi-annual monitoring reports to ADB. The suggested semi-annual environmental monitoring report format is in **Appendix 6**. Project budgets will reflect the costs of monitoring and reporting requirements. For projects likely to have significant adverse environmental impacts during operation, reporting will continue at the minimum on an annual basis. Monitoring reports will be posted in a location accessible to the public.

116. ADB will review project performance against the executing agency's commitments as agreed in the legal documents. The extent of ADB's monitoring and supervision activities will be commensurate with the Project's risks and impacts. Monitoring and supervising of social and environmental safeguards will be integrated into the project performance management system.

117. ADB will monitor projects on an ongoing basis until a project completion report is issued. ADB will carry out the following monitoring actions to supervise project implementation:

(i) conduct periodic site visits for projects with adverse environmental or social impacts;
(ii) conduct supervision missions with detailed review by ADB's safeguard specialists/officers or consultants for projects with significant adverse social or environmental impacts;
(iii) review the periodic monitoring reports submitted by EA to ensure that adverse impacts and risks are mitigated as planned and as agreed with ADB;
(iv) work with EA to rectify to the extent possible any failures to comply with their safeguard commitments, as covenanted in the legal agreements, and exercise remedies to re-establish compliance as appropriate; and
(v) prepare a project completion report that assesses whether the objective and desired outcomes of the safeguard plans have been achieved, taking into account the baseline conditions and the results of monitoring.

C. Institutional Capacity

118. There is low capacity to implement projects in accordance with ADB safeguard requirements in both project cities. The ULBs do not have environmental/social safeguards personnel, capacity to handle environmental/IR/IP impacts, gender and vulnerability issues. The DMSC will be responsible for training of PMU and PIUs staff on aspects such as environmental planning/resettlement planning/implementation, social protection and gender, including the specific recording, reporting and disclosure requirements.

119. The DMSC will provide the basic training required for environmental awareness and management in accordance with both ADB and government requirements. Specific modules customized for the available skill set shall be devised after assessing the capabilities of the target participants and the requirements of the Project. The entire training will cover basic principles of environmental assessment and management; mitigation plans and programs, implementation techniques, monitoring methods and tools. Typical modules that will be present for the training session would be as follows: (i) sensitization; (ii) introduction to environment and environmental considerations in urban development projects; (iii) review of IEEs and Integration into the subproject detailed design; (iv) improved coordination within Nodal Departments; (v) monitoring

and reporting system. The proposed training program along with the frequency of sessions is presented in **Table 14**.

Table 14: Training Program for Environmental Management

Program	Description	Participants	Form of Training	Duration/ Location	Conducting Agency
A. Pre-Construction Stage					
Sensitization Workshop	**Introduction to Environment:** ✓ Basic Concept of environment ✓ Environmental Regulations and Statutory requirements as per Government of India and ADB	Secretaries, Chief Engineer, Superintendent Engineers of PWD, PHED and UDD, the Development Commissioner, Chairman, CEO of DMB and Project Director (PD) and PIUs Environmental Officers (EOs)	Workshop	½ Working Day	DMSC Team
Session I					
Module I	**Introduction to Environment:** ✓ Basic Concept of environment ✓ Environmental Regulations and Statutory requirements as per Government of India and ADB	Engineers of PWD, PHED and UDD, ULBs, PMU (Technical Unit) and PIUs EOs	Lecture	¼ Working Day	DMSC Team
Module II	**Environmental Considerations in Urban Development Projects:** ✓ Environmental components affected by urban development in construction and operation stages ✓ Activities causing pollution during construction and operation stages ✓ Environmental Management Good Practices in Urban Infrastructure Projects	Engineers of PWD, PHED and UDD, ULBs, PMU (Technical Unit) and PIUs EOs	Workshop	¼ Working Day	DMSC Team

Program	Description	Participants	Form of Training	Duration/ Location	Conducting Agency
Module III	**Review of IEE and its Integration into Designs:** ✓ IEE Methodology ✓ Environmental Provisions in the EMPs ✓ Implementation Arrangements ✓ Methodology of Assessment of Pollution Monitoring ✓ Methodology for site selection of borrow areas, waste disposal	Engineers of PWD, PHED and UDD, ULBs, PMU (Technical Unit) and PIUs EOs	Lecture and Field Visit	½ Working Day	DMSC Team
Module IV	**Improved Coordination with other Departments:** ✓ Overview of the Project ✓ Environmental and Social Impacts ✓ Statutory Permissions ✓ Procedural Requirements ✓ Cooperation and Coordination with other Departments.	Engineers of PWD, PHED and UDD, ULBs, PMU (Technical Unit) and PIUs EOs	Lecture / Interactive Sessions	½ Working Day	DMSC Team
Module V	**Special Issues in the Project** ✓ Bio-Diversity Assessment and Conservation ✓ Geomorphological Assessment and Slope Protection ✓ Statutory Permissions– Procedural Requirements ✓ Consultation and Counseling	Engineers of PWD, PHED and UDD, ULBs, PMU (Technical Unit) and PIUs EOs	Lecture	½ Working Day	DMSC Team
B. Construction Stage					
Session II					

Program	Description	Participants	Form of Training	Duration/ Location	Conducting Agency
Module VI	**Role during Construction** ✓ Roles and Responsibilities of officials/ contractors/ consultants towards protection of environment ✓ Implementation Arrangements ✓ Monitoring mechanisms	Engineers of PWD, PHED and UDD, ULBs, PMU (Technical Unit) and PIUs EOs	Lecture / Interactive Sessions	½ Working Day	DMSC Team
Module VII	Monitoring and Reporting System	PMU (Technical Unit) and PIUs EOs	Lecture / Interactive Sessions	½ Working Day	DMSC Team

Notes: CFE – Consent for Establishment, CFO – Consent for Operation, DFO – Divisional Forest Officer, DMSC – Design, Monitoring and Supervision Consultant, EAC - Environmental Appraisal Committee, EARF – Environmental Assessment and Review Framework, EC – Environmental Clearance, EMP – Environmental Management Plan, FAM – Facility Administration Memorandum, IEE – Initial Environmental Examination, NOC – No Objection Certificate, PHED - Public Health Engineering Department, PIU - Public Implementation Unit, PMU - Program Management Unit, PWD - REA – Rapid Environmental Assessment, SEAC – State Environment Assessment Committee, SEIAA – State Environment Impact Assessment Authority, STP – sewage treatment plant, TOR – Terms of Reference, UDD - Urban Development Department, ULB - Urban Local Body

VI. GRIEVANCE REDRESS MECHANISM

120. A project-specific grievance redress mechanism (GRM) has been established to receive, evaluate and facilitate the resolution of affected people's concerns, complaints and grievances about the social and environmental performance at the level of the Project. The GRM will aim to provide a time-bound and transparent mechanism to voice and resolve social and environmental concerns linked to the project. The grievance redress mechanism and procedure is depicted in **Figure 9** below. The project-specific GRM is not intended to bypass the government's own redress process; rather it is intended to address affected people's concerns and complaints promptly, making it readily accessible to all segments of the affected people and is scaled to the risks and impacts of the project.

121. The PMU and PIUs will make the public aware of the GRM through public awareness campaigns. Grievances can be filed in writing using the Complaint Register and Complaint Forms **(Appendix 7)** or by phone with any member of the PMU or PIU. The contact phone number of the respective PIUs and the PMU will serve as a hotline for complaints and will be publicized through the media and placed on notice boards outside their offices and at construction sites. The safeguard documents made available to the public in an accessible version will include information on the GRM and will be widely disseminated throughout the corridor by the safeguards officers in the PMU and PIUs

122. **First tier of GRM.** The PIU is the first tier of GRM which offers the fastest and most accessible mechanism for resolution of grievances. The Resettlement Officer and Environmental Officer in each PIU will be designated as the key officers for grievance redress. Resolution of complaints will be done within seven working days. At this stage, the Resettlement Officer and Environmental Officer will inform the PMU's Safeguards Compliance and Monitoring Unit (SCMU) for additional support and guidance in grievance redress matters. Investigation of grievances will

involve site visits and consultations with relevant parties (e.g., affected persons, contractors, traffic police, etc.). Grievances will be documented and personal details (name, address, date of complaint, etc.) will be included unless anonymity is requested. A tracking number will be assigned for each grievance, including the following elements:

(i) Initial grievance sheet (including the description of the grievance) with an acknowledgement of receipt given to the complainant when the complaint is registered;
(ii) Grievance monitoring sheet with actions taken (investigation, corrective measures); and
(iii) Closure sheet, one copy of which will be handed to the complainant after he/she has agreed to the resolution and signed-off.

123. The updated register of grievances and complaints will be available to the public at the PIU office, construction sites, and other key public offices along the project corridor. Should the grievance remain unresolved it will be escalated to the second tier.

124. **Second Tier of GRM.** The Resettlement Officer and Environmental Officer in each PIU will activate the second tier of GRM by referring the unresolved issue (with written documentation) to the PMU's Safeguards Compliance and Monitoring Unit who will pass unresolved complaints upward to the Grievance Redress Committee (GRC).[6] A hearing will be called with the GRC, if necessary, where the affected person can present his/her concern/issues. The process will facilitate resolution through mediation. The local GRC will meet as necessary when there are grievances to be addressed. The local GRC will suggest corrective measures at the field level and assign clear responsibilities for implementing its decision within fifteen (15) working days. The contractor will have observer status on GRC. If unsatisfied with the decision, the existence of the GRC will not impede the complainant's access to the Government's judicial or administrative remedies.

125. The PMU SCMU officers will be responsible for processing and placing all papers before the GRC, maintaining database of complaints, recording decisions, issuing minutes of the meetings and monitoring to see that formal orders are issued and the decisions carried out.

126. Third tier of GRM. In the event that a grievance cannot be resolved directly by the PIUs (first tier) or GRC (second tier), the affected person can seek alternative redress through the union Parishad or ward committees or in the appropriate court of law. The PIUs or GRC will be kept informed by the district, municipal or national authority.

127. The safeguard monitoring reports will include the following aspects pertaining to

[6] The GRC consists of the following persons: (i) Project Director; (ii) representative of the affected person(s); (iv) representative of the local Deputy Commissioners office (land); and (v) representative of APCB (for environmental-related grievances). The functions of the local GRC are as follows: (i) resolve problems quickly and provide support to affected persons arising from various environmental issues and including dust, noise, utilities, power and water supply, waste disposal, traffic interference and public safety as well as social and resettlement related issues such as land acquisition (temporary or permanent); asset acquisition; and eligibility for entitlements, compensation and assistance; (ii) reconfirm grievances of displaced persons, categorize and prioritize them and aim to provide solutions within a month; (iii) report to the aggrieved parties about developments regarding their grievances and decisions of the GRC.

progress on grievances: (i) number of cases registered with the GRC, level of jurisdiction (first, second and third tiers), number of hearings held, decisions made, and the status of pending cases; and (ii) lists of cases in process and already decided upon may be prepared with details such as Name, ID with unique serial number, date of notice, date of application, date of hearing, decisions, remarks, actions taken to resolve issues, and status of grievance (i.e., open, closed, pending).

128. The GRM notwithstanding, an aggrieved person shall have access to the country's legal system at any stage. This can run parallel to accessing the GRM and is not dependent on the negative outcome of the GRM.

129. In the event that the established GRM is not in a position to resolved the issue, the affected persons can also use the ADB Accountability Mechanism through directly contacting (in writing) the Complaint Receiving Officer at ADB headquarters or the ADB India Resident Mission. The complaint can be submitted in any of the official languages of ADB's Developing Member Countries. The ADB Accountability Mechanism information will be included in the Project Information Document to be distributed to the affected communities, as part of the project GRM.

130. **Costs:** All costs involved in resolving the complaints (meetings, consultations, communication and reporting / information dissemination) will be borne by the PMU.

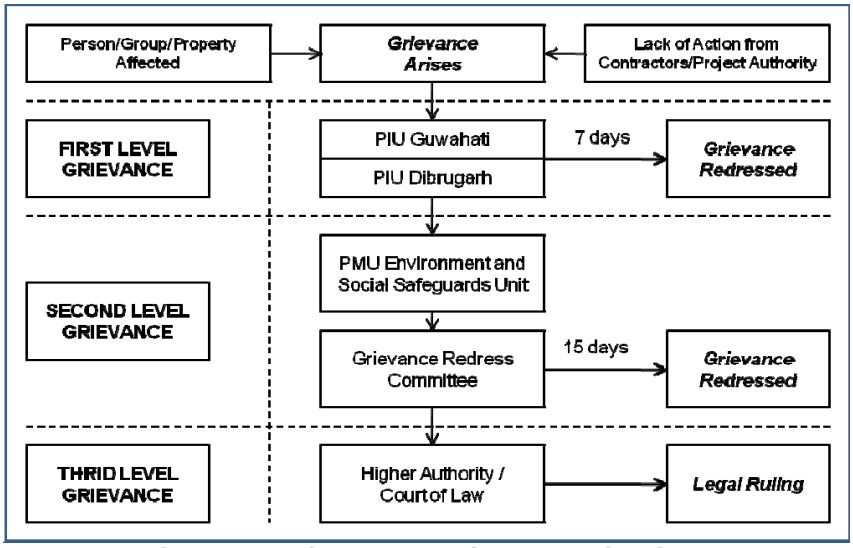


Figure 9: Grievance Redress Mechanism

131. Notification for GRM and setting up GRC for the project has been done on 1 July 2015.

VII. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

A. Process for Consultation

132. Detailed consultations were held with the local community and the representatives from DMB. These consultations provide input for finalization of the project components as well as helps in understanding the need of the stakeholders for incorporation in the subproject components. The following stakeholders were consulted:

(i) Officials of various Government Departments,
(ii) Community people of slums;
(iii) Elected representatives and technical stuff from Dibrugarh municipal Board
(iv) Ward commissioner of the respective ward; and
(v) Local communities of different wards.

133. The tools for consultation included formal meetings, structured discussions, focus group discussions apart from questionnaire administered for a sample population. These consultations included specific discussions on issues pertaining to need for improvement of drainage systems in the city. The priorities for improvement varied across the various localities in the city.

134. The details of primary consultations held in Dibrugarh are presented in **Table 15**. A sector wise summary of the issues particularly relevant to the situation analysis of the project is presented in the **Table 16** Apart from the other infrastructure issues the problem of recurrent flooding due to the improper drainage system was discussed during the consultation process. The community has expressed their views on the proposed improvement measures within the area and also in the other parts of the town.

Table 15: Details of Consultations During Subproject Preparation

S. No.	Type of consultation	Stakeholder	Area, ward	Venue of consultation	Number of participants	Date	Time duration
Community/Representatives/Official							
1	Focus Group Discussion	Settlers of AMC Road Market, Elected representatives and Technical staff of DMB, The chairman of the DMB, Ward Commissioner	22	AMC Road market	28	06.03.14 - 07.03.14	180 min
Consultation With The Community							
2	FGD	Local Shopkeepers and habitants	1	Seujpur	7	08.03.14	30 min
3	FGD	Local vendors	6	Chiring Chapori	15	08.03.14	90 min
4	FGD	Local Shopkeepers	5	Mancotta Road	15	20.03.14	90 min
5	FGD	Local Community	8	Bashbari	2	08.03.14	15 min
6	FGD	Local Shopkeepers	4	Pathanpatti	3	11.03.14	20 min

(Summary outcome of consultation: At different areas of the city blocking the free flow of the Dibrugarh Town Protection (DTP) Drain and its network of feeder secondary & tertiary drains by garbage and silt are noted. Low laying areas adjacent to DTP drain get flooded due to overflow of the main drain water. Particularly at monsoon season low laying area of Dibrugarh is flooded in general. Immediate attention is needed for improvement of drainage system of Dibrugarh)

Table 16: Results of Consultations with Government Departments

Stakeholder Consulted	Issues raised/suggestion received	How the issues/ suggestions are incorporated into the subproject design
PWD, DMB	✓ Artificial floods within the city by overflowing of missing links of secondary drains. ✓ Blocking the free flow of the second main drain and its network of feeder drains by garbage and silt ✓ Need for improved drainage system	Inclusion of subproject in Tranche 2
Seujpur	Due to earthen drains, the free flow of water is restricted due to erosion as a result of which it overflows and cause inundation of the area	Construction of new RCC box drain.
Polo Ground	Water from the low-lying areas needs to be diverted to the DTP drain	
AMC Road	Due to non-existence and missing links of drains the AMC Road gets flooded during rainy season	
Chiring Chapori	Due to non-existence and missing links of drains the area gets flooded during rainy season	
Jail Road	Lack of maintenance and cleaning of the drains it gets flooded during rainy season.	

135. Recently public consultation has been carried out at project sites. **Appendix 8** shows the detail consultation and list of public attended in consultation meetings.

B. Future Consultation and Disclosure

136. The public consultation shall be a continuous process and will continue in future during subproject implementation. The DMSC will be appointed to handle this key aspect of the program, who will conduct a wide range of activities in relation to all subprojects in each town, to ensure that the needs and concerns of stakeholders are registered, and are addressed in subproject design, construction or operation where appropriate. The program of activities include the following:

(i) Public meetings with affected communities to discuss and plan work program and allow issues to be raised and addressed once construction has started; and

(ii) Smaller-scale meetings to discuss and plan construction work with individual communities to reduce disturbance and other impacts, and provide a mechanism through which stakeholders can participate in subproject monitoring and evaluation.

137. For the benefit of the community the summary IEE will be translated in Assamese and made available at: (i) ULB office; (ii) District Magistrate Office; and, (iii) PMU; and (iv) PIUs. Hard copies of the IEE will be kept in public locations accessible to citizens as a means to disclose the document and at the same time creating wider public awareness. Electronic version of the IEE will be placed in the official website of the PMU/State Government and the official website of ADB after approval of the IEE by Government and ADB. The PMU will issue Notification on the locality-wise start date of implementation of the subproject. The notice will be issued by the PMU in local

newspapers one month ahead of the implementation works. Copies of the IEE will be kept in the PMU and PIU offices and will be distributed to any person willing to consult the IEE.

VIII. ENVIRONMENTAL MANAGEMENT PLAN

138. The potential impacts identified and assessed and the mitigation measures formulated to minimize those impacts to acceptable levels identified in the earlier sections are summarized in the following tables. The table also delegates the responsibility of implementing mitigation to various agencies involved in the program implemented as listed above.

A. Environmental Mitigation Plan

139. **Tables 17 to 19** show the potential adverse environmental impacts, proposed mitigation measures, responsible parties. This EMP will be included in the bid documents and will be further reviewed and updated during implementation.

B. Environmental Monitoring Program

140. **Tables 20 to 22** show the proposed environmental monitoring program for this subproject. It includes all relevant environmental parameters, location, method of monitoring, indicators/ standards of monitoring including frequency and responsibility of monitoring.

Table 17: Anticipated Impacts and Mitigation Measures – Pre-construction Stage

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
Legislation, permits and agreements	Noncompliance on Environmental legislation – work will be stopped	• In all instances-covering Environment & Forest, implementation agency, contractors and consultants must remain in compliance with relevant local and national legislation. • Proof of compliance to Air Act & Noise Act must be forwarded by the contractor to PMU/DMSC/PIU (in relation to hot mixing, batch mix plants, stone crushers, diesel generators, etc. if any) • Permission of tree felling if any from forest dept. • A copy of the EMP must be kept on site during the construction period	PIU, PMU, DMSC	(i) Checking of all permit including tree felling if any (ii) Availability of EMP at site
Technical design of the project	Lack of sufficient planning to assure long term sustainability of the improvements and ensure protection of the assets created	Design will include provisions for ensuring effective maintenance and protection of the assets created so as to ensure the long-term sustainability. Designs will be worked out and implemented in accordance with the	PIU, DMSC	Checking of technical design – considering sustainability of the project

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
		provisions and will strictly conform to state rule		
Utilities	Telephone lines, electric poles and wires, water lines within proposed project area	(i) Identify and include locations and operators of these utilities in the detailed design documents to prevent unnecessary disruption of services during construction phase; and (ii) Require construction contractors to prepare a contingency plan to include actions to be done in case of unintentional interruption of services.	DMSC	(i) List of affected utilities and operators; (ii) Bid document to include requirement for a contingency plan for service interruptions
Traffic Management	Impede traffic flow during construction	(i) Prepare a traffic management strategy during preconstruction phase.	DMSC	Ensure Traffic Management strategy is included in bidding documents.
Social and Cultural Resources	Ground disturbance can uncover and damage archaeological and historical remains	(i) Consult Archaeological Survey of India (ASI) or concerned department in Dibrugarh/ Guwahati to obtain an expert assessment of the archaeological potential of the site; (ii) Consider alternatives if the site is found to be of medium or high risk; (iii) Develop a protocol for use by the construction contractors in conducting any excavation work, to	DMSC	Chance Finds Protocol

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
		ensure that any chance finds are recognized and measures are taken to ensure they are protected and conserved.		
Construction work camps, hot mix plants, stockpile areas, storage areas, and disposal areas.	Disruption to traffic flow and sensitive receptors	(i) Prioritize areas within or nearest possible vacant space in the subproject location; (ii) If it is deemed necessary to locate elsewhere, consider sites that will not promote instability and result in destruction of property, vegetation, and drinking water supply systems; (iii) Do not consider residential areas; (iv) Take extreme care in selecting sites to avoid direct disposal to water body which will inconvenience the community.	PMU/PIU and DMSC to determine locations prior to award of construction contracts.	List of selected sites for construction work camps, hot mix plants, stockpile areas, storage areas, and disposal areas.
Sources of Materials	Extraction of materials can disrupt natural land contours and vegetation resulting in accelerated erosion, disturbance in natural drainage patterns, ponding and water logging, and water pollution.	(i) Prioritize sites already permitted by the Mining Department; (ii) If other sites are necessary, inform construction contractor that it is their responsibility to verify the suitability of all	PMU/PIU and DMSC to prepare list of approved quarry sites and sources of materials	(i) List of approved quarry sites and sources of materials; (ii) Bid document to include requirement for verification of suitability of sources and permit for additional quarry sites if necessary.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
		material sources and to obtain the approval of PMU/PIU and (iii) If additional quarries will be required after construction is started, inform construction contractor to obtain a written approval from PMU/PIU.		
Disposal sites of dredge and solid wastes	Cleaning of drains will generate large amounts of dredge material (i.e., silt) and solid waste which needs to be disposed in designated area away from sensitive receptors	Identify agreed sites with local officials to dispose of dredge		PMU, PIU, and DMSC to ensure sites are agreed with local officials and in locations which are away from sensitive receptors.

DMSC = Design, Management and Supervision Consultant, PMU = Project Management Unit; PIU = Project Implementation Unit

Table 18: Anticipated Impacts and Mitigation Measures – Construction Stage

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
Sources of Materials	Extraction of rocks and material may cause ground instability	(i) Use quarry sites and sources permitted by government; (ii) Verify suitability of all material sources and obtain approval of Investment PMU/PIU; (iii) If additional quarries will be required after construction has started, obtain written approval from PMU/PIU; and;	Construction Contractor	Construction Contractor documentation

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
		(iv) Submit to DMSC on a monthly basis documentation of sources of materials.		
Air Quality	Emissions from construction vehicles, equipment, and machinery used for excavation and construction resulting to dusts and increase in concentration of vehicle-related pollutants such as carbon monoxide, sulfur oxides, particulate matter, nitrous oxides, and hydrocarbons)	(i) Consult with PMU/PIU/DMSC on the designated areas for stockpiling of construction materials; (ii) Carry out air quality monitoring; (iii) Damp down exposed soil and any stockpiled on site by spraying with water when necessary during dry weather; (iv) Use tarpaulins to cover sand and other loose material when transported by trucks; and (v) Fit all heavy equipment and machinery with air pollution control devices which are operating correctly.	Construction Contractor	(i) Location of stockpiles; (ii) Complaints from sensitive receptors; (iii) Heavy equipment and machinery with air pollution control devices
Traffic Management	Impede traffic flow during construction	(i) Implement a traffic management strategy (if required- partly closed) during construction phase.	Construction Contractor	DMSC to ensure traffic management measures are implemented and traffic is not significantly impeded during construction period.
Surface water quality	Mobilization of settled silt materials, run-off from stockpiled materials, and chemical contamination	(i) Avoid stockpiling of dredged silt/ sludge especially during the monsoon season unless	Construction Contractor	(i) Areas for stockpiles, storage of fuels and lubricants and waste materials;

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
	from fuels and lubricants during construction works can contaminate nearby surface water quality.	covered by tarpaulins or plastic sheets; (ii) Prioritize re-use of excess spoils and materials in the construction works. If spoils will be disposed, consult with PMU/PIU/DMSC on designated disposal areas; (iii) Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies; (iv) Place storage areas for fuels and lubricants away from any drainage leading to water bodies; (v) Dispose any wastes generated by construction activities in designated sites- preferably for landfill site development ; and (vi) Conduct surface quality inspection according to the Environmental Management Plan.		(ii) Number of silt traps installed along drainages leading to water bodies; (iii) Records of surface water quality inspection; (iv) Effectiveness of water management measures.
Noise Levels	Increase in noise level due to dredging work -moving and excavation equipment, and the transportation of equipment, materials, and people	(i) Plan activities in consultation with PMU/ PIU/ DMSC so that activities with the greatest potential to generate noise are conducted during periods of the day which will result in	Construction Contractor	(i) Complaints from sensitive receptors; (ii) Use of silencers in noise- producing equipment and sound barriers.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
		least disturbance; (ii) Require horns not be used unless it is necessary to warn other road users of the vehicle's approach; (iii) Minimize noise from construction equipment by using vehicle silencers, fitting jackhammers with noise- reducing mufflers, and portable street barriers the sound impact to surrounding sensitive receptor, (iv) Maintain maximum sound levels not exceeding 80 decibels (dbA) when measured at a distance of 10 m or more from the vehicle/s; and (v) Carry out noise level monitoring		
Ecological resources – Terrestrial	Felling of the trees – affect terrestrial ecological balance	(i) Minimize removal of vegetation and disallow cutting of trees; (ii) approx. 75 nos. of tree feeling will be required, obtain tree-cutting permit from forest and environment dept., (iii) Require to plant three (3) native trees for every one (1) that is removed; and (iv) Prohibit employees from cutting of trees for firewood.	Construction Contractor	(i) Complaints from sensitive receptors; (ii) checking of conservation management plan for tree species
Existing Infrastructure and	Disruption of service (if	(i) Obtain from	Construction Contractor	Existing Utilities

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
Facilities	any) and damage to existing infrastructure at specified project location	PMU/PIU/DMSC the list of affected utilities and operators if any; (ii) Prepare a contingency plan to include actions to be done in case of unintentional interruption of service		Contingency Plan
Disposal sites of dredged sludge and solid wastes	Cleaning of drains will generate large amounts of dredge material (i.e., silt) and solid waste which needs to be disposed in designated areas away from sensitive receptors Preliminary design indicates generation of 1172 cum of drainage sludge	Dispose dredge and solid waste at pre-identified agreed upon sites (e.g., existing dumpsites or use for development of landfill) away from sensitive receptors. Physico chemical testing will be required before disposal.	Construction Contractor	DMSC to monitor contractors on disposal of dredge and solid wastes at pre-identified agreed site
Landscape and Aesthetics	Solid wastes as well as excess construction materials	(i) Prepare and implement Waste Management List; (ii) Avoid stockpiling of excess excavated soils; and (iii) Coordinate with DMB for beneficial uses of dredged silt or immediately dispose to designated areas (specifically use for development of landfill); (iv) Recover used oil and lubricants and reuse or remove from the sites; (v) Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated	Construction Contractor	(i) Waste Management List; (ii) Complaints from sensitive receptors; (iii) PMU/PIU/DMSC to report in writing that the necessary environmental restoration work has been adequately performed before acceptance of work.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
		areas; (vi) Remove all wreckage, rubbish; and (vii) Request PMU/PIU/DMSC to report in writing that the necessary environmental restoration work has been adequately performed before acceptance of work.		
Accessibility	Traffic problems and conflicts near project locations and haul road	(i) Plan transportation routes so that heavy vehicles do not use narrow local roads, except in the immediate vicinity of delivery sites; (ii) Schedule transport and hauling activities during non- peak hours; (iii) Locate entry and exit points in areas where there is low potential for traffic congestion; (iv) Keep the site free from all unnecessary obstructions; (v) Drive vehicles in a considerate manner; (vi) Coordinate with Dibrugarh Traffic Office for temporary road diversions and with for provision of traffic aids if transportation activities cannot be avoided during peak hours; (vii) Notify affected sensitive receptors by providing sign boards	Construction Contractor	(i) Traffic Management Strategy; (ii) Complaints from sensitive receptors; (iii) Number of signages placed at subproject location

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
		informing nature and duration of construction works and contact numbers for concerns/complaints. (viii) Provide planks across drains in front of businesses, and ensure works are completed quickly to avoid disruption, and (ix) Avoid full street closure		
Socio-Economic – Income.	Impede the access of residents and customers to nearby shops	(i) Leave spaces for access between mounds of soil; (ii) Provide walkways and metal sheets where required for people; (iii) Increase workforce in front of critical areas such as institutions, place of worship, business establishment, hospitals, and schools; (iv) Consult businesses and institutions regarding operating hours and factoring this in work schedules; and (v) Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints.	Construction Contractor	(i) Complaints from sensitive receptors; (ii) Number of walkways, signages, and metal sheets placed at subproject location.
Socio-Economic - Employment	Generation of contractual employment and increase in local revenue	(i) Employ at least 50% of the labor force, or to the maximum extent, local persons within the 2-km immediate area if	Construction Contractor	(i) Employment records; (ii) records of sources of materials

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
		manpower is available; and (ii) Secure construction materials from local market.		
Occupational Health and Safety	Occupational hazards which can arise during work	(i) Develop and implement site-specific Health and Safety (H&S) Plan which will include measures such as: (a) excluding public from the site; (b) ensuring all workers are provided with and use Personal Protective Equipment like helmet, gumboot, safety belt, gloves, nose mask and ear plugs; (c) H&S Training for all site personnel; (d) documented procedures to be followed for all site activities; and (e) documentation of work-related accidents; (ii) Ensure that qualified first- aid can be provided at all times. Equipped first-aid stations shall be easily accessible throughout the site; (iii) Provide medical insurance coverage for workers; (iv) Secure all installations from unauthorized intrusion and accident risks; (v) Provide supplies of potable drinking water; (vi) Provide clean eating areas where workers are not	Construction Contractor	(i) Site-specific Health and Safety (H&S) Plan; (ii) Equipped first-aid stations; (iii) Medical insurance coverage for workers; (iv) Number of accidents; (v) Supplies of potable drinking water; (vi) Clean eating areas where workers are not exposed to hazardous or noxious substances; (vii) record of H&S orientation trainings (viii) personal protective equipment; (ix) % of moving equipment outfitted with audible back-up alarms; (xi) sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
		exposed to hazardous or noxious substances; (vii) Provide H&S orientation training to all new workers to ensure that they are apprised of the basic site rules of work at the site, personal protective protection, and preventing injuring to fellow workers; (viii) Provide visitor orientation if visitors to the site can gain access to areas where hazardous conditions or substances may be present. Ensure also that visitor/s do not enter hazard areas unescorted; (ix) Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas; (x) Ensure moving equipment is outfitted with audible back- up alarms; (xi) Mark and provide sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal. Signage shall be in accordance with international standards and		

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
		be well known to, and easily understood by workers, visitors, and the general public as appropriate; and (xii) Disallow worker exposure to noise level greater than 85 dBA for a duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively.		
Community Health and Safety.	Traffic accidents and vehicle collision with pedestrians during material and waste transportation	(i) Plan routes to avoid times of peak-pedestrian activities. (ii) Liaise with PMU/PIU/DMSC in identifying high-risk areas on route cards/maps. (iii) Maintain regularly the vehicles and use of manufacturer-approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure. (iv) Provide road signs and flag persons to warn. (v) Provide protective fencing around drain, and cover any open trench with metal planks during non-construction hours. potentially cause soil contamination; (vi) Recover used oil and lubricants and reuse or remove from the site; (vii)	Construction Contractor	(i) Traffic Management Strategy; (ii) Complaints from sensitive receptors

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
		Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas; (viii) Remove all wreckage, rubbish, or temporary structures which are no longer required; and (ix) Request PMU/PIU/DMSC to report in writing that the camp has been vacated and restored to pre-project conditions before acceptance of work.		
Camp sites (if needed)	Temporary air and noise pollution from machine operation, water pollution from storage and use of fuels, oils, solvents, and lubricants	(i) Consult PMU/PIU/DMSC before locating project offices, sheds, and construction plants; (ii) Minimize removal of vegetation and disallow cutting of trees; (iii) Provide water and sanitation facilities for employees; (iv) Prohibit employees from cutting of trees for firewood; (v) Train employees in the storage and handling of materials which can potentially cause soil contamination; (vi) Recover used oil and lubricants and reuse or remove from the site; (vii) Manage solid waste	Construction Contractor	(i) Complaints from sensitive receptors; (ii) Water and sanitation facilities for employees ; and (iii) PMU/PIU/DMSC report writing that the camp has been vacated and restored to pre-project conditions

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
		according to the following preference hierarchy: reuse, recycling and disposal to designated areas; (viii) Remove all wreckage, rubbish, or temporary structures (such as buildings, shelters, and latrines) which are no longer required; and (ix) Request PMU/PIU/DMSC to report in writing that the camp has been vacated and restored to pre-project conditions before acceptance of work.		
Social and Cultural Resources	Risk of archaeological chance finds	(i) Strictly follow the protocol for chance finds in any excavation work; (ii) Request PMU/PIU/DMSC or any authorized person with archaeological field training to observe excavation; (iii) Stop work immediately to allow further investigation if any finds are suspected; and (iv) Inform PMU/PIU/DMSC if a find is suspected, and take any action they require ensuring its removal or protection in situ.	Construction Contractor	Records of chance finds

DMSC = Design, Management and Supervision Management Consultant, H&S = health and safety, RPM = respirable particulate matter, SPM = suspended particulate matter, DMB = Dibrugarh Municipal Board; PMU = Project Management Unit; PIU = Project Implementation Unit

Table 19: Anticipated Impacts and Mitigation Measures – Operation & Maintenance Stage

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
General maintenance	General impact	(i) Conduct work during non- monsoon period; and (ii) Cover or wet excavated material to prevent dusts.	DMB and O&M Contractors	Complaints from sensitive receptors
Occupational Health and Safety	Adverse impacts on the appearance of surrounding environment and exposure of workers to hazardous debris	(i) Ensure persons employed will be provided with suitable equipment for cleaning of drain silts; and (ii) Ensure all removed material will be deposited in the municipal waste disposal site	DMB and O&M Contractors	(i) Records of training; and (ii) H & S plan
Economic Development	Impediments to residents and business	(i) Inform all residents and business establishment about the nature and duration of the work well in advance so that they can make preparations if necessary; and (ii) Conduct these works to provide wooden walkways near working sites	DMB and O&M Contractors	Complaints from sensitive receptors
Social and Cultural Resources		(i) Consult the city authorities to identify any buildings at risk from vibration damage and avoiding any use of high vibrating equipment or heavy vehicles in the vicinity; (ii) Complete work in	DMB and O&M Contractors	Complaints from sensitive receptors

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
		sensitive areas quickly; (iii) Consult municipal authorities, custodians of important buildings, cultural and tourism authorities and local communities in advance of the work to identify and address key issues, and avoid working at sensitive times, such as religious and cultural festivals.		

Table 20: Pre-construction Environmental Monitoring Program

Field	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
Legislation, permits and agreements	-As per requirement	PIU, PMU, DMSC	Checking of all permit including tree felling if any Availability of EMP at site	Checking of records and documents	Recorded and documents related to NOC/ permit	Start, continued as per requirement	PMU, DMSC
Technical design of the project	Office, project sites	PIU, DMSC	Checking of technical design – considering sustainability of the project	Checking of records and documents	Design document availability – showing maintenance and protection of the assets and confirmation of state rules	Once, after change of design	PMU, DMSC
Utilities	As per site requirement	DMSC	(i) List of affected utilities if	Checking of records	(i) List of affected utilities and	Once	PMU/PIU/ DMSC

Field	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
			any and operators; (ii) Bid document to Include requirement for a contingency plan for service interruptions		operators prepared; (ii) Requirement for a contingency plan for service interruptions included in bid documents		
Construction work camps, hot mix plants, stockpile areas, storage areas, and disposal areas.	As per site requirement	DMSC to determine locations prior to award of construction contracts.	List of selected location for construction work camps, hot mix plants, stockpile areas, storage areas, and disposal areas.	Checking of records	List of selected sites for construction work camps, hot mix plants, stockpile areas, storage areas, and disposal areas provided to construction contractors prior to commencement of works.	Once	PMU/PIU/DMSC
Sources of Materials	As per site requirement	DMSC to prepare list of approved quarry sites and sources of materials	(i) List of approved quarry sites and sources of materials; (ii) Bid document to include requirement for verification of suitability of	Checking of records	(i) List of approved quarry sites and sources of materials provided to construction contractors (ii) Bid document included	Once	PMU/PIU/DMSC

Field	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
			sources and permit for additional quarry sites if necessary		requirement for verification of suitability of sources and permit for additional quarry sites if necessary.		
Disposal sites of dredge and solid wastes	As per site requirement	DMSC to ensure sites are agreed with local officials and in locations which are away from sensitive receptors.	(i) Identify agreed sites with local officials to dispose of dredge	Confirmation of site and checking records	Sites are agreed with local officials and in locations which are away from sensitive receptors.	Once	PMU/PIU/DMSC
Orientation training program for implementation of EMP by contractor	Working location	DMSC	(i) Checking whether contractor gain knowledge after training-through question answer season	Confirmation of training program	Supply of materials related to EMP application and training record	Before starting of the physical activity and continued till completion of work	PMU/PIU/DMSC

DMSC = Design, Management and Supervision Management Consultant, O&M = operation and maintenance, PMU = Project Management Unit; PIU = Project Implementation Unit

Table 21: Construction Environmental Monitoring Program

Field	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
Sources of Materials	Quarries and sources of materials	Construction Contractor	Construction Contractor documentation	(i) Checking of records; (ii) visual inspection of sites	(i) Sites are permitted; (ii) Report submitted by construction contractor monthly (until such time there is excavation work)	Monthly submission for construction contractor As needed for DMSC	DMSC
Air Quality	Construction sites and areas designated for stockpiling of materials	Construction Contractor	(i) Location of stockpiles; (ii) complaints from sensitive receptors; (iii) heavy equipment and machinery with air pollution control devices	(i) Checking of records; (ii) visual inspection of sites	(i) Stockpiles on designated areas only; (ii) complaints from sensitive receptors satisfactorily addressed; (iii) air pollution control devices working properly	Monthly for checking records	DMSC in coordination with Pollution Control Board
Surface Water Quality	(i) Construction sites; (ii) areas for stockpiles, storage of fuels and lubricants and waste materials;	Construction Contractor	(i) Areas for stockpiles, storage of fuels and lubricants and waste materials; (ii) number of silt traps installed along drainages leading to water bodies; (iii) records of surface water quality inspection; (iv) effectiveness of water management measures	visual inspection	(i) Designated areas only; (ii) silt traps installed and functioning; (iii) no noticeable increase in suspended solids and silt from construction activities	Monthly	DMSC in coordination with Pollution Control Board

Field	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
Noise Levels	(i) Construction sites; (ii) areas for stockpiles, storage of fuels and lubricants and waste materials; (iii) work camps	Construction Contractor	(i) Complaints from sensitive receptors; (ii) use of silencers in noise-producing equipment and sound barriers	(i) Checking of records; (ii) visual inspection	(i) Complaints from sensitive receptors satisfactorily addressed; (ii) silencers in noise-producing equipment functioning as design; and (iii) sound barriers installed where necessary	Monthly	DMSC in coordination with Pollution Control Board
Existing Utilities and Infrastructure	Construction sites	Construction Contractor	(i) Existing Utilities Contingency Plan	(i) Checking of records; (ii) visual inspection	Implementation according to Utilities Contingency Plan	As needed	DMSC
Landscape and Aesthetics	(i) Construction sites; (ii) areas for stockpiles, storage of fuels and lubricants and waste materials; (iii) work camps	Construction Contractor	(i) Waste Management List; (ii) complaints from sensitive receptors; (iii) PMU/PIU/DMSC to report in writing that the necessary environmental restoration work has been adequately performed before acceptance of work.	(i) Checking of records; (ii) visual inspection	(i) No accumulation of solid wastes on-site; (ii) implementation of Waste Management Plan; (iii) complaints from sensitive receptors satisfactorily addressed.	Monthly	DMSC
Accessibility	(i) Construction sites; (ii) traffic haul road	Construction Contractor	(i) Traffic Management Strategy; (ii) complaints from	Visual inspection	(i) Implementation of Traffic Management	Monthly	DMSC

Field	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
			sensitive receptors; (iii) number of signages placed at subproject location.		Strategy, if required; (ii) complaints from sensitive receptors satisfactorily addressed; (iii) signages visible and located in designated areas		
Socio-Economic - Income	Construction sites	Construction Contractor	(i) Employment records; (ii) records of sources of materials	Visual inspection	(i) Complaints from sensitive receptors satisfactorily addressed; (ii) walkways, ramps, and metal sheets provided; and (iii) signages visible and located in designated areas	Quarterly	DMSC
Socio-Economic - employment	Construction sites	Construction Contractor	i) Employment records; (ii) records of sources of materials	Checking of records	Number of employees from Dibrugarh equal or greater than 50% of total workforce	Quarterly	DMSC
Occupational Health and Safety	construction sites	Construction Contractor	(i) Site-specific Health and Safety (H&S) Plan; (ii) Equipped first-aid stations; (iii) Medical insurance coverage for workers; (iv) Number of accidents;	(i) Checking of records; (ii) visual inspection	(i) Implementation of H&S plan; (ii) number of work-related accidents; (iii) % usage of personal protective equipment; (iv) number of first-aid stations, frequency of potable water delivery, provision	Quarterly	DMSC

Field	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
			(v) Supplies of potable drinking water; (vi) Clean eating areas where workers are not exposed to hazardous or noxious substances; (vii) record of H&S orientation trainings (viii) personal protective equipment; (ix) % of moving equipment outfitted with audible back-up alarms; (x) sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal.		of clean eating area, and number of sign boards are according to approved plan; and (v) % of moving equipment outfitted with audible back-up alarms		
Community Health and Safety	Construction sites	Construction Contractor	(i) Traffic Management strategy ; (ii) complaints from sensitive receptors	Visual inspection	(i) Implementation of Traffic Management strategy; (ii) complaints from sensitive receptors	Quarterly	DMSC

Field	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
					satisfactorily addressed		
Work Camps	Work camps	Construction Contractor	(i) Complaints from sensitive receptors; (ii) water and sanitation facilities for employees; and (iii) PMU/PIU/DMSC report in writing that the camp has been vacated and restored to pre-project conditions	Visual inspection	(i) Designated areas only; (ii) complaints from sensitive receptors satisfactorily addressed	Quarterly	DMSC

BOD = biological oxygen demand, DMSC = Design, Management and Supervision Management Consultant, H&S = health and safety, RPM = respirable particulate matter, GOI= Government of India, SPM = suspended particulate matter; PMU = Project Management Unit; PIU = Project Implementation Unit

Table 22: Operation and Maintenance Environmental Monitoring Program

Field	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
Occupational Health and Safety	Subproject location	DMB and O&M Contractors	Complaints from sensitive receptors	(i) Records of training; (ii) H&S Plan approved by DMB	Complaints from sensitive receptors satisfactorily addressed	As needed	PMU
General Maintenance	Subproject location	DMB and O&M Contractors	Complaints from sensitive receptors	(i) Records of training; (ii) H&S Plan approved by DMB	Complaints from sensitive receptors satisfactorily addressed	As needed	PMU

Field	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
Community Health & safety	Subproject location	DMB and O&M Contractors	Complaints from sensitive receptors	(i) Records of training; (ii) H&S Plan approved by DMB	Complaints from sensitive receptors satisfactorily addressed	As needed	PMU

O&M = operation and maintenance, DMB = Dibrugarh Municipal Board, PMU = Project Management Unit

C. Environmental Management Plan Costs

141. **Design**. The subproject is assessed to have no as such design or location impacts. However, there will be requirement for plantation of trees against tree cutting (about 75 nos.). Tree plantation cost is included in project cost.

142. **Construction**. The Contractor's cost for site establishment, preliminary activities, construction, and defect liability activities will be incorporated into the contractual agreements, which will be binding on him for implementation. The air quality, water quality and noise level monitoring of construction and defect liability phases will be conducted by the contractor.

143. The activities identified in environmental monitoring program mainly includes site inspections and informal discussions with workers and local people and this will be the responsibility of PMU with the assistance of DMSC, costs of which are part of project management.

144. **Operation**. The operational phase mitigation measures will be the responsibility of DMB operation agency, and include standard operating practices. No additional costs operating costs for monitoring are envisioned.

145. The costs of these various inputs are shown in **Table 23**.

Table 23: Indicative Cost for EMP Implementation

Component	Description	Number	Cost per Unit (₹)	Cost (₹)	Source of Funds
Legislation, Permits and Agreements	Consent to Establish and Consent to Operate for plants and machinery of the contractor.	As required	Not Applicable	Not Applicable	These consents are to be obtained by contractor on his own cost.
Tree plantation	Compensatory plantation	About 225 trees	600/-	1,35,000.00	Project Management cost/ PMU
Public consultations and information disclosure during implementation	Information disclosure and consultations during preconstruction and construction phase.	As required	Lump sum	80,000.00	By contractor
Providing access to commercial establishments and properties.	Providing access, in case of access disruptions, to affected properties.	As required	Contractor's liability	Not applicable	Covered in Engineering cost
Dust Suppression at subproject sites	Application of dust suppression measures during construction phase.	As required	Lump sum	90,000.00	By contractor

Component	Description	Number	Cost per Unit (₹)	Cost (₹)	Source of Funds
Protection measures against noise pollution	Construction of noise walls (as per requirement)	As required	Lump sum	50,000.00	By contractor
Traffic management	Safety Signboards, delineators, traffic regulation equipment, flagman, temporary diversions, etc	Wherever required	Not applicable	Not applicable	Covered in engineering cost Covered under engineering design
Air- Construction phase	Once before start of construction works at 6 sites as identified by DMSC. Continued semiannually for 3 years	36	7,000 per sample	2,52,000.00	By contractor
Noise- Construction phase	Once before start of construction works at 6 sites as identified by DMSC. Continued semiannually for 3 years	42	1,000 per sample	42,000.00	By contractor
Testing of sludge/silt before disposal	Testing in respect to physic chemical analysis [7] for at least 15 locations – once before disposal	15	10,000.00 per sample	1,50,000.00	By contractor
Water- Construction phase	Once before start of construction works at 4 sites as identified by DMSC. Continued semiannually for 3 years	24	8,000 per sample	1,92,000.00	By contractor
Total				**9,91,000.00**	

IX. FINDINGS & RECOMMENDATIONS

146. The IEE process described in the earlier sections of this report assessed the environmental impacts of all components proposed under the subproject. Potential negative impacts were identified related to design, location, construction and operation of the subproject. Negative impacts due to the design, location and operation and maintenance are assessed to be minimal.

[7] Parameters: pH, EC, texture, lead, copper, nickel, chromium, arsenic, cadmium, mercury etc.

147. The potential adverse environmental impacts are mainly related to the construction period, which can be minimized by the proposed mitigation measures and environmentally sound engineering and construction practices. Mitigation measures have been developed to reduce all negative impacts to acceptable levels. The recommended contract clauses for the construction contractors are attached as **Appendix 9**.

148. As stated above, most impacts are due to construction; this is because construction work is to be carried out within the town. The important impacts identified are dust and noise generation from construction activities; impacts due to disposal of large quantities of construction waste; disturbance and inconvenience to local people due to excavation of trenches along the road; impacts on roadside hawkers and vendors; public safety; interference; and damage to other infrastructure facilities.

149. These impacts are mostly temporary in nature and can be effectively avoided or mitigated by observing appropriate mitigation measure as defined in the EMP. The mitigation measures includes following the existing alignment of drains along roads, scheduling appropriately and working section-wise, wetting of soil and construction area to reduce the dust; immediate transport of excess soil; beneficial use of dredged drain silts; scheduling of activities to reduce noise impacts; special precaution near sensitive areas like schools and hospitals; and traffic diversions and public information to reduce the impact. Proper safety measures during construction activities to ensure worker as well public safety.

X. CONCLUSIONS

150. All components proposed under this subproject involve straightforward construction and simple operation. No significant environmental impacts are anticipated. In most cases, environmental issues identified are typical for the type of construction components, and a range of proven mitigation strategies exist to address them, and are outlined in the EMP.

151. This IEE has assessed all potential environmental impacts associated with the subproject. There are no impacts that are significant or complex in nature or which need an in-depth study to assess the impact or to develop the mitigation measures. The environmental impacts identified are manageable, and PMU and PIU will implement the mitigation measures as stated in the EMP. The subproject, therefore, does not warrant further environmental study. Based on the findings of the IEE, it can be seen that no adverse or harmful impacts of any significance are expected and so a full scale EIA is not required. The subproject is confirmed to be Category B consistent with ADB's Safeguard Policy Statement (2009) and an IEE is determined to be a sufficient level of environmental examination.

APPENDIX 1: CENTRAL POLLUTION CONTROL BOARD (CPCB) APPLICABLE ENVIRONMENTAL STANDARDS

General Standards for Discharge of Environmental Pollutants: Effluents

S. No.	Parameter	Standards			
		Inland surface water	**Public sewers**	**Land of irrigation**	**Marine/coastal areas**
		(a)	(b)	(c)	(d)
1.	Colour and odour	remove as far as practicable			
2.	Suspended solids mg/l. max.	100	600	200	(a) For process waste water100 (b) For cooling water effluent 10% above total suspended matter of influent.
3.	Particle size of suspended solids	shall pass 850 micron IS Sieve			(a)Floatable solids, max. 3mm. (b)Settable solids (max 850 micron)
4.	pH value	5.5. to 9.0	5.5 to 9.0	5.5 to 9.0	5.5 to 9.0
5.	Temperature	shall not exceed 5^0C above the receiving water temperature			shall not exceed 5^0C above the receiving water temperature
6.	Oil and grease, mg./l, max.	10	20	10	20
7.	Total residual chlorine, mg/l. max.	1.0			1.0
8.	Ammonical nitrogen (as N.) mg/l max	50	50		50
9.	Total Kjeldahl Nitrogen (as NH_3) mg/l. max	100			100
10.	Free ammonia (as NH_3), mg/l.max	5.0			5.0
11.	Biochemical oxygen demand (3 days at 27^0C), mg/l. max.	30	350	100	100
12.	Chemical oxygen demand, mg/l, max.	250			250

S. No.	Parameter	Standards			
		Inland surface water	**Public sewers**	**Land of irrigation**	**Marine/coastal areas**
13.	Arsenic (as As) mg/l, max.	0.2	0.2	0.2	0.2
14.	Mercury (As Hg), mg/l, max.	0.01	0.01		0.01
15.	Lead (as Pb) mg/l, max	0.1	1.0		2.0
16.	Cadmium (as Cd) mg/l. max	2.0	1.0		2.0
17.	Hexavalent chromium (as Cr. +6). mg/l, max	0.1	2.0		1.0
18.	Total Chromium (as Cr) mg/l, max	2.0	2.0		2.0
19.	Copper (as Cu) mg/l, max	3.0	3.0		3.0
20.	Zinc (as Zn) mg/l, max	5.0	15		15
21.	Selenium (as Se) mg/l, max	0.05	0.05		0.05
22.	Nickel (as Ni) mg/l, max	3.0	3.0		5.0
23.	Cyanide (as CN) mg/l, max	0.2	2.0	0.2	0.2
24.	Fluoride (as F) mg/l, max	2.0	15		15
25.	Dissolved phosphates (as P) mg/l, max	5.0			
26.	Sulfide (as S) mg/l, max	2.0			5.0
27.	Phenolic compounds (as C_6H_5OH) mg/l, max	1.0	5.0		5.0

S. No.	Parameter	Standards			
		Inland surface water	**Public sewers**	**Land of irrigation**	**Marine/coastal areas**
28.	Radioactive materials: (a) Alfa emitters microcurie/ml, max. (b)Beta emitters micro curie/ml, max.	10^{-7} 10^{-6}	10^{-7} 10^{-6}	10^{-8} 10^{-7}	10^{-7} 10^{-6}
29.	Bio-assay test	90% Survival of fish after 96 hours in 100% effluent	90% survival of fish after 96 hours in 100% effluent	90% survival of fish after 96 hours in 100% effluent	90% survival of fish after 96 hours in 100% effluent
30.	Manganese (as Mn)	2 mg/l	2 mg/l		2 mg/l
31.	Iron (as Fe)	3 mg/l	3 mg/l		3 mg/l
32.	Vanadium (as V)	0.2 mg/l	0.2 mg/l		0.2 mg/l
33.	Nitrate Nitrogen	10 mg/l			20 mg/l

These standards shall be applicable for industries, operations or process other than those industries operations or process for which standards have been specified in schedule of the Environment Protection Rules, 1989

CPCB Primary Water Quality Criteria

Designated-Best-Use	Class of Water	Criteria
Drinking Water Source without conventional treatment but after disinfection	**A**	❖ Total Coliform Organisms: MPN # 50 per 100Ml ❖ 6.5 # pH # 8.5 ❖ Dissolved Oxygen: ∃6 mg/L ❖ Biochemical Oxygen Demand (5 days @ 20°C): # 2 mg/L
Outdoor bathing (organized)	**B**	❖ Total Coliform Organisms: MPN # 500 per 100mL ❖ 6.5 # pH # 8.5 ❖ Dissolved Oxygen: ∃5 mg/L ❖ Biochemical Oxygen Demand (5 days @ 20°C): # 3 mg/L
Drinking water sources after conventional treatment and disinfection	**C**	❖ Total Coliform Organisms: MPN # 5000 per 100mL ❖ 6 # pH # 9 ❖ Dissolved Oxygen: ∃4 mg/L ❖ Biochemical Oxygen Demand (5 days @ 20°C): # 3 mg/L
Propagation of wildlife and fisheries	**D**	❖ 6.5 # pH # 8.5 ❖ Dissolved Oxygen: ∃4 mg/L

Designated-Best-Use	Class of Water	Criteria
		❖ Free ammonia (as N): # 1.2 mg/L
Irrigation, industrial cooling, controlled waste disposal	**E**	❖ # pH # 8.5 ❖ Electrical conductivity at 25°C: #2250 micro mhos/cm ❖ Sodium absorption ratio: Max 26 ❖ Boron: Max 2 mg/L

Indian Standards for Drinking Water - Specification (BIS 10500: 2012)

S. No	Substance or Characteristic	Requirement (Desirable Limit)	Permissible Limit in the absence of Alternate source
Essential characteristics			
1.	Colour, (Hazen units, Max)	5	25
2.	Odour	Unobjectonable	Unobjectionable
3.	Taste	Agreeable	Agreeable
4.	Turbidity (NTU, Max)	5	10
5.	pH Value	6.5 to 8.5	No Relaxation
6.	Total Hardness (as $CaCo_3$) mg/L., Max	300	600
7.	Iron (as Fe) mg/L, Max	0.3	1.0
8.	Chlorides (as Cl) mg/L, Max.	250	1000
9.	Residual, free chlorine, mg/L, Min	0.2	--
Desirable Characteristics			
10.	Dissolved solids mg/L, Max	500	2000
11.	Calcium (as Ca) mg/L, Max	75	200
12.	Magnesium (as Mg)mg/L, Max.	30	100
13.	Copper (as Cu) mg/L, Max	0.05	1.5
14.	Manganese (as Mn)mg/L ,Max	0.10	0.3
15.	Sulfate (as SO_4) mg/L, Max	200	400
16.	Nitrate (as NO_3) mg/L, Max	45	100
17.	Fluoride (as F) mg/L, Max	1.0	1.5
18.	Phenolic Compounds (as C_6H_5OH) mg/L, Max.	0.001	0.002
19.	Mercury (as Hg)mg/L, Max	0.001	No relaxation
20.	Cadmiun (as Cd)mg/L, Max	0.01	No relaxation
21.	Selenium (as Se)mg/L,Max	0.01	No relaxation
22.	Arsenic (as As) mg/L, Max	0.05	No relaxation
23.	Cyanide (as CN) mg/L, Max	0.05	No relaxation
24.	Lead (as Pb) mg/L, Max	0.05	No relaxation
25.	Zinc (as Zn) mg/L, Max	5	15
26.	Anionic detergents (as MBAS) mg/L, Max	0.2	1.0
27.	Chromium (as Cr^{6+}) mg/L, Max	0.05	No relaxation
28.	Polynuclear aromatic hydro carbons	--	--

S. No	Substance or Characteristic	Requirement (Desirable Limit)	Permissible Limit in the absence of Alternate source
	(as PAH) g/lit, Max		
29.	Mineral Oil mg/L, Max	0.01	0.03
30.	Pesticides mg/l, Max	Absent	0.001
31	Radioactive Materials		
	i. Alpha emitters Bq/l, Max	--	0.1
	ii. Beta emitters pci/l,Max	--	1.0
32	Alkalinity mg/L. Max	200	600
33	Aluminium (as Al) mg/l,Max	0.03	0.2
34	Boron mg/L, Max	1	5

Ambient Air Quality Standards

Pollutant	Time Weighted Average	Industrial, Residential, Rural and Other Areas	Sensitive Area (Notified by Central Govt.)	Method of Measurement
Sulphur Dioxide (SO_2)	Annual Average * 24 hours Average**	50 µg / m^3 80 µg/m^3	20 µg / m^3 80 µg/m^3	• Improved West & Gaeke method • Ultraviolet Fluorescence
Oxides of Nitrogen (NO_X)	Annual Average * 24 hours Average**	40 µg / m^3 80 µg/m^3	30 µg / m^3 80 µg/m^3	• Jacobs & Hochheiser modified (NaoH – $NaAsO_2$) method • Gas Chemiluminiscence
Particulate Matter (PM_{10}) (Size <10 µm)	Annual Average * 24 hours Average**	60 µg / m^3 100 µg/m^3	60 µg / m^3 100 µg/m^3	• Gravimetric • TOEM • Beta Attenuation
Particulate Matter ($PM_{2.5}$) (Size <2.5 µm)	Annual Average * 24 hours Average**	40 µg / m^3 60 µg/m^3	40 µg / m^3 60 µg/m^3	• Gravimetric • TOEM • Beta Attenuation
Ozone (O_3)	8 hours average ** 1 hour **	100 µg/m^3 180 µg/m^3	100 µg/m^3 180 µg/m^3	• UV photometric • Chemiluminiscence • Chemical method
Lead (Pb)	Annual Average * 24 hours Average**	0.5 µg / m^3 1.0 µg / m^3	0.5 µg/m^3 1.0 µg/m^3	• AAS method after sampling using EPM 2000 or equivalent filter paper
Carbon Monoxide (CO)	8 hours Average** 1 hour **	2.0 mg/ m^3 4.0 mg/ m^3	2.0 mg/ m^3 4.0 mg/ m^3	• Non Dispersive Infrared Spectroscopy
Ammonia (NH_3)	Annual Average * 24 hours Average**	100 µg / m^3 400 µg / m^3	100 µg / m^3 400 µg / m^3	• Chemiluminiscence • Indophenol blue method

Pollutant	Time Weighted Average	Industrial, Residential, Rural and Other Areas	Sensitive Area (Notified by Central Govt.)	Method of Measurement
Benzene (C_6H_6)	Annual Average *	5 ng/ m^3	5 ng/ m^3	• Gas Chromatography continuous analyzer • Adsorption & desorption followed by GC analysis
Benzo(o)pyrene particulate phase only	Annual Average *	1 ng/ m^3	1 ng/ m^3	• Solvent extraction followed by GC/HPLC analysis
Arsenic (As)	Annual Average *	6 ng/ m^3	6 ng/ m^3	• AAS/ICP method after sampling using EPM 2000 or equivalent filter paper
Nickel (Ni)	Annual Average *	20 ng/ m^3	20 ng/ m^3	• AAS/ICP method after sampling using EPM 2000 or equivalent filter paper

(**Source**: Central Pollution Control Board, New Delhi, Notification dated 18th November 2009)

Notes:

1. ** Indicate Annual Arithmetic Mean of Minimum 104 measurement in a year measured twice a week, 24 hourly at uniform intervals*
2. *** 24 hourly / 8 hourly/1 hourly values should be met 98% of the time in a year. However, 2% of the time, it may exceed by not on two consecutive days*

Standards for Diesel Generator Sets: Stack Height

The minimum height of stack to be provided with each generator set can be worked out using the following formula:
H = h+0.2x ÖKVA
H = Total height of stack in metre
h = Height of the building in metres where the generator set is installed
KVA = Total generator capacity of the set in KVA
Based on the above formula the minimum stack height to be provided with different range of generator sets may be categorized as follows:

For Generator Sets	Total Height of stack in metre
50 KVA	Ht. of the building + 1.5 metre
50-100 KVA	Ht. of the building + 2.0 metre
100-150 KVA	Ht. of the building + 2.5 metre
150-200 KVA	Ht. of the building + 3.0 metre
200-250 KVA	Ht. of the building + 3.5 metre
250-300 KVA	Ht. of the building + 3.5 metre

Similarly, for higher KVA ratings a stack height can be worked out using the above formula.

Noise Standards

Noise limits for domestic appliances and construction equipment at the manufacturing stage in dB(A).

Window air conditioners of 1 -1.5 tonne	68
Air coolers	60
Refrigerators	46
Diesel generator for domestic purposes	85
Compactors (rollers), front loaders, concentrate mixers, cranes (movable), vibrators and saws	75

National Ambient Noise Standards
The Noise Pollution (Regulation and Control) Rules, 2000

Area Code	Category of Area	Limit 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 zone	50	40

Note-1 Day time is reckoned in between 6 a.m. and 10 p.m.

Note-2 Night time is reckoned in between 10 p.m. and 6 a.m.

Note-3 Silence zone is an area comprising not less than 100 m around hospitals, educational institutions, courts, religious places or any other area which is declared as such by the competent authority

Note-4 Mixed categories of areas may be declared as one of the four above mentioned categories by the competent authority.

* dB(A) Leq denotes the time weighted average of the level of sound in decibels on scale A which is relatable to human hearing.

A “decibel” is a unit in which noise is measured.

“A”, in dB(A) Leq, denotes the frequency weighting in the measurement of noise and corresponds to frequency response characteristics of the human ear.

Leq: It is an energy mean of the noise level over a specified period.

APPENDIX 2: PHOTO ILLUSTRATION

Non existing drain – AMC road

Road side vendors along the drain (Mancota Road)

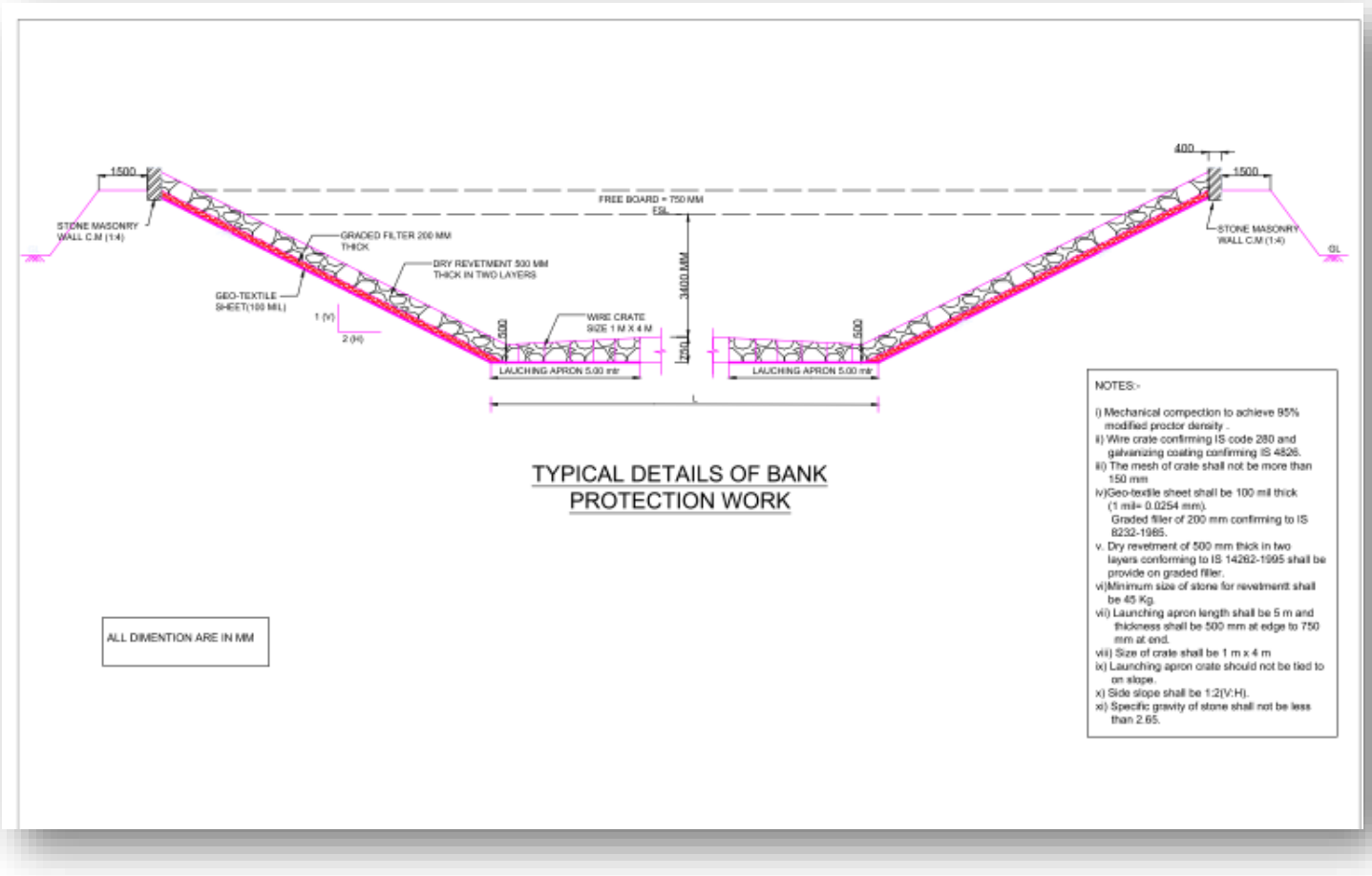
Road side vendors and status of drain at Mancota Road

Temporary shop in the drain (AMC road)

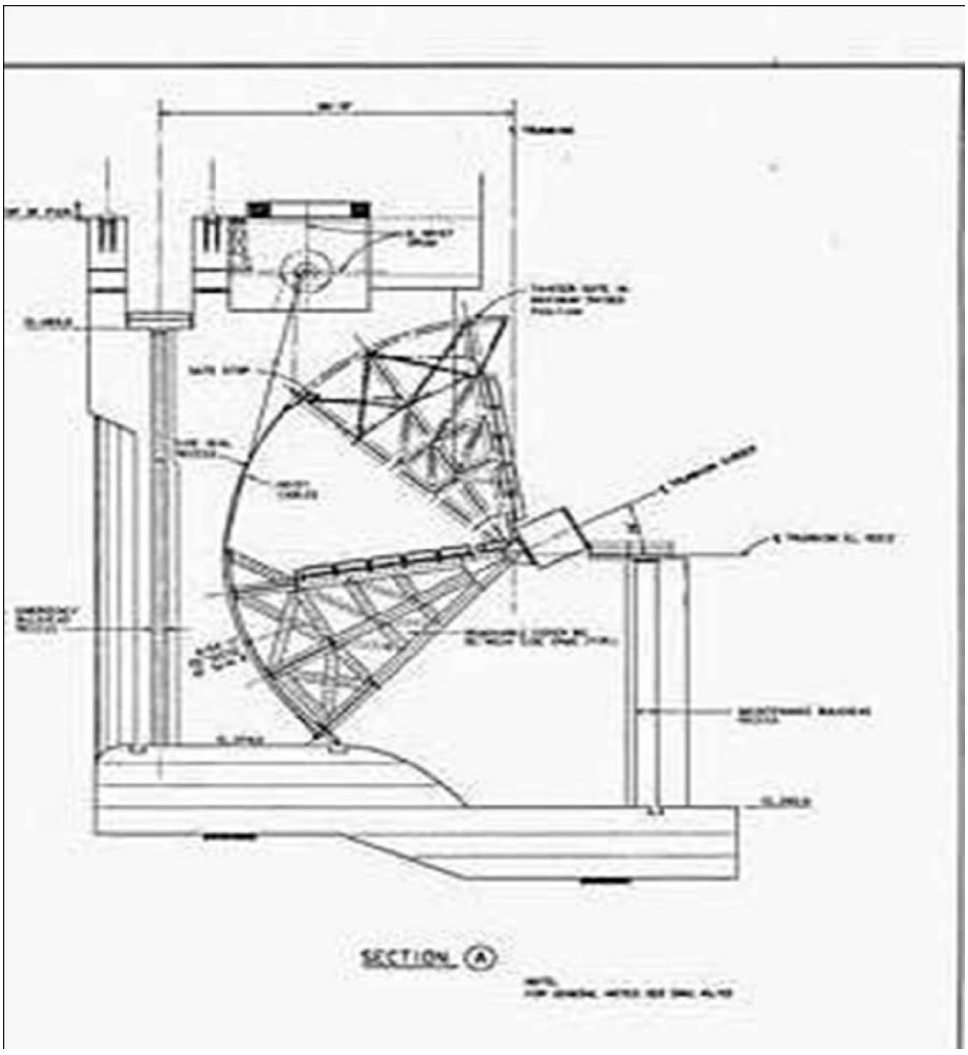
Non Existing Drain – Polo ground to 1080 chainage

Boundary wall along the drain – Chiring Chapori Road

APPENDIX 3: DESIGN DRAWING OF DRAIN AND SLUICE GATE



Cross Section of Drain



Radial Sluice Gate Arrangement

Vertical Sluice Gate Arrangement

APPENDIX 4: RAPID ENVIRONMENTAL ASSESSMENT (REA) CHECKLIST

Screening Questions	Yes	No	Remarks
a. Project siting Is the project area			
▪ Densely populated?	✓		Built-up area in Guwahati accounts for about 50% of the land. The project will cover South Guwahati's East Zone (total area of 71 km^2) which has a 0.202 million population in 2001 and projected population of 0.64 million by 2040. This translates to a population density of 2,845 inhabitants per square kilometer in 2001. Dibrugarh is an emerging town and population distribution shows DMB area is densely populated. According to the 2011 census Dibrugarh has a population of 1,327,748 and a population density of 393 inhabitants per square kilometer.
▪ Heavy with development activities?		✓	Guwahati is predominantly residential, commercial, and public and semi-public areas as per the Land Use Zoning Plan 2025 of GMDA. Dibrugarh has tea processing industries, rice, saw mills and other light manufacturing industries.
▪ Adjacent to or within any environmentally sensitive areas?		✓	
• Cultural heritage site		✓	
• Protected area		✓	
• Wetland		✓	
• Mangrove		✓	
• Estuarine		✓	
• Buffer zone of protected area		✓	
b. Potential environmental impacts will the project cause…			
• Encroachment on historical/cultural areas; disfiguration of landscape by road embankments, cuts, fills, and quarries?		✓	Not applicable.
• Encroachment on precious ecology (e.g. sensitive or protected areas)?		✓	Not applicable.
• Alteration of surface water hydrology of waterways crossed by roads, resulting in increased sediment in streams affected by increased soil erosion at construction site?		✓	Not anticipated.
• Deterioration of surface water quality due to silt runoff and sanitary wastes from worker-based camps and chemicals used in construction?	✓		Run-off during construction will be more. Anticipated during construction activities. The impacts are negative but temporary, short-term, site-specific and not significant within a relatively small area and reversible through mitigation measures specified in the EMP. Construction contractors will be prohibited from stockpiling loose materials along drain channels and will be required to immediately dispose any waste materials.
• Increased local air pollution due to rock crushing, cutting and filling works, and chemicals from asphalt processing?	✓		Anticipated during construction activities. The impacts are negative but temporary, short-term, site-specific and not significant within a relatively small area and reversible through mitigation measures specified in the EMP. Construction contractors will be prohibited from stockpiling loose materials along drain channels and will be required to immediately dispose any waste materials.

Screening Questions	Yes	No	Remarks
• Risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and radiological hazards during project construction and operation during project construction and operation?		✓	Not applicable. Construction will not involve use explosives and chemicals. Excavation will be done manually. Construction contractors will be required to implement health and safety (H&S) plan.
• Noise and vibration due to blasting and other civil works?	✓		Blasting activities is not anticipated. However, noise due to other civil works is anticipated during construction activities. The impacts are negative but temporary, short-term, site-specific and not significant within a relatively small area and reversible through mitigation measures specified in the EMP.
• Dislocation or involuntary resettlement of people?		✓	Dislocation is not anticipated. However, during pipe-laying work, temporary economic displacement is anticipated. An RP has been prepared to mitigate these temporary impacts.
• Dislocation and compulsory resettlement of people living in right-of-way?		✓	Dislocation is not anticipated. However, during pipe-laying work, temporary economic displacement is anticipated. An RP has been prepared to mitigate these temporary impacts.
• Disproportionate impacts on the poor, women and children, indigenous peoples or other vulnerable groups?		✓	Not applicable. The subproject will not affect indigenous peoples or other vulnerable group. The subproject will be beneficial to women and children as flooding will be reduced resulting to reduction of household healthcare cost, person-days lost, and temporary resettlement due to flooding and water logging problems.
• Other social concerns relating to inconveniences in living conditions in the project areas that may trigger cases of upper respiratory problems and stress?		✓	Not applicable.
• Hazardous driving conditions where construction interferes with pre-existing roads?	✓		Construction contractors will be required to implement traffic management plan and coordinate with local authority.
• Poor sanitation and solid waste disposal in construction camps and work sites, and possible transmission of communicable diseases (such as STI and HIV/AIDS) from workers to local populations?		✓	Construction contractors will be required to provide sanitation facilities and ensure proper waste management at all times. Contracts will include provisions on STI and HIV/AIDS.
• Creation of temporary breeding habitats for diseases such as those transmitted by mosquitoes and rodents?		✓	Construction contractors will be required to ensure cleanliness at all times to prevent breeding of mosquitoes and rodents.
• Accident risks associated with increased vehicular traffic, leading to accidental spills of toxic materials?		✓	Not applicable.
• Increased noise and air pollution resulting from traffic volume?		✓	Not anticipated. For noise and dust coming from construction activities, these impacts are temporary and short in duration. The EMP ensures measures are included to mitigate the impacts. Construction contractors will be required to coordinate with the local traffic police.
• Increased risk of water pollution from oil, grease and fuel spills, and other materials from vehicles using the road?		✓	Not anticipated.
• Social conflicts if workers from other regions or countries are hired?		✓	Priority in employment will be given to local residents.
• Large population influx during project construction and operation that causes		✓	Improved management systems through capacity building and institutional development will ensure

Screening Questions	Yes	No	Remarks
increased burden on social infrastructure and services (such as water supply and sanitation systems)?			reduced burden on services and infrastructure. Construction contractors will be required to provide workers camp with water supply and sanitation. DMB will provide manpower to operate the improved system.
• Risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during operation and construction?		✓	Not applicable. Construction will not involve use of explosives and chemicals.
• Community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could results in injury to the community throughout project construction, operation and decommissioning?		✓	Operational area will be clearly demarcated and access will be controlled. Only worker and project concerned members will be allowed to visit the operational sites.

Climate change and disaster risk questions The following questions are not for environmental categorization. They are included in this checklist to help identify potential climate and disaster risks	**Yes**	**No**	**Remarks**
▪ Is the Project area subject to hazards such as earthquakes, floods, landslides, tropical cyclone winds, storm surges, tsunami or volcanic eruptions and climate changes ?	✓		Project location may experience flooding during high rain season.
▪ Could changes in temperature, precipitation, or extreme events patterns over the Project lifespan affect technical or financial sustainability (e.g., changes in rainfall patterns disrupt reliability of water supply; sea level rise creates salinity intrusion into proposed water supply source)?		✓	No
▪ Are there any demographic or socio-economic aspects of the project area that are already vulnerable (e.g. high incidence of marginalized populations, rural-urban migrants, illegal settlements, ethnic minorities, women or children)?		✓	No
▪ Could the project potentially increase the climate or disaster vulnerability of the surrounding area (e.g., by using water from a vulnerable source that is relied upon by many user groups, or encouraging settlement in earthquake zones)?		✓	No

APPENDIX 5: GENERATION OF SILTS/DRAINAGE SLUDGE FOR DISPOSAL

A. DRAIN ZONE-I

Sl No.	Location Of Proposed Drain	Length (M)	Chainage (m)		Distance	Width of drain		Quantity in cum	Remarks
			From	To		Existing	Depth		
1	AMC Road Drain	900	0	900	900	1	0	0	No silt
2	Seujpur Road Drain	335	0	335	335	1.8	0	0	No silt
3	K.G. Gogoi Path Drain	850	0	379	379	1.2	0.2	90.96	–
			379	850	471	1.2	0.2	113.04	
4	Polo Ground to Ch-1080	549	0	549	549	1.2	0.2	131.76	–
5	Red Cross Road Drain	357	0	115	115	1	0.2	23	–
			115	357	242	1	0.2	48.4	
6	Jail Road Drain	475	0	229	229	1.1	0.1	25.19	–
			229	478	249	1.1	0.1	27.39	
7	Police Reserve-I Drain	158	0	158	158	0	0	0	No Drain
8	Police Reserve-II Drain	166	0	166	166	0	0	0	No Drain
9	Police Reserve-III Drain	20	0	20	20	0	0	0	No Drain
10	K.C.Gogoi Path to Jail Road Drain	500	0	338	338	1.3	0.3	131.82	–
			338	500	162	1.5	0.3	72.9	
11	Bor Pukhuri Road Drain	266	0	266	266	0	0	0	no Drain
12	Bor Pukhuri to Police Reserve Road Drain	620	0	169	169	0	0	0	No Drain
			169	253	84	1.2	0.3	30.24	–
			253	390	137	1.2	0.3	49.32	–
			390	620	230	0	0	0	No Drain
13	Horu Pukhuri Road Drain	152	0	152	152	0.5	0.2	15.2	–
14	Jalukpara Road Drain	120	0	120	120	0	0	0	No Drain
15	Kalibari Road Drain	107	0	107	107	0.5	0.2	10.7	–

B. DRAIN ZONE -II

Sl No.	Location Of Proposed Drain	Length (M)	Chainage (m)		Distance	Width of drain		Quantity in cum	Remarks
			From	To		Existing	Depth		
1	Pathan Patti Road Drain	620	0	333	333	0.9	0.3	89.91	–
			333	620	287	0.9	0.3	77.49	
2	Chiring Chapori Road Drain	2340	0	2340	2340	0	0	0	No silt
3	Santipara to Bashbari Road Drain	870	0	357	357	0.9	0.3	96.39	–
			357	870	513	0.9	0.3	138.51	

C. DRAIN ZONE -III

Sl No.	Location Of Proposed Drain	Length (M)	Chainage (m)		Distance	Width of drain		Quantity in cum	Remarks
			From	To		Existing	Depth		
1	Dr. Leela Gogoi Path Drain	660	0	660	660	1.5	0	0	No silt
2	Mancotta Road to Rajabheta Drain	1724	0	1724	1724	2.5	0	0	No silt

Total Silt Quantity **1172.22 Cum**

The Ghoramara, Dibrugarh land fill (Municipal Solid Waste Management and Disposal) site requires some filling for preparation of site for scientific disposal of MSW. The silt, soil etc will serve the purpose as beneficial use of the material and as a filling material only before the site is prepared for actual sanitary land fill and scientific disposal of MSW.

Appendix 6: Semi-Annual Environmental Monitoring Report Format (Dibrugarh Drainage)

XI. INTRODUCTION

- Overall project description and objectives
- Environmental category as per ADB Safeguard Policy Statement, 2009
- Environmental category of each subproject as per national laws and regulations
- Project Safeguards Team

Name	Designation/Office	Email Address	Contact Number	Roles
1. PMU				
2. PIUs				
3. Consultants				

- Overall project and sub-project progress and status
- Description of subprojects (package-wise) and status of implementation (preliminary, detailed design, on-going construction, completed, and/or O&M stage)

Package Number	Components/List of Works	Contract Status (specify if under bidding or contract awarded)	Status of Implementation (Preliminary Design/Detailed Design/On-going Construction/Completed/O&M)[8]	If On-going Construction	
				%Physical Progress	Expected Completion Date

[8] If on-going construction, include %physical progress and expected date of completion

XII. COMPLIANCE STATUS WITH NATIONAL/STATE/LOCAL STATUTORY ENVIRONMENTAL REQUIREMENTS[9]

Package No.	Subproject Name	Statutory Environmental Requirements[10]	Status of Compliance[11]	Validity if obtained	Action Required	Specific Conditions that will require environmental monitoring as per Environment Clearance, Consent/Permit to Establish[12]

XIII. COMPLIANCE STATUS WITH ENVIRONMENTAL LOAN COVENANTS

No. (List schedule and paragraph number of Loan Agreement)	Covenant	Status of Compliance	Action Required

XIV. COMPLIANCE STATUS WITH THE ENVIRONMENTAL MANAGEMENT PLAN (REFER TO EMP TABLES IN APPROVED IEE/S)

- Confirm if IEE/s require contractors to submit site-specific EMP/construction EMPs. If not, describe the methodology of monitoring each package under implementation.

Package-wise IEE Documentation Status

Package Number	Final IEE based on Detailed Design				Site-specific EMP (or Construction EMP) approved by Project Director? (Yes/No)	Remarks
	Not yet due (detailed design not yet completed)	Submitted to ADB (Provide Date of Submission)	Disclosed on project website (Provide Link)	Final IEE provided to Contractor/s (Yes/No)		

[9] All statutory clearance/s, no-objection certificates, permit/s, etc. should be obtained prior to award of contract/s. Attach as appendix all clearance obtained during the reporting period. If already reported, specify in the "remarks" column.

[10] Specify (environmental clearance? Permit/consent to establish? Forest clearance? Etc.)

[11] Specify if obtained, submitted and awaiting approval, application not yet submitted

[12] *Example: Environmental Clearance requires ambient air quality monitoring, Forest Clearance/Tree-cutting Permit requires 2 trees for every tree, etc.*

- For each package, provide name/s and contact details of contractor/s' nodal person/s for environmental safeguards.

Package-wise Contractor/s' Nodal Persons for Environmental Safeguards

Package Name	Contractor	Nodal Person	Email Address	Contact Number

- With reference to approved EMP/site-specific EMP/construction EMP, complete the table below

Summary of Environmental Monitoring Activities (for the Reporting Period)[13]

Impacts (List from IEE)	Mitigation Measures (List from IEE)	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name of Person Who Conducted the Monitoring
Design Phase						
Pre-Construction Phase						
Construction Phase						
Operational Phase						

[13] Attach Laboratory Results and Sampling Map/Locations

Overall Compliance with CEMP/ EMP

No.	Sub-Project Name	EMP/ CEMP Part of Contract Documents (Y/N)	CEMP/ EMP Being Implemented (Y/N)	Status of Implementation (Excellent/ Satisfactory/ Partially Satisfactory/ Below Satisfactory)	Action Proposed and Additional Measures Required

XV. APPROACH AND METHODOLOGY FOR ENVIRONMENTAL MONITORING OF THE PROJECT

- Briefly describe the approach and methodology used for environmental monitoring of each sub-project.

XVI. MONITORING OF ENVIRONMENTAL IMPACTS ON PROJECT SURROUNDINGS (AMBIENT AIR, WATER QUALITY AND NOISE LEVELS)

- Discuss the general condition of surroundings at the project site, with consideration of the following, whichever are applicable:
    - Confirm if any dust was noted to escape the site boundaries and identify dust suppression techniques followed for site/s.
    - Identify if muddy water is escaping site boundaries or if muddy tracks are seen on adjacent roads.
    - Identify type of erosion and sediment control measures installed on site/s, condition of erosion and sediment control measures including if these are intact following heavy rain;
    - Identify designated areas for concrete works, chemical storage, construction materials, and refueling. Attach photographs of each area in the Appendix.
    - Confirm spill kits on site and site procedure for handling emergencies.
    - Identify any chemical stored on site and provide information on storage condition. Attach photograph.
    - Describe management of stockpiles (construction materials, excavated soils, spoils, etc.). Provide photographs.
    - Describe management of solid and liquid wastes on-site (quantity generated, transport, storage and disposal). Provide photographs.
    - Provide information on barricades, signages, and on-site boards. Provide photographs in the Appendix.
    - Indicate if there are any activities being under taken out of working hours and how that is being managed.

- Briefly discuss the basis for environmental parameters monitoring.
- Indicate type of environmental parameters to be monitored and identify the location.
- Indicate the method of monitoring and equipment used.
- Provide monitoring results and an analysis of results in relation to baseline data and statutory requirements.

As a minimum, the results should be presented as per the tables below.

Air Quality Results

Site No.	Date of Testing	Site Location	Parameters (Government Standards)		
			PM10 µg/m3	SO2 µg/m3	NO2 µg/m3

Site No.	Date of Testing	Site Location	Parameters (Monitoring Results)		
			PM10 µg/m3	SO2 µg/m3	NO2 µg/m3

Water Quality Results

Site No.	Date of Sampling	Site Location	Parameters (Government Standards)					
			pH	Conductivity µS/cm	BOD mg/L	TSS mg/L	TN mg/L	TP mg/L

Site No.	Date of Sampling	Site Location	Parameters (Monitoring Results)					
			pH	Conductivity µS/cm	BOD mg/L	TSS mg/L	TN mg/L	TP mg/L

Noise Quality Results

Site No.	Date of Testing	Site Location	LA_{eq} (dBA) (Government Standard)	
			Day Time	Night Time

Site No.	Date of Testing	Site Location	LA_{eq} (dBA) (Monitoring Results)	
			Day Time	Night Time

XVII. GRIEVANCE REDRESS MECHANISM

- Provide information on establishment of grievance redress mechanism and capacity of grievance redress committee to address project-related issues/complaints. Include as appendix Notification of the GRM (town-wise if applicable).

XVIII. COMPLAINTS RECEIVED DURING THE REPORTING PERIOD

- Provide information on number, nature, and resolution of complaints received during reporting period. Attach records as per GRM in the approved IEE. Identify safeguards team member/s involved in the GRM process. Attach minutes of meetings (ensure English translation is provided).

XIX. SUMMARY OF KEY ISSUES AND REMEDIAL ACTIONS

- Summary of follow up time-bound actions to be taken within a set timeframe.

XX. APPENDIXES

- Photos
- Summary of consultations
- Copies of environmental clearances and permits
- Sample of environmental site inspection report
- all supporting documents including **signed** monthly environmental site inspection reports prepared by consultants and/or contractors
- Others

SAMPLE ENVIRONMENTAL SITE INSPECTION REPORT

Project Name
Contract Number

NAME: _____ DATE: _____
TITLE: _____ DMA: _____
LOCATION: _____ GROUP: _____

WEATHER CONDITION:
_____

INITIAL SITE CONDITION: _____

CONCLUDING SITE CONDITION:

Satisfactory _____ Unsatisfactory _____ Incident _____Resolved _____ Unresolved _____

INCIDENT:
Nature of incident:
_____

Intervention Steps:
_____

Incident Issues

Resolution

Project Activity Stage	Survey	
	Design	
	Implementation	
	Pre-Commissioning	
	Guarantee Period	

Inspection

Emissions	Waste Minimization
Air Quality	Reuse and Recycling
Noise pollution	Dust and Litter Control
Hazardous Substances	Trees and Vegetation

Site Restored to Original Condition Yes ☐ No ☐

Signature
_____

Sign off

_____ _____

Name **Name**
Position **Position**

APPENDIX 7: SAMPLE GRIEVANCE REGISTRATION FORM

(To be available in Hindi, Assamese or any other local languages, if any)

The AUIIP 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. Thank you.

Date		**Place of registration**			
Contact Information/Personal Details					
Name		**Gender**	■ **Male** ■ **Female**	**Age**	
Home Address					
Village / Town					
District					
Phone no.					
E-mail					
Complaint/Suggestion/Comment/Question Please provide the details (who, what, where and how) of your grievance below: If included as attachment/note/letter, please tick here:					
How do you want us to reach you for feedback or update on your comment/grievance?					

FOR OFFICIAL USE ONLY

Registered by: (Name of Official registering grievance)	
If ver: ■ **Note/Letter** ■ **E-mail** ■ **Verbal/Telephonic**	
Reviewed by: (Names/Positions of Official(s) reviewing grievance)	
Action Taken:	
Whether Action Taken Disclosed:	■ **Yes** ■ **No**
Means of Disclosure:	

APPENDIX 8: PUBLIC CONSULTATION DETAILS

Location: AMC Road Market **Date: 06.03.14 and 07.03.2014**
No. of people: 28
Profile of the people consulted: Shop owners, locals
Key issues discussed:

A. General		
1.	Number of shops	There are forty nine temporary shops/hawkers/vendor/ stall at A.M.C. Road market. Most of the temporary shops are on top of/along the drain. Livelihood of these shops may be temporarily impacted during construction /widening of secondary drain.
2	Awareness and extent of the project and development components	The temporary shop/ hawkers /vendor /stall owners are aware of the project due to consultations and surveys carried out. They wanted the project to be completed soon. They are ready to shift their temporary shops on the other side of the road during construction time
3	Perceptions and view of the local community on the project–is the project relevant or not?	The people in the project areas agreed on the relevance of the project. They shared that the area gets flooded during the rains, causing nuisance as well as health hazards, and therefore it is necessary to undertake this project.
4	What is the nature of drainage/ solid waste problem in the community at present? What is the view of the people on improving it?	There is no adequate drainage system. The solid wastes are directly disposed into the DTP drain. According to the people, almost 50% of the drainage problem will be solved if the DTP drain is constructed and covered.
5	If it is possible to start construction activity avoiding busy hours of the day.	It was informed that when the contractor is mobilized arrangements will be made to start full-fledged construction activities avoiding the busy working hours so as to cause minimum inconveniences to the general public.
6	Whether they want complaint / suggestion system through Grievance redressal system related to work	They appreciate that it will be helpful if contact number for compliant placed at working locations in local language
B. Environment-related issues:		
7	Labor availability in the project area or requirement of outside labor	The community shared that labor can be locally available if needed.
8	Current water logging and drainage problem, if any.	There is a lot of water logging and overflow of drains during rainy season.
9	Forest and sensitive areas near the project sites	None
10	Movement of wild animals within the village/community	None

Location: Seujpur Road Drain (Paltan Bazar Road drain) **Date: 08.03.2014**
No. of people: 7
Profile of the people consulted: Shop owners

Key issues discussed:

A. General		
1.	Number of shops	There are five residential cum commercial shops and four residential houses will temporarily impacted. These shop owner placed their goods on slab of the drain, some of them are plastered on drain slab and some of them constructed drain foundation, wall and slab on their own cost at Paltan Bazar road drain. During construction period, access to these residential houses and residential cum commercial houses and their facade will temporarily impacted. Livelihood of these shops may be temporarily impacted during construction /widening of secondary drain.
2	Awareness and extent of the project and development components	The temporary shops and households are aware of the project due to consultations and surveys carried out. They wanted the project to be completed soon. They are ready to shift their temporary shops on the other side of the road during construction time
3	Perceptions and view of the local community on the project– is the project relevant or not?	The people in the project areas agreed on the relevance of the project. They shared that the area gets flooded during the rains, causing nuisance as well as health hazards, and therefore it is necessary to undertake this project.
4	What is the nature of drainage/ solid waste problem in the community at present? What is the view of the people on improving it?	There is no adequate drainage system. The solid wastes are directly disposed into the DTP drain. According to the people almost 50% of the drainage problem will be solved if the DTP drain is constructed and covered.
5	If it is possible to start construction activity avoiding busy hours of the day.	It was informed that when the contractor is mobilized arrangements will be made to start full-fledged construction activities avoiding the busy working hours so as to cause minimum inconveniences to the general public.
6	Whether public want complaint / suggestion system through Grievance redressal system related to work	They appreciate that it will be helpful if contact number for complaint placed at working locations in local language
A. **Environment-related issues:**		
7	Labor availability in the project area or requirement of outside labor	The community shared that labor can be locally available if needed.
8	Current water logging and drainage problem, if any.	There is a lot of water logging and overflow of drains during rainy season.
9	Forest and sensitive areas near the project sites	None
10	Movement of wild animals within the village/community	None

Location: Chiring Chapori road drain
No. of people: 15 **Date: 18.03.2014**

Profile of the people consulted: Temporary shop owners

Key issues discussed:

A. General		
1	Number of shops	There are 15 temporary shops/hawkers/vendor/ stall at Chiring Chapori Road. Most of the temporary shops are on top of/along the drain. Livelihood of these shops may be temporarily impacted during
2	Socioeconomic profile of the temporary shop/ hawkers/vendor/stall owners in the community	The temporary shop/hawkers/vendor/stall owners mainly comprise lower-income group shops/ households engaged in small business, and/or wage labor.
3	Awareness and extent of the project and development components	The temporary shop/hawkers/vendor/stall owners are aware of the project due to consultations and surveys carried out.
4	If this proposed work will be able solve the problem of water stagnation in our locality.	The problem of water stagnation will surely be mitigated in Dibrugarh. There is no existence of drain in some portion of Chiring Chapori road.
5	If it is possible to start construction activity avoiding busy hours of the day.	It was informed that when the contractor is mobilized arrangements will be made to start full-fledged construction activities avoiding the busy working hours so as to cause minimum inconveniences to the general public.
6	What is the nature of drinking water problem in the community at present?	There is no water supply and most people are dependent upon tube wells or deep boring for water.
7	Land title status	Some of them are Title holders and some are squatters and running temporary shops on
B. Resettlement and rehabilitation		
8	In case of adverse impacts – what assistance do they expect/should be provided to them by the government?	NA
9	In case of displacement – rehabilitation options? Where will they resettle? Project- supported, or self-relocate? What assistance/support will they require from the project? If opting	NA
C. Environment-related questions		
10	Labor availability in the project area or requirement of outside labor.	The community shared that wage labor is an occupation of some of the households in the community, who can in turn provide the labor
11	Current water logging and drainage problem, if any	There is no proper drainage provision in the area leading to water logging during rainy
12	Forest and sensitive areas near the	None
13	Movement of wild animal/s within the community	None

Location: Mancotta to Rajabheta drain **Date: 20.03.14**
No. of people: 15
Profile of the people consulted: Temporary shop owners

Key issues discussed:

A. General		
1.	Number of shops	There are 20 temporary shops/hawkers/vendor/ stall at Mancotta Road drain. Most of the temporary shops are on top of/along the drain. Livelihood of these shops may be temporarily impacted during construction /widening of
2	Awareness and extent of the project and development components	The temporary shops and households are aware of the project due to consultations and surveys carried out. They wanted the project to be completed soon. They are ready to shift their temporary shops on the other side of the road during construction time
3	Perceptions and view of the local community on the project– is the project relevant or not?	The people in the project areas agreed on the relevance of the project. They shared that the area gets flooded during the rains, causing nuisance as well as health hazards, and therefore it is necessary to undertake this project.
4	What is the nature of drainage/ solid waste problem in the community at present? What is the view of the people on improving it?	There is no adequate drainage system. The solid wastes are directly disposed into the DTP drain. According to the people almost 60% of the drainage problem will be solved if the DTP drain is constructed and covered.
5	If it is possible to start construction activity avoiding busy hours of the day.	It was informed that when the contractor is mobilized arrangements will be made to start full-fledged construction activities avoiding the busy working hours so as to cause minimum inconveniences to the general public.
6	Whether public want complaint / suggestion system through Grievance redressal system related to work	They appreciate that it will be helpful if contact number for complaint placed at working locations in local language
B. Environment-related issues:		
7	Labor availability in the project area or requirement of outside labor	The community shared that labor can be locally available if needed.
8	Current water logging and drainage problem, if any.	There is a lot of water logging and overflow of drains during rainy season.
9	Forest and sensitive areas near the project sites	None
10	Movement of wild animals within the village/community	None

Attendance

ASSAM URBAN INFRASTRUCTURE INVESTMENT PROGRAM

Attendance Sheet of Public Consultation Meeting
Name of the project: Drainage Subproject, Dibrugarh
(.....Secondary Drainage.....)

District Dibrugarh
Block Ward No. 22
Venue AMC Road.
Duration of Discussion 1½ hr
Male 12 Female 1 Total 13
Date 07.03.2014
Time 3:50PM
Total No. of Paticipants

S. No.	Name	Sex	Age	Profession 1. Service 2. Business 3. Agriculture 4. Labour 5. Not working 6. Any other	Social Category 1.SC 2.ST 3 OBC 4.Gen 5 Any Other	Signature
1	Umar Ali	M	16	2	4	Umar Ali
2	Toramoni Das	M	45	2	4	
3	Uma Devnath	F	35	2	4	
4	Sudip Devnath	M	20	2	3	Sudip Debnath
5	Sanjay Kr. Gupta	M	25	2	3	
6	Biswajit Dev	M	45	2	4	Biswajit Deb
7	Vijay Kr. Sah	M	21	2	4	
8	Ratish Choudhary	M	33	2	4	
9	Indrajit Das	M	66	2	4	Indrajit Das
10	Biren Kalita	M	36	2	4	Biren Kalita
11	Sakir Khan	M	34	2	4	
12	Sudhansun Sarker	M	45	2	4	
13	Abdul Kalam	M	21	2	4	Abdul Kalam
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ASSAM URBAN INFRASTRUCTURE INVESTMENT PROGRAM

Attendance Sheet of Public Consultation Meeting
Name of the project: Drainage Subproject, Dibrugarh
(.....Secondary Drain.....)

District Dibrugarh
Venue AMC Road
Date 06/03/2014

Block Ward No-22
Duration of Discussion 1½ hrs.
Time 3.45PM Total No. of Paticipants
Male 14 Female 3 Total 17

S. No.	Name	Sex	Age	Profession 1. Service 2. Business 3. Agriculture 4. Labour 5. Not working 6. Any other	Social Category 1.SC 2.ST 3 OBC 4.Gen 5 Any Other	Signature
1	Sanjay Malik	M	24	2	1	Sanjay Mallick
2	Bijay Rai	M	24	2	1	Bijay Rai
3	Sorab Khan	M	65	2	4	सोहराब खान
4	Rajag Khan	M	15	2	4	Rajak Khan
5	Chandrama Ram	M	45	4	1	चन्द्रमा राम
6	Roop Lal Ram	M	40	6	1	रूपलाल राम
7	Dilip Sarma	M	45	6	4	दिलीप शर्मा
8	Ananda Sarkar	M	21	6	4	Ananda Sarkar
9	Tuleshwar Neog	M	38	6	3	Tuleshwar Neog
10	Hriday Thakuria	M	43	6	3	हृदय ठाकुरिया
11	Chandra Mandal	M	22	2	1	Sri Chandra M.
12	Usha Das.	F	45	6	1	उषा दास
13	Sajana Begum	F	40	6	4	सजना बेगम
14	Salim Ahmad	M	36	6	4	सलीम अहमद
15	Md. Ali Hussin	M	60	6	4	Ali Hussen

ASSAM URBAN INFRASTRUCTURE INVESTMENT PROGRAM

Attendance Sheet of Public Consultation Meeting

Name of the project: Secondary Drainage Subproject, Dibrugarh

(.....Secondary.....Drainage.....)

Sanjpur

District Dibrugarh Block Ward No. 01

Venue Sanjpur Road Drain Duration of Discussion 30 mins.

Date 08.03.2014 Time 11 AM Total No. of Paticipants Male 6 Female 1 Total 7

S. No.	Name	Sex	Age	Profession 1. Service 2. Business 3. Agriculture 4. Labour 5. Not working 6. Any other	Social Category 1.SC 2.ST 3 OBC 4.Gen 5 Any Other	Signature
1	Sunil Sharma	M	35	2	4	S. Sharma
2	Multi Devi	F	50	2	4	मल्टी देवी
3	Lalit Sarmah	M	50	2	4	Lalit
4	Ajay Kr Sah	M	30	2	4	Ajay Kumar
5	Pradip Kr Marodia	M	47	2	4	Pradip
6	Purna Das.	M	43	2	4	Purna Das
7	Biren Chandra Das	M	65	2	1	
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ASSAM URBAN INFRASTRUCTURE INVESTMENT PROGRAM

Attendance Sheet of Public Consultation Meeting
Name of the project: Drainage Subproject, Dibrugarh
(.....Secondary drainage.....)

District Dibrugarh Block Ward No. 05.

Venue Maneotta Road Drain Duration of Discussion 1½ hrs.

Date 20.03.2014 Time 10:30AM Total No. of Paticipants Male 15 Female 0 Total 15

S. No.	Name	Sex	Age	Profession 1. Service 2. Business 3. Agriculture 4. Labour 5. Not working 6. Any other	Social Category 1.SC 2.ST 3 OBC 4.Gen 5 Any Other	Signature
1	Jugan Kalita	M	48	2	4	Jugen Kalita
2	Jayant Kr Das	M	24	2	4	
3	Avijit Baruah	M	26	2	3	A. Baruah
4	Bisitro Das.	M	30	2	1	
5	Dhanti Das	M	27	2	1	
6	Ganesh Das	M	30	2	1	
7	Tulan Das	M	39	2	1	Tulan Das
8	Umesh Gogoi	M	47	2	3	Umesh Gogoi
9	Koruna Sonowal	M	22	2	1	Koruna Sonowal
10	Madhab Baruah.	M	28	2	3	MB
11	Kubar Das.	M	47	2	1	
12	Vijoy Saikia	M	42	2	3	B Saikia
13	Amal Dutta	M	48	2	3	Amal Dutta
14	Rupam Dutta	M	40	2	3	
15	Bimal Saikia	M	34	2	3	Bimal Saikia

ASSAM URBAN INFRASTRUCTURE INVESTMENT PROGRAM

Attendance Sheet of Public Consultation Meeting
Name of the project: Secondary Drainage Subproject, Dibrugarh
(.....Secondary.....Drainage.....)

District Dibrugarh
Block Ward No - 06
Venue Charing Chapori Road Drain
Duration of Discussion 1 1/2 hrs.
Date 08.03.14
Time 3 PM.
Total No. of Paticipants
Male 14 Female 0 Total 14

S. No.	Name	Sex	Age	Profession 1. Service 2. Business 3. Agriculture 4. Labour 5. Not working 6. Any other	Social Category 1.SC 2.ST 3 OBC 4.Gen 5 Any Other	Signature
1	Mohipal Das	M	40	2	3	
2	Atul Borah	M	72	2	1	A. Borah.
3	(illegible)	M	22	2	4	
4	Sankar Prajapat	M	32	2	4	
5	Ranjit Kumar Singh	M	25	2	5(OBC)	Ranjit Kr Singh
6	Tinku Lukharakhan	M	30	2	3	
7	Bijay Das	M	33	2	1	Bijay Das
8	Biswajeet Das	M	37	2	4	Biswajit Das
9	TINKU Das	M	35	2	1	Tinku Das
10	Romeyo Kr Das	M	23	2	1	
11	Umesh Shaw	M	28	2	4	Umesh Sha
12	Ramesh Singh	M	15	2	4	Rakesh Singh
13	Nagandra Singh	M	51	2	4	Nagendra Singh
14	Sanjeet Bhattacharya	M	46	2	4	
15	Umesh Shah	M	28	2	4	

ASSAM URBAN INFRASTRUCTURE INVESTMENT PROGRAM

Attendance Sheet of Public Consultation Meeting
Name of the project: Secondary Drainage Subproject, Dibrugarh
(.....Secondary.....Drainage.....)

District Dibrugarh. Block 12

Venue Bashbari Road Drain. Duration of Discussion 15 mins.

Date 08.03.2014 Time 3:30PM Total No. of Paticipants Male 2 Female 0 Total 2

S. No.	Name	Sex	Age	Profession 1. Service 2. Business 3. Agriculture 4. Labour 5. Not working 6. Any other	Social Category 1.SC 2.ST 3 OBC 4.Gen 5 Any Other	Signature
1	Shymol Kanti Nojumder	M	54	1	4	Shyamal Majumder
2	Sanku Paul	M	42	1	3	Sanku
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ASSAM URBAN INFRASTRUCTURE INVESTMENT PROGRAM

Attendance Sheet of Public Consultation Meeting
Name of the project: Secondary Drainage Subproject, Dibrugarh
(.....Secondary Drainage.....)

District Dibrugarh. Block Ward No-4

Venue Pathan Patti Duration of Discussion

Date 11.03.2014 Time 10 AM Total No. of Paticipants Male Female Total

S. No.	Name	Sex	Age	Profession 1. Service 2. Business 3. Agriculture 4. Labour 5. Not working 6. Any other	Social Category 1.SC 2.ST 3 OBC 4.Gen 5 Any Other	Signature
1	Parwej Ali	M	34	2	4	Parwej Ali
2	Afruje Khan	M	35	2	4	Afroj Khan
3	Samim Khan	M	30	2	4	Khan.
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Public Consultation

Appendix 9: Recommended Contract Clauses for the Construction Contractors

1. Sources of Materials
   (i) Use material sources permitted by government;
   (ii) Verify suitability of all material sources and obtain approval of Design, Management and Supervision Consultant (DMSC); and
   (iii) Submit to DMSC on a monthly basis documentation of sources of materials.

2. Air Quality.
   (i) Prevent/minimize dust generation by removing the waste soil immediately from the site;
   (ii) Construction material, particularly sand/gravel for trench bedding, shall be brought as and when required; minimize on-site storage;
   (iii) Consult with DMSC on the designated areas for stockpiling of clay, soils, gravel, and other construction materials;
   (iv) Excavate the foundations at the same time as the access roads (if needed) are built so that dug material is used immediately, avoiding the need to stockpile on site;
   (v) Damp down exposed soil and any stockpiled on site by spraying with water when necessary during dry weather;
   (vi) Use tarpaulins to cover sand and other loose material when transported by trucks; and
   (vii) Fit all heavy equipment and machinery with air pollution control devices which are operating correctly.

3. Surface Water Quality
   (i) Avoid excavation activities during monsoon. Ensure that works complete before onset of monsoon
   (ii) Minimize on-site storage of waste soil/desilted sludge/other materials
   (iii) Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets;
   (iv) Prioritize re-use of excess spoils and materials in the construction works. If spoils will be disposed, consult with DMSC on designated disposal areas;
   (v) Place storage areas for fuels and lubricants away from any drainage leading to water bodies;
   (vi) Dispose any wastes generated by construction activities in designated sites; and
   (vii) Conduct surface water quality inspection according to the Environmental Management Plan (EMP).

4. Noise Levels.
   (i) Plan activities in consultation with DMSC so that activities with the greatest potential to generate noise are conducted during periods of the day which will result in least disturbance;
   (ii) Require horns not be used unless it is necessary to warn other road users or animals of the vehicle's approach;
   (iii) Minimize noise from construction equipment by using vehicle silencers, fitting jackhammers with noise-reducing mufflers, and portable street barriers the sound impact to surrounding sensitive receptor; and
   (iv) Maintain maximum sound levels not exceeding 80 decibels (dbA) when measured at a distance of 10 m or more from the vehicle/s.
   (v) Existing Infrastructure and Facilities.
   (vi) Obtain from DMSC the list of affected utilities and operators;
   (vii) Prepare a contingency plan to include actions to be done in case of unintentional interruption of services

5. Landscape and Aesthetics.
   (i) Prepare and implement Waste Management List;
   (ii) Avoid stockpiling of excess excavated soils;
   (iii) Coordinate with DMB for beneficial uses of excess excavated soils or immediately dispose to designated areas;
   (iv) Recover used oil and lubricants and reuse or remove from the sites;
   (v) Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas;
   (vi) Remove all wreckage, rubbish, or temporary structures which are no longer required; and
   (vii) Request DMSC to report in writing that the necessary environmental restoration work has been adequately performed before acceptance of work.

6. Accessibility.
   (i) Plan transportation routes so that heavy vehicles do not use narrow local roads, except in the immediate vicinity of delivery sites;
   (ii) Schedule transport and hauling activities during non-peak hours;
   (iii) Locate entry and exit points in areas where there is low potential for traffic congestion;
   (iv) Keep the site free from all unnecessary obstructions;
   (v) Drive vehicles in a considerate manner;
   (vi) Coordinate with Dibrugarh Traffic Department for temporary road diversions and with for provision of traffic aids if transportation activities cannot be avoided during peak hours; and
   (vii) Notify affected sensitive receptors by providing sign boards informing nature and duration of construction works and contact numbers for concerns/complaints.

7. Socio-Economic – Income.
   (i) Leave spaces for access between mounds of soil;
   (ii) Provide walkways and metal sheets where required to maintain access across for people and vehicles;
   (iii) Increase workforce in front of critical areas such as institutions, place of worship, business establishment, hospitals, and schools;
   (iv) Consult businesses and institutions regarding operating hours and factoring this in work schedules; and
   (v) Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints.

8. Socio-Economic – Employment.
   (i) Employ majority of the labour force, or to the maximum extent, local persons within the 2-km immediate area if manpower is available; and
   (ii) If available, secure construction materials from local market.

9. Occupational Health and Safety.
   (i) Develop and implement site-specific Health and Safety (H&S) Plan which will include measures such as: (a) excluding public from the site; (b) ensuring all workers are provided with and use Personal Protective Equipment; (c) H&S Training for all site personnel; (d) documented procedures to be followed for all site activities; and (e) documentation of work-related accidents;
   (ii) Ensure that qualified first-aid can be provided at all times. Equipped first-aid stations shall be easily accessible throughout the site;
   (iii) Provide medical insurance coverage for workers;
   (iv) Secure all installations from unauthorized intrusion and accident risks;

(v) Provide supplies of potable drinking water;
(vi) Provide clean eating areas where workers are not exposed to hazardous or noxious substances;
(vii) Provide H&S orientation training to all new workers to ensure that they are apprised of the basic site rules of work at the site, personal protective protection, and preventing injuring to fellow workers;
(viii) Provide visitor orientation if visitors to the site can gain access to areas where hazardous conditions or substances may be present. Ensure also that visitor/s do not enter hazard areas unescorted;
(ix) Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas;
(x) Ensure moving equipment is outfitted with audible back-up alarms;
(xi) Mark and provide sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal. Signage shall be in accordance with international standards and be well known to, and easily understood by workers, visitors, and the general public as appropriate; and
(xii) Disallow worker exposure to noise level greater than 85 dBA for a duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced activity.

10. Community Health and Safety.
(i) Plan routes to avoid times of peak-pedestrian activities.
(ii) Liaise with DMSC in identifying risk areas on route cards/maps.
(iii) Maintain regularly the vehicles and use of manufacturer-approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure.
(iv) Provide road signs and flag persons to warn of dangerous conditions, in case of location near the road.

11. Work Camps (if needed).
- Consult with DMSC before locating project offices, sheds, and construction plants;
- Minimize removal of vegetation and disallow cutting of trees;
- Provide water and sanitation facilities for employees;
- Prohibit employees from cutting of trees for firewood;
- Train employees in the storage and handling of materials which can potentially cause soil contamination;
- Recover used oil and lubricants and reuse or remove from the site;
- Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas;
- Remove all wreckage, rubbish, or temporary structures which are no longer required; and
- Request DMSC to report in writing that the camp has been vacated and restored to pre-project conditions before acceptance of work.

12. Social and Cultural Resources.
- Stop work immediately to allow further investigation if any finds are suspected
- Inform DMSC if a find is suspected, and take any action they require ensuring its removal or protection in situ
- Request DMSC or any authorized person with archaeological/historical field training to observe excavation