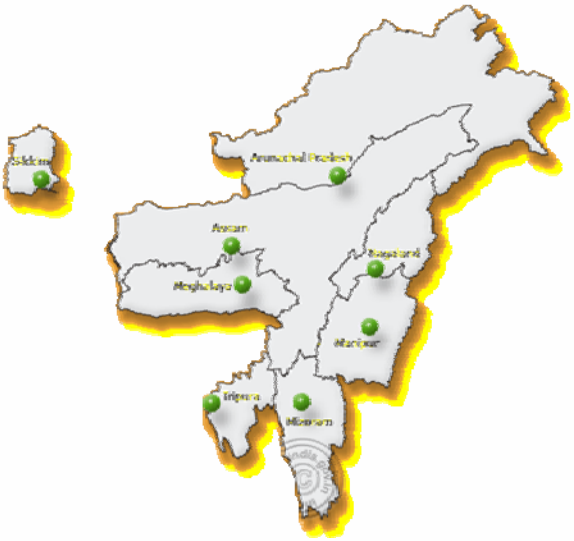
Project Implementation and Urban Management Improvement in the North Eastern Region – Package A

Draft Initial Environmental Examination Report for Solid Waste Management Project in Shillong

Asian Development Bank TA 4779 - IND

Volume VI

March, 2009



SMEC INDIA

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ANNEXURE

ACRONYMS

ADB	Asian Development Bank
ADTA	Advisory Technical Assistance
BPL	Below Poverty Line
BWQC	Biological Water Quality Criteria
CFE	Certificates for Establishment
CFO	Consent for Operation
DSCs	Design and Supervision Consultants
DO	Dissolve Oxygen
EARP	Environmental Assessment and Review Procedures
EMP	Environmental Management Plan
EC	Environmental clearance
GIS	Geographic Information System
GSPA	Greater Shillong Planning Area
IPMU	Investment Program Management Unit
IPDF	Indigenous People's Development Framework
IPEC	Investment Program Empowered Committee
IPMIU	Investment Program Management and Implementation Unit
IPPMS	Investment Program Performance Monitoring System
JNNURM	Jawaharlal Nehru National Urban Renewal Mission
LAD	Local Administration Department
UDHD	Urban Development and Housing Department
LIBOR	London Interbank offered Rate
LCB	Local Competitive Bidding
MoDNER	Ministry for Development of North-eastern Region
MOUD	Ministry of Urban Development
MFF	Multitranche Finance Facility
NER	North Eastern Region
NERCCDIP[1]	North Eastern Region Capital Cities Development Investment Program
NERUDP[2]	North Eastern Region Urban Development Project
NBCC	National Building Construction Company
NOC	No Objection Certificate

[1] **Phase I**-Formerly North Eastern Region Urban Development Project
[2] **Phase II**- Cities includes Dibrugarh, Guwahati, Imphal and Itanagar

PPTA	Project Preparatory Technical Assistance
PC	Planning Commission
PHEDs	Public Health Engineering Departments
PSC	Program Steering Committee
PMC	Project Management Consultants
RP	Resettlement plans
SMB	Shillong Municipal Board
SEA	State level Executing Agency
SES	Socio Economic Survey
SWM	Solid Waste Management
SSC	State Steering Committee
SPCB	State Pollution Control Board
STPs	Sewerage Treatment Plants
SIPMIU	State Level Investment Program Management and Implementation Unit
SEIAA	State Environment Impact Assessment Authority
SWMHR	Solid Waste Management and Handling Rules
SES	Socio-economic survey
UDD	Urban Development Department

I. INTRODUCTION

A. OVERVIEW

1. The North Eastern Region Capital Cities Development Investment Program (NERCCDIP) envisages achieving sustainable urban development in the Project Cities of Agartala, Aizawl, Kohima, Gangtok and Shillong through investments in urban infrastructure sectors. The urban infrastructure and services improvement is proposed in the following sectors (i) water supply, (ii) sewerage and sanitation, and (iii) solid waste management. The expected impact of the Investment Program, is increased economic growth potential, reduced poverty, and reduced imbalances between the NER and the rest of the country. The expected outcomes of the Investment Program will be an improved urban environment and better living conditions for the 1.65 million people expected to be living in the Investment Program cities by 2018. To this end, the Investment Program will (i) improve and expand urban infrastructure and services in the cities including in slums and (iii) strengthen urban institutional, management, and the financing capacity of the institutions, including the urban local bodies. Based on considerations of economic justification, absorptive capacity and sustainability of the implementing agencies, sub-projects have been identified in each city in the priority infrastructure sectors.

2. Though the Project aims to improve the environmental condition of urban areas, the proposed improvements of infrastructure facilities may exert certain adverse impacts on the natural environment. While developing urban infrastructure facilities, impacts during the construction stage are expected to be more severe than impacts during the operation phase, though for a short duration. Exceptions being some facilities such as solid waste landfills and sewage treatment plants, which may also exert adverse impacts during the operation phase, if due care is not taken.

3. The mandatory requirements applicable to the NERCCDIP may also necessitate the proposed components to go through the environmental assessment process at an appropriate level. Hence, considering these issues and particularly to facilitate the State-level Investment Program Management and Implementation Units (SIPMIU) and the Executing Agencies (EA) with definite environmental criteria to be met for implementation of NERCCDIP sub-projects and sub-components, an environmental assessment and review framework (EARF) has been prepared (see EARF for NERCCDIP). The EARF provides criteria for sub-project selection and guidelines for environmental assessment.

4. Above all, this exercise ensures that the NERCCDIP, in its project cycle, will not deteriorate or interfere with the environmental sensitivity of a project area but rather improve environmental quality through development of infrastructure facilities. Moreover, any component included in NERCCDIP shall comply with the environmental requirements of the Government of India (GoI), the respective state governments, and ADB. Details of components and sub-components financed under the NERCCDIP are given below.

B. NERCCDIP COMPLIANCE

5. The NERCCDIP will consist of two parts. Part A covers urban infrastructure and services improvement including the rehabilitation, improvement and expansion of (i) water supplies, (ii) sewerage and sanitation, and (iii) solid waste management. Part B covers provision of project management support, institutional development, capacity building and project administration. **Table 1** outlines the broad components by sector proposed in the program cities.

TABLE 1: PROPOSED NERCCDIP COMPONENTS

Sub- Projects	Components
Water supply	(a) source and treatment works; (b) distribution system including Non-Revenue Water (NRW) reduction; and (c) institutional development and
Sewerage and Sanitation	(a) collection and treatment system; (b) low cost sanitation facilities; and (c) institutional
Solid Waste Management	(a) improvement of collection system; (b) treatment and disposal system; and (c) institutional

6. In accordance with ADB's environmental safeguard requirements for a Multi-Tranche Financing Facility (MFF), the environmental assessment of individual tranches is required. Accordingly, the following four sub-projects are proposed for Tranche I: (i) water supply in Gangtok, (ii) NRW and small-scale water supply improvements in Agartala, Aizawl, and Kohima. (iii) solid waste management in Kohima, and (iv) solid waste management in Shillong. The focus of this IEE is solid waste management in Shillong.

C. ENVIRONMENTAL REGULATORY COMPLIANCE

7. The implementation of any sub-project proposed under NERCCDIP will be governed by the Environmental Acts, Rules, Policies, and Regulations of the GoI and the respective state governments of the Northeast Region. These regulations impose restrictions on the activities to minimize/mitigate likely impacts on the environment. The following are the environmental regulations applicable to NERCCDIP:

(i) The Water (Prevention and Control of Pollution) Act, 1974, amended 1988;

(ii) The Water (Prevention and Control of Pollution) Rules, 1975;

(iii) The Air (Prevention and Control of Pollution) Act 1981, amended 1987;

(iv) The Air (Prevention and Control of Pollution) Rules, 1982;

(v) The Environment (Protection) Act, 1986, amended 1991 and including the following Rules/Notification issued under this Act;

(vi) The Environment (Protection) Rules, 1986, including amendments;

(vii) The Municipal Solid Wastes (Management and Handling) Rules, 2000;

(viii) The Hazardous Wastes (Management and Handling) Rules, 1989;

(ix) The Bio-Medical Waste (Management and Handling) Rules, 1998;

(x) Noise Pollution (Regulation and Control) Rules, 2000;

(xi) Wild Life (Protection) Amendment Act, 2002;

(xii) Environmental Impact Assessment Notification, 2006;

(xiii) Environmental Standards of Central Pollution Control Board (CPCB);

(xiv) The Indian Wildlife (Protection) Act, 1972, amended 1993;

(xv) The Wildlife (Protection) Rules, 1995;

(xvi) The Indian Forest Act, 1927;

(xvii) Forest (Conservation) Act, 1980, amended 1988;

(xviii) Forest (Conservation) Rules, 1981 amended 1992 and 2003; and

(xix) Guidelines for Diversion of Forest Lands for Non-Forest Purpose under the Forest (Conservation) Act, 1980.

8. Any component included in NERCCDIP shall comply with the above environmental laws, standards, rules and requirements. Key standards include those related to drinking water quality, air quality, effluent discharge, leachate quality, and protected areas. Compliance is required in all stages of the project including design, construction, and operation and maintenance. Components relevant to this sub-project, which fall under the ambit of environmental regulations and mandatory requirement, are indicated in **Table 2**.

TABLE 2: ENVIRONMENTAL REGULATORY COMPLIANCE FOR SUB PROJECT

Sl. No	Component	Applicable Legislation	Compliance	Action Required
1	All components that require forest land acquisition	Forest (Conservation) Act, 1980 &and Wildlife Act, 1972	Approval of the Ministry of Environment and Forests, GoI	Identification of non-forest land and afforestation program need to be formulated
2.	Municipal Solid Waste Facility	Municipal Solid Waste Management and Handling Rules (SWMHR), 2000; Water (Prevention and Control of Pollution) Act, 1974 and/or the Air (Prevention and Control of Pollution) Act, 1981	Authorization from SPCB. No Objection Certificates (NOC), Certificates for Establishment (CFE) and Certificates for Operation (CFO).	Municipal Authority to receive proper authorization (CFE and CFO) from State Pollution Control Board (SPCB) for setting up waste processing and disposal facility including landfills.
			Renewal of CFO during operation	Based on the performance of the solid waste facility and its compliance with the discharge standards CFO will be renewed every year.

9. Under the Water (Prevention and Control of Pollution) Act, 1974 and/or the Air (Prevention and Control of Pollution) Act, 1981, the following sub-projects require Consent for Establishment (CFE) and Consent for Operation (CFO) from the respective State Pollution Control Board (SPCB). The applicable forms, “FORM-1”, to get the Consent for Emission/ Constitution of Emission under Section 21 of the Air (Prevention and Control of Pollution) Act 1981 and “FORM-A”, Consent for Discharge under Section 25/26 of the Water Act, 1974 is given in **Annexure 3**. The CFE/CFO is issued upon project review and site visits. The Board issues the CFE before start of construction and the CFO after completion of construction and satisfying CFE conditions, if any. During the operation period, the effluent and air emissions must conform to the stipulated standards (CPCB Environmental Standards). The CFO is renewed every year based on the operation performance of the facility. The following sub-projects require SPCB consent for establishment and operation.

(i) New or augmentation of water treatment plants (under the Water Act);

(ii) New or augmentation of sewage treatment plants (under the Water Act);

(iii) Solid waste composting and landfills (under the Water Act and the Air Act);

(iv) Diesel generators (under the Air Act); and

(v) Hot Mix Plants, Wet Mix Plants, Stone Crushers etc, if installed for construction (under the Air Act).

10. The new EIA Notification of 2006 of GoI, which replaces the EIA Notification of 1994, requires environmental clearance for certain defined activities/projects. This Notification classifies the projects/activities that require environmental clearance (EC) into 'A' and 'B' categories depending on the impact potential and/or scale of project. For both category projects, prior environmental clearance is mandatory before any construction work, or preparation of land except for securing the land, is started on such project or activity. Clearance provisions are as follows:

(i) Category 'A' projects require prior environmental clearance from the MoEF, Government of India[3];

(ii) Category 'B' projects require prior environmental clearance from the State Environment Impact Assessment Authority (SEIAA)[4]; and

(iii) This Notification provides that, any project or activity specified in Category 'B' will be treated as Category A, if located in whole or in part within 10 km from the boundary of (i) Protected Areas notified under the Wild Life (Protection) Act, 1972, (ii) Critically Polluted areas as notified by the Central Pollution Control Board from time to time, (iii) Notified Eco-sensitive areas, (iv) inter-State boundaries and international boundaries. Also, in the case where a SEIAA does not exist, Category B project will be reclassified as Category A and reviewed by the MoEF.

11. Consequently, the only NERCCDIP subproject listed in the EIA Notification of 2006 Schedule of Projects Requiring Prior Environmental Clearance is solid waste facilities, otherwise referred to as Common Municipal Solid Waste Facilities (CMSWF). Common municipal solid waste management facilities qualify as Category B projects and are thus reviewed by the respective SEIAA. For solid waste facilities, the Government of India further ensures environmental safeguards through its Municipal Solid Waste Management and Handling Rules (SWMHR), 2000 as published under MoEF.

12. This subproject focuses only on solid waste components. Therefore the construction of a sanitary landfill site (solid waste facility) qualifies the project as a Category B under GoI law. The project is to be reviewed by the Meghalaya SEIAA, as well as ensure environmental safeguards through its Municipal Solid Waste Management and Handling Rules (SWMHR), 2000 as published under MoEF.

[3] For Category A projects, based on the preliminary details provided by the project proponent as per Notification, the Expert Appraisal Committee (EAC) of MoEF, determine comprehensive TOR for EIA studies. This TOR will be finalized within 60 days. On the recommendation of the EAC based on EIA studies, MoEF provides the EC.

[4] The B category projects will be further divided by State Level EAC into B1 – that require EIA studies and B2 – no EIA studies. The Sate Level EAC will determine TOR for EIA studies for B1 projects with in 60 days. On the recommendation of the State level EAC based on EIA studies, SEIAA provides the EC.

13. These Rules issued under the Environment (Protection) Act, 1986 with the objective of regulating the management and handling of the municipal solid wastes is applicable to all municipal solid waste subprojects. The important provisions are:

    (i) Solid waste generated in a municipal area shall be managed, including segregation, collection, transportation, and disposal in accordance with the Rules.

    (ii) The State Pollution Control Board will authorize waste processing and landfills.

    (iii) Solid waste processing and landfills shall meet design and operation specifications/standards specified under the Rules. These include site and facility design specifications, output compost characteristics, pollution control and monitoring programs, including closure of landfill site and post-care.

14. At the state government level, solid waste subprojects require review by the respective State Pollution Control Board (SPCB). These subprojects are required to obtain the following clearances from SPCB: No Objection Certificates (NOC), Certificates for Establishment (CFE) and Certificates for Operation (CFO).

FOREST LEGISLATION

15. Forest legislation in India dates back to enactment of the Indian Forest Act, 1927. This Act empowers the State Government to declare "any forest land or waste-land, which is the property of Government or over which the Government has proprietary rights or to the whole or any part of the forest-produce of which the Government is entitled", a reserved forest or protected forest. The State Government may assign to any village-community the rights of Government over a reserved forest - those are called village-forests. Act also allows Government control over forest and lands not being the property of Government.

16. Acts like clearing or break up of any land for cultivation or for any other purpose, damage to vegetation/trees and quarrying or removing any forest produce from reserved forest is prohibited. All these are also applicable to village-forests. For protected forests, with the provision of the Act, the State Government makes rules 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.

17. Forest (Conservation) Act, 1980 (amended in 1988) enacted by Government of India, restricts the deforestation of forests for use of non-forest purposes. According to the Act, State Government requires prior approval of GoI for the use of forest land for non-forest purposes (means the breaking up or clearing of any forest land) or for assigning least to any private person or agency not controlled by government. The Forest (Conservation) Rules, 2003 issued under this Act, provide specific procedures to be followed for conversion of forest land for non-forest purposes.

18. Limited sub-projects notably solid waste composting and landfills may require acquisition of forest land[5]. The Government of Meghalaya Forest & Environment Department has officially granted permission (**Annexure 4**) to use the land for solid waste disposal purposes for the existing and proposed solid waste disposal site; this is because the site is part of Riatkhwan

[5] The term 'Forest land' refers to land owned by the Forest Department; it may or may not include reserved forest, protected forest or any area recorded as forest in the government records.

Reserve Forest. The Government of Meghalaya Forest & Environment Department has extended the lease under letter no. FOR 76/99/16 dated 25th February 2000 to the Shillong Municipality for 18 Acres of land in Riat Khwan Forest Compartment No-4 (Plot No-1, Plot No-2 and Plot-3).The Possession Certificate of proposed solid waste site has been also issued by the Forest Department.

19. Linear subprojects like water supply rising mains/trunks mains may traverse forest lands. The forest land conversion will follow the "Guidelines for Diversion of Forest Lands for Non-Forest Purpose" under Forest (Conservation) Act, 1980. Compensatory afforestation is one of the most important conditions stipulated for diversion of forest land. The proposals for conversion will be forwarded by the State Government to the MoEF, GoI:

    (i) Forest land involving up to 5 ha will cleared by the Regional Office of the MoEF.

    (ii) Forest land involving more than 5 ha and up to 20 ha sent will be cleared by the Regional Office after referring the case to MoEF.

    (iii) Conversion of forest land (i) having density above 0.4 irrespective of the area involved, and, (ii) of more than 20 ha in the plains and 10 ha in the hilly region, irrespective of density, will be cleared by MoEF.

    (iv) Compensatory afforestation is compulsory for conversion:

    (v) Afforestation will be done over an equivalent area of non-forest land.

    (vi) As far as possible, the non-forest land for compensatory afforestation should be identified contiguous to or in the proximity of Reserved Forest or Protected Forest. If non-forest lands are not available in the same district other non-forest land may be identified elsewhere in the state.

    (vii) Where non-forest lands are not available, compensatory afforestation may be carried out over degraded forest twice in extent to the area being diverted.

    The flow chart of Forest clearance is given in **Annexure 2**.

20. Conversion of forest lands that are part of National Parks/Sanctuaries and Tiger Reserve areas (notified under Indian Wildlife (Protection) Act, 1972) is not permitted. In exceptional case, the State Government requires consent of the Indian Board of Wildlife for obtaining approval of the State Legislature for denotification of the area as a sanctuary.

21. Cutting of trees in non-forest land, irrespective of land ownership, also requires permission from the State Forest Department. Afforestation to the extent of two trees per each tree felled is mandatory.

D. PURPOSE OF IEE

22. This IEE deals with the environment assessment of the solid waste sub components in Shillong.

    The NERCCDIP covers five cities, in each of which sub-projects in the various priority infrastructure sectors are identified. In accordance with the ADB's environmental assessment requirement for Multi-Tranche Financing Facility (MFF) modality, the environmental assessment of sample sub-projects has been carried out.

23. Solid Waste Management is managed by three different authorities viz. (i) The Shillong Municipal Board (SMB) within the municipal area (ii) The Dorbars, outside the municipal area, and (iii) The Defense Authorities, within the cantonment area. The Municipal Solid Waste in

Shillong in general is a mixture of bio-medical, residential, commercial and hotel wastes apart from construction debris.

24. The proposed transfer station, garage and disposal site will be located within the existing landfill site at Municipal Trenching Ground at Marten, Mawiong which has been operational and used for disposal purposes since 1938. The site already includes an operating compost facility.

25. The collected wastes throughout the city are disposed at Mawiong disposal site at a distance of about 8 km from the city. The proposed land fill area is 5.2503 Acres. The existing and proposed location map of the solid waste and compost facility in Shillong is presented in **Figure 1.0**. Plot No-1 is proposed solid waste disposal site, which is the part of Compartment no-4 (It includes Plot No-1, Plot No-2 and Plot-3 of 18 Acres land) in Forest Department's record and the Possession Certificate for the same has been issued by the Forest Department under Notification letter no FOR 76/99/16 dated 25 February, 2000 (Refer **Annexure 4**). There are no sensitive receptors occurring within 500 m of the site. Umiam Lake is approximately 3.0 km from proposed disposal site. The proposed Solid Waste Disposal site and Umian reservoir is shown in **Figure 1.0 (a)**. The existing and proposed solid waste disposal site is the part of Riatkhwan Reserve Forest, which is shown in **Figure 1.0 (b)**. The Meghalaya Forests and Environment Department has officially granted permission to use the land for solid waste disposal purposes (Annexure 4).

E. ENVIRONMENTAL CATEGORY

26. The project has been categorized as Category B project per ADB as none of the components are proposed at locations in or near sensitive and valuable ecosystems. The existing and proposed Solid Waste Disposal site is the part of Riat Khwan Reserve Forest. The Government of Meghalaya Forest & Environment Department has extended the lease under letter no. FOR 76/99/16 dated 25th February 2000 to the Shillong Municipality for 18 Acres of land in Riat Khwan Forest Compartment No-4 (Plot No-1, Plot No-2 and Plot-3 of **Figure 1.0**) for the purpose of trenching ground of Municipal waste with certain conditions **(Refer Annexure 4)**. The land possession certificate has been also issued by the Forest & Environment Department to Shillong Municipality **(Refer Annexure 4)**. The lease period is from 1938 to 2026.

27. At present the proposed Disposal site is Plot No-1 and the Umiam Lake (a man-made reservoir used for hydroelectric power) is 3.0 km from proposed Disposal site. Umiam Lake is a "potential Ramsar site". It has not been officially designated a Ramsar Wetland. The Meghalaya State Biodiversity Action Plan has identified pockets of rich biodiversity as conservation hotspots. None of the identified hotspots are located within the Greater Shillong boundaries. Also all the project interventions are within the GSPA boundaries and (ii) no project components are located within the sensitive areas of GSPA. The proposed landfill at the existing disposal site is a continuation of the disposal land use that has occurred on the property since 1938.

28. As such, an Initial Environmental Examination (IEE) has been conducted, and no significant adverse impact has been envisaged, as mentioned above. The details are given in REA checklist enclosed as **Annexure 5**. To further mitigate any environmental impacts, an Environmental Management Plan (EMP) is included as part of this IEE.

F. SCOPE OF IEE

29. The IEE is based on secondary sources information such as information collected from previous PPTA/ DPR report prepared by Lea Associates, information collected from SPCB & forest department and field reconnaissance surveys. Stakeholder consultation was an integral part of the IEE.

30. This Report contains eight (8) sections including this introductory section:

(i) Introduction;
(ii) Description of project components;
(iii) Description of the environment;
(iv) Screening of potential environmental impacts and mitigation measures;
(v) Environmental management plan;
(vi) Public consultation and information disclosure;
(vii) Finding and recommendation; and
(viii) Conclusions.

G. IMPLEMENTATION SCHEDULE

31. The investment program is to be implemented over a ten-year period, commencing in FY 2009. Completion is scheduled by 2015. Implementation of sub-projects is proposed in three tranches over the program implementation period of (2009-2015). The implementation of the solid waste sub-projects in Shillong is proposed to be undertaken in the first tranche (with expected approval in 2009).

H. PROJECT BENEFITS

32. The solid waste management sub project in Shillong has proposed improvements in collection of solid waste through house-to-house waste collection, source segregation, transportation and scientific disposal of the wastes. The benefits accrued due to the present project components are:

(i) Reduction in unhygienic conditions;
(ii) Cleaner surroundings;
(iii) Reduction in choking of drains and streams;
(iv) Improvement in the conditions within the city;
(v) Reduction in vulnerability to diseases; and,
(vi) Reduction in the hazards of pollution of surface water and ground water.

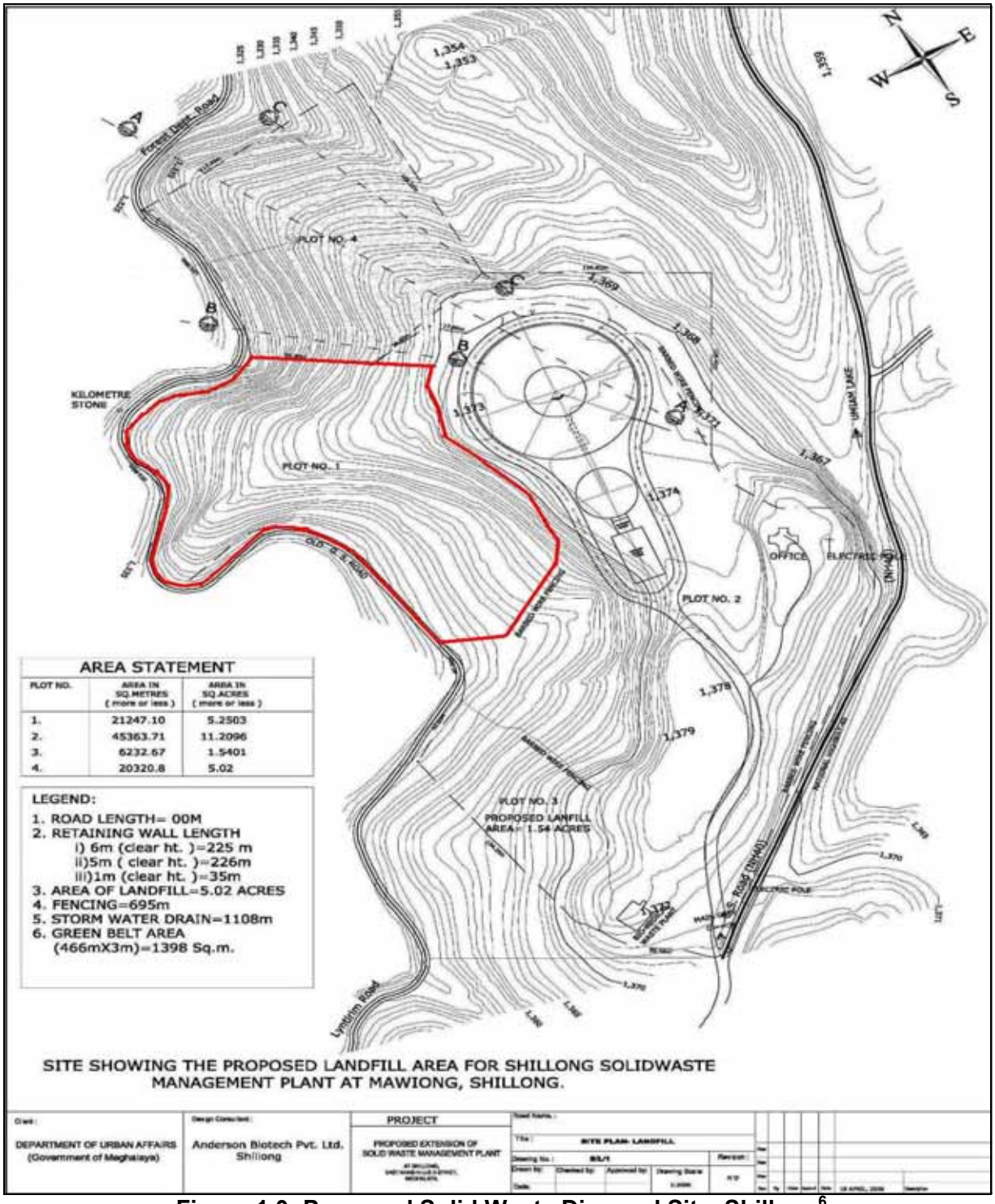


Figure 1.0: Proposed Solid Waste Disposal Site, Shillong[6]

[6] **Source:** Director, Urban Affairs, Meghalaya, Shillong

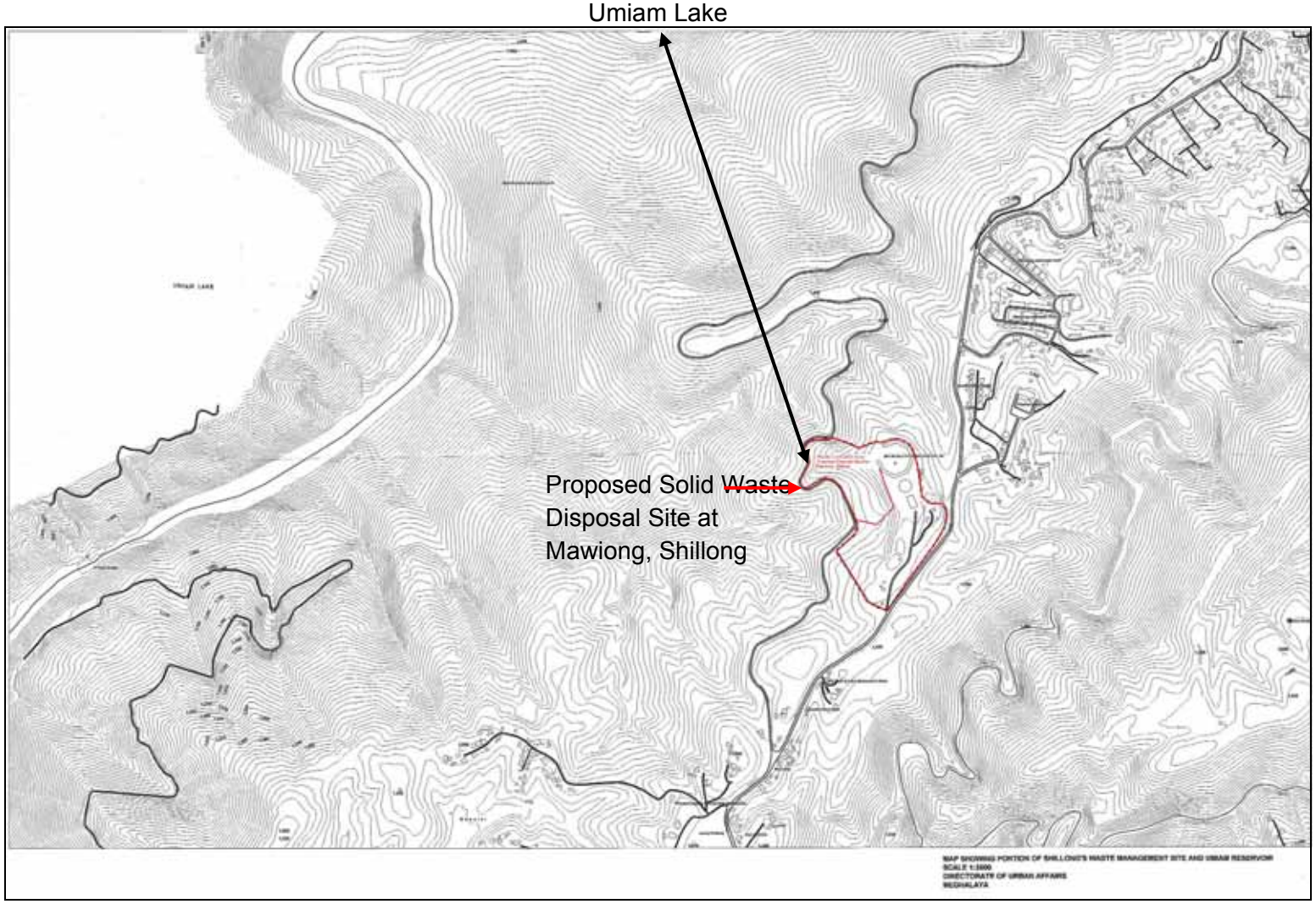


FIGURE 1.0 (A): THE PROPOSED SOLID WASTE DISPOSAL SITE AND UMIAM RESERVOIR

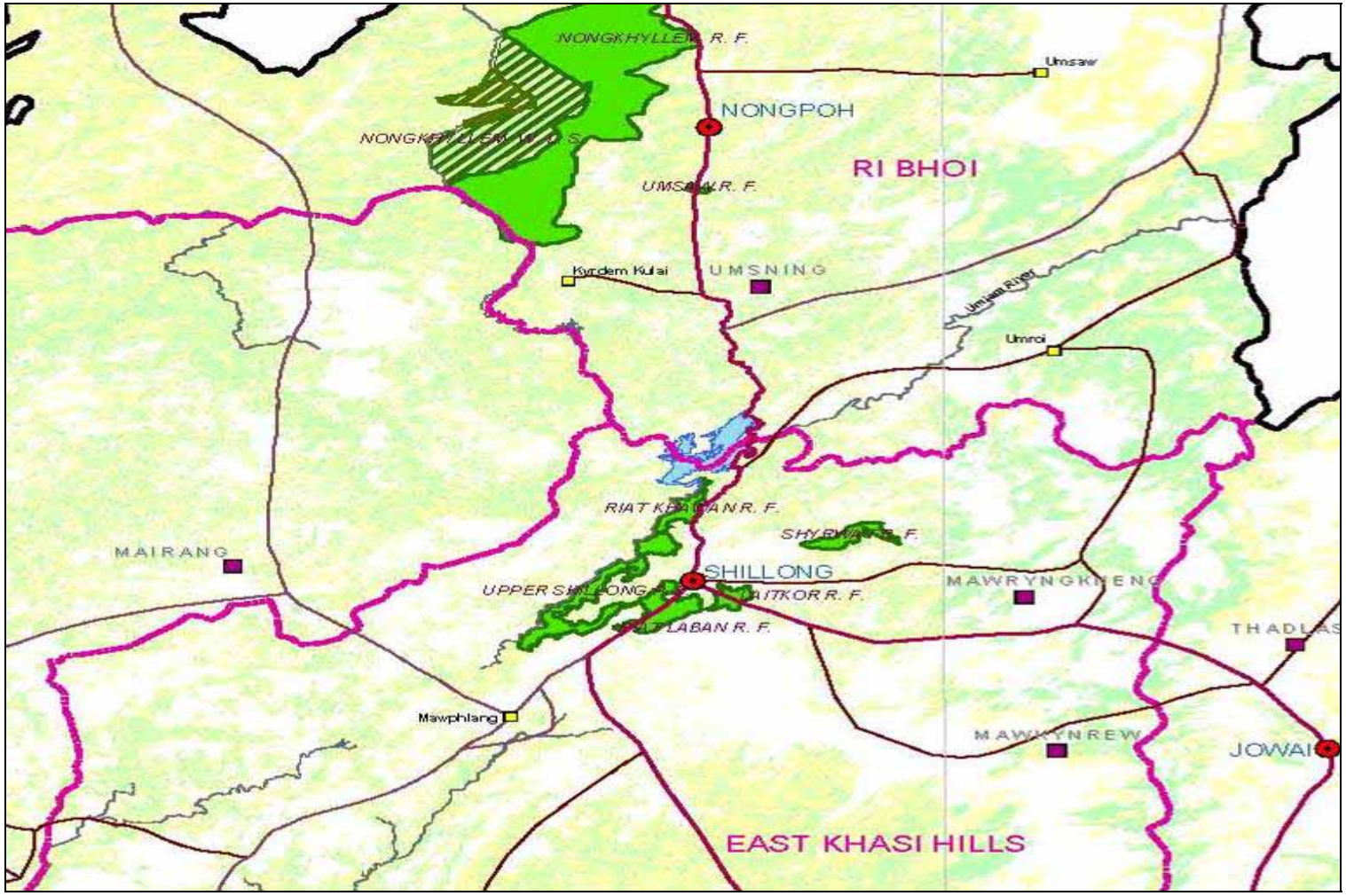


FIGURE 1.0 (B): THE EXISTING AND PROPOSED SOLID WASTE DISPOSAL SITE IN RIATKHWAN RESERVE FOREST

II. DESCRIPTION OF THE PROJECT COMPONENTS

A. PROJECT COMPONENTS

33. Shillong Municipal Board (SMB) was created in 1910. At present, SMB is governed as per the provisions of the Meghalaya Municipal Act, 1973 and the Meghalaya Municipal (amendment) Act, 2000. Unlike the other municipalities in the Project area, the SMB lacks public representation. The last election was held in 1967. In 1973, the elected Board was superseded by the government and the SMB since then has functioned as an administrative body under the direction of a Chief Executive Officer appointed by the State Government. The CEO operates through two executive officers and staff.

34. The functions of SMB as per the Meghalaya Municipal Act are managing water supply, lighting, drainage, sanitation and other amenities. The Act also mentions (Section 60, u/s 1) setting apart of funds for specific purposes including water and lighting, removal of sewerage and rubbish, public health administration including measures to control epidemic, construction, maintenance and improvement of roads, bridges, squares, gardens, tanks, ghats, well, drains, latrines and urinals and variety of other purposes in the interest of residents of the municipal area, which promote comfort or convenience of the inhabitants.

35. The Greater Shillong Planning Area (GSPA) is spread over an area of 173.87 sq.km. It comprises three distinct areas, comprising the Shillong Municipal Board (SMB) area, 6 other urban centers namely Shillong Cantonment, Mawlai, Nongthymmai, Pynthorumkhrah, Madantring, and Nongmynsong[7] towns and rural areas with 32 settlements. GSPA, with its total population of 312,539 (2001 Census) accounts for 78% of the total urban population of Meghalaya. Shillong is mainly a service centre for the entire state, apart from being a major tourist destination. The city population is 77% tribal, with most of the population belonging to Khasi tribe. There are 19 notified slums within GSPA, which account for about 22% of the population. The per capita income in 2005 was INR 1,881 per month, slightly above the Indian urban average of INR 1,695. About 25% of the city population is classified by the state government as below poverty line (BPL).

36. Solid Waste Management is managed by three different authorities viz. (i) The Shillong Municipal Board (SMB) within the municipal area (ii) The Dorbars, outside the municipal area, and (iii) The Defense Authorities, within the cantonment area. The Municipal Solid Waste in Shillong in general is a mixture of bio-medical, residential, commercial and hotel wastes apart from construction debris. The proposed transfer station, garage and disposal site will be located within the existing landfill site at Municipal Trenching Ground at Marten, Mawiong. The collected wastes throughout the city are disposed at Mawiong disposal site at a distance of about 8 km from the city. The site has been operational since 1938. The proposed land fill area is 5.2503 Acres. The existing and proposed location map of the solid waste and compost facility in Shillong is presented in **Figure 1.0**. Plot No-1 is proposed solid waste disposal site, which is the part of Compartment no-4 (It includes Plot No-1, Plot No-2 and Plot-3 of 18 Acres land) in Forest Department's record and the Possession Certificate for the same has been issued by the Forest Department under Notification letter no FOR 76/99/16 dated 25 February, 2000 **(Refer Annexure 4)**. Umiam Lake is approximately 3.0 km from proposed disposal site. The proposed Solid Waste Disposal site and Umian reservoir is shown in **Figure 1.0(a)**. The existing and proposed solid waste disposal site is the part of Riatkhwan Reserve Forest, which is shown in

[7] The town was included as part of the Shillong Urban Agglomeration in 2001.

Figure 1.0(b). The photographs of existing disposal site at Marten, Mawiong are given in **Annexure 6**.

IMPROVEMENT OF COLLECTION SYSTEM

37. The proposal includes improvement of the following: (i) primary and secondary collection efficiencies, (ii) existing system for transportation of wastes, and (iii) treatment and disposal of wastes in accordance with SWHR. The proposed components include:

IMPROVEMENT OF COLLECTION SYSTEM

38. Improvement of the existing SW collection system from 45% to 60% by 2011, through improvements in primary and secondary collection facilities and through an intensive community awareness and consultation program, in consultation with communities, dorbars and NGOs. The proposed components include:

- Introduction of house-to-house waste collection through source segregation on a pilot basis, initially to about 2000 households within the SMB area.
- Provision of 1000, 30 litre dustbins to be placed in public places;
- Provision of 2000, 25-litre household dustbins and 2000 Nos. heavy duty PVC bags to be used for segregation of wastes at source (non biodegradable);
- Provision of 250 wheelbarrows to be used by sweepers in the central areas of the city; and,
- Provision of 35 nos, 4.5 cum community dustbins to be used in areas where bell ringing or house-to-house service is not provided.

TRANSPORTATION FACILITIES

39. Operational improvements of the existing refuse vehicles through incorporation of more vehicles with proper tipping and hydraulic loading/unloading arrangements.

- Provision of 5, medium duty tipper trucks for collecting the wastes from house to house with introduction of bell ringing system in the periphery areas to households along the main road;
- Provision of 7 new dumper placers for secondary collection. The medium tippers and dumper placers shall be used for carrying waste from the waste generating sources to transfer station; and,
- Provision of 6 large tipper trucks with 8-10 cum waste carrying capacities per trip. The larger tipper shall be used for carrying waste from transfer station to sanitary landfill sites.

GARAGE AND TRANSFER STATION

40. The proposed components include

- Development of a transfer station at the existing disposal site at Mawlai towards increase in vehicle trips and area of coverage. The transfer station shall also function as recovery centre for segregation of biodegradable portions from the recoverable/ recyclables.

- Construction of new parking/garage/workshop facility at Mawlai (the existing disposal site) for accommodation and maintenance of 24 refuse vehicles. The garage shall also be used for maintenance of wheelbarrows and mechanised containers.

TREATMENT AND DISPOSAL

41. The proposed components include

- Development of a sanitary landfill site at Mawiong, with adequate leachate collection facilities and environmental protection measures.
- Provision of 2 bulldozers, 2 tipper trucks and 1 JCBs for disposal site and composting plant operations;
- Provision of environmental protection measures at the present disposal site at Mawlai, as intermediate protection measures till the new sanitary landfill site starts operation; and,
- Introduction of weighbridges at landfill sites to track waste supply to compost plant and fuel consumption.

CAPACITY DEVELOPMENT

42. This will consist of the following

- Safeguards compliance studies;
- Community awareness programs,
- Compost marketing studies;
- Private sector participation opportunities studies

B. PROJECT ALTERNATIVES

43. There is currently no alternative site for Solid Waste Disposal, however, the proposed site is intended to serve as an immediate sanitary disposal location at the existing disposal site for the near future, while the Shillong government is actively searching for more land to be used for future landfill activity. The proposed solid waste system will be designed in compliance with the MSW Rules, 2000 of GoI. The hygiene, efficiency and environmental suitability are the main criteria in selecting the waste collection, transportation and disposal system.

44. Door-to-door waste collection system is proposed. This system is preferred to the community bin collection system, which is generally unhygienic. The door-to-door collection system will ensure proper collection of waste and will avoid littering of the streets and unhygienic neighborhoods. Litter bins are proposed on main roads and commercial areas to avoid littering. The secondary collection and transportation system proposed ensures no manual handling of waste. Solid waste will be transported in closed vehicles to avoid the nuisance. The containers are lifted and unloaded mechanically minimizing the health risk to the sanitary workers. A sanitary landfill site and a compost plant are proposed to be developed at the disposal site.

45. These above mentioned measures will ensure establishment of an efficient solid waste management system in Shillong that will conform to the SWHR of the GoI and also minimize impacts on the environment and better the quality of life in the urban area.

III. DESCRIPTION OF THE ENVIRONMENT

A. ENVIRONMENTAL PROFILE OF SHILLONG

46. Shillong, which had been the Capital of Assam, since 1874, was founded by Col. Henry Hopkins, the then Commissioner of Assam, in 1864. In 1972 it became the capital city of the State of Meghalaya. It falls under the East Khasi Hills District being one of the seven districts of the State. Popularly referred to as "The Scotland of the East", Shillong functioned, during the British regime, as the administrative capital of the erstwhile Assam province apart from being the only major tourist destination in the region. Situated at 250 31' 26'' - 250 39' 56''N Latitude and 910 47'20'' - 9200'39'' E Longitude, the altitude of the city varies between 1400 to 1900 meters (m) above mean sea level (MSL). The National Highway NH-40 links Shillong with Guwahati and rest of the country. There is a minor airport at Umroi, 35 kilometers (km) from Shillong. Guwahati, the largest urban centre of the region, is located 120 km from Shillong, is the nearest railhead and airport.

47. The Greater Shillong Planning Area (GSPA) is spread over an area of 173.87 sq.km. It comprises three distinct areas, comprising the Shillong Municipal Board (SMB) area, 6 other urban centers namely Shillong Cantonment, Mawlai, Nongthymmai, Pynthorumkhrah, Madantring, and Nongmynsong8 towns and rural areas with 32 settlements. GSPA, with its total population of 312,539 (2001 Census) accounts for 78% of the total urban population of Meghalaya. Shillong is mainly a service centre for the entire state, apart from being a major tourist destination. The city population is 77% tribal, with most of the population belonging to Khasi tribe. There are 19 notified slums within GSPA, which account for about 22% of the population. The per capita income in 2005 was INR 1,881 per month, slightly above the Indian urban average of INR 1,695. About 25% of the city population is classified by the state government as below povertyline (BPL).

48. The city is located in Seismic Zone V. The slopes within the city are generally only moderately steep and range generally from 5% to 10% with some more steep areas. Shillong experiences a humid sub tropical climate, and is characterized by moderate warm wet summers and cool dry winters. The average annual rainfall is about 2100 millimeters (mm), mostly from the southwest monsoon. The physical growth of the city is in the northeastern direction, where the new Shillong Township is proposed. The growth of the city can be traced to the establishment of the cantonment by the British in 1867. In 1878, two sub urban villages of Mawkhar and Laban were formed into a station with the consent of the Syiem of the Mylliem. Subsequently, Lachumiere and Haneng Umkhrah were included in the station. The station was converted into a municipality in 1910.

49. Shillong is the only city, amongst the five project cities, which contains tribal areas falling under the VI Schedule[9] of the Constitution. There are two distinct areas; one comprising the SMB, which does not fall within the power and ambit of the Autonomous District Councils (ADC), and the rest of the GSPA governed by the Sixth Schedule. Outside the SMB and within GSPA, the

[8] The town was included as part of the Shillong Urban Agglomeration in 2001.

[9] Clause (2) of Article 244 of the Constitution of India, stipulates that the provisions of the Sixth Schedule shall apply to the administration of the tribal areas in the State of Assam, Meghalaya, Tripura and Mizoram. In accordance to the Sixth Schedule each of these areas shall be an 'autonomous district', the word 'autonomous' indicates a right of self-government. This essentially means that the tribal area of Meghalaya will be governed not by other provisions of the Constitution relating to the States or Union Territories of the Union of India but by the provisions of the Sixth Schedule alone, which contain a self contained code for the governance of the tribal areas. Although the VI Schedule also applies to Tripura and Mizoram, neither Agartala nor Aizawl has tribal areas within the boundaries of the city.

Autonomous District Council and the village heads, or dorbar schnongs,[10] play an important role in provision of civic services and in small development works particularly water supply.

B. PHYSICAL RESOURCES

a. TERRAIN

50. Shillong falls on deeply dissected central upland of the Meghalaya Plateau. The relief of the city varies from 1400 to 1900m above mean sea level (MSL). The Khasi Hills range at the south descends at a slope of 200+ towards the city and acts as a water divide. The slope within the city ranges from 5% to 10%, except at the locations such as Happy Valley, Pynthomukhrah and Polo Ground area, where slope are gentle within the range of upto 5%. Wah Umkhrah, Wah Umshyrpi and Wah Umkhen are the three main streams draining the city through a number of second and third order tributaries.

b. CLIMATE

51. The climate of Shillong is characterized by moderate warm wet summers and cool dry winters. Shillong experiences a humid sub tropical climate. There are four distinct seasons: mild summer (March to mid May), rainy season (mid May to mid October), autumn (mid October to November) and winter (December to February). The average maximum and minimum temperature is around 17°C and 7.5° C respectively. The average annual rainfall in Shillong is about 2100 mm. Shillong experiences a prolonged rainy seasons with intermittent rain for almost throughout the year, since it is located close to “Cherrapunjee”. The wettest place in the World (aerial disdatnce approximately 30 km). Two thirds of the rainfall occurs in months from June to September from southwest monsoons. The relative humidity is highest during rainy season (above 80%). The humidity is generally more than 50% for all throughout the year (except March).

C. GEOLOGY AND SEISMICITY

52. Shillong lies on low-grade metamorphic rocks of Shillong Group. The rock types are predominantly of quartzite with subordinate of phyllites and slates followed by schist and gneisses. The Quartzite band dips at 200 to 400 in North-North East to South-South West direction. The rock band is found at a depth of one to three metres from the topsoil level, except at places where the crusted Quartzite bands are exposed. Four sets of joints have been noted in these quartzite, which have rendered them splintery at places where all the sets are intensely developed. The quartzite exhibits broad open folds.

53. The generalized lithological succession in the area is presented in the **Table 3.1**.

[10] These are grass root traditional institutions involved in the civic affairs of the city. The Dorbar Schnong, though without constitutional or state recognition, is the most powerful and active body at the local level. The headman of the Dorbar Schnong looks after (i) certain administrative, municipal and financial functions (ii) law and order and common properties of the village and (iii) conventional municipal services like water supply, sanitation, management of roads, footpaths and water sources.

TABLE 3.1: LITHOLOGICAL SUCCESSION IN SHILLONG

Type of material	Nature of material	Depth of occurrence
Top soil	Sandy and micaceous	0m-1.5m
Weathered rock/debris	Unconsolidated, saturated with water	1.5m-4/6m
Weathered quartzite interbanded with metabasic	Hard and fresh bed rock	6m-20/30m
Hard and fresh quartzite interbanded with metabasic rocks	Hard and fresh rock	30m-35m

54. No major fault or thrust occurs within the Shillong Urban Zone but prominent lineament and a major shear zone (Tyrsad-Barapani Shear) occur in the vicinity. Shillong falls in the seismic Zone V.

55. The base of Shillong group is marked by conglomerate bed containing cobbles and boulders of Archaen rocks. In case of Shillong the other environmental factors like lithology, regolithic characteristics have very limited or no influence on the foundation, which is already found to be suitable, and the area is free from landslide problems.

d. SOILS

56. The soil in Shillong is mainly laterite soil, deficient in phosphorus and potash content but rich in nitrogen and organic matter. The soils are mildly acidic in nature. pH ranges from 4.8 to 6.2. Some areas have alluvial fills, which are heavy loams and contain larger amount of organic matter. The thickness of the soil varies from 1 to 10 meters.

e. Land Use

57. Shillong Master Plan Area covers an area of around 17400 hectares and includes 6 urban areas and 32 rural settlements. Of the total area, 5494.10 hectares or 31.58% is developed area, 1573.88 hectares or 9.04 % is undevelopable area, 5077.02 hectares or 29.18% is developable area, 803.07 hectares or 4.62 % is under urban agriculture and rest are covered by forest and water bodies. The Master Plan has classified the existing land use of Greater Shillong as given in **Table 3.2** and proposed land use (Shillong Master Plan) is given in **Table 3.3**. The land use pattern of Greater Shillong Planning Area is shown in **Figure 3.1**. The existing and proposed land use of Shillong Master Plan is shown in **Figure 3.2** and **Figure 3.3** respectively.

TABLE 3.2: EXISTING LAND USE IN SHILLONG, 1991

Land use	Area in hectares	Percentage to total area	Percentage to developed area
Residential	2662.78	15.30	48.47
Commercial	56.62	0.33	1.03
Public and Semi Public Uses	1202.01		
Administrative	*117.93*	.68	2.16
Institutional	*903.20*	5.19	16.44
Organized open spaces	*118.13*	.68	2.16

Land use	Area in hectares	Percentage to total area	Percentage to developed area
Graveyards	*61.75*	.35	1.12
Security	779.33	4.48	14.18
Industrial	10.00	0.06	0.18
Circulation	783.36	4.50	14.26
Vacant	6650.90	38.23	-
Urban Agriculture	803.07	4.62	-
Forests and Water Bodies	4451.93	25.58	-
Total	17400	100.0	100

Source: *Master Plan of Shillong, 1991-2011, Directorate of Urban Affairs, Meghalaya, Shillong*

TABLE 3.3: PROPOSED LAND USE (SHILLONG MASTER PLAN)

Land use	Area in hectares	Percentage to total area	Percentage to developed area
Residential	5095.27	29.28	60.85
Commercial	97.72	0.56	1.17
Public and Semi Public Uses	1326.03	0.85	1.76
a) Administrative	147.93	5.54	1.76
b) Institutional	963.2	0.88	11.51
c) Organized open spaces	161.75	0.35	0.74
d) Graveyards	53.15	4.48	9.31
Security	779.33	0.34	0.72
Industrial	60.00	5.82	
Circulation	1013.41	4.53	
Urban Agriculture	788.07	25.24	
Forests and Water Bodies	4391.93	22.13	
Conservation	3848.24		

Source: *Master Plan of Shillong, 1991-2011, Directorate of Urban Affairs, Meghalaya, Shillong*

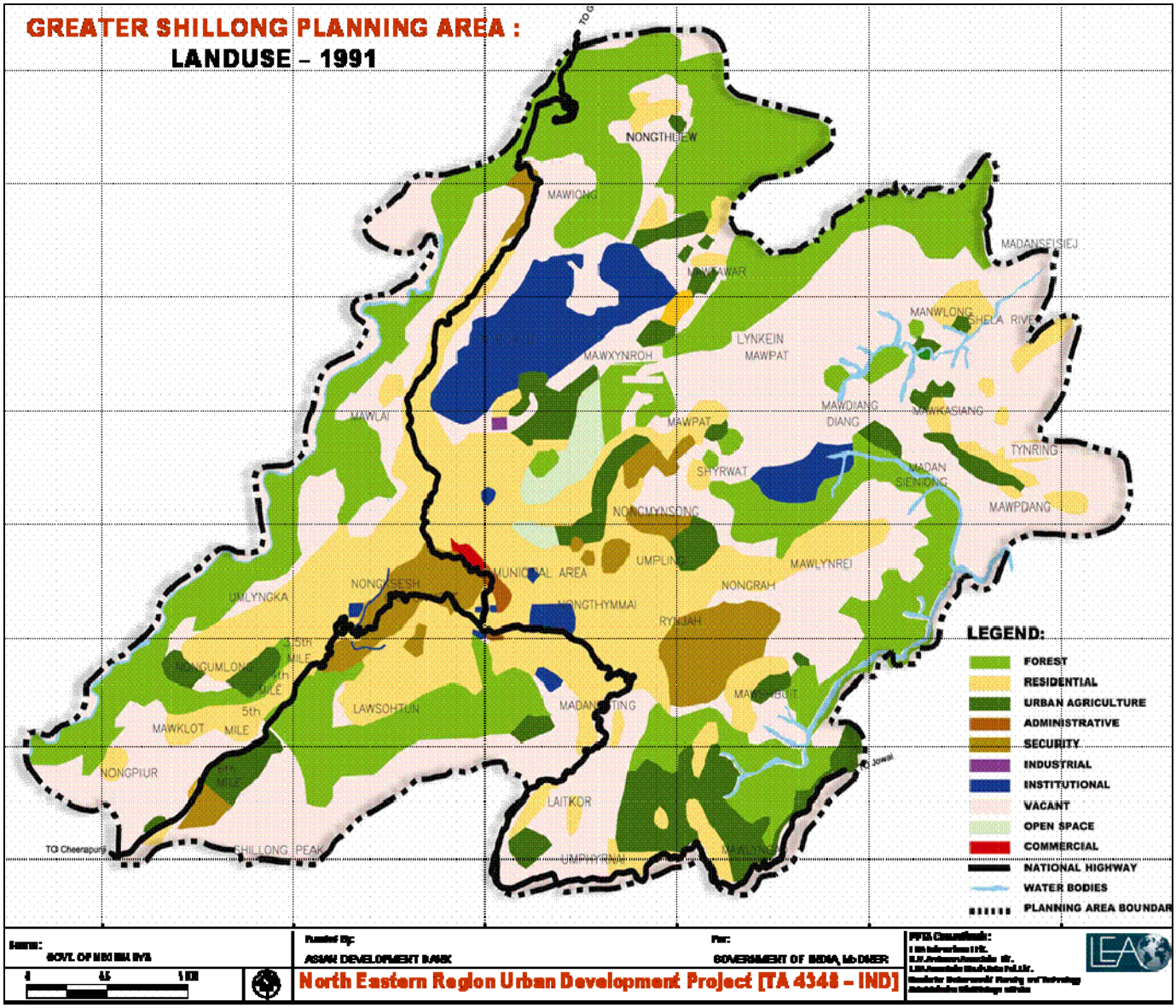


Figure 3.1: Existing Land Use in GSPA, 1991

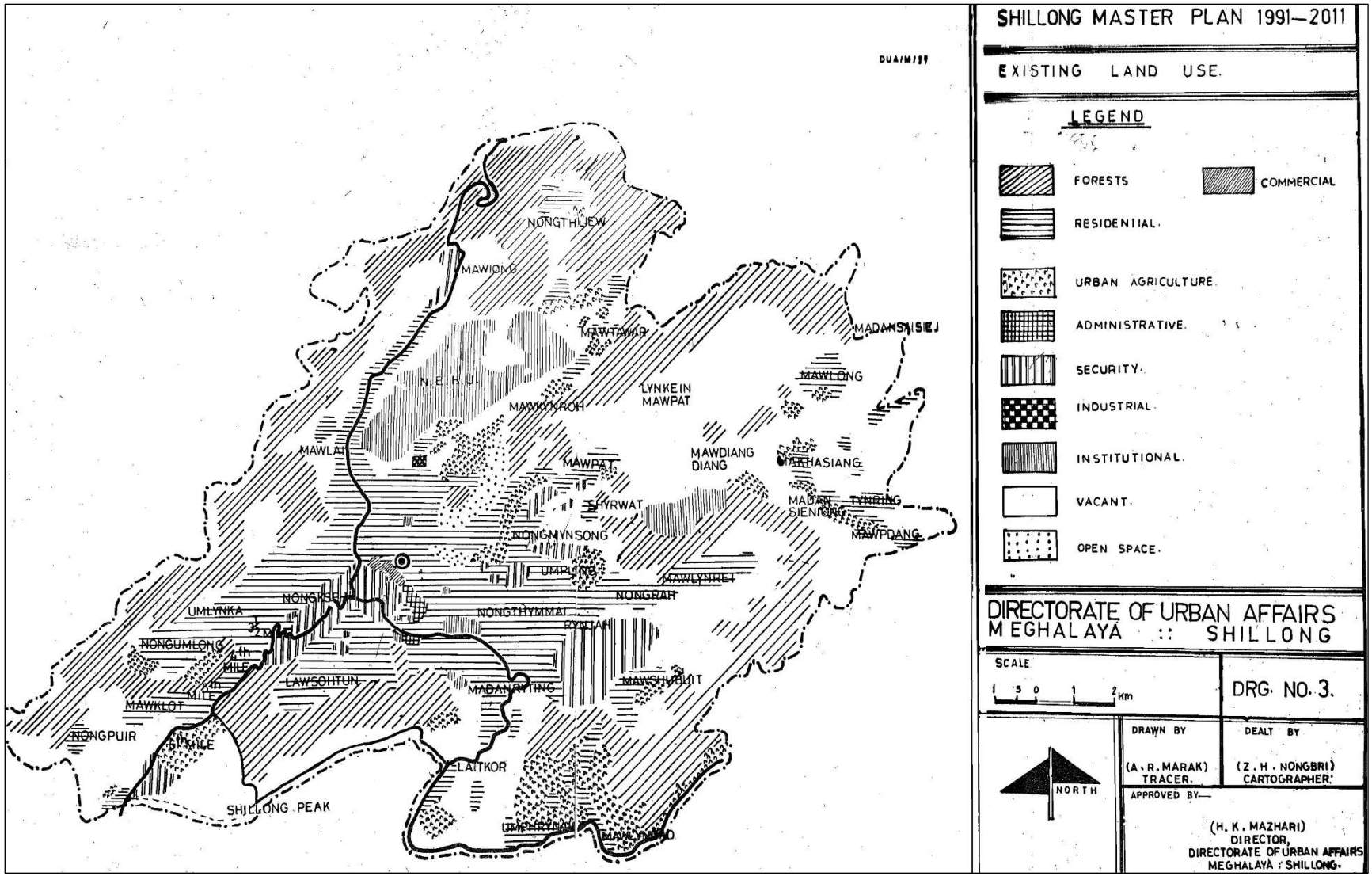


Figure 3.2: Existing Land Use Map Of Shillong Master Plan

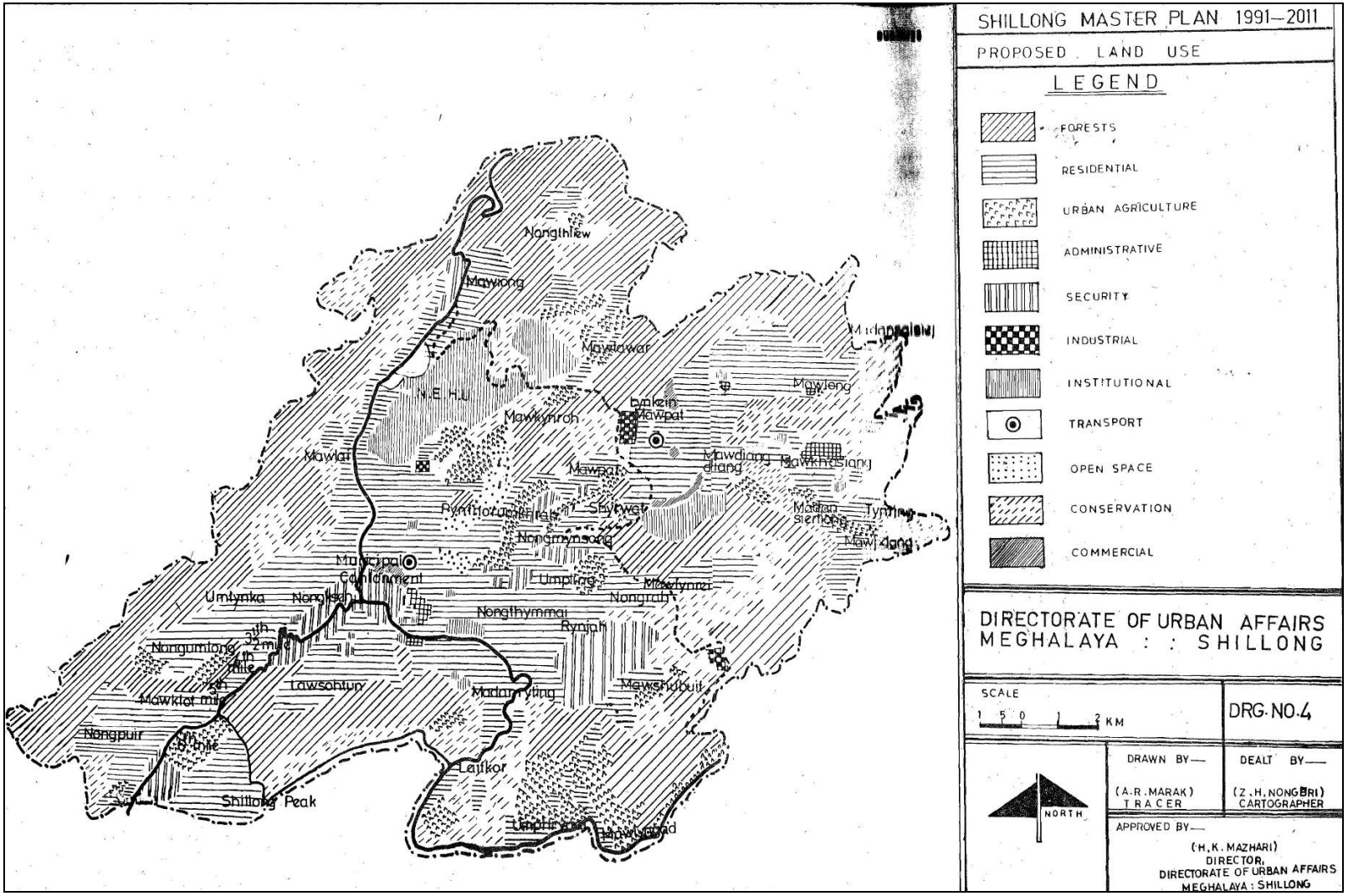


Figure 3.3: Existing Land Use Map Of Shillong Master Plan

f. SURFACE WATER RESOURCES

58. There is no stream or surface water that drain in or near the proposed disposal site, where as natural stream/ tributaries are available below approximately 1 km from proposed disposal site.

59. The Umkhrah and Umshyrpi Rivers are the two major rivers of Shillong city. These two rivers are running in the centre of the city and it is approximately 8 km away from proposed disposal site. These two rivers finally joins the Umain Reservior. These are basically the second order rivers that flow across the city from south-east towards north-west directions and then join together to form River Wah Ro Ro near Sunapani after a sudden fall known as "Bidon and Bishop Falls" prior to its confluence with the River Uniam further downstream. The water of these rivers is mostly used for irrigation, bathing and washing purposes. This river flows north into Lake Barapani (Umiam reservoir) and ultimately into Brahmaputra River. Other Rivulets such as Wah Demthring, Wah Nongrimbah flows towards the southeastern side and rivers Wah Dieng Lieng, Wah Um Jasai flows towards the western side of the city. The Drainage map of Shillong Urban Agglomeration with major watersheds is given in **Figure 3.4**. Siltation in Umiam lake has also been an issue raised by the government in recent years.

g. GROUND WATER RESOURCES

60. As per Central Ground Water Board (CGWB) the occurrence and movement of ground water in Shillong area is controlled by secondary structures and joints. Ground Water occurs under semi-confined conditions in the zone of permanent saturation. Drilling of good number of bore wells in Shillong area with the Down- the- Hole -Hammer Rig has proved that hard rock area holds and transmits sufficient quantity of water under favorable conditions. The yield of medium deep tube well varies from 5 to 25 m^3/hr.

h. Surface Water Quality

61. The water quality of Umshyrpi and Umkhrah rivers monitored during 1997-2000 is presented in **Table 3.4**.

TABLE 3.4: WATER QUALITY OF UMSHYRPI AND UMKHRAH RIVERS

Sampling Time	pH	DO mg/l	CON □mho/ cm	TDS mg/l	NO_2 mg/l	NO_3 mg/l	BOD mg/l	COD mg/l	TC MPN/ 100ml	FC MPN/ 100ml
River Umshyrpi										
Nov 1997	7.0	5.0	258.0	180.5	0.20	9.60	79.5	130.0	94,000	49,000
Mar 1998	7.6	4.3	262.4	185.8	0.30	10.00	84.7	140.5	1,00,000	54,000
Apr 1999	7.4	2.9	290.0	200.4	0.45	12.50	90.8	150.0	1,10,000	60,000
May 2000	7.2	7.9	134.0	-	0.10	-	40.0	68.4	35,000	22,000
River Umkhrah										
Nov 1997	7.0	3.0	290.0	220.5	0.50	12.50	94.50	178.50	1,60,000	1,10,000
Mar 1998	7.1	2.5	285.0	210.8	0.40	13.20	96.00	189.00	1,79,000	1,15,000
Apr 1999	7.6	Nil	360.0	279.2	0.62	14.50	112.50	210.00	2,00,000	1,30,000
May 2000	7.2	7.9	221.0	-	0.14	-	43.20	70.50	90,000	50,000

Source: *Meghalaya State Pollution Control Board*

62. Water Quality Analysis show, low dissolved oxygen (DO), higher Bio-chemical Oxygen Demand (BOD) and Chemical Oxygen Demand (COD) values and higher values of Total Coliform (TC), Faecal coliform (FC) and Nitrite (N) during 1997 and 1998 (lean season) as compared to those recorded during the year 2000 (peak monsoon season). The reason being that high dilution takes place during the monsoon months. During the monsoon, even with maximum dilution, the BOD values are normally more than 30 mg/lit (exceeding the maximum permissible limits of BOD concentration in industrial effluents for discharge into inland surface water bodies). **Figure 3.5** and **Figure 3.6** presents the DO – BOD profiles of the Umkhrah and Umshyrpi River. Sewage disposal from households is predominantly through septic tanks and soak pits with many households releasing their soak pit effluents into streams or springs. As a consequence, the river Umkhrah and Umshyrpi have become highly polluted, hence the high BOD and low DO levels. Direct discharge into drains is also a common practice.

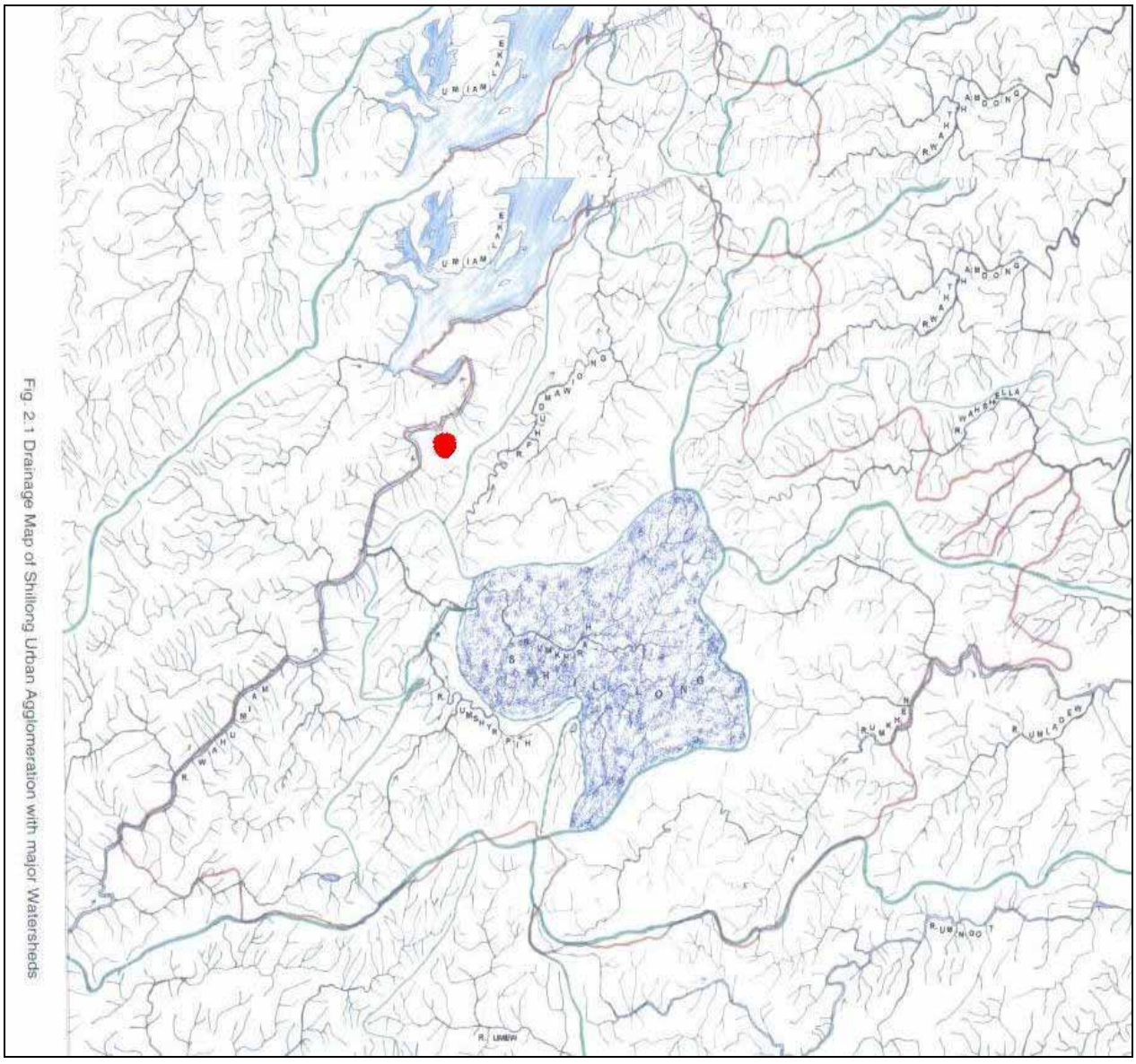


Figure 3.4: Drainage Map Of Shillong Urban Agglomeration with Major Watersheds

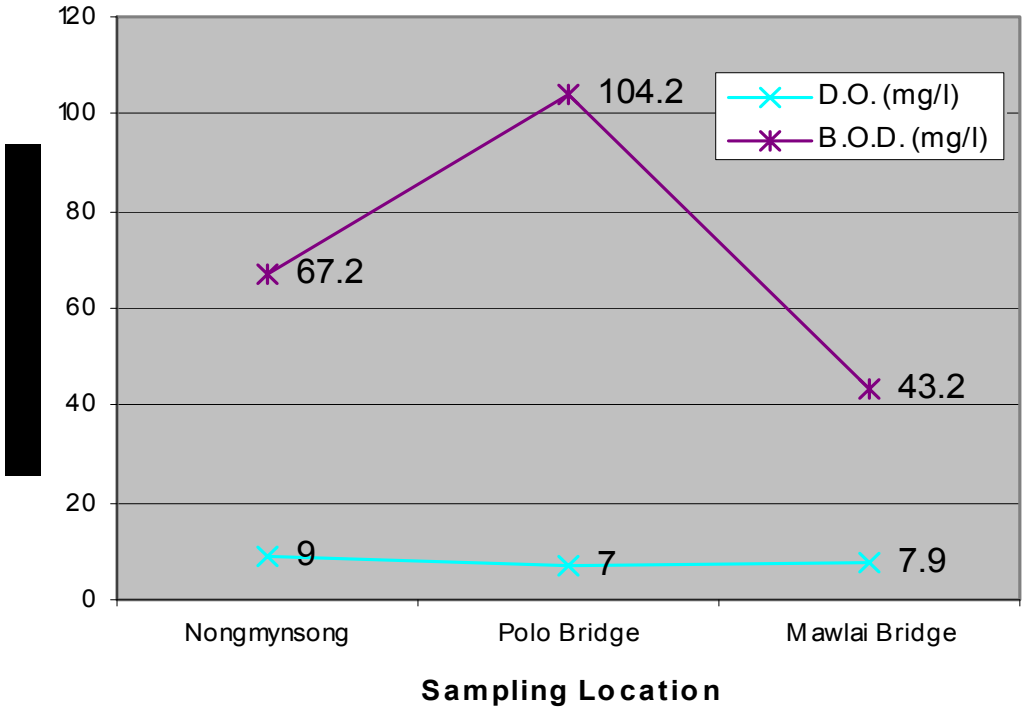


Figure 3.5: DO-BOD Profile of River Umkhrah

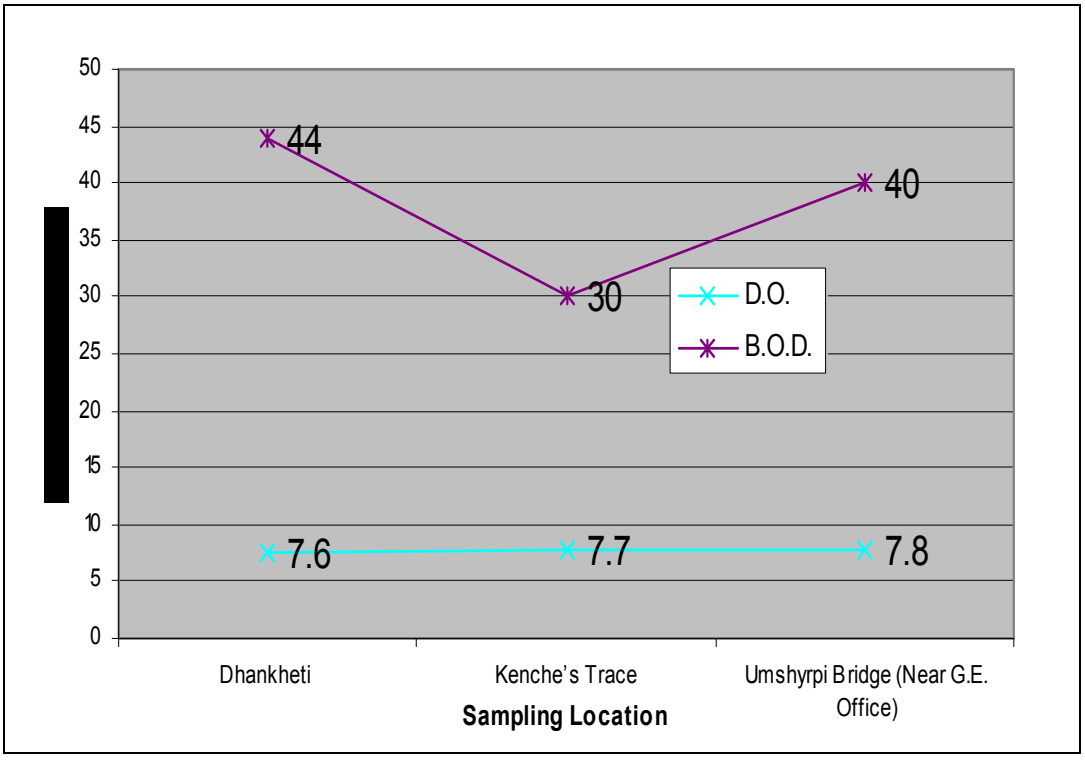


Figure 3.6: DO-BOD Profile of River Umshyrpi

63. **Water Quality of Umiam Lake:** The water quality of Umiam Lake is given in **Table 3.5**. As the table indicates, the water quality of Umiam lake is considered moderately polluted according to the BOD levels. Siltation has also been an issue raised in recent years.

TABLE 3.5: WATER QUALITY OF UMIAM LAKE

Table – 2
WATER QUALITY OF UMIAM LAKE

PARAMETER	APRIL 2003	JULY 2003	OCT. 2003	JAN. 2004
pH	7.0	7.5	7.2	6.8
Conductivity (µmho/cm²)	275.5	215.0	220.5	286.0
Turbidity (NTU)		32.0		
Chloride (mg/l)		12.0		
Hardness (mg/l)		32.0		
Alkalinity (mg/l)		32.0		
Nitrite (mg/l)	0.3	Nil	Nil	0.06
Nitrate (mg/l)	11.6	2.0	2.5	8.0
Sulphate (mg/l)		4.0		
Phosphate (mg/l)		BDL		
Calcium (mg/l)		3.0		
Dissolved Oxygen (mg/l)	6.4	6.8	6.2	6.5
Biochemical Oxygen Demand (mg/l)	12.5	8.0	10.0	9.6
Chemical Oxygen Demand (mg/l)		24.0		
Ammonia Nitrogen (mg/l)		1.1		
Kjeldahl Nitrogen (mg/l)		1.8		
Total Dissolved Solids (mg/l)		150.8		
Total Coliform (MPN/100 ml)	3300	2200	3400	3500
Faecal Coliform (MPN/100 ml)	2600	1700	2200	1700
Sodium (mg/l)		4.0		
Potassium (mg/l)		3.4		
Magnesium (mg/l)		4.0		
TSS (mg/l)		90.2		
Flouride (mg/l)		0.04		
Arsenic (µg/l)		Nil		
Cadmium (µg/l)		Nil		
Copper (µg/l)		Nil		
Lead (µg/l)		Nil		
Chromium (µg/l)		Nil		
Nickel (µg/l)		Nil		
Zinc (µg/l)		0.006		
Iron (mg/l)		0.1		
Temperature ° C	17.0	24.0	24.0	12.0

Meghalaya State Pollution Control Board, Shillong

Source: *Meghalaya Sate Pollution Control Board*

i GROUND Water Quality

64. Ground water extraction for public use is insignificant in Shillong. The ground water quality from 11 deep tube well located in different part of the city are presented in **Table 3.6**. These samples were collected and analyzed by various government and private agencies during 1998-2000.

TABLE 3.6: GROUND WATER QUALITY PROFILE IN SHILLONG

Sl. No.	Location (Year)	TC MPN/ 100 ml	pH	COND µmho/cm	TH mg/l	No_2 mg/l	Cl mg/l	Fe mg/l	Alk. Mg/l
1.	Mawroh, Mawlai (2000)	-	6.6	-	18	0.1	-	1.3	-
2.	Dinam Hall, Jaiaw (2000)	-	5.9	47	-	-	22	1.44	19.2
3.	Pynthrbah (1998)	-	5.5	31	8	-	50	0.06	28.8
4.	Government Press (1998)	-	-	-	36	0.2	30	0.07	76.8
5.	Seven Set School (1998)	-	5.2	184	-	BDL	-	0.08	9.6
6.	Hotel Polo Tower (1999)	-	-	-	-	-	-	0.57	-
7.	Cleve Colony (1999)	-	7.75	113	5	BDL	11	0.07	18
8.	Oakland (1999)	-	-	-	-	-	22	0.08	4
9.	Centre Point Hotel, Police Bazaar (1999)	6	5.8	410	90	0.067	68.9	0.174	20
10.	Dhankheti, LIC Building	-	6.05	52	-	-	1.0	1.096	-
11.	Fire Brigade	170	6.3	38	30	Trace	15	1.3	40

Source: *The State of Environment of Shillong city, MSPCB*

j. AMBIENT AIR QUALITY

65. The Meghalaya State Pollution Control Board is maintaining six ambient air quality-monitoring locations viz. (i) Nongthymmai, (ii) Dhankheti, (iii) Barik, (iv) Police Bazaar, (v) Bara Bazaar and (vi) Mawlai. The Ambient Air Quality for February-March, 2000, monitored at these locations is presented in **Table 3.7**.

TABLE 3.7: AMBIENT AIR QUALITY IN SHILLONG CITY (FEBRUARY – MARCH 2000)

Sl. No.	Land use	Station	Conc. in µg/Nm^3 (24 Hrs Average)		
			SO_2	NO_x	SPM
1.	Road Crossing (Residential)	Nonthymmai	30.6	44.9	347.2
2.	Road Crossing (Residential)	Dhankheti	11.8	42.1	400.8
3.	Road Crossing	Barik	10.6	28.1	227.3
4.	Commercial	Police Bazar	9.2	30.8	259.9
5.	Commercial	Barabazar	4.2	37.9	234.9
6.	Road Crossing (Residential)	Mawlai	19.2	43.2	349.8

Source: *Meghalaya Sate Pollution Control Board*

66. Result shows that the concentration of both Sulphur Dioxide (SO_2) and Oxides of Nitrogen (NO_X) are well within the prescribed norms for residential and other areas i.e. 80 µg/m^3 (24 hours weighted average) whereas the concentration of Suspended Particulate Matter (SPM) exceeds the prescribed norms for residential and other areas i.e. 200 µg/m^3 (24 hours weighted average) at all monitored locations.

67. In absence of air polluting industrial activities in the city, the high concentration of SPM may be attributed to vehicle emissions, since the monitored locations are either along the National Highway or busy traffic crossings.

k. AMBIENT NOISE LEVELS

68. Ambient noise monitoring (day time only) had been carried out by Shillong Pollution Control Board at 26 locations. The results are presented in **Table 3.8**.

TABLE 3.8: AMBIENT NOISE LEVEL IN SHILLONG CITY DURING DECEMBER 2000

Sl. No.	Location	Category of Area/Zone	Daytime Noise Level in dB (A) Leq.	Daytime Noise Limit in dB (A) Leq.
1.	Lumpyngngad (A.G. Qtrs.)	Residential	50.5	55.0
2.	Laitumkhrah (Fire Brigade)	Residential	65.0	55.0
3.	Golf Links	Residential	46.8	55.0
4.	Polo Ground	Residential	53.0	55.0
5.	Mawkhar	Residential	53.6	55.0
6.	Mawlai (Jingkieng)	Residential	65.9	55.0
7.	Umpling (BSF)	Residential	46.8	55.0
8.	Mawiong (G.S. Road)	Residential	62.7	55.0
9.	Nongthymmai (Dum Dum)	Residential	67.7	55.0
10.	Barabazar (Motphran)	Commercial	65.4	65.0
11.	Police Bazar (Police Point)	Commercial	71.4	65.0
12.	Garikhana	Commercial	68.8	65.0
13.	Mawlai (Petrol Pump)	Commercial	65.6	65.0
14.	Rynjah Bazar	Commercial	62.1	65.0
15.	Nazareth Hospital	Silence Zone	50.9	50.0
16.	Don Bosco Square	Silence Zone	61.2	50.0
17.	Shillong College	Silence Zone	49.5	50.0
18.	K.J.P. Synod Hospital (Jaiaw)	Silence Zone	50.1	50.0

Sl. No.	Location	Category of Area/Zone	Daytime Noise Level in dB (A) Leq.	Daytime Noise Limit in dB (A) Leq.
19.	Dhankheti	Silence Zone	69.6	50.0
20.	Military Hospital	Silence Zone	64.1	50.0
21.	Red Cross (Laban)	Silence Zone	59.6	50.0
22.	Civil Hospital	Silence Zone	64.1	50.0
23.	Legislative Assembly	Silence Zone	58.8	50.0
24.	Main Secretariat Compound	Silence Zone	56.1	50.0
25.	St. Anthony's College (Gate)	Silence Zone	53.2	50.0
26.	Mayurbhanj Campus (NEHU)	Silence Zone	48.1	50.0

Source: *Meghalaya Sate Pollution Control Board*

Note: 1. **Day time** (6:00 am to 10:00 pm)
2. **Night time** (10:00 pm to 6:00 am)
3. **Silence Zone**- Area comprising not less than 100 meters around Hospital, Educational Institutions and Court.
4. **dB(A)Leq**: Denotes the time-weighted average of the level of sound in decibels on scale, "A" which is related to human hearing.

69. The summary of the monitoring results is as follows:

- Out of 9 monitoring locations in residential areas, at 4 locations the noise levels (Leq) are exceeding national standards [55 dB (A)]
- The ambient noise levels (Leq) in all monitored commercial areas (4 locations) exceed the national standards of 65 dB (A).
- In all deemed silence zone areas, except for Mayurbhanj Campus (NEHU), high noise levels exceeding the permissible limit of 50 dB (A) are recorded.

C. ECOLOGICAL RESOURCES

a. Forest and Vegetation

70. Within the Shillong Master Plan area of 174 sq. km, there exists about 6.0 sq. km of Reserved Forests in three pockets and another 12 sq. km of Protected Forests. The Reserve Forests in Greater Shillong Area are:

- Riat Laban
- Laitkor Protected Forest
- Raid Laban (Forest committee under long term lease to FD)
- Riat Khwan RF (Catchment of Umiam)
- Shyrwat RF

- Short round RF (Golf Link area)

71. The Upper Shillong Protected Forest and adjacent areas (Riat Laban Reserve Forest and Laitkor Protected forest) are located close to Shillong City. The forest around Shillong peak is a traditional Sacred Grove.

72. While a major area of these forests is sub-tropical pine forest, there exist small pockets of wet temperate broad leaf forests. In the upper Shillong, Riat Laban and Laitkor, sub-tropical pine and broad leaf vegetation are seen. The pine forests have only Khasi Pine (Pinus kesiya). Among broad leafed trees, a few flowering trees such as Rhododendron formosum, R. arborea and Pyrus pashia are observed. A prominent timber species of the forests is the Oak (Quercus griffithii).

73. However in some of the areas of Greater Shillong, the luxuriant sub tropical pine forest has become degraded to almost barren land as a consequence of forest clearing and jhum cultivation. The secondary formations are of negligible density and number. Some of the common trees and ferns are:

- Schima khasiana
- S. wallichi
- Engelhardtia spicata
- Acacia mollisima
- Myrica nagi
- Alnus nepalensis
- Rhododendron arboretum
- Rhus simi alata
- Quercus spp.
- Lantana camera
- Rubus ellipticus
- Eupatorium bushes
- Asteraceae rubiaceae

b. Phyto diversity of Shillong

74. A phyto diversity survey was carried out at the following identified locations in GSPA :

- Barapani (Kalikhola)
- Raitkhwan
- Umkhra River Bank

- Umshillong
- Mawphlong
- New Shillong

75. Diversity was measured using the Shannon-Wiener Diversity Index, and evenness with the Evenness index, calculated using the following formulae:

Shannon-Wiener Index of Diversity, $H = -\Sigma\, p_i \log p_i$
Where, $p_i = n_i/N$, n_i = number of individuals of the ith species,
N = total number of individuals of all the species

Evenness Index, $J = H/H_{max}$
Where H= Shannon-Wiener Index of Diversity
H_{max} = Log S, where S = number of species

76. The indices were employed to get a comprehensive, easily comparable, and quantitative estimate of the diversity and degree of evenness (i.e., uniformity) of the plant community. The key characteristics of these locations are presented in **Table 3.9**.

77. The key findings of the biodiversity assessment are as follows:

TABLE 3.9: PHYTO DIVERSITY AT VARIOUS LOCATIONS WITHIN GSPA

Characteristics	Barapani (Kalikhola)	Riat khan	Umkhra River bank	Umshilling	Maphlong	New Shillong
Tree species (no)	10	7	4	6	16	17
Shrubs & herbs (no)	13	15	19	14	21	19
Relative dominance						
Highest (species)	36.766, Pinus kesiya	29.39 Pinus kesiya	***71.17 Eucalyptus cytrodora***	***30.8 Ilex khasiana***	11.71 Ilex khasina	46.3 ***Pinus keshiya***
Lowest (species)	4.668 Sapium baccatum.	5.47 ***Myrica esculenta***		9.32 ***Garcinia cowa***	1.51 Exbucklandia populnea	0.994 ***Lindera latifolia***
Relative density						
Highest (species)	33.628 Pinus kesiya	33.33 Pinus kesiya	***52.63 Eucalyptus cytrodora***	25.0 ***Pinus kesiya***, ***Ilex khasiana***	13.79 Ilex khasiana	50.39 ***Pinus ke***shiya
Lowest (species)	3.65 Albizia procera , Artocarpus chama	***4.44 Myrica esculenta***		36.25 ***Litcea citrata***	1.72 Exbucklandia populnea	0.79 ***Melia azedarach***
Relative frequency						
Highest	4.126	140	***60***	40.0	40.0	***100***

Characteristics	Barapani (Kalikhola)	Riat khan	Umkhra River bank	Umshilling	Maphlong	New Shillong
(species)	Pinus kesiya	Pinus kesiya	***Eucalyptus cytrodora***	***Pinus kesiya***	Zanthoxylum khasianum , Glochidion assamicum and Ilex khasiana	***Pinus keshiya***
Lowest (species)		***10 Myrica esculenta***		10.0 ***Litcea citrata***		***10 Schima wallichii***
IVI value						
Highest (species)	170.394 Pinus kesiya	202.73 Pinus kesiya	***183.8 Eucalyptus cytrodora***	89.95 ***Pinus Kesiya***	65.5 Ilex khasiana	***Pinus Kashiya***
Lowest (species)	109.22 Rhus hookeri	***19.92 Myrica esculenta***			13.24 *Exbucklandia* populnea	12.11 ***Melia azedarach***
Stocking value						
Highest (species)	248.589 Pinus kesiya	12.348 ***Pinus kesiya***	***7.962 Eucalyptus cytrodora***	4.65 ***Litcea citrata***	4.88 *Ilex khasiana*	
Lowest (species)	27.90 ***Sapium baccatum***	**2.301** ***Myrica esculenta***		1.40 ***Garcinia cowa***.	0.631 *Exbucklandia populnea*	
Trees						
Shannon diversity index (H)	1.93 Kalikhola	1.79	1.09 ***Eucalyptus cytrodora***	1.72	2.66	2
Evenness index (E)	0.84 Kalikhola	0.92	0.79 ***Eucalyptus cytrodora***	0.96	0.96	0.7
Simpson's Index	0.195	0.192	0.387	0.186	0.076	0.274
1/Simposon's Index	5.211	5.201	2.582	5.378	0.195	3.654
Species richness or α-diversity	5.438	4.234.	3.12	4.612	10.774	8.081
β- diversity (Whittaker's measure)		-0.984	-0.979	-0.970	-0.972	-0.987
Shrubs and herbs						
Shannon diversity index (H)	1.78	1.94	2.34	2.44	2.92	2.54

Characteristics	Barapani (Kalikhola)	Riat khan	Umkhra River bank	Umshilling	Maphlong	New Shillong
Evenness index (E)	0.74	0.78	0.91	0.93	0.96	0.92
Species richness or α-diversity			3.128	4.234	10.774	8.081
β- diversity (Whittaker's measure)						
Dominence index	0.255					
Medicinal value plants		***Cannbis sativa Plantago major*** , ***Cynodon actylon***		***Gaultheria fragrantissima, Centella asiatica, Achyranthes aspera***	Lyonia ovalifolia, Digitaria corymbosa , Centella asiatica and Gaultheria fragrantissima.	Lantana camara, Cynodon dactylon and Amomum subulatum

c. Terrestrial & Aquatic Fauna

78. As per the survey carried out by Zoological Survey of India in 1986, there are diverse terrestrial and aquatic fauna found within Greater Shillong Area. However, none of these are endangered. The prominent species are mentioned in **Table 3.10**.

TABLE 3.10: SHILLONG – TERRESTRIAL & AQUATIC FAUNA

Group	Species
Lepidoptera	Eurema blaada, Mucalesis mineus, Pelopidas mathais, Euploe core, Eurema hecabe
Odonota	Crocothemis sp., Orthetrum sp.
Crustacean	Prawns
Reptilla	Calotes versicolor
Ambhibia	Rana limnocharis, R. cyanpphlyctis

d. Avifauna

79. As per Bio diversity Conservation Prioritization Project (BCPP), there are four sites in Greater Shillong Area, highly ranked in terms of biodiversity. These areas are: Umshing, Shillong, Laitkor Peak, Mawphlang. These areas are also designated as Important Bird Area by IBA and Endemic Bird Area by EBA. The prominent species include Brown Shrike (Lanius C. cristatus), Grey Backed Shrike (Lanius T. tephronotus), Grey Headed Myna (Stumus M. malebaricus) and Jungle Crow (Corvus macrohynchos).

e. Biodiversity Rich Areas

80. As per the Meghalaya State Biodiversity Action Plan[11], there are no biodiversity conservation hotspots within the Shillong Master Plan area. Site visits and interactions with the stakeholders in Shillong especially with the officials of the Forest Department and NGOs, has helped in identifying pockets in the city rich in biodiversity and ideal for conservation. (**Refer Table 3.11**).

TABLE 3.11: SHILLONG – BIO DIVERSITY RICH AREAS

Name of Location	Key Feature
Wards Lake	Few primitive plants in fringe areas of lake.
Barapani Lake	Birds and Fishes
Elephant Falls	Amphibia, Birds
Bidon-Bishop Falls	Amphibia, Birds
Sweet Falls	Amphibia, Birds and Reptiles
Botanical Garden	Biodiversity and biotechnologically important species.

Source: *Meghalaya State Biodiversity Action Plan*

D. SOCIAL AND CULTURAL RESOURCES

81. GSPA with its total population of 312539 accounts for 78% of the total urban population of Meghalaya. Distribution of population within GSPA is not consistent with Shillong Urban Agglomeration area densely populated. Only 14% of the total geographical area of Greater Shillong i.e the core area is supporting 82% of the total population. While the population growth rate in Shillong Municipal Area and the cantonment has continuously declined, the urban centers within the SUA i.e., Pynthorumkhrah and Madantring (classified as urban in 1981) have shown high growth rates.

- **Migration Pattern** - Unlike other project cities more than 82.8% of the people are born within Shillong. Migration is not common within GSPA.

- **Sex Ratio** - Sex ratio in the city was quite low in 1991 at 892 females per 1000 males. However, between 1991-2001, the figure has increased to 1009 females per 1000 males more than the national average of 933.

- **Literacy and Education (For Population Above 6 years)** - The literacy rate in GSPA is 88%, which is more than the national average of 65.4% (Census 2001). In terms of education around 15% of the population is having education up to class V.

- **Work Participation Rate** - The work participation rate within the city is 27.6% much less than the national average of 39.3%. Though there has been a significant increase in the total main workers from 14% in 1991 to 31% in 2001 the percentage of non-workers has also increased tremendously from 27% in 1991 to 67.1% in 2001indicating towards growing unemployment.

[11] Prepared as part of the National Biodiversity Strategy and Action Plan (NBSAP), Government of India

- **Occupational Profile** - Occupational profile of the city reflects a predominance of tertiary sector with 39% of the population engaged in government services followed by 25% in other non-defined services.

PHYSICAL & CULTURAL HERITAGE

82. Shillong has numerous waterfalls viz. Elephant Falls in Upper Shillong, Sweet falls in Happy Valley and the Bishop Bidon falls in Mawlai. There are several beautiful Cathedrals in and around the city. Shillong has one of the oldest natural golf courses in the world.

INDIGENOUS PEOPLE

83. In Shillong and the entire state of Meghalaya, the tribes constitute the mainstream society. Shillong has predominantly tribal population (77% of the total population) with Khasis being the dominant tribe followed by Jaintia, Bhoi, War and Garo. All the tribal communities are into modern means of livelihood. They have the same traditions, customs and usage with a little variation owing to geographical divisions. The most predominant indigenous group is Khasi accounting for 85% of the total IPs. The Khasi speak the language of Khasi and follow Christianity.

E. ECONOMIC DEVELOPMENT

INDUSTRIAL DEVELOPMENT

84. There is only one industrial estate in Shillong located at Short Round Road with an area of 4.1 Ha. The estate has 9 industries, all small-scale units. List of industries and type of units established in the estate are presented in **Table 3.12**.

TABLE 3.12: INDUSTRIES & TYPE OF UNITS ESTABLISHED IN THE SHILLONG INDUSTRIAL ESTATE

Name of Industrial unit	Nature of Industrial Activity
M/S R.K.B Industries	Processing of Paraffin wax from stack wax for manufacture of candles and polishes.
M/S Meghalaya iron and steel fabrication unit	Iron and steel fabrication works.
M/S Above Pharmaceuticals	Repacking and bottling plants.
M/S EMO Chemicals and Additives (p) Ltd.	Bitumen emulsion processing.
M/S Warjri Industries	Manufacturing of fencing materials.
M/S Meghalaya Watches	HMT watch Assembly
M/S Meghalaya Roller Flour Mills	Heat products.
M/S Meghalaya Metals and Minerals (p) Ltd	ACSR and ACC conductors
M/S Meghalaya Wood Crafts	Wood Mosaics

85. Most of mentioned industries in the industrial estate are non-polluting except one flourmill, which generates liquid effluents. The other small scale units of Shillong relate to automobile repairing and servicing workshops, steel and wooden furniture, tyre retreading, printing press, bakeries and confectionaries, flour mills, rice mills and other handicraft units. Automobile repairing and servicing workshops is the prominent activity. **Table 3.13** shows the distribution of automobile workshops along with daily quality of waste generated.

TABLE 3.13: TOWN WISE DISTRIBUTIONS OF AUTOMOBILE WORKSHOPS IN SHILLONG

Name of the town	No. of Workshops	Daily quantity of waste generated	
		Solid (kg)	Liquid (kl)
Shillong municipal Area	68	735.0	4.25
Shillong Cantonment Area	7	148.0	.265
Madantring Area	24	505.0	.795
Nongthymmai Area	52	600.0	4.42
Mawlai Area	31	363.0	9.75
Pynthorumkhrah Area	-	-	-

Source: *Draft Final Report, TR-17, TA-4348*

F. PHYSICAL INFRASTRUCTURE SERVICES

a. Water Supply

86. The main source of water supply for Greater Shillong is River Umiam situated at a distance of 24 km to the southwest of the city. Across the river Umiam, a 50 meter high dam has been constructed by the PHED at Mawphlang, having a live storage of 7.21 million cubic meters and dead storage of 1.94 million cubic meters. Water is lifted from the river and pumped to the inlet of treatment plant at an elevation of 1847 m through a three stage pumping with a total static lift of 302 meter (m).

87. Water production and distribution in the Greater Shillong Area is managed by three agencies – The Public Health Engineering Department (PHED), the Shillong Municipal Board (SMB) and the Cantonment. Production and distribution for areas outside the municipal boundaries is under PHED, while distribution within the municipality is under SMB. Salient features of the water supply in Shillong are mentioned in **Table 3.14**.

TABLE 3.14: SHILLONG – SALIENT FEATURES OF WATER SUPPLY

Sl. No.	Particulars	Item
1.	Households with tap in dwelling (%)	47
2.	Residential water consumption (lpcpd)	85
3.	Water availability (lpcpd) (consumer end)	102
4.	Unaccounted for water (%)	50
6.	Priority for improvement	1
7.	Water Supply Sources	Umiew River, Wah Risa, Wahjalynnoh, Umjasai, Crinoline, Madan Laban, Wah Ding ling, Patta Khana.
8.	Distance from the city (km)	24
9.	Water Supply from PHED (MLD)	33.75
10.	Remaining Supply from seven sources (MLD)	2.7-3.7
11.	Total Production (%)	36.45-37.45
12.	Quantity reaching Consumers (MLD)	18.5
13.	Actual Demand in 2005 (MLD)	59.06

Sl. No.	Particulars	Item
14.	Total Number of Zonal Reservoirs	21

b. Sewerage and Sanitation

88. At present, Shillong does not possess any sewerage system. All the house sullage (kitchen and bath room waste water) drains either into the Um Shyrpi in the south or in the Um Khrah in the north.

89. Sewage disposal from households is predominantly through septic tanks and soak pits with many households releasing their soak pit effluents into streams or springs. As a consequence, the river Umkhrah and Umshyrpi have become highly polluted. Direct discharge into drains is also a common practice.

90. A survey was carried out by Meghalaya State Pollution Control Board along the banks of river Umkhrah in 2002, to assess the extent of pollution caused by the direct discharge of sewage into the river. The survey covered the area along the bank of the river Umkhrah from Laplang up to Mawlai Bridge. A total of 1255 houses were surveyed. The results of the surveys are presented in **Table 3.15**.

TABLE 3.15: SHILLONG – SANITATION STATUS

Sl. No.	Particulars	Item	Comments
1.	Toilet in dwelling (%)	73	SES
2.	Pipe to stream or drain (%)	8	SES
3.	Priority for improvement	2/6, 4/6(Community toilets)	SES

Source: *Draft Final Report, TR-17, TA-4348*

91. From **Table 3.15** it can be seen that around 40% of raw sewage is being directly discharged into the river increasing its pollution load.

c. Drainage

92. The drains are kutcha in Greater Shillong Area except for Shillong Municipality, where the drains are pucca. The natural flow of the drains has been blocked due to dumping of garbage in the drains. The wastewater from households and commercial areas also flows down these drains and ultimately draining into the rivers Umkhrah and Umshyrpi. The municipal drain of Shillong either terminates directly in these two rivers or into their secondary or tertiary tributaries. It is therefore observed that the natural streams in most parts of Shillong are gradually being converted from storm water drains to sewage canal carrying the sewage of the city. As such there are no instances of flooding within Greater Shillong Area but flooding during the rainy season does occur in the Polo Ground area.

93. The salient features of the major tributaries of Umkhrah and Umshyrpi rivers, showing the location of their confluence and their command areas are furnished in **Table 3.16** and **Table 3.17**.

TABLE 3.16: MAJOR TRIBUTARIES OF UMKHRAH RIVER

Name of Tributaries/Drain	Location of Confluence	Command Area	Major Character
Wah Disoi	Below Mawpdang Bridge, Mawprem	Mawprem, Garikhana, Lama Villa, Jaiaw Langsning, Slaughter House Area, Naspatigarhi	Domestic Sewage, Trade Effluent
Jaiaw Lumsyntiew Drain	Behind Old CRPF Camp, Mawlai	KJP Synod Hospital, Jaiaw	Domestic Sewage, Hospital Effluent
Mawlai Phudmuri Drain	Slaughter House	Mawlai Phudmuri Slaughter House	Domestic Sewage, Slaughter House Waste
Mawlai Stream	Near Cremation Ground, Jaiaw	Raitsamthiah, Jaiaw	Domestic Sewage, Trade Effluent
Jaiaw Drain	Near Lawmali Graveyard	Raitsamthiah, Wahingdoh	Domestic Sewage,
Raitsamthiah-Wahingdoh Drain	Lawmali Bridge	Ganesh Das Hospital	Domestic Sewage, Hospital Effluent
Lawmali Drain	Lawmali Bridge	Keating Road, Mawlonghat, Barabazar, Mawkhar, Police Bazaar, Umsohsun, Jail Road, Wahingdoh	Domestic Sewage, Trade Effluent, Hospital Effluent
Wahindoh-Raimohan Drain	Wahindoh Bridge	Botanical Garden, Wards Lake, Oak Land	Domestic Sewage, Trade Effluent
Oakland Drain	Polo Bazaar	Lower Lachumiere, Laitumkhrah	Domestic Sewage, Trade Effluent
Laitumkhrah Drain	4th Furlong	Lawjynriew, Lumpyngngad, Jinkieng Nongthymmai, Nongrim Hills, Nongrimbah, Nongrimmaw, Demseiniong	Domestic Sewage
Wah Thangsniang Stream	Demseiniong	Mawpat, Lalchand Basti	Domestic Sewage, Domestic/Trade Effluent
Wah Kdait	Below Spread Eagles Falls	Happy Valley	Domestic Sewage
Phud Raimut	Laplang Bridge	Nongthymmai, Madantring	Domestic Sewage
Wah Demthring			Domestic Sewage, Domestic/Trade Effluent

Source: *Meghalaya State Pollution Control Board*

TABLE 3.17: MAJOR TRIBUTARIES OF UMSHYRPI RIVER

Name of Tributaries/Drain	Location Of Confluence	Command Area	Major Character
Motinagar Stream	Fish Dale	Motinagar, Fire Brigade, Area, Park View Nursing Home Area	Domestic Sewage, Garage Effluent, Hospital Effluent
Dhankheti Stream	Near Wood Land	Parts Of Laitumkhrah,	Trade Effluent,

Name of Tributaries/Drain	Location Of Confluence	Command Area	Major Character
	Hospital	Laitumkhrah Bazaar, Woodland Hospital	Domestic Sewage, Hospital Effluent, Sullage
Malki Stream	Near Seven Set School	Malki Area	Domestic Sewage And Sullage
Wah Risa Stream	Near Cinolin Swimming School	Malki Reserved Forest	Fresh Water
Um Kynrud Stream	Idgah, Laban	Laban Area	Domestic Sewage And Garage Effluent And Sullage
Wah Sohkhlur Stream	Near Kenches Trace Bridge	Madan Laban, Kenches Trace Area	Domestic Sewage And Sullage
Um Jasai Stream	Near Ribong Bridge	Ribong, Lawshotun Area, Defence Area	Domestic Sewage And Sullage
Wah Dienglieng		Lum Shillong Reserved Forests, Risa Colony	Fresh Water

Source: *Meghalaya State Pollution Control Board*

d. Solid Waste Management

94. Municipal Solid Waste Management in Shillong may be classified into two categories i.e

Organised areas: -areas falling under the jurisdiction of Shillong Municipality or Cantonment Board;

Unorganised areas: - areas outside the Shillong Municipality or Cantonment Board;

95. There are no actual records with respect to the solid waste generation in Shillong city. Available information reveals that the Shillong Municipal Board is lifting about 75-80 MT/ day and the Cantonment Board is lifting about 15 to18 MT/day. The solid waste generated in other towns of the Shillong agglomeration, viz Madanrting, Mawlai, Nongthymmai and Pynthor Umkhrah remains unaccounted for.

96. Average Physical Characteristics (Wet Weight Basis) and Chemical Characteristics (Dry Weight Basis) of Shillong 's solid waste is given in **Table 3.18** and **Table 3.19** respectively.

TABLE 3.18: AVERAGE PHYSICAL CHARACTERISTIC OF SHILLONG'S SOLID WASTE IN PERCENTAGE (WET WEIGHT BASIS)

Sl. No.	Particulars of Waste	Contents (%)
1	Compostable matter	48.41
2	Paper	10.91
3	Rubber & Leather	1.81
4	Plastics	0.96
5	Rags/ Textiles	2.85

Sl. No.	Particulars of Waste	Contents (%)
6	Wooden	1.85
7	Metals	0.85
8	Glass & Crockery	2.51
9	Stone, Bricks, ashes, fine organics etc.	29.85
10	Moisture	44.80

Source: *The State of Environment of Shillong city, MSPCB*

TABLE 3.19: AVERAGE CHEMICAL CHARACTERISTIC OF SHILLONG'S SOLID WASTE IN PERCENTAGE (DRY WEIGHT BASIS)

Sl. No.	Particulars of Waste	Contents (%)
1	pH	7.60
2	Organic matter (in %)	61.00
3	Carbon (in %)	35.40
4	Nitrogen (in %)	0.61
5	Phosphorous (in %)	0.20
6	Potash (ask_{20} in %)	0.23
7	C/N ratio	58.31
8	Colorific Value (Keal/Kg)	2704.80

Source: *The State of Environment of Shillong city, MSPCB*

97. Monitoring of the Quality of compost from solid waste dumping site (land fill site) at Mawiong is given in **Table 3.20**.

TABLE 3.20: MONITORING OF THE QUALITY OF COMPOST FROM SOLID WASTE SITE AT MAWIONG

MONITORING OF THE QUALITY OF COMPOST FROM SOLID WASTE DUMPING SITE (LANDFILL SITE) AT MAWIONG

During 2004, the Board has carried out the monitoring on the quality of compost from the solid waste dumping ground at Mawiong with respect to heavy metals concentration. The result presented in Table 1.0 shows that the concentration of Chromium is found to be above the prescribed standards. Other parameters tested were within the prescribed standards.

Table 1.0: QUALITY OF COMPOST OF SHILLONG MUNICIPAL DUMPING GROUND, MAWIONG

Sl. No	Parameters	Standards for compost quality to ensure safe application of compost	Results
1.	Cadmium (mg/kg)	5.0	1.0
2.	Chromium (mg/kg)	50.0	71.0
3.	Copper (mg/kg)	300.0	133.0
4.	Lead (mg/kg)	100.0	41.0
5.	Nickel (mg/kg)	50.0	31.0
6.	Zinc (mg/kg)	1000.0	373.0

Source: MSPCB

98. Monitoring of the Quality of Leachates from solid waste dumping site (land fill site) at Mawiong is given in **Table 3.21**. As the table indicates, pollution levels for several indicators (TDS, TSS, BOD, and Chloride) at the existing site are higher than the standards.

TABLE 3.21: MONITORING OF THE QUALITY OF LEACHATES FROM SOLID WASTE SITE AT MAWIONG

MONITORING OF THE QUALITY OF LEACHATES FROM SOLID WASTE DUMPING SITE (LANDFILL SITE) AT MAWIONG

During 2002, 2004 and 2007, the Board has carried out the monitoring on the quality of Leachates from the solid waste dumping ground at Mawiong .The results presented in Table below indicates that the concentrations of Total Dissolved Solids ,Total Suspended Solid, , Biochemical Oxygen Demand, Chloride were found to be above the prescribed standards .

Table 1.0: LEACHATE QUALITY OF SHILLONG MUNICIPAL DUMPING GROUND, MAWIONG

Sl. No.	Parameters	Standards for Land Disposal as per Municipal Solid Waste (Management and handling) Rules 2000	Monitoring Results of the Year		
			2002	2004	2007
1.	pH	5.5 – 9.0	10.8	11.0	7.2
2.	Total Dissolved Solids (mg/l)	2100.0	9415	9614	5500.0
3.	Total Suspended Solids (mg/l)	200.0	960	1075	800.0
4.	Chemical Oxygen Demand (mg/l)	-	1800	--	1400.0
5.	Bio-chemical Oxygen Demand (mg/l)	100.0	1145.6	1240.5	910.0
6.	Ammonia Nitrogen (mg/l)	-	45.3	55.3	50.4
7.	Total Kjeldahl Nitrogen (mg/l)	-	--	90.0	80.0
8.	Chloride (mg/l)	600.0	1090	1142.2	900.2
9.	Chromium (mg/l)	-	--	0.36	0.1
10.	Copper (mg/l)	-	--	1.6	0.3
11.	Lead (mg/l)	-	--	5.2	0.1
12.	Zinc (mg/l)	-	--	261.7	0.5

Source: MSPCB

e. Road and Transportation

99. Shillong is connected to Guwahati towards the north through NH-40 and to Silchar towards the south-east through NH-44. The total road length of Shillong is 142.5 km with a road density of 0.8 km/sq km. Salient Features of Roads and Transportation, GSPA, 2005 is given in **Table 3.22**.

TABLE 3.22: SALIENT FEATURES OF ROADS AND TRANSPORTATION, GSPA 2005

S. No.	Particulars	Item
1.	Households with paved roads or footpaths (%)	92
2.	Households with cars (%)	16
3.	Average journey speed (kmph) on road network	8-20
4.	Priority for improvement	3/6

100. The main constraints and problem areas with regards to roads in Shillong are narrow and winding hilly roads with poor geometrics lack of parking spaces and lack of pedestrian facilities.

f. Slum Upgradation

101. There are 19 notified slum pockets within the Shillong Master Plan Area. Nearly 22% of the city's population lives in these slums. The slums in Shillong have a unique characteristic as compared to other slums. While in the rest of the country, slums and squatter settlements are formed by squatting on government lands, the slums in Shillong are located on private lands, in most cases with the permission of the landlord. However, the cause of formation of slums remains the same i.e., poor access to services and infrastructure. The localities with the largest concentration of slum population include Lumparing, Laban, Pynthomukhrah, Laitumkhrah, and Lummawrie.

g. Heath Facilities

102. According to 1991 census there are 8 hospitals, one family planning center, one maternity and child welfare center, one T.B center and ten dispensaries. There are altogether 1124 beds in the different medical centers within Shillong Municipality.

h. Education Facilities

103. As per 1991 census, in Shillong Urban Agglomeration there are 109 Primary Schools, 52 Junior Secondary and Middle Schools, 64 Secondary Schools, 12 Colleges, 20 Vocational institutions and 1 university. The city has sufficient number of educational institutions, but lacks in specialized educational facilities such as technical and medical colleges.

IV. SCREENING OF POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

104. The assessment for each of the sub-projects has been carried out for potential impacts during the following stages of the project planning and implementation:

(i) **Location impacts.** Impacts associated with site selection, including impacts on environment and resettlement or livelihood related impacts on communities

(ii) **Design impacts.** Impacts arising from project design, including the technology used, scale of operations, discharge standards etc

(iii) **Construction impacts.** Impacts resulting from construction activities including site clearance, earthworks, civil works, etc.

(iv) **O&M impacts.** Impacts associated with the operation and maintenance of the infrastructure built in the project.

105. Screening of environmental impacts has been based on the impact magnitude (negligible/moderate/severe – in the order of increasing degree) and impact duration (temporary/permanent). The following **Table 4.1** shows the screening of impacts; N/T represents the lowest impact while S/P represents the highest impact. Numerator represents the Degree of Impact and denominator represents the Duration of impact.

TABLE 4.1: SCREENING OF IMPACTS

Duration of Impact	Magnitude (Degree of Impact)		
	Negligible (N)	*Moderate (M)*	*Severe (S)*
Temporary (T)	N/T	M/T	S/T
Permanent (P)	N/P	M/P	S/P

106. The following tables show the potential environmental impacts and mitigation measures of all the sub-project components proposed for Shillong under NERCCDIP.

A. ENVIRONMENTAL IMPACTS AND MITIGATION: LOCATION AND DESIGN

107. In many environmental assessments there are certain effects that, although they will occur during either the construction or operation stage, should be considered as impacts primarily of the location or design of the project, as they would not occur if an alternative location or design was chosen. For example, if leachate from an unsealed landfill drains into an exploited aquifer and pollutes water sources this would be an impact of both location and design as it would not have occurred with a sealed landfill located in an area with no groundwater resources.

108. In the case of this subproject there are few impacts that can clearly be said to result from the design or location. This is because:

(i) The proposed transfer station, garage, and sanitary landfill (5.25 acres) will be sited the Municipal Trenching Ground at Marten, Mawiong (18 acres). The government owns the land so there is no land acquisition involved.

(ii) The existing and proposed solid waste disposal site is the part of Riatkhwan Reserve Forest, however, the Government of Meghalaya Forest & Environment Department has officially granted permission (Annexure 4) to use the land for solid waste disposal purposes. The Government of Meghalaya Forest & Environment Department has extended the lease under letter no. FOR 76/99/16 dated 25th February 2000 to the Shillong Municipality for 18 Acres of land in Riat Khwan Forest Compartment No-4 (Plot No-1, Plot No-2 and Plot-3).The Possession Certificate of proposed solid waste site has been also issued by the Forest Department.

(iii) The proposed sanitary landfill will present significant improvements over the existing waste disposal operations of Shillong.

(iv) The infrastructure involves relatively straightforward construction and operation, so it is unlikely that there will be major environmental impacts;

(v) Any sensitive environmental receptors (surface waters) will be protected by detailed design and proper engineering. Proper operation and maintenance of the landfill site will be critical to protecting the environment, therefore, training for Shillong Municipality staff is built into the project.

(vi) Impacts associated with the construction process, and are produced because that process involves excavation or other ground disturbance. However the routine nature of the impacts means that most can be easily mitigated.

(vii) The project site is sufficiently elevated above water bodies to avoid flooding and impacts to groundwater.

(viii) The collected wastes throughout the city are disposed at Mawiong disposal site at a distance of about 8 km from the city, so the project will not have impacts on surrounding inhabitants.

(ix) There are no sensitive receptors occurring within 500 m of the site. Umiam Lake is located approximately 3.0 km away from the site, and any leachate will be collected and treated as part of the project design.

(x) The project will generate significant benefits for the whole Shilllong Municipality as a whole

(xi) A buffer zone of no-development shall be maintained around landfill site and shall be incorporated in the Town Planning Department's land-use plans, as per the MSW Handling Rules, 2000.

109. **Scope of Land Acquisition and Resettlement.** There are no resettlement issues anticipated for the solid waste facility in Shillong. All the projects of solid waste are proposed on available government lands. Hence, permanent land acquisition is not envisaged as part of this sub project. The proposed transfer station, garage and disposal site will be located within the existing landfill site at Municipal Trenching Ground at Marten, Mawiong. The collected wastes throughout the city are disposed at Mawiong disposal site at a distance of about 8 km from the city, the same route and location used historically for waste collection in Shillong. The proposed land fill area is 5.2503 Acres. The Possession Certificate of proposed solid waste site has been issued by the Forest Department under Notification letter no FOR 76/99/16 dated 25 February, 2000 (Refer **Annexure 4**) and hence, the land acquisition and resettlement impacts are not envisaged. The garage and transfer station will be located at same location, as

existing disposal site is operational. No temporary impacts such as temporary land occupation and temporary loss of access to resources and services during construction are anticipated.

110. An overview of the land acquisition and resettlement requirements is given in **Table 4.2**.

TABLE 4.2: SUMMARY OF LAND ACQUISTION / RESETTLEMENT

S. No	Project	Land Acquisition / Resettlement requirements	Area of land required (Ha)	Number of AHs significantly impacted	Number of AHs consulted and surveyed
a.	Rehabilitation of existing disposal site	×	0		
b.	New Disposal Site	×	0		
c.	Transfer Station and Garage at the existing disposal site	×	0		

111. For the unidentified components in the solid waste component[12], the extent of land acquisition and resettlement are unknown at this stage. These will be addressed at the detailed design stage consistent with this Resettlement Framework. This classifies the solid waste sub-project component into 'Sc' category (Insignificant Resettlement), based on ADB's Involuntary Resettlement (IR) Policy.

112. **Landfill Design**. The sanitary landfill site will be designed to meet the standards of the GOI MSW Handling Rules, 2000, including leachate treatment and collection. The Municipality is also required to improve the existing dumping site as per provisions of the MSWHR, 2000 (Schedule I). The project will make provisions of environmental protection measures and short-term sanitary landfill facilities (approx. 6 acres) at the present disposal site at Mawlai, as intermediate protection measures till the new sanitary landfill site starts operation. Although the sanitary landfillll site is 5.0 acres, not large enough to meet the Rule's requirements of lasting 20-25 years, the landfill will act as near term solution while the Shillong Municipality is actively searching to identify land to suffice future landfill operations.

113. Design Impacts:

(i) The cell dumping process may cause side slippage during heavy rainfall. Appropriate slope protection measure need to be incorporated into the designs.

(ii) There is the risk of runoff from the uphill areas contaminating the water bodies in the downhill areas. Provision of drainage interceptors (impermeable lining and collection pipes) to capture the runoff and redirect into the leachate tanks shall be done.

[12] In addition to the identified components to be taken up in the NERCCDIP, at a later stage of the project, the SIPMIU may, based on the priorities of the Government of Meghalaya, identify eligible sub-projects conforming to the sub-project selection criteria to be taken up under the program. Cost provisions for inclusion of such components is provided for in the program costs, under a different category called "the unidentified projects".

(iii) The proposed landfill site at Mawiong is located in a densely vegetated area. The layout of the landfill site shall be designed to minimize impact on floral resources.

B. ENVIRONMENTAL IMPACTS AND MITIGATION: CONSTRUCTION

114. There will therefore be quite large physical changes at the site as a result of the excavation and other earthworks, and this relatively large quantity of waste could not be dumped without causing further adverse physical impacts (on air quality (dust), topography, soil quality, etc) at the disposal site. It will be important therefore to take steps to reduce the amount of dumping by finding beneficial uses for as much of the waste material as possible. The civil works contractor (appointed to carry out the construction work) should be required to:

(i) Re-use as much excavated material in this project as possible (for example in creating the bunds or for landfill cover as outlined above);

(ii) Retain suitable soil in stockpiles for use when the landfill is operating, to cover waste periodically and for the final covering when each cell is full.

115. Most excavation is likely to be conducted in the dry season to avoid the difficult conditions that can occur when earthworks are carried out during rain. There will therefore be a risk of producing dust. Although this is a rural location where there is no inhabitation nearby, precautions will nevertheless be needed to reduce dust to provide a suitable and safe environment for workers. Contractors should therefore be required to:

(i) Cover or damp down working areas and stockpiled soil in dry, windy weather;

(ii) Use tarpaulins to cover loose material during transportation to and from the site.

116. Another physical impact associated with large-scale excavation is the effect on drainage and the local water table if groundwater and/or surface water collect in the cavities as they are dug. Conducting the work in the dry season will reduce these impacts, but as the area surrounding the site contains downhill surface waters careful design and engineering will be required to protect these waters from leachate.

117. The other construction work at the landfill site (e.g., applying impermeable sheeting, installing pipes, etc.) will all have physical impacts but these will be small compared to those of the landfill excavation, and will thus be of little significance in themselves.

118. There are no protected areas in the vicinity of this site (the closest sensitive area is Umiam Lake which is sufficiently far—approximately 3.0 km away) and no special ecological interest, because natural habitat of the site was destroyed many years ago (1938) when the area was cleared for waste disposal purposes. Any surface waters located downhill of the proposed site will be carefully considered for their protection detailed design and engineering stage. Construction should therefore have no major ecological impacts. To ensure further environmental protections of surrounding area the contractor should be required to ensure that:

(i) No toxic materials (fuel, oil, cement, etc) are stored at or near the site;

(ii) The contractor's Method Statement (submitted with the tender) includes adequate safety measures to prevent fuel and other spills as a result of accidents.

119. The other aspect of the work that may have economic implications is the transportation of

waste material to a disposal site and to locations where it can be put to beneficial use as recommended above. This will require a large number of truck movements, which could disrupt traffic, particularly if such vehicles were to enter the town. This activity will be implemented by the contractor in liaison with Shillong Municipality, and the following precautions should be adopted to reduce effects on traffic:

(i) Plan transportation routes carefully to prevent heavy vehicles entering Khulna town; and ensure that if this cannot be avoided, vehicles use main roads only, and do not use narrow local roads, except in the immediate vicinity of delivery sites;

(ii) Schedule transportation activities to avoid peak traffic periods.

120. Construction activities inevitably produce noise and dust, and these plus the visual appearance of the site and restrictions in access caused by excavation and the presence of vehicles and machinery, are generally the factors that disturb people who live or work in the vicinity. These should however not be major problems in this case as the facilities are all located in rural areas outside the town, and there are no people living nearby.

121. The health and safety of workers will be protected by measures included in a Health and Safety Plan, which the contractor will be required to produce and apply. Even though rural areas are sparsely populated, this should include measures to assure the safety of the public. The plan should thus require:

(i) Exclusion of the public from all sites;

(ii) Provision and use of appropriate Personal Protective Equipment (PPE) by all workers;

(iii) Health and Safety Training for all site personnel;

(iv) Documented procedures to be followed for all site activities;

(v) Accident reports and records;

(vi) Etc.

122. Construction work can provide short-term socio-economic gains for local communities if contractors employ local people in the workforce. To ensure that these benefits are directed to communities that are most affected by the work, contractors should be encouraged to employ at least 50% of their workforce from communities in the vicinity of construction sites. This will help to mitigate the impacts of any disturbance as well as creating a positive impression of the project. Building a workforce from mainly local people will also avoid problems that can occur if workers are imported, including social difficulties in the host community and issues of health and sanitation in poorly serviced temporary accommodation camps.

123. Construction Impacts:

(i) Construction activities associated with sanitary landfill site (at Mawiong) will result in increase in daytime noise levels. Impacts to be mitigated through procurement of equipments / vehicles with inbuilt mechanism to arrest high noise levels. Construction during the night time to be strictly avoided.

(ii) Leveling, compaction and construction of the landfill site will result in generation of fugitive dust, which needs to be suppressed with regular water sprinkling.

(iii) Health impact on construction workers associated with dust and noise generation. Workers to be provided with appropriate PPEs

C. ENVIRONMENTAL IMPACTS AND MITIGATION: O & M

124. Shillong Municipality will be responsible for operating the waste management facilities and will be given further support by the project in the form of staff training and financial assistance. All solid waste management activity is required to comply with the GoI Municipal Solid Waste Handling Rules, 2000.

125. Waste for landfilling will be moved into position by bulldozer and backhoe, and will be compacted when the vehicles move over the surface. When a cell is full, vertical gas venting pipes will be installed and the waste will be covered with compacted clay, sand and layer of topsoil, to seal the cell and control odour and pests.

126. At the composting plant, waste will be sorted manually and any unsuitable material will be removed and transferred to the landfill. Biodegradable waste will be left to decompose in a series of piles ("windrows") in the open air, and material will be turned periodically by a machine provided by the project. Once the compost has been formed it will be loaded into bags and taken away on a truck for sale to retailers or direct to farmers.

127. If the composting plant is to be successful, Shillong Municipality will need to ensure that residents separate out their biodegradable waste into a "green" waste bin at source, and that the segregation is maintained during secondary transfer and transportation. The project will fund community awareness education programs to inform the community about the facility and their role in waste separation.

128. Clearly it is imperative that Shillong Municipality maintains both the transfer station and the landfill in proper working order, because if the system begins to fall into disrepair then waste will rapidly accumulate in the streets and the sanitary landfill will become an insanitary dumpsite, with consequent adverse impacts on environmental health. Capacity building, public education campaigns and other support provided by this subproject are aimed at promoting the long-term successful operation of the system.

129. If waste is collected regularly from the transfer station and full or partially full bins are not left in or around the facility for extended periods then there should be no direct physical impacts during operation. Even air quality should not deteriorate greatly if bins are taken to the landfill daily or more frequently, any spilled waste is cleared away rapidly and the transfer station and waste bins are hosed down regularly. Procedures will be set out in Operation and Maintenance (O&M) manuals prepared during the detailed design stage, so the design consultant should ensure that:

(i) O&M procedures require staff at the transfer station deposit any spilled waste into bins immediately and to wash down internal floors and empty waste bins at least daily;

(ii) O&M procedures require staff to be fully trained before they begin work at the transfer station and given refresher training annually;

(iii) The transfer station includes adequate drainage that is connected to the municipal system.

130. The greatest physical impacts will occur at the landfill, where decomposing waste will rise to higher heights ground level, which will alter the topography and appearance of the site.

Although these impacts would be significant at certain locations that should not be the case here as there are no people living in the vicinity whose views of that landscape would be impeded. However, the landfill design includes effective screening by the planting of densely-leaved trees at the perimeter of the site.

131. The landfill design includes measures to collect leachate and prevent pollution of surface- and ground- water. Leachate will be treated by simple sedimentation and evaporation, and sludge that collects in the bottom of ponds will be allowed to dry out before being returned to the landfill. Given the amount of rain that falls in this region, and the pollution of land and water that can occur if a landfill is subjected to flooding, the consultant responsible for the detailed design should ensue that:

(i) Surface water drains at the site are adequate to retain and dispose of the heaviest rains;

(ii) O&M procedures require drains to be kept in working order at all times and checked regularly and cleared of any sediment or other debris.

132. Landfill management must involve the covering of waste until a cell is full and is being closed. The site therefore will need to operate as a sanitary landfill as noxious odours and pests that are associated with open dumping are also present. Two actions are required in order to prevent this:

(i) Operating procedures should involve periodic covering of deposited waste, sot simply when a cell is full; and

(ii) O&M procedures for the transfer station and landfill should be prepared by an experienced solid waste management expert.

133. As described above, proper design and engineering, and O&M should ensure that no significant impacts on surface waters in or around the proposed landfill site, and therefore the solid waste management system should operate without adverse ecological impacts. Routine environmental monitoring, as described below, will track environmental quality around the site during operation.

134. Poorly-managed landfills can cause negative ecological impacts by allowing the development of large colonies of scavenging birds, rodents and other vermin, which can then be a nuisance and a health hazard in nearby communities, and can damage crops on surrounding farmland. Such animals are discouraged by the regular covering of waste, so this reinforces the need to adopt this mitigation measure. Shillong Municipality should also routinely monitor the incidence of pests at the site so that controlling action (for example by regular culling) can be taken if necessary.

135. There can be small ecological gains as well as improvements in the appearance of such sites if trees are planted at the periphery and on completed waste cells, so this should be done.

136. Business and small industry in the town should operate more efficiently if their waste is removed speedily and efficiently, so there should be small economic gains once the system is operating. The main direct economic benefit will be obtained by companies that are involved in operating the secondary transfer system, supplying the trucks to transport the waste, and/or operating the landfill if this is contracted out to local business.

137. There should also be a significant economic benefit in the long term from the commercial

sale of organic fertilizer produced at the composting plant. There should also be economic gains from increased yields in farms where the compost is used to fertilize the land, and these could be significant in areas where nutrients have been leached out by paddy cultivation and denuded by regular planting of the same or similar crops.

138. The only negative economic impact from the operating waste management system will be on traffic and transport in and around the transfer station in the town and on roads leading to the landfill, as there will be more heavy traffic on roads at these locations. This should be mitigated by carrying waste to the landfill outside peak traffic periods, even in the early morning if necessary. Any remaining economic impacts should be counterbalanced by the economic and other benefits of the scheme.

139. The main beneficiaries of the improved waste management infrastructure and system will be the citizens of the town, whose general environment, and in some cases living conditions, will be improved considerably. There should be fewer unsightly mounds of garbage in the town, including in slum areas, and the attendant appearance, smell and public health risks should be reduced.

140. There will also be socio-economic benefits for people who are able to gain employment to operate the scheme and/or with Shillong Municipality if they operate elements of the system themselves. Farmers who benefit from fertilizer produced at the composting plant should also experience an increase in their income.

141. O&M Impacts shall pertain to:

(i) Noise pollution due to movement of the heavy refuse vehicles to the site to be reduced through development of vegetative buffer.

(ii) Everyday earth cover of 2-3 cm above the garbage layer will require significant quantities of borrow materials. Earth obtained from excavation of the cells and of leachate pits is to be used as earth cover.

(iii) Overflowing of leachate pipes due to heavy loads (especially in the rainy season) and choking due to accumulation of debris and wastes leading to pollution of nearby streams. A trench in front of leachate pipes be constructed with covering of plastic /tarpaulin layer to take the overflow. The perforations in the leachate pipe shall be cleaned by hosing with water jet.

(iv) Early filling of leachate pit during rainy season cause spillage and pollution in the nearby stream thereby requiring frequent emptying of leachate pits.

(v) Washing waters from the transfer station loaded with grit may lead to choking of nearby storm water drains. A grit chamber to be provided to arrest such particles at the outfall line of the washing platform.

(vi) Floor washing in the garage and workshop may have oil and grease which can contaminate the storm water drain and ultimately the nearby streams. An oil and grease trap to be provided at the outfall line from the garage.

(vii) Routing and scheduling of refuse vehicles may not match with users waste dumping behavior. The mismatch to be minimized with adequate awareness programs through NGOs, CBOs, and the media.

142. Overview of Potential Impacts and Mitigation Measures of Solid Waste Disposal site is given in **Table 4.3**.

TABLE 4.3: OVERVIEW OF POTENTIAL IMPACTS AND MITIGATION MEASURES, SOLID WASTE

Sl No	Impacts	Duration/ Extent	Magnitude	Mitigation Measures	Responsibility
1	**REHABILITATION OF EXISTING DISPOSAL SITE**			Provision of environmental protection measures and short-term sanitary landfill facilities (approx. 6 acres) at the present disposal site at Mawlai, as intermediate protection measures till the new sanitary landfill site starts operation. Existing site shall come into compliance with Schedule I of MSWHR, 2000 which states that improvement of existing landfill sites will done per provisions of these rules	Shillong Municipality (SWM Div.)
2	**NEW DISPOSAL SITE AT MAWIONG 8 KM FROM SHILLONG CITY**			Sanitary land filling process will be followed in tandem with the existing compost plant at this site. Only the rejects from the plant will be dumped in a cell dumping sanitary landfill process. The cells will be protected by one isolated footing barrier wall at the bottom. In addition, it will also have half perforated leachate pipes to collect the leachate and drain the same at the leachate pit. The site will require obtaining a COE from SPCB to establish site.	Shillong Municipality (SWM Div.)
2.1	**Location Impacts**				
(i)	Odour related and other Impacts on surrounding habitations and proposed developments	Permanent	Moderate	Sanitary land filling shall reduce the chances of foul odour to a large extent. The edge of the proposed land is approximately 8 km away from the city. Further a green buffer zone will be developed along the landfill site.	Shillong Municipality (SWM Div.) / DSMC/SIPMIU
(ii)	Flooding during monsoon season	Temporary	Significant	Storm drains surrounding the landfill will be designed to	DSMC

Sl No	Impacts	Duration/ Extent	Magnitude	Mitigation Measures	Responsibility
	will pollute surrounding area with leachate.			withstand heaviest monsoon rain	
(iii)	Resettlement Impacts	NA	NA	All improvements are proposed on government owned land	Shillong Municipality (SWM Div.) / DSMC/SIPMIU
2.2	**Design Impact**			Design will allow facility to comply with MSWHR, 2000.	DSMC/ SIPMIU
(i)	The daily earth cover of 2-3cm above the garbage layer will require a significant amount of earth. Risk of side slippage during rainy season.	Permanent	Moderate	The excavated earth at the time leachate pit construction shall be stored and used for earth cover of cells. If this is found inadequate and any additional borrowing is required from other surrounding areas, restoration of borrow areas shall be done. Appropriate slope protection measures shall be integrated as part of the design.	DSMC/ SIPMIU
(ii)	The site selected for location of the disposal site is a valley. Potential impacts to surface waters.	Permanent	Moderate	Appropriate leachate capturing measures and drainage interceptors to capture the direct runoff from the landfill site and redirecting into the leachate pipes shall effectively minimize the impacts of runoff polluting surface, ground water, and soil. The landfill facility shall be developed as per the provisions of MSW Rules, 2000.	DSMC/ SIPMIU
(iii)	Production of leachate during operation stage can potentially contaminate soil, surface and ground water resources.	Permanent	Moderate	The landfill design includes measures to collect leachate and prevent pollution of surface- and ground- water. Leachate will be treated by simple sedimentation and evaporation, and sludge that collects in the bottom of ponds will be allowed to dry out before being returned to the landfill. Given the amount of rain that falls in this region, and	DSMC/ SIPMIU

Sl No	Impacts	Duration/ Extent	Magnitude	Mitigation Measures	Responsibility
				the pollution of land and water that can occur if a landfill is subjected to flooding, the consultant responsible for the detailed design should ensue that: Surface water drains at the site are adequate to retain and dispose of the heaviest rains.	
(iv)	Production of Methane gas	Permanent	Moderate	Use of a compost system to reduce methane gas output.	
(iv)	Site drainage could cause ponding or flooding	Permanent	Moderate	Site drainage measures are needed to prevent ponding and flooding, promote slope stability, and reduce surface erosion and run-off.	
2.3	**Construction Impacts**				
(i)	The movement of heavy vehicle for construction of compost plant and preparing the landfill site will cause noise pollution problem in the vicinity.	Temporary	Moderate	All the vehicles used for the construction shall comply with relevant environmental standard. Worker to be provided with PPE's like earplugs to minimize the health impacts. Construction in the night time to be restricted to the extent possible.	Contractor/ DSMC / SIPMIU
(ii)	Trees on site could be removed when landfill is built	Temporary	Moderate	Plant and maintain two trees for every one removed	Contractor/ DSMC
(iv)	Excavation of landfill will produce large amounts of waste soil and stone	Temporary	Moderate	Re-use excavated material in this project wherever possible (eg bunds), Retain soil for covering waste when landfill is operating	Contractor/ DSMC
(v)	Excavation could generate dust in dry, windy weather	Temporary	Moderate	Remove waste soil for disposal as soon as it is excavated; Spray stockpiled soil and working areas in windy weather	Contractor/ DSMC
(vi)	Rainwater could collect in excavated areas	Temporary	Moderate	Conduct all excavation in the dry season	Contractor
(vii)	Water discharged from site may damage ecology	Temporary	Moderate	Do not store toxic materials at or near the landfill site; Include accident & spill	Contractor; Shillong Municipality

Sl No	Impacts	Duration/ Extent	Magnitude	Mitigation Measures	Responsibility
	of rivers if polluted			prevention in Method Statement	
(viii)	Economic benefits if local people are employed in Contractor's workforce	Temporary	Moderate	Contractor should employ at least 50% of workforce from communities in vicinity of work sites if possible	Contractor
(ix)	Workers and the public are at risk from accidents on site	Temporary	Moderate	Prepare and implement a site Health and Safety Plan that includes measures to: Exclude the public from all construction sites; Ensure that workers use Personal Protective Equipment; Provide Health & Safety Training for all personnel; Follow documented procedures for all site activities; Keep accident reports and records.	Contractor;
(xi)	Leveling and compaction of the site & Construction of haul roads will involve significant dust generation problems.	Temporary	Moderate	Regular water sprinkling to be ensured to minimize the impact. Worker to be provided with PPE's like dust masks.	Contractor/ DSMC/ SIPMIU
(xii)	Siltation caused during construction	Temporary	Moderate	The Design consideration will take care of temporary silt runoff due to construction. Silt fences will be used to mitigate siltation impacts.	Contractor/ DSMC/ SIPMIU
2.4	**O&M Impacts**			Facility requires CFO from SPCB to operate.	Shillong Municipality
(i)	Composting may fail if public do not separate green waste	Permanent	Significant	Public education on benefits of composting & role of public	Shillong Municipality (SWM Div)
(ii)	Town environment will deteriorate if system malfunctions			Public education; build capacity of Shillong Municipality staff; Maintain facilities and system in full working order	Shillong Municipality (SWM Div
(iii)	Refuse vehicles movement towards the site may lead to increase in day	Permanent	Moderate	Green buffer to be developed around the site.	Shillong Municipality (SWM Div)

Sl No	Impacts	Duration/ Extent	Magnitude	Mitigation Measures	Responsibility
	time noise levels.				
(iv)	Landfill may flood in monsoon, polluting land and water	Permanent	Significant	Ensure surface water drains will handle heaviest rains; &M procedure: regularly clear drains of debris and ensure they are in working order at all times	Shillong Municipality (SWM Div
(v)	Traffic may be impeded by heavy waste vehicles	Permanent	Significant	Carry waste to landfill outside peak traffic periods	Shillong Municipality (SWM Div
(vi)	The leachate collected in the pits has high contamination levels. Improper disposal of the leachate will lead to pollution of soil, surface and ground water resources.	Permanent	Moderate	O&M procedures require drains to be kept in working order at all times and checked regularly and cleared of any sediment or other debris. Monitoring leachate collection system in accordance with the MSWHR, 2000 requirements.	Shillong Municipality (SWM Div)
(vii)	Half perforated leachate pipes to be laid at the bottom of the disposal site. The pipes at times may overflow due to heavy load (especially in the rainy season). The pipes wrapped with iron mesh may also get choked due to accumulation of debris and wastes. This may lead to overflowing of leachate instead of flowing through the leachate pipe. The leachate may overflows and may pollute the nearby streams.	Permanent	Moderate	It is suggested that a small trench (of 1ft depth) with a covering of plastic/tarpaulin layer be constructed in front of the leachate pipes to take care the overflow. The perforations shall be cleaned by hosing with water jet. Regular monitoring of the same is necessary.	Shillong Municipality (SWM Div)

Sl No	Impacts	Duration/ Extent	Magnitude	Mitigation Measures	Responsibility
(viii)	Early filling of leachate pit during rainy season may cause spillage and pollute the nearby stream.	Temporary	Moderate	Regular monitoring and cleaning of leachate pits shall be necessary.	Shillong Municipality (SWM Div)
3	**TRANSFER STATION AT THE EXISTING DISPOSAL SITE**			Development of a transfer station and garage at the existing disposal site at Mawlai towards increase in vehicle trips and area of coverage. The transfer station shall also function as recovery centre for segregation of biodegradable portions from the recoverables/ recyclables	
3.1	**Location Impacts**				
(i)	May lead to nuisance in term of foul odors, breeding of vermin and other associated impacts if wastes are not cleared at regular intervals.	Permanent	Moderate	The transfer station shall be sited at the existing dumpsite in Mawlai away from inhabited areas and away from sensitive receptors.	Shillong Municipality (SWM Div)/ SIPMIU
3.2	**Design Impacts**				
(i)	The wash waters from the transfer station in absence of any drainage arrangements will stagnate around the site leading to prevalence of unsanitary conditions.	Permanent	Moderate	Proper drainage arrangements shall be made around the site to prevent any stagnation of wash waters.	Shillong Municipality (SWM Div)/ DSMC
(ii)	Wash waters from the transfer station may cause choking of nearby drains.	Permanent	Moderate	A grit chamber to be provided to arrest the materials contained in the wash waters.	Shillong Municipality (SWM Div)/ DSMC
3.3	**Construction Impacts**				
(i)	Construction activity can generate dust in dry, windy weather	Temporary	Moderate	Spray stockpiled soil and working areas in windy weather	Contractor/ DSMC
3.4	**O&M Impacts**				
(i)	Transfer Station could produce	Permanent	Moderate	O&M procedure: remove any spilled waste immediately;	

Sl No	Impacts	Duration/ Extent	Magnitude	Mitigation Measures	Responsibility
	odour if not cleaned regularly			&M procedure: wash floors & empty waste bins daily; O&M procedure: initial and annual training for all staff; Ensure transfer station design includes adequate drainage	
(ii)	The impacts associated with operation stage include frequent movements of waste collection vehicles, production of foul odours, waste spillage and breeding of vermins and other associated impacts.	Permanent	Moderate	Regular washing and disinfections of transfer station shall be carried out. Vegetative buffer around the site shall be provided. Ensuring that wastes are collected stored and transferred as per the SWHR 2000.	Shillong Municipality (SWM Div)
4	**GARAGE**			Construction of new parking/garage/workshop facility at Mawlai (the existing disposal site) for accommodation and maintenance of 24 refuse vehicles. The garage shall also be used for maintenance of wheelbarrows and mechanised containers.	
4.1	**Location Impacts**				
(i)	The garage and maintenance workshop is to be located on Govt. land so no impacts are envisaged.	NA	NA	NA	NA
4.2	**Design & Construction Impacts**				
(i)	NA			NA	NA
4.4	**O&M Impacts**				
(ii)	Garage washing waste water will contain oil and grease, which may increase the pollution load at the storm water drains.	Permanent	Negligible	An Oil trap to be provided to arrest the oil and grease.	Shillong Municipality (SWM Div)

Sl No	Impacts	Duration/ Extent	Magnitude	Mitigation Measures	Responsibility
5	**IMPROVEMENT OF COLLECTION SYSTEM**			The proposal includes improvement of the following: (i) primary and secondary collection efficiencies, (ii) existing system for transportation of wastes, and (iii) treatment and disposal of wastes in accordance with SWHR. The proposed components include: Improvement of the existing SW collection system from 45% to 60% by 2011, through improvements in primary and secondary collection facilities and through an intensive community awareness and consultation program, in consultation with communities, dorbars and NGOs. The proposed components include: Introduction of house-to-house waste collection through source segregation on a pilot basis, initially to about 2000 households within the SMB area; Provision of 1000, 30 litre dustbins to be placed in public places; Provision of 2000, 25-litre household dustbins and 2000 Nos. heavy duty PVC bags to be used for segregation of wastes at source (non biodegradable); Provision of 250 wheelbarrows to be used by sweepers in the central areas of the city; and, Provision of 35 nos, 4.5 cum community dustbins to be used in areas where bell ringing or house-to-house service is not provided.	
5.1	**Location, design and construction impacts**				
(i)	NA			NA	NA
5.4	**O&M Impacts**				
(ii)	It may happen that the scheduling of vehicles do not match with peoples waste dumping behavior. This may lead to improper collection even with such improvements.	Temporary	Moderate	Adequate public awareness programme to be arranged through Village Councils and NGOs to educate people about the routing and scheduling to ensure their participation.	Shillong Municipality (SWM Div) / NGO

V. INSTITUTIONAL REQUIREMENTS AND ENVIRONMENTAL MONITORING PLAN

A. INSTITUTIONAL REQUIREMENTS

143. The national-level Executing Agency (NEA) for the Investment Program will be MOUD. An Investment Program Coordination Cell (IPCC) will be established in MOUD. IPCC will be responsible for overall management of the Investment Program in the five cities. It will be headed by an Investment Program Manager and consist of at least a three person-team of administrative/financial, technical, and social/environmental officials whose major tasks will include (i) monitoring overall Program implementation, (ii) reviewing the subprojects submitted by States in accordance with subproject selection criteria, and submission of the periodic financing requests to Department of Economic Affairs (DEA), (iii) reporting to ADB on Investment Program implementation progress and other matters, (iv) monitoring the overall reform program and compliance with loan covenants, and (v) providing assistance to the States. A national level Steering Committee (NSC) will be set up by GOI within three months of loan effectiveness to monitor the use of funds under MFF and overall implementation performance of the Investment Program. NSC will be chaired by the Secretary MOUD and comprise representatives of DEA, MDONER, and the Planning Commission. The IPCC will be assisted by a Project Management Consultant (PMC) to provide support and coordination for environmental assessment and review procedures. A State-level Executing Agency (SEA) in each State will be responsible for executing the part of the loan falling under the respective State Governments. There would be in each State a State Steering Committee (SSC), an Investment Program Empowered Committee (IPEC).

144. A consolidated State Investment Program Management and Implementation Unit (SIPMIU) will be established in each of the five SEAs. The SIPMIU to be headed by a State Investment Program Director will be responsible for overall management and implementation, including program progress monitoring at state level, preparing and forwarding subprojects for approval to SSC and MOUD, ensuring compliance with the design and monitoring framework and subproject selection criteria and loan covenants and urban reform targets, and coordinating with MOUD and other State agencies selection of consultants and contractors, approval of the detailed designs of the subprojects, disbursement requests for ADB and forwarding the same to the MOUD for onward transmission to ADB, administering the contracts of consultants and contractors, certifying payments and preparing change orders, and implementing awareness programs, environment and resettlement plans.

145. For implementation of the infrastructure components of the subprojects, the SIPMIU would have a number of small engineering cells each headed by an additional chief engineer/superintending engineer or additional director and with staff deputed from line departments and ULBs where applicable. The tasks of the engineering units would include designing, contracting, supervising and administering work in various sectors of the Program. There would be also units for implementation of awareness campaigns, consultations with affected persons, rehabilitation and resettlement, environmental management, and capacity building and training. For environmental issues, an Environmental Safeguards staff member is to be designated within SIPMIU to oversee all issues pertaining to environmental assessment and review procedures.

146. The SIPMIU will be assisted by the Design, Supervision, and Management Consultants (DSMC), who will design the infrastructure, manage tendering of contracts, and supervise the construction process. DSMC will also assist in providing capacity development support and training. The SIPMIU will appoint Construction Contractors (CC) to build elements of the infrastructure. The CCs will be managed by the SIPMIU, and construction will be supervised

by the DSMC. **Figure 5** illustrates the organizational chart of the proposed institutional arrangement.

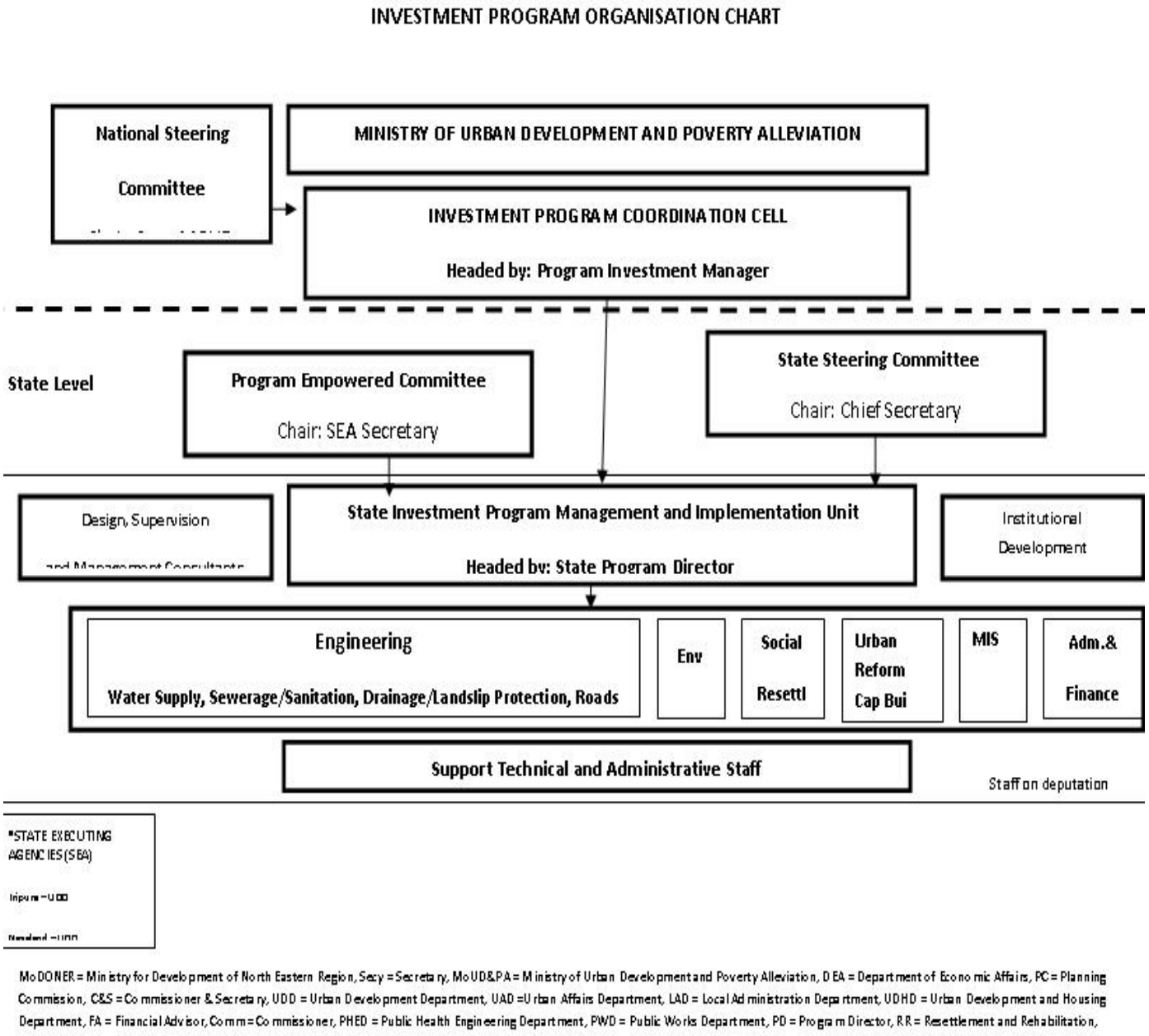


Figure 5: Organizational Chart of Investment Program

B. ENVIRONMENTAL MONITORING PLAN

147. An integral part of environmental protection is the continuous monitoring of the conditions of the receiving environment to determine if any undesirable changes are occurring as a result of the investment program. Since the effects on living receptors are received mainly through the surface water, air, and surrounding soil, environmental monitoring principally requires quantitative measurements of the amount of pollutants present in these environmental media.

148. Environmental monitoring will be done during construction in three levels; namely as monitoring of development of performance indicators done by the Environmental Specialist of the Design, Supervision, and Management Consultants, monitoring of implementation of mitigation measures done by the Contractor; and overall regulatory monitoring of the environmental issues done by Environmental Officer of the SIPMIU. Management of the landfill site will require compliance with all rules set out by the GoI Municipal Solid Waste Handling Rules, 2000.

149. The environmental monitoring plan of all relevant environmental parameters, with a description of the sampling stations, frequency of monitoring, applicable standards and responsible agencies is presented in **Table 5.1**.

TABLE 5.1: ENVIRONMENTAL MONITORING PLAN FOR SHILLONG

Sl No	Attributes	Stage	Parameters to be Monitored	Location	Frequency	Standard	Responsibility
1	Top soil conservation & Adequate Drainage arrangements within / around the disposal site	Construction Stage	Visual inspection to check separate stockpiling of topsoil. Monitoring includes checking siltation caused during construction and the use of silt fences Stockpiles of earth not to be higher than 2 and side slopes shall not be more than 1:2. Proper Drainage arrangements to prevent any water logging within / around the site especially in the area around the leach pits.	Proposed Landfill site at Mawiong colony.	Monthly Inspection by the SIPMIU during the site preparation period		Contractor / SIPMIU
2	Leachate Monitoring	Operation Stage	Overflowing of leachate pits, Chocking of leachate pipes. Quality of leachate in terms of pH, TDS, BOD, COD, Coliforms	Landfill site at Mawlai - Leachate pits and lechate pipes..	Daily inspection by operation and monthly inspection by the SIPMIU (for first 3 years of operation). Leachate Quality monitoring to be done twice a year for first three years of	MSW Handling Rules, 2000	Operator / SIPMIU

Sl No	Attributes	Stage	Parameters to be Monitored	Location	Frequency	Standard	Responsibility
					operation		
3	Odour Monitoring in peripheral residential areas of the landfill site in the downwind direction	Operation Stage	Hydrogen Sulphide (H_2S) and Ammonia (NH_3)	At roadway	Once in 6 month for the first three years of operation		Operator
4	Vegetative Buffer Survival Rate	Operation Stage	Survival Rate of Proposed Trees around the disposal site	Within landfill site at Mawlai	Twice a year till the trees reach a minimum height of 2 m	-	Operator
5.	Surface water quality of Umiam Lake	Operation Stage	pH, TDS, BOD, COD, Coli forms	Umiam Lake	Twice a year		SPCB
6.	Ground water within 50 meters of site	Operation Stage	Basic parameters set by SPCB for groundwater quality (including iron, ph, etc.)	At designated groundwater sampling locations at/near site.	Twice a year (Pre-monsoon, post monsoon)	MSW Handling Rules, 2000; Ground Water Board.	SPCB
7	Water Quality of Transfer Station wash waters	Operation Stage	pH, TDS, BOD, COD, Coli forms	At Transfer Station	Twice a year for the first three years of operation	IS: 2296	SPCB
8	Standard for compost	Operation Stage	Visual inspection to check for physical composition (e.g., glass, plastic and other physical inerts and fragments); and no offensive smell. Also testing of compost to meet standards.	Compost facility	Twice a year	MSW Handling Rules, 2000	Operator /SPCB
9	Collection Efficiency	Operation Stage	Visual inspection to check for uncleared garbage piles and spillage along haul routes	5 different localities/ month covered by the Collection	Once every month at 5 different localities for the first 3 years of operation	-	Shillong Municipality

Sl No	Attributes	Stage	Parameters to be Monitored	Location	Frequency	Standard	Responsibility
				Network			
10	Community Perception	Operation Stage	Community Perception Survey to identify the problems associated with the process and develop suitable modifications	5 different localities/ month covered by the Collection Network	Once every month at 5 different localities for the first 3 years of operation	-	Shillong Municipality
11	Bio Medical Waste	Operation Stage	Visual inspection for bio medical waste	Nearest Community collection point near hospitals like (I) Welsh Mission Hospital (ii) Ganesh Das Hospital (iii) Nazareth Hospital	Once every three month for the first three years of operation	Rules for Handling and Management of Bio Medical Waste, 1998	Shillong Municipality

Note: In many cases repetition of monitoring locations will be observed for different sub projects. This has been intentionally kept as it may so happen that different sub projects are prioritised and phased differently

150. The following environmental parameters shall be monitored on a regular basis as per the standards stipulated in the Municipal Solid Waste Handling Rules, 2000:

- Standard for compost
- Quality of leachate after treatment
- Surface water quality
- Ground water quality
- Quantity and quality of gas generated
- Ambient air quality

C. CAPACITY BUILDING

151. Members of the Environmental Cell of the State Investment Program Management Implementation Unit (SIPMIU) and Engineers of Nodal / Line Departments associated with the proposed improvements in NERCCDIP will be trained in environmental protection both in theoretical and practical aspects for urban infrastructure, specifically solid waste management projects. While theoretical aspects will form the bedrock of the training programme, it will be the practical site visits and /or hands-on training at site itself, which will be of direct use to the Program. Training in complying with the Municipal Solid Waste

Handling Rules, 2000 will be an important focus.

152. The training programme will kick off with a Sensitization Workshop for Secretaries, Chief Engineers and Superintendent Engineers of the line departments and also involving the Project Director and Environmental Officer of the Investment Program Management Unit (SIPMIU).

153. The Environmental Specialist of the Design and Supervision Consultants (DSC) will provide the basic training required for environmental awareness followed by specific aspects of Urban Sector Projects along with Environmental implications in NERCCDIP. Specific modules customized for the available skill set shall be devised after assessing the capabilities of the members of the Training Programme and the requirements of the Program. The entire training would cover basic principles of environmental assessment and management; mitigation plans and programmes, implementation techniques, monitoring methods and tools. Specific issues of Urban Environmental Management shall be taken up in separate sessions.

154. Typical modules that would be present for the training session would be as follows:

(i) Sensitization

(ii) Introduction to Environment

(iii) Environmental Considerations in Urban Development Projects

(iv) Review of IEE and Integration into Design

(v) Improved Co-ordination within Nodal Departments

(vi) Special issues in NERCCDIP

(vii) Role during construction

(viii) Monitoring & Reporting System

155. The proposed training program along with the frequency of sessions is presented in **Table 5.2**.

TABLE 5.2: TRAINING PROGRAM FOR ENVIRONMENTAL MANAGEMENT

Programme	Description	Participants	Form of Training	Duration/ Location	Training Conducting Agency
A. Pre-Construction Stage					
Sensitization Workshop	**Introduction to Environment:** ▪ Basic Concept of environment ▪ Environmental Regulations and Statutory requirements as per Government of	Secretaries, Chief Engineer Superintendent Engineers of PWD, PHED and UDD, the Development Commissioner, Mayor, senior management of	Workshop	½ Working Day	Environmental Specialist of the Design and Supervision Consultants

Programme	Description	Participants	Form of Training	Duration/ Location	Training Conducting Agency
	India and ADB	Shillong Municipality and Project Director (PD) and Environmental Officer (EO) of the SIPMIU			
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 SWM Division and senior management of Shillong Municipality, SIPMIU (Technical Unit) and SIPMIU (Environmental Unit)	Lecture	¼ Working Day	Environmental Specialist of the Design and Supervision Consultants
Module II	**Environmental Considerations in Urban Development and Solid Waste Management (SWM) Projects:** ▪ Environmental components affected by urban development and SWM in construction and operation stages ▪ Activities causing pollution during construction and operation stages ▪ Environmental Management Good Practices in Urban Infrastructure and SWM Projects ▪ MSW Handling Rules, 2000 monitoring requirements.	Engineers of PWD, PHED and SWM Division and senior management of Shillong Municipality, SIPMIU (Technical Unit) and SIPMIU (Environmental Unit including the EO)	Workshop	¼ Working Day	Environmental Specialist of the Design and Supervision Consultants
Module III	**Review of IEE and its Integration into Designs:** ▪ IEE Methodology	Engineers of PWD, PHED and SWM Division and senior management of	Lecture and Field Visit	½ Working Day	Environmental Specialist of the Design and Supervision

Programme	Description	Participants	Form of Training	Duration/ Location	Training Conducting Agency
	▪ ADB and GoI requirements ▪ Environmental Provisions in NERCCDIP ▪ Implementation Arrangements ▪ Methodology of Assessment of Pollution Monitoring ▪ Methodology for site selection of borrow areas, waste disposal areas etc.	Shillong Municipality, SIPMIU (Technical Unit) and SIPMIU (Environmental Unit including the EO)			Consultants
Module IV	**Improved Co-ordination with other Departments:** ▪ Overview of NERCCDIP ▪ Environmental & Social Impacts ▪ Statutory Permissions – Procedural Requirements ▪ Co-operation & Co-ordination with other Departments.	Engineers of PWD, PHED and UDD of Shillong Division, SIPMIU (Technical Unit) and SIPMIU (Environmental Unit including the EO)	Lecture / Interactive Sessions	½ Working Day	Environmental Specialist of the Design and Supervision Consultants
Module V	**Special Issues in NERCCDIP** ▪ Bio-Diversity Assessment & Conservation ▪ Geomorphological Assessment and Slope Protection ▪ Statutory Permissions – Procedural Requirements ▪ Consultation and Counseling	SIPMIU (Technical Unit) and SIPMIU (Environmental Unit including the EO)	Lecture	½ Working Day	Environmental Specialist of the Design and Supervision Consultants

Programme	Description	Participants	Form of Training	Duration/ Location	Training Conducting Agency
B. Construction Stage					
Session II					
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 SWM Division of Shillong Municipality, SIPMIU (Technical Unit) and SIPMIU (Environmental Unit including the EO)	Lecture / Interactive Sessions	½ Working Day	Environmental Specialist of the Design and Supervision Consultants
Module VII	**Monitoring and Reporting System** Monitoring mechanisms MSW Handling Rules, 2000 monitoring requirements.	SIPMIU (Technical Unit) and SIPMIU (Environmental Unit including the EO); SWM Division and senior management of Shillong Municipality	Lecture / Interactive Sessions	½ Working Day	Environmental Specialist of the Design and Supervision Consultants

D. ENVIRONMENTAL BUDGET

156. As part of good engineering practices, there have been several measures as erosion prevention, rehabilitation of borrow areas, safety, signage, provision of temporary drains, etc the costs for which are included in the design costs of specific subprojects. Therefore, these items of costs have not been included in the IEE budget. Only those items not covered under budgets for construction and RAP are costed in the IEE budget. The IEE costs include mitigation, monitoring and capacity building costs. The summary budget for the environmental management costs for different subprojects is presented in **Table 5.3**.

TABLE 5.3: ENVIRONMENTAL BUDGET, SOLID WASTE

Sl. No.	Particulars	Stages	Unit	Rate (INR)	Cost (INR Million)
A.	**Mitigation Measures**				
3.1	Silt Fencing	Construction	Per running meter	500	0.025
3.2	Vegetative Buffer	Operation	Per tree	350	0.182
3.3	Oil and Grease Trap	Operation	Per Unit	5000	0.005
3.4	Grit Chamber	Operation	Per Unit	3500	0.004
	Sub -Total (A)				**0.216**
B.	**Monitoring Measures**				
3.1	Leachate Monitoring	Operation	Per sample	3000	0.018

Sl. No.	Particulars	Stages	Unit	Rate (INR)	Cost (INR Million)
3.2	Odour Monitoring	Operation	Per sample	3000	0.018
3.3	Wash Water Quality	Operation	Per sample	2000	0.012
	Sub -Total (B)				**0.048**
C	**Capacity Building**				
1	Sensitization Workshop	Pre-Construction	L.S		0.075
2	Training Session I	Pre-Construction	L.S		0.300
3	Training Session II	Construction	L.S		0.150
	Sub-Total C				**0.525**
	Total (A+B+C)				**0.789**
	Add Contingencies (@5 %)				**0.828**

VI. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

A. PROCESS FOR CONSULTATION

157. Consultations with stakeholders on environmental issues have been taken up as an integral part of the PPTA process. These consultations provided inputs to the various sector specialists in identification of the felt needs of the communities, and the relevant stakeholders. The outputs of the consultation sessions are documented in Volume TR11 (Draft Final Report, TR-11, TA-4348) on Stakeholder Consultations. Consultations were held with the following stakeholders:

- Officials of State Government Departments;
- Elected representatives;
- NGOs and environmental groups; and,
- Communities.

Primary Consultation

158. The tools for consultation included formal meetings, structured discussions, focus group discussions apart from questionnaire administered for a sample population. A total of 13 primary consultation meetings have been held in Shillong during April- September 2005. **Table 6.1** lists the details of the meetings such as location, date, time, venue etc of the meeting.

TABLE 6.1: DETAILS OF PRIMARY CONSULTATION PROGRAM IN SHILLONG

S. No.	Type of Consultation	Stakeholder	Area	Venue	No of Participants	Date	Time	Duration
1	FGD	Community	Upper Lumparing	Residence of one of the participants	9	17-9-05	10.30-11.30	60 min
2	FGD	Community	Madan Laban	Community Hall	14	19-9-05	16.30-17.30	60 min
3	FGD	Community	Happy Valley, Madantring Durbar	Residence of one of The participant	6	20-9-05	14.30-15.15	45 min
4	FGD	Community	Khliehschnong, Pynthorumkhrah Durbar	Residence of one of The participant	5	21-9-05	8.00-8.30 am	30 min
5	FGD	Community	Bara Patthar	Sarva Shiksha Abhiyan School	14	23-9-05	11.00-12.00	60 min
	Gender and Women's groups							

S. No.	Type of Consultation	Stakeholder	Area	Venue	No of Participants	Date	Time	Duration
6	FGD	Women from several areas, SHG and members of residential women association	Lumshopo, Lumbordorbar, Mynsi	Lumshopo Community Hall	17	27-6-05	11.30-13.30	120 min
7	FGD	Local residents/Women	Upper Laban, Lachumiere	Residence of one of the participants in Upper Laban	15	28-6-05	15.30-17.00	90 min
	Non Governmental Organizations (NGO)							
12	Interview with President of NGO	New Age NGO	Shillong	Office of NGO	1	22-04-05		
9	Project Information Dissemination and FGD with community development societies	Thrift and Credit Societies Self Help Groups	Shillong	Urban Affairs Department	21	27-4-05	14.00-15.00	60 min
8	FGD (Gender) with NGO groups and community based women groups	Impulse Network WISE) Civil and democratic rights groups Voluntary Health Association of Shillong Northeast network Freedom Project	Shillong	St. Mary's Convent	10	28-6-05	12.00-14.30	150 min
	Interview with President of Impulse Netwofk, Ms	Impulse Network	Shillong	Office of NGO	1	19-9-05	14.00-14.30	30 min

S. No.	Type of Consultation	Stakeholder	Area	Venue	No of Participants	Date	Time	Duration
	Hasina Kharbih							
11	Interview with Program manager and Coordinator	World Vision	Shillong	Office of NGO	2	20-9-05	10.30-11.00 am	30 min
	Community Based Organizations							
13	FGD	Traditional Women's organization -Synkenthai	Nonglum	Residence of Headman of Mawlai Durbar	9	23-9-05	13.30 – 14.30 pm	60 min

Secondary and Tertiary Consultations

159. The summary of consultations held during the PPTA assignment in Shillong is presented in **Table 6.2**. The details of the various issues raised and suggestions received during the various consultation sessions are summarized in the **Table 6.2**.

TABLE 6.2: SUMMARY OF CONSULTATIONS HELD IN SHILLONG

Stage of PPTA	Stakeholders Consulted	Tool	Scope of consultation	Consultations carried out by
Study Inception	State Government officials from Urban Development Department Shillong Municipal Board Public Health Engineering Department Public Works Department Department of Forests	Formal meetings/ Discussions	Introduction of project, project components, time frame and expectations from the departments Overview of Environment and Social assessments	Team leader, deputy team leader, environment specialist
Inception workshop	Officials from Ministry of Development of North-eastern region (MoDNER), GoI Government of Meghalaya	Workshop	Discussions on approach and methodology for the study, including EA/SA	PPTA team
Situation analysis	State Government Departments NGOs including Impulse Network, World Vision, Women for Integrated Sustainable Development (WISE), Voluntary Health Association of Shillong, North East Network, Freedom Project.	Formal meetings/ Discussions	Status of infrastructure services	Sector specialists
Interim workshop	Officials from Ministry of Development of North-eastern region	Workshop	Dissemination of findings of interim report	PPTA team

Stage of PPTA	Stakeholders Consulted	Tool	Scope of consultation	Consultations carried out by
	(MoDNER), GoI Government of Meghalaya			
Feasibility analysis	State Government Departments NGOs including Impulse Network, World Vision, Women for Integrated Sustainable Development (WISE), Voluntary Health Association of Shillong, North East Network, Freedom Project. Local leaders and elected representatives, panchayat members Communities and self help groups	Formal meetings/ Structured Discussions FGDs, SES	Felt needs/ perceptions of the communities Willingness to Pay (WTP) for the infrastructure improvements Environmental issues due to project interventions Possibilities of involvement of communities	Team Leader, Sector Specialists Environment specialist Public Consultation specialist Biodiversity specialist
Finalization of project components	State Government Departments NGOs including Impulse Network, World Vision, Women for Integrated Sustainable Development (WISE), Voluntary Health Association of Shillong, North East Network, Freedom Project. Local leaders and elected representatives, panchayat members Communities and self help groups	Meetings	Response to the communities on incorporation of felt needs and perceptions Dissemination of project components	Team Leader, Sector Specialists Environment specialist Public Consultation specialist

B. CONSULTATION OUTCOMES

Inception Stage

160. The consultations at the Inception stage provided the team an opportunity to provide an orientation to the departments of the Government of Meghalaya on the project, its likely scope, time frame and the nature and extent of studies including environmental and social assessments to be carried out as part of the project.

Situation Analysis and Assessment

161. The process of consultation with stakeholders was carried out as part of the situation analysis for the various infrastructure sectors. These consultations provided inputs in identifying the needs and priorities of these agencies to be taken up for implementation in the proposed project. A sector wise summary of the issues particularly relevant to the environment in the project is presented in the **Table 6.3**.

TABLE 6.3: ISSUES RAISED AND SUGGESTIONS RECEIVED – SITUATION ANALYSIS STAGE

Sector	Stakeholders consulted	Issues raised / suggestions received	Response
Solid Wastes Management	SMB, Durbar, NGOs	• Existing solid waste dumping site is located in Riat Khwan RF. The dumping method followed is open and crude posing serious danger to the forest and the bio diversity. • Leachate from the waste is flowing into streams draining into Umiam Lake and polluting it. • Present disposal not in conformance with the SWHR – 2000. • Inefficiency of collection system leading into disposal of wastes in the streams, drains and valleys.	• Conformance of the SWHR – 2000 shall be done in the project. • Identification of alternative disposal site with provision for treatment and collection of leachate will be done. Development of the site as sanitary land filling site. • Enhancement of the collection system through fleet augmentation, provision of community bins, transfers stations shall be done. • Possibilities of involvement of NGOs, CBOs, for collection and disposal of solid wastes from steep and inaccessible areas will be looked into.

162. The situation analysis for each of the sectors were presented in the Interim Workshop wherein sector wise potential list of proposals in each of the priority infrastructure sectors were presented to the representatives of the various line departments. The discussions and feedback obtained on the proposals provided feedback towards the feasibility analysis for the formulation of projects.

Feasibility Analysis

163. The inputs received from the stakeholders during the interim workshop, provided critical inputs towards scoping of the proposed improvements in each of the infrastructure sectors. Further consultations were carried out wherein specific improvements and sub-projects were discussed. These consultations also provided an opportunity to identify the sub-projects as desired by the communities, NGOs, to be implemented in the project. These projects, have been included as part of the proposed components to the extent possible. During these consultations, the stakeholders have been apprised of the participatory approach that shall be further adopted during the detailed design and implementation of the components.

C. FRAMEWORK FOR CONTINUED PARTICIPATION IN SUBSEQUENT PROGRAM STAGES

164. Regular and continued participation of the communities shall be ensured during the project. The participation framework for the NERUDP proposes regular and continued stakeholder participation, at all stages during the project design and implementation. A grievance redressal cell shall be set up within the PIU to register grievances of the people regarding technical, social and environmental aspects. This participatory process shall ensure that all views of the people are adequately reviewed and suitably incorporated in the design and implementation process. Further, to ensure an effective disclosure of the project proposals to

the stakeholders and the communities in Shillong, an extensive project awareness campaigns shall be carried out regarding different sectoral projects with the following objectives:

- To educate the communities on the project provisions and the potential benefits due to the proposed improvements
- To impart awareness on hygienic practices to be adopted for proper utilization of the proposed infrastructure improvements.

165. For the benefit of the community the IEE will be translated made available13 at: (i) SMB office; (ii) District Magistrate Office; and, (iii) PMU. Hard copies of the IEE will be kept in the city library, 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 project. The notice will be issued by the PMU in local newspapers one month ahead of the implementation works. This will create awareness of the project implementation among the public. Posters designed to mass campaign the basic tenets of the IEE will be distributed to libraries in different localities that will be generating mass awareness. Copies of the summary of the IEE will be kept in the PMU office and will be distributed to any person willing to consult the IEE.

[13] In accordance with Operations Manual Section F2/BP on involuntary resettlement

VII. FINDINGS AND RECOMMENDATIONS

166. The proposed transfer station, garage and disposal site will be located within the existing landfill site at Municipal Trenching Ground at Marten, Mawiong. The collected wastes throughout the city are disposed at Mawiong disposal site at a distance of about 8 km from the city. The site has been operational since 1938. The proposed land fill area is 5.2503 Acres (Plot No-1). Plot No-1 is the part of Compartment no-4 of Riat Khwan Reserve Forest (It includes Plot No-1, Plot No-2 and Plot-3). The Government of Meghalaya Forest & Environment Department has extended the lease from 1938 to 2026 under letter no. FOR 76/99/16 dated 25th February 2000 to the Shillong Municipality for 18 Acres of land in Riat Khwan Forest Compartment No-4 for the purpose of trenching ground of Municipal waste with certain conditions. Umiam Lake is approximately 3.0 km from proposed disposal site. Umiam Lake is a "potential Ramsar site". It is not officially a Ramsar designated Wetland; however the site design and environmental mitigation measures seeks to avoid impacts to surface water quality of the surrounding area.

167. Government of Meghalaya may likely to establish SIPMIU with the supporting staff at an early date. SIPMIU is to be headed by a Programme/Project Director supported by technical and other staff and the same may be established within the State level Executing Agency (SLEA). SLEA may be a state department responsible for executing the part of the loan approved for ADB assistance for the state. MOUD is the executing Agency at the National level, while in the state it is either the Finance department or the Urban Development Department.

168. All components in the solid waste management sub-project effectively avoid encroachment / direct impact onto environmentally sensitive locations or protected area networks within Shillong. To minimize environmental impacts associated with construction of new infrastructure facilities, the site selection for these components has been done carefully. It is to be noted that as per the statutory requirements of Government of India (Environmental Impact Assessment Notification, September, 2006), and as per the ADB guidelines, 2003, the proposed improvements do not warrant an EIA as none of the project components are: (i) likely to have significant adverse environmental impacts and (ii) located within designated environmental sensitive or protected areas. However, the development of the landfill site and the composting facility shall require an authorization from the Meghalaya State Pollution Control Board.

169. The significance of the environmental impacts shall be more due to the construction related impacts than any impacts associated with areas of rich environmental sensitivity. It is to be noted that the resultant potential impacts from these proposals can be offset through provision of proven mitigation measures during the design and adoption of good engineering practices during construction and implementation. While no further detailed EIA shall be required for the proposed components, the addressal of the following key provisions have been included in the ToR for the environmental specialist of the DSC:

- Site Management Plan to address impacts during construction;
- Waste Management Plan to address disposal of wastes generated during construction;
- Occupational Safety Plan to address occupational hazard during construction and operation;
- Sludge Management & Disposal Plan to address sludge handling and management during operation of the STP;

- Lechate Management & Disposal Plan to address lechate management and disposal plans during operation of the Landfill Site; and

- Natural Habitat Management Plan to address issues relating to conservation of natural habitats during construction and operation phases.

170. The effective implementation of the same shall be ensured through the building up of capacity towards environmental management within the PMU supplemented with the technical expertise of an Environmental Specialist as part of the DSC. Further, the monitoring plans shall provide adequate opportunities towards course correction to address any residual impacts during construction or operation stages.

171. The Design consideration will take care of surface and ground water pollution from leachate coming from sanitary landfill sites or methane gas produced from decomposition of solid wastes. The Design consideration will take care of temporary silt runoff due to construction.

172. Adequate institutional and financial capabilities for the management of the landfill operation will be provided to avoid hazards to public health.

173. The loss of deep-rooted vegetation (e.g. tress) from the project will be compensated with at least two times of tree plantation at suitable locations

VIII. CONCLUSION

174. The proposed components should proceed through to design and implementation, subject to mitigation measures and monitoring programs identified in the IEE, which will be updated and detailed during detailed design stage, and based on above recommendations. It may be emphasized that, owing to: (i) scale of activity, (ii) location of the proposed sub-project component, and (iii) 'no environmental sensitivity' of the sub-projects, none of the components required to go through the process of EIA. It may be emphasized that the present IEE, which identifies potential impacts and suggests appropriate mitigation measures, is sufficient enough to safeguard the environment. There are no significant adverse impacts, which are irreversible or may lead to considerable loss/destruction of environment, envisaged. Proven mitigation measures exist to minimize/mitigate the same. Hence, no further study such as an EIA is required.

ANNEXURE 1: NOTIFICATION & SCHEDULES

Municipal Solid Wastes (Management and Handling)

Ministry of Environment and Forests

Notification

New Delhi, the 25th September, 2000

S.O. 908(E).- Whereas the draft of the Municipal Solid Wastes (Management and Handling) Rules, 1999 were published under the notification of the Government of India in the Ministry of Environment and Forests number S.O. 783(E), dated, the 27th September, 1999 in the Gazette of India, Part II, Section 3, Sub-section (ii) of the same date inviting objections and suggestions from the persons likely to be affected thereby, before the expiry of the period of sixty days from the date on which the copies of the Gazette containing the said notification are made available to the public;

And whereas copies of the said Gazette were made available to the public on the 5th October, 1999;

And whereas the objections and suggestions received from the public in respect of the said draft rules have been duly considered by the Central Government;

Now, therefore, in exercise of the powers conferred by section 3, 6 and 25 of the Environment (Protection) Act, 1986 (29 of 1986), the Central Government hereby makes the following rules to regulate the management and handling of the municipal solid wastes, namely:-

1. Short title and commencement.--

1. These rules may be called the Municipal Solid Wastes (Management and Handling) Rules, 2000.

2. Save as otherwise provided in these rules, they shall come into force on the date of their publication in the Official Gazette.

2. Application -- These rules shall apply to every municipal authority responsible for collection, segregation, storage, transportation, processing and disposal of municipal solid wastes.

3. Responsibility of municipal authority

1. Every municipal authority shall, within the territorial area of the municipality, be responsible for the implementation of the provisions of these rules, and for any infrastructure development for collection, storage, segregation, transportation, processing and disposal of municipal solid wastes.

2. The municipal authority or an operator of a facility shall make an application in **Form-I,** for grant of authorization for setting up waste processing and disposal facility including landfills from the State Board or the Committee in order to comply with the implementation programme laid down in **Schedule I**.

3. The municipal authority shall comply with these rules as per the implementation schedule laid down in **Schedule I.**

4. The municipal authority shall furnish its annual report in Form-II,-

a. to the Secretary-incharge of the Department of Urban Development of the concerned State or as the case may be of the Union territory, in case of a metropolitan city; or

b. to the District Magistrate or the Deputy Commissioner concerned in case of all other towns and cities,

with a copy to the State Board or the Committee on or before the 30th day of June every year.

5. Responsibility of the State Government and the Union territory Administrations .--

(1) The Secretary-incharge of the Department of Urban Development of the concerned State or the Union territory, as the case may be, shall have the overall responsibility for the enforcement of the provisions of these rules in the metropolitan cities.

(2) The District Magistrate or the Deputy Commissioner of the concerned district shall have the overall responsibility for the enforcement of the provisions of these rules within the territorial limits of their jurisdiction.

6. Responsibility of the Central Pollution Control Board and the State Board or the Committees

1. The State Board or the Committee shall monitor the compliance of the standards regarding ground water, ambient air, leachate quality and the compost quality including incineration standards as specified under **Schedules II, III** and **IV**.

2. The State Board or the Committee, after the receipt of application from the municipal authority or the operator of a facility in **Form I,** for grant of authorization for setting up waste processing and disposal facility including landfills, shall examine the proposal taking into consideration the views of other agencies like the State Urban Development Department, the Town and Country Planning Department, Air Port or Air Base Authority, the Ground Water Board or any such other agency prior to issuing the authorization.

3. The State Board or the Committee shall issue the authorization in **Form-III** to the municipal authority or an operator of a facility within forty-five days stipulating compliance criteria and standards as specified in **Schedules II, III** and **IV** including such other conditions, as may be necessary.

4. The authorization shall be valid for a given period and after the validity is over, a fresh authorization shall be required.

5. The Central Pollution Control Board shall co-ordinate with the State Boards and the Committees with particular reference to implementation and review of standards and guidelines and compilation of monitoring data.

7. Management of municipal solid wastes

1. Any municipal solid waste generated in a city or a town, shall be managed and handled in accordance with the compliance criteria and the procedure laid down in **Schedule-II**.

2. The waste processing and disposal facilities to be set up by the municipal authority on their own or through an operator of a facility shall meet the specifications and standards as specified in **Schedules III** and **IV.**

8. Annual Reports

1. The State Boards and the Committees shall prepare and submit to the Central Pollution Control Board an annual report with regard to the implementation of these rules by the 15th of September every year in **Form-IV**.

2. The Central Pollution Control Board shall prepare the consolidated annual review report on management of municipal solid wastes and forward it to the Central Government alongwith its recommendations before the 15th of December every year.

9. Accident Reporting

When an accident occurs at any municipal solid wastes collection, segregation, storage, processing, treatment and dispoosal facility or landfill site or during the transportation of such wastes, the municipal authority shall forthwith report the accident in **Form-V** to the Secretary in-charge of the Urban Development Department in metropolitan cities, and to District Collector or Deputy Commissioner in all other cases.

Schedule I

[see rules4(2) and (3)]

Implementation Schedule

Serial No.	Compliance Criteria	Schedule
1.	Setting up of waste processing and disposal facilities	By 31.12.2003 or earlier
2.	Monitoring the performance of waste processing and disposal facilities	Once in six months
3.	Improvement of existing landfill sites as per provisions of these rules	By 31.12.2001 or earlier
4.	Identification of landfill sites for future use and making site (s) ready for operation	By 31.12.2002 or earlier

Schedule -II

[see rules 6(1) and (3), 7(1)]

Management of Municipal Solid Wastes

S. No	Parameters	Compliance criteria
1.	**Collection of municipal solid wastes**	1. Littering of municipal solid waste shall be prohibited in cities, towns and in urban areas notified by the State Governments. To prohibit littering and facilitate compliance, the following steps shall be taken by the municipal authority, namely :- i. Organising house-to-house collection of municipal solid wastes through any of the methods, like community bin collection (central bin), house-to-house collection, collection on regular pre-informed timings and scheduling by using bell ringing of musical vehicle (without exceeding permissible noise levels); ii. Devising collection of waste from slums and squatter areas or localities including hotels, restaurants, office complexes and commercial areas; iii. Wastes from slaughter houses, meat and fish markets, fruits and vegetable markets, which are biodegradable in nature, shall be managed to make use of such wastes; iv. Bio-medical wastes and industrial wastes shall not be mixed with municipal solid wastes and such wastes shall follow the rules separately specified for the purpose; v. Collected waste from residential and other areas shall be transferred to community bin by hand-driven containerised carts or other small vehicles; vi. Horticlutural and construction or demolition wastes or debris shall be separately collected and disposed off following proper norms. Similarly, wastes generated at dairies shall be regulated in accordance with the State laws; vii. Waste (garbage, dry leaves) shall not be burnt; viii. Stray animals shall not be allowed to move around waste storage facilities or at any other place in the city or town and shall be managed in accordance with the State laws. 2. The municipal authority shall notify waste collection schedule and the likely method to be adopted for public benefit in a city or town. 3. It shall be the responsibility of generator of wastes to avoid littering and ensure delivery of wastes in accordance with the collection and segregation system to be notified by the municipal authority as per para 1(2) of this Schedule.
2.	**Segregation of municipal solid wastes**	In order to encourage the citizens, municipal authority shall organise awareness programmes for segregation of wastes and shall promote recycling or reuse of segregated materials. The municipal authority shall undertake phased programme to ensure community participation in waste segregation. For this purpose, regular meetings at quarterly intervals shall be arranged by the municipal authorities with representatives of local resident welfare associations and non-governmental organizations.

3.	**Storage of municipal solid wastes**	Municipal authorities shall establish and maintain storage facilities in such a manner as they do not create unhygienic and insanitary conditions around it. Following criteria shall be taken into account while establishing and maintaining storage facilities, namely :- i. Storage facilities shall be created and established by taking into account quantities of waste generation in a given area and the population densities. A storage facility shall be so placed that it is accessible to users; ii. Storage facilities to be set up by municipal authorities or any other agency shall be so designed that wastes stored are not exposed to open atmosphere and shall be aesthetically acceptable and user-friendly; iii. Storage facilities or 'bins' shall have 'easy to operate' design for handling, transfer and transportation of waste. Bins for storage of bio-degradable wastes shall be painted green, those for storage of recyclable wastes shall be printed white and those for storage of other wastes shall be printed black; iv. Manual handling of waste shall be prohibited. If unavoidable due to constraints, manual handling shall be carried out under proper precaution with due care for safety of workers.
4.	**Transportation of municipal solid wastes**	Vehicles used for transportation of wastes shall be covered. Waste should not be visible to public, nor exposed to open environment preventing their scattering. The following criteria shall be met, namely:- i. The storage facilities set up by municipal authorities shall be daily attended for clearing of wastes. The bins or containers wherever placed shall be cleaned before they start overflowing; ii. Transportation vehicles shall be so designed that multiple handling of wastes, prior to final disposal, is avoided.
5.	**Processing of municipal solid wastes**	Municipal authorities shall adopt suitable technology or combination of such technologies to make use of wastes so as to minimize burden on landfill. Following criteria shall be adopted, namely:- (i) The biodegradable wastes shall be processed by composting, vermicomposting, anaerobic digestion or any other appropriate biological processing for stabilization of wastes. It shall be ensured that compost or any other end product shall comply with standards as specified in Schedule-IV; ii. Mixed waste containing recoverable resources shall follow the route of recycling. Incineration with or without energy recovery including pelletisation can also be used for processing wastes in specific cases. Municipal authority or the operator of a facility wishing to use other state-of-the-art technologies shall approach the Central Pollution Control Board to get the standards laid down before applying for grant of authorisation.
6.	**Disposal of municipal solid wastes**	Land filling shall be restricted to non-biodegradable, inert waste and other waste that are not suitable either for recycling or for biological processing. Land filling shall also be carried out for residues of waste processing facilities as well as pre-processing rejects from waste processing facilities. Land filling of mixed waste shall be avoided unless the same is found unsuitable for waste processing. Under unavoidable circumstances or till

		installation of alternate facilities, land-filling shall be done following proper norms. Landfill sites shall meet the specifications as given in Schedule – III.

Schedule III

[see rules 6(1) and (3), 7(2)]

Specifications for Landfill Sites

Site Selection

1. In areas falling under the jurisdiction of 'Development Authorities' it shall be the responsibility of such Development Authorities to identify the landfill sites and hand over the sites to the concerned municipal authority for development, operation and maintenance. Elsewhere, this responsibility shall lie with the concerned municipal authority.

2. Selection of landfill sites shall be based on examination of environmental issues. The Department of Urban Development of the State or the Union territory shall co-ordinate with the concerned organisations for obtaining the necessary approvals and clearances.

3. The landfill site shall be planned and designed with proper documentation of a phased construction plan as well as a closure plan.

4. The landfill sites shall be selected to make use of nearby wastes processing facility. Otherwise, wastes processing facility shall be planned as an integral part of the landfill site.

5. The existing landfill sites which continue to be used for more than five years, shall be improved in accordance of the specifications given in this Schedule.

6. Biomedical wastes shall be disposed off in accordance with the Bio-medical Wastes (Management and Handling) Rules, 1998 and hazardous wastes shall be managed in accordance with the Hazardous Wastes (Management and Handling) Rules, 1989, as amended from time to time.

7. The landfill site shall be large enough to last for 20-25 years.

8. The landfill site shall be away from habitation clusters, forest areas, water bodies monuments, National Parks, Wetlands and places of important cultural, historical or religious interest.

9. A buffer zone of no-development shall be maintained around landfill site and shall be incorporated in the Town Planning Department's land-use plans.

10. Landfill site shall be away from airport including airbase. Necessary approval of airport or airbase authorities prior to the setting up of the landfill site shall be obtained in cases where the site is to be located within 20 km of an airport or airbase.

Facilities at the Site

11. Landfill site shall be fenced or hedged and provided with proper gate to monitor incoming vehicles or other modes of transportation.

12. The landfill site shall be well protected to prevent entry of unauthorised persons and stray animals.

13. Approach and other internal roads for free movement of vehicles and other machinery shall exist at the landfill site.

14. The landfill site shall have wastes inspection facility to monitor wastes brought in for landfill, office facility for record keeping and shelter for keeping equipment and machinery including pollution monitoring equipments.

15. Provisions like weigh bridge to measure quantity of waste brought at landfill site, fire protection equipments and other facilities as may be required shall be provided.

16. Utilities such as drinking water (preferably bathing facilities for workers) and lighting arrangements for easy landfill operations when carried out in night hours shall be provided.

17. Safety provisions including health inspections of workers at landfill site shall be periodically made.

Specifications for land filling

18. Wastes subjected to land filling shall be compacted in thin layers using landfill compactors to achieve high density of the wastes. In high rainfall areas where heavy compactors cannot be used alternative measures shall be adopted.

19. Wastes shall be covered immediately or at the end of each working day with minimum 10 cm of soil, inert debris or construction material till such time waste processing facilities for composting or recycling or energy recovery are set up as per Schedule I.

20. Prior to the commencement of monsoon season, an intermediate cover of 40-65 cm thickness of soil shall be placed on the landfill with proper compaction and grading to prevent infiltration during monsoon. Proper drainage berms shall be constructed to divert run-off away from the active cell of the landfill.

21. After completion of landfill, a final cover shall be designed to minimize infiltration and erosion. The final cover shall meet the following specifications, namely :--

a. The final cover shall have a barrier soil layer comprising of 60 cms of clay or amended soil with permeability coefficient less that 1×10^{-7} cm/sec.

b. On top of the barrier soil layer there shall be a drainage layer of 15 cm.

c. On top of the drainage layer there shall be a vegetative layer of 45 cm to support natural plant growth and to minimize erosion.

Pollution prevention

22. In order to prevent pollution problems from landfill operations, the following provisions shall be made, namely:-

a. Diversion of storm water drains to minimize leachate generation and prevent pollution of surface water and also for avoiding flooding and creation of marshy conditions;

b. Construction of a non-permeable lining system at the base and walls of waste disposal area. For landfill receiving residues of waste processing facilities or mixed waste or waste having contamination of hazardous materials (such as aerosols, bleaches, polishes, batteries, waste oils, paint products and pesticides) minimum liner specifications shall be a composite barrier having 1.5 mm high density polyethylene (HDPE) geomembrane, or equivalent, overlying 90 cm of soil (clay or amended soil) having permeability coefficient not greater than 1 x 10^{-7} cm/sec. The highest level of water table shall be at least two meter below the base of clay or amended soil barrier layer;

c. Provisions for management of leachates collection and treatment shall be made. The treated leachates shall meet the standards specified in Schedule- IV;

d. Prevention of run-off from landfill area entering any stream, river, lake or pond.

Water Quality Monitoring

23. Before establishing any landfill site, baseline data of ground water quality in the area shall be collected and kept in record for future reference. The ground water quality within 50 metres of the periphery of landfill site shall be periodically monitored to ensure that the ground water is not contaminated beyond acceptable limit as decided by the Ground Water Board or the State Board or the Committee. Such monitoring shall be carried out to cover different seasons in a year that is, summer, monsoon and post-monsoon period.

24. Usage of groundwater in and around landfill sites for any purpose (including drinking and irrigation) is to be considered after ensuring its quality. The following specifications for drinking water quality shall apply for monitoring purpose, namely :-

S.No.	Parameters	IS 10500: 1991 Desirable limit (mg/l except for pH)
1.	Arsenic	0.05
2.	Cadmium	0.01
3	Chromium	0.05
4.	Copper	0.05
5.	Cyanide	0.05
6.	Lead	0.05
7.	Mercury	0.001
8.	Nickel	-
9.	Nitrate as NO_3	45.0
10	PH	6.5-8.5
11.	Iron	0.3

S.No.	Parameters	IS 10500: 1991 Desirable limit (mg/l except for pH)
12.	Total hardness (as $CaCO_3$)	300.0
13.	Chlorides	250
14.	Dissolved solids	500
15.	Phenolic compounds (as C_6H_5OH)	0.001
16.	Zinc	5.0
17.	Sulphate (as SO_4)	200

Ambient Air Quality Monitoring

25. Installation of landfill gas control system including gas collection system shall be made at landfill site to minimize odour generation, prevent off-site migration of gases and to protect vegetation planted on the rehabilitated landfill surface.

26. The concentration of methane gas generated at landfill site shall not exceed 25 per cent of the lower explosive limit (LEL).

27. The landfill gas from the collection facility at a landfill site shall be utilized for either direct thermal applications or power generation, as per viability. Otherwise, landfill gas shall be burnt (flared) and shall not be allowed to directly escape to the atmosphere or for illegal tapping. Passive venting shall be allowed if its utiliztion or flaring is not possible.

28. Ambient air quality at the landfill site and at the vicinity shall be monitored to meet the following specified standards, namely :-

S.No.	Parameters	Acceptable levels
(i)	Sulphur dioxide	120 □□□□□□□□□
(ii)	Suspended Particulate Matter	500 □□□□□□□□□
(iii)	Methane	Not to exceed 25 per cent of the lower explosive limit (equivalent to 650 mg/m^3)
(iv)	Ammonia daily average	
	(Sample duration 24 hrs)	0.4 mg/m^3 (400 □□□□
(v)	Carbon monoxide	1 hour average : 2 mg/m^3 8 hour average : 1 mg/m^3

29. The ambient air quality monitoring shall be carried out by the concerned authority as per the following schedule, namely:-

(a) Six times in a year for cities having population of more than fifty lakhs;

(b) Four times in a year for cities having population between ten and fifty lakhs;

(c) Two times in a year for town or cities having population between one and ten lakhs.

Plantation at Landfill Site

30. A vegetative cover shall be provided over the completed site in accordance with the and following specifications, namely:-

(a) Selection of locally adopted non-edible perennial plants that are resistant to drought and extreme temperatures shall be allowed to grow;

(b) The plants grown be such that their roots do not penetrate more than 30 cms. This condition shall apply till the landfill is stabilised;

(c) Selected plants shall have ability to thrive on low-nutrient soil with minimum nutrient addition;

(d) Plantation to be made in sufficient density to minimize soil erosion.

Closure of Landfill Site and Post-care

31. The post-closure care of landfill site shall be conducted for at least fifteen years and long term monitoring or care plan shall consist of the following, namely :-

(a) Maintaining the integrity and effectiveness of final cover, making repairs and preventing run-on and run-off from eroding or otherwise damaging the final cover;

(b) Monitoring leachate collection system in accordance with the requirement;

(c) Monitoring of ground water in accordance with requirements and maintaining ground water quality;

(d) Maintaining and operating the landfill gas collection system to meet the standards.

32. Use of closed landfill sites after fifteen years of post-closure monitoring can be considered for human settlement or otherwise only after ensuring that gaseous and leachate analysis comply with the specified standards.

Special provisions for hilly areas

33. Cities and towns located on hills shall have location-specific methods evolved for final disposal of solid wastes by the municipal authority with the approval of the concerned State Board or the Committee. The municipal authority shall set up processing facilities for utilization of biodegradable organic wastes. The inert and non-biodegradable waste shall be used for building roads or filling-up of appropriate areas on hills. Because of constraints in finding adequate land in hilly areas, wastes not suitable for road-laying or filling up shall be disposed of in specially designed landfills.

Schedule IV

[see rules 6(1) and (3), 7(2)]

Standards for Composting, Treated Leachates and Incineration

1. The waste processing or disposal facilities shall include composting, incineration, pelletisation, energy recovery or any other facility based on state-of-the-art technology duly approved by the Central Pollution Control Board

2. In case of engagement of private agency by the municipal authority, a specific agreement between the municipal authority and the private agency shall be made particularly, for supply of solid waste and other relevant terms and conditions.

3. In order to prevent pollution problems from compost plant and other processing facilities, the following shall be complied with, namely :-

   i. The incoming wastes at site shall be maintained prior to further processing. To the extent possible, the waste storage area should be covered. If, such storage is done in an open area, it shall be provided with impermeable base with facility for collection of leachate and surface water run-off into lined drains leading to a leachate treatment and disposal facility;

   ii. Necessary precautions shall be taken to minimise nuisance of odour, flies, rodents, bird menace and fire hazard;

   iii. In case of breakdown or maintenance of plant, waste intake shall be stopped and arrangements be worked out for diversion of wastes to the landfill site;

   iv. Pre-process and post-process rejects shall be removed from the processing facility on regular basis and shall not be allowed to pile at the site. Recyclables shall be routed through appropriate vendors. The non-recyclables shall be sent for well designed landfill site(s).

   v. In case of compost plant, the windrow area shall be provided with impermeable base. Such a base shall be made of concrete or compacted clay, 50 cm thick, having permeability coefficient less than 10^{-7} cm/sec. The base shall be provided with 1 to 2 per cent slope and circled by lined drains for collection of leachate or surface run-off;

   vi. Ambient air quality monitoring shall be regularly carried out particularly for checking odour nuisance at down-wind direction on the boundary of processing plant.

Ambient air quality monitoring shall be regularly carried out particularly for checking odour nuisance at down-wind directi

Parameters	**Concentration not to exceed * (mg/kg dry basis , except pH value and C/N ratio)**
Arsenic	10.00
Cadmium	5.00
Chromium	50.00

Copper	300.00
Lead	100.00
Mercury	0.15
Nickel	50.00
Zinc	1000.00
C/N ratio	20-40
PH	5.5-8.5

* Compost (final product) exceeding the above stated concentration limits shall not be used for food crops. However, it may be utilized for purposes other than growing food crops.

4. The disposal of treated leachates shall follow the following standards, namely:-

S.No	**Parameter**	**Standards (Mode of Disposal)**		
		Inland surface water	**Public sewers**	**Land disposal**
1.	Suspended solids, mg/l, max	100	600	200
2.	Dissolved solids (inorganic) mg/l, max.	2100	2100	2100
3	PH value	5.5 to 9.0	5.5 to 9.0	5.5 to 9.0
4	Ammonical nitrogen (as N), mg/l, max.	50	50	-
5	Total Kjeldahl nitrogen (as N), mg/l, max.	100	-	-
6	Biochemical oxygen demand (3 days at 27^0 C) max.(mg/l)	30	350	100
7	Chemical oxygen demand, mg/l, max.	250	-	-
8	Arsenic (as As), mg/l, max	0.2	0.2	0.2
9	Mercury (as Hg), mg/l, max	0.01	0.01	-
10	Lead (as Pb), mg/l, max	0.1	1.0	-
11	Cadmium (as Cd), mg/l, max	2.0	1.0	-

12	Total Chromium (as Cr), mg/l, max.	2.0	2.0	-
13	Copper (as Cu), mg/l, max.	3.0	3.0	-
14	Zinc (as Zn), mg/l, max.	5.0	15	-
15	Nickel (as Ni), mg/l, max	3.0	3.0	-
16	Cyanide (as CN), mg/l, max.	0.2	2.0	0.2
17	Chloride (as Cl), mg/l, max.	1000	1000	600
18	Fluoride (as F), mg/l, max	2.0	1.5	-
19	Phenolic compounds (as C_6H_5OH) mg/l, max.	1.0	5.0	-

Note : While discharging treated leachates into inland surface waters, quantity of leachates being discharged and the quantity of dilution water available in the receiving water body shall be given due consideration.

The incinerators shall meet the following operating and emission standards, namely:-

A. Operating Standards

(1) The combustion efficiency (CE) shall be at least 99.00%.

(2) The combustion efficiency is computed as follows :

$$C.E. = \frac{\%CO_2}{\%CO_2 + \%CO} \times 100$$

1. Emission Standards

Parameters	Concentration mg/Nm^3 at (12% CO_2 correction)
(1) Particulate matter	150
(2) Nitrogen Oxides	450
(3) HCl	50

(4) Minimum stack height shall be 30 metres above ground.

(5) Volatile organic compounds in ash shall not be more than 0.01%.

Note:

1. Suitably designed pollution control devices shall be installed or retrofitted with the incinerator to achieve the above emission limits, if necessary.

2. astes to be incinerated shall not be chemically treated with any chlorinated disinfectants

3. Chlorinated plastics shall not be incinerated.

4. Toxic metals in incineration ash shall be limited within the regulatory quantities as specified in the Hazardous Wastes (Management and Handling) Rules, 1989 as amended from time to time.

5. Only low sulphur fuel like l.d.o., l.s.h.s or Diesel shall be used as fuel in the incinerator.

Form –I

[see rules 4(2) & 6(2)]

Application for obtaining authorization

To,
The Member Secretary

1.	Name of the municipal authority/Name of the agency appointed by the municipal authority	:	
2.	Correspondence address Telephone No. Fax No.	:	
3.	Nodal Officer & designation(Officer authorised by the municipal authority or agency responsible for operation of processing or disposal facility)	:	
4.	Authorization applied for (Please tick mark)	:	(a) Setting up & operation of waste processing facility (b)Setting up & operation of disposal facility
5.	Detailed proposal of waste processing/disposal facility (to be attached) to include	:	
5.1	**Processing of Waste** i. Location of site ii. Name of waste processing technology iii. Details of processing technology iv. Quanitty of waste to be processed per day v. Site clearance (from local authority) vi. Details of agreement between municipal authority and operating agency vii. Utilization programme for waste processed (Product utilization) viii. Methodology for disposal of waste processing rejects (quantity and quality) ix. Measures to be taken for prevention and control of environmental pollution x. Investment on Project and expected returns xi. Measures to be taken for safety of workers working in the plant	:	
5.2	**Disposal of Waste** i. Number of sites indentified ii. Layout maps of site iii. Quantity of waste to be disposed per day iv. Nature and composition of waste	:	

	v. Details of methodology or criteria followed for site selection vi. Details of existing site under operation vii. Methodology and operational details of landfilling viii. Measures taken to check enviornmental pollution		

Date	Signature of Nodal Officer

Form - II

[See rule 4(4)]

Format of Annual Report to be submitted by the Municipal Authority

i. Name of City/Town:……

ii. Population ……

iii. Name of municipal body:…… and Address
……
……

Telephone No. : …….

Fax : ……

iv. Name of Incharge dealing with municipal solid wastes ……
…….…… with designation
……..

1. **Quantity and composition of solid wastes**

(i) Total quantity of wastes generated per day

(ii) Total quantity of wastes collected per day

(iii)Total quantity of wastes processed for :

a. Composting: ……
b. Vermiculture: ……
c. Pellets: ……
d. Others, if any, please specify …….

(iv) Total quantity of waste disposed by landfilling:
……

a. no. of landfill sites used : ……
b. Area used: ……
c. Whether Weigh bridge facilities available : Yes/No

a. Whether area is fenced : Yes/No

a. Lighting facility on site : Yes/No

(f) Whether equipment like Bulldozer, Compacters etc.available. (Please specify) :---------- ---------- ----------

a. Total Manpower available on site: ----------

a. Whether covering is done on daily basis : Yes/No

i. Whether covering material is used and whether it is adequately available : ---------- ----------

a. Provisions for gas venting provided : Available (Yes/No) /Not available

a. Provision for leachate collection : Provisions made/ Provisions not made

2. Storage facilities

(i) Area covered for collection of wastes : ----------

(ii) no. of houses covered : ----------

(iii) Whether house-to-house collection is practiced (if yes, whether done by Municipality or through Private Agency or Non-Governmental Organisation) : ----------

(iv) Bins : ----------

Specifications Existing Proposed

(Shape & Size) Numbers for future

----

a. RCC Bins (Capacity) :

b. Trolleys (Capacity) :

c. Containers (Capacity) :

d. Dumper Placers :

e. Others, please specify :

(v)Whether all bins/collection spots are attended for daily lifting of garbage : Yes/No

(vi)Whether lifting of garbage from dustbins is manual or mechanical i.e. for example by using of front-end : Manual/Loader/Others, please specify

loaders (Please tick mark)

3. Transportation

	Existing number	Actually Required/Proposed
(i) Truck :		
(ii) Truck-Tipper :		
(iii) Tractor-Trailer :		
(iv) Refuse-collector :		
(v) Dumper-placers :		
(vi) Animal Cart :		
(vii) Tricycle :		
(viii) Others (please specify) :		

4. Whether any proposal has been made to improve solid wastes management practices

5. Are any efforts made to call for private firms etc. to attempt for processing of waste utilising technologies like :

	Waste Utilisation Technology	Proposals	Steps taken (Quantity to be processed)
i.	Composting :		
ii.	Vermiculture :		
iii.	Pelletisation :		
iv.	Others if any, Please specify :		

6. What provisions are available and how these are implemented to check unhygienic operations of :

i. Dairy related activities :

ii. Slaughter houses and unauthorised slaughtering :

iii. Malba (cnstruction debris) lifting :

iv. Encroachment in Parks, Footpaths etc. :

7. How many slums are identified and whether these are provided with sanitation facilities :

8. **Are municipal magistrates appointed for Taking penal action :** Yes/No

[If yes, how many cases registered & settled during last three years (give year-wise details)]

9. Hospital waste management

i. How many Hospitals/Clinics under the control of the Corporation:

ii. What methods are followed for disposal of bio-medical wastes ?:

iii. Do you have any proposal for setting up of common treatment facility for disposal of bio-medical wastes :

iv. How many private Nursing Homes, Clinics etc. are operating in the city/town and what steps have been taken to check disposal of their wastes :

Signature of Municipal Commissioner

Dated :

Form –III

[See-rule 6(2)]

Format for Issue of Authorisation

File No.: _____

Date:_____

To,
_____
_____
_____

Ref: Your application number _____dt. _____

The _____State Pollution Control Board/Pollution Control Committee after examining the proposal hereby authorises_____having their administrative office at _____to set up and operate waste processing/waste disposal facility at_____on the terms and conditions (including the standards to comply) attached to this authorization letter.

1. The validity of this authorization is till_____. After the validity, renewal of authorization is to be sought.
2. The _____State Pollution Control Board/Pollution Control Committees may, at any time, revoke any of the conditions applicable under the authorization and shall communicate the same in writing.
3. Any violation of the provision of the Municipal Solid Wastes (Managemeant and Handling) Rules, 2000 will attract the penal provision of the Environment (Protection) Act, 1986 (29 of1986).

(Member Secretary)

State Pollution Control Board/
Pollution Control Committee

Date :
Place :

Form - IV

[see rule 8(1)]

Format of Annual Review Report to be submitted by the State Pollution Control Board/Committees to the Central Pollution Control Board

To,
The Chairman,
Central Pollution Control Board,
(Ministry of Environment and Forests)
Government of India,
'Parivesh Bhawan', East Arjun Nagar,
DELHI- 110 0032.

1.	Name of the State/Union territory	:	
2.	Name & address of the State Pollution Control	:	
3.	Board/Pollution Control Committee Number of municipal authorities responsible for management of municipal solid wastes in the State/Union territory under these rules	:	
4.	A Summary Statement on progress made by municipal authorities in respect of implementation of Schedule I [rule 4(3)]	:	Please attach as Annexure-I
5.	A Summary Statement on progress made by municipal authorities in respect of implementation of Schedule II [rules 6(1) and (3), 7(1)]	:	Please attach as Annexure-II
6.	A Summary Statement on progress made by municipal authorities in respect of implementation of Schedule III [rules 6(1) and (3), 7(2)]	:	Please attach as Annexure-III
7.	A summary statement on progress made by municipal authorities in respect of implementation of Schedule IV [rules 6(1) and (3), 7(2)]		Please attach as Annexure-IV

Date: _____	Chairman or the Member Secretary
Place : _____	State Pollution Control Board/
	Pollution Control Committee

Form - V

[see rule 9]

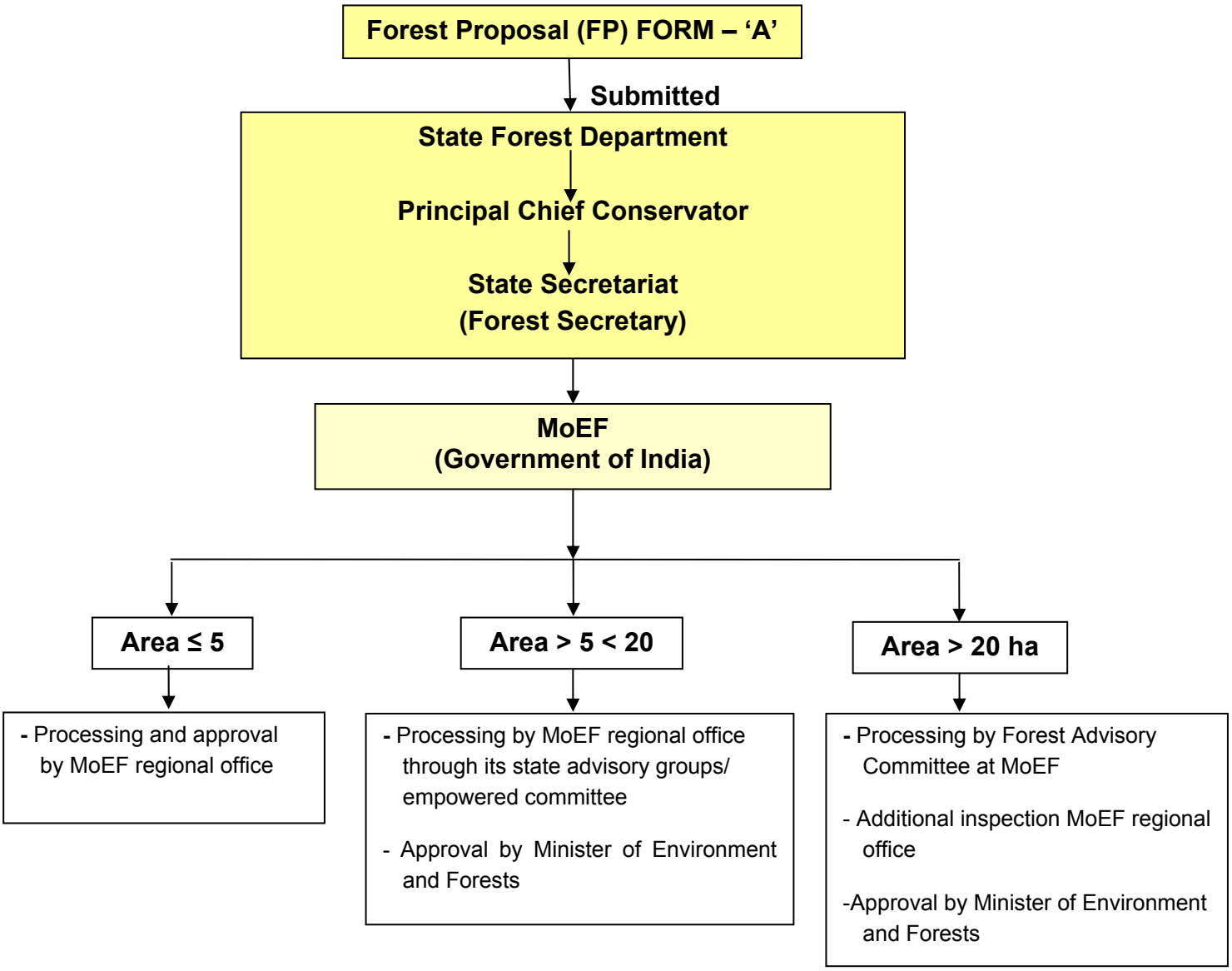
Accident reporting

1.	Date and time of accident	:	
2.	Sequence of events leading to accident	:	
3.	The waste involved in accident	:	
4.	Assessment of the effects of the accidents on human health and the environment	:	
5.	Emergency measures taken	:	
6.	Steps taken to alleviate the effects of accidents	:	
7.	Steps taken to prevent the recurrence of such an accident	:	

Date : ……	Signature : ……
Place : ……	Designation : ……

V. Rajagopalan, Jt. Secy.
[F.No.17-2/95-HSMD]

ANNEXURE 2: FOREST CLEARANCE APPROVAL PROCESS



ANNEXURE 3: FORM 1 – APPLICATION FOR CONSENT FOR EMISSION/CONTINUATION OF EMISSION UNDER SECTION 21 OF THE AIR ACT.

398 **Price Rs. 100/-**

(To be submitted in Triplicate)

FORM - 1

(To be submitted in triplicate)

APPLICATION FOR CONSENT FOR EMISSION/ CONTINUATION OF EMISSION UNDER SECTION 21 OF THE AIR ACT.

(See Rule 4)

From Date .....

.....

.....

.....

.....

To

The Member Secretary,
Meghalaya State Pollution Control Board,
'ARDEN', Motinagar, SHILLONG 793014

Sir

I*.....occupier of the industrial plant **.....hereby apply for consent under section 21 of the Air (Prevention and Control of Pollution) Act 1981 for a Period upto of ..... (not exceeding three years) to operate the above mentioned industrial plant, detail pertaining to it being given in the Annexure and the accompaniments submitted at part of this application.

2. I declare that the information furnished in this application, annexure, accompaniments and appendixes, if any, are correct and true to the best of my knowledge and belief.

3. I hereby agree to inform the Board within 15 days of any change in the particulars in respect of the occupier/or authorised agent.

4. I hereby submit that in case of a change either of the point or the quality or emission or its quantity, a fresh application for consent shall be made and until such consent is granted no change shall be made.

5. I hereby agree to submit to the Board application for renewal of consent six months in advance of the date of expiry of the consented period if the operation of the industrial plant is to be continued thereafter.

6. An amount of Rs. ..... (Rupees .....) as the consent fee for this application has been remitted in the office of the Board *vide* Receipt No. ..... Dated ..... an authenticated copy of which is attached as proof of payment.

1

7. I undertake to furnish any other information called for by the Board within such times as specified by the Board.

Yours faithfully,

Occupier's signature .....

Name .....

Address .....

Note : * Here enter the name and address of the occupier who, in relation to any factory or the premises, is the person who has control over the affairs of the factory or the premises and where the said affairs are entrusted to a managing agent, such agent shall be deemed to the occupier of the factory or the premises.
** Here enter the name and address of the industrial plant.

Accompaniments :

i) Index / Site plan
ii) Topographical map
iii) Detailed layout of different process and point, of emissions and position of stacks & chimneys.
iv) Process flow sheet
v) Emission analysis report
vi) Ambient air quality report, if available
vii) Details of air pollution control devices provided or proposed to be provided.
viii) Copy of the receipt for the consent fee.

ANNEXURE TO FORM - I

Chimney { Existing / New / Altered

NOTE : (i) Form I in set of three is obtainable from the office of the Meghalaya State Pollution Control Board, Shillong on payment of Rs. 100 (Rupees one hundred only) in cash or by Money Order.

(ii) Read the explanatory note at the end of the application form carefully before filling the form.

(iii) While filling this Annexure, the applicant (occupier) shall mark 'not applicable' against items which are not pertaining to this Industrial plant and no space shall be left blank.

(iv) Any applicant knowingly giving incorrect information or suppressing any information pertaining thereto shall be liable to be punished under the Act.

2

1) *a)* Full name of the occupier
   b) Designation
   c) Postal address
   d) Telegraphic address
   e) Telex / Fax No.
   f) Telephone No.

2) Full name & address of the Industry & its registered office.

3) Name/s, designation/s and postal address of authorised agent/agents.

4) *a.* Type of industry (with reference to the schedule of the Act)
   b. Category of Industry, small scale/medium scale/large scale.
   c. Capital investment (with year of investment)

5) Month and year in which the plant : was actually put into commission or is proposed to be put into commission

6) Location of the Industrial plant.
   a. Revenue Survey No.
   b. Area in Hectares
   c. Village
   d. Taluk
   e. District
   f. Panchayat/Municipality/ Corporation.

7) *a.* State whether the Industry premises has been declared a prohibited area. Yes/No
   b. If yes, state the name of authority making the declaration & furnish a certified copy of the declaration order.

8. *a.* State whether the Industry is working round the year or seasonal
   b. If seasonal, state the period From ..... to .....

9. *a.* Number of persons attending in the premises/ the factory per day.....
   b. Number of persons residing in the premises .....

10. List of individual plants in the Industry.

11. *a.* List of materials used in process (other than fuels)

3

Sl. No.	Name of material	Process where used	Consumption in tonnes/day

A Process flow diagram must be attached showing the entry and exit points of all raw materials, intermediate products, by-products and products Label process and control equipments and give process description.

b. Details of fuel consumption.

Fuel identification/commercial name	Coal	Oil	Wood	Gas	Others
a) Daily consumption in tonnes					
b) Where used					
c) Calorific value					
d) Ash content percent					
e) Sulphur content percent					
f) Others (specify)					

List of products and by-products.

Sl. No.	Name	Quantity in tonnes/day

12) *a)* Indicate the present use of the land within 5 Km radius, :

i) Human settlements of more than 1000 population (Specify population and distance from the plants) :

.....

.....

ii) Commercial .....

iii) Industrial .....

iv) Fisheries .....

4

v) Hills / mountains/sanctuary/National Parks .....

vi) Ancient monuments .....

vii) Worship centres .....

viii) Others .....

b) Climatological and metrological details (if available)

i) Climate condition & the site .....

(eg. arid, semi-arid etc)

ii) Rainfall, yearly average, range .....

iii) Temperature, seasonal changes .....

iv) Speed and direction of wind .....

v) Humidity, solar radiation .....

13. a) Details of furnaces :

Ref. No. of chimney in layout plant through which emission take place	Type of furnace	Fuel used, quantity of fuel, tonne/day	Operation & Loading

b) Details of boilers :

Ref. No. of chimney in layout plant through which emission take place	Type of fuel used	boiler	Quantity fuel tonne/ day.	Steam pressure	Capacity	Operation and loading

5

14. *a)* Details of chimney :

Ref. No. of Chimney in lay-out plan	Nature of Construction	Height in m above ground level	Height in m above roof level	Inside shape circle, square etc.	Inside dimension in m diameter size etc. (specify)	Qnty. m3/hour	Exit Gas Temperature 0^{c} C^{0}	Exit Gas Velocity m/sec

b) Chimney emission :

Ref of chimney in lay-out Plan	Source of emission	Analysis of gas* mg/m3			
		Oxides of S C N	Hydrocarbons	Particulars	Others

c) Any other emission :

Source/Outlet	Quantity m3/hr.	Temperature °C	Analysis of gas* mg/m3			
			Oxides of S C N	Hydrocarbons	Particulars	Others

d) Particulate analysis (if available Identification refering to 14(b) (c)

	size distribution %	
	50/m/10/m/5/m/3/m/1/m	Chemical composition

* *(i)* Attach copy of laboratory report
(ii) Specify the parameters.

6

15.	Laboratory facilities for air emission analysis	Existing	/	Proposed
16.	Quantity of air handled by ventilation equipments, specifying the number and size of equipments installed or to be installed.			

17. Detailed of emission sampling facilities available :

Identification of emission	Sampling, points ladder platforms etc., available	Remarks

18. Details of Air pollution control system with specifications and drawings.

(a) Existing *(b)* Proposed

19. *(a)* Capital investment for air pollution control and year of investment

Existing

Proposed

(b) Annual recurring expenditure for air pollution control.

Existing

Proposed

20. Number and date of consent, if any under the water (Prevention and control of pollution)

Act, 1974 (Central Act 6 of 1984).....

21. Other relevent information, if any

Occupier's signature .....

Name .....

Address .....

7

Explanatory Note — For filling in Form I and the Annexure

The notes given only for those items for which explanation is considered desirable. If the space is not sufficient for filling in any item, the details may be given in separate sheets of paper.

Item No. 7. The amount payable as consent fee is specified in *Appendix II* of the Air (Prevention and Control of Pollution) Rules 1988. The amount may be remitted in cash or as demand draft drawn in favour of the Member Secretary Payable at Shillong.

ANNEXURE TO FORM

'Chimney' : Includes any structure with an opening or outlet through which any air pollutant may be emitted.

'Existing' : Means that which is in operation at the time of applying for the consent.

'New' : Means that which will be brought into operation in future.

'Altered' : Means that which has been modified due to change in quantity and/or quality of emission, arrangement and / or point of emission etc.

Item No. 3 : Here give the name's, designation's and addresses of the persons authorised to receive, on behalf of the occupier the 'notice' of intention to have sample 'anlysed' served as per section 26 of the Act. .....

Item No. 4. a. Here state the type of Industry, with reference to the schedule of the Act.

Item No. 4. b. The Industries are categorised on the basis of the capital investment as follows.

Large scale Industry. More than 2 crore rupees; medium scale industry : 20 lakhs to 2 Crore rupees; small scale Industry : Less than 20 lakhs rupees.

Item No. 14. : Analysis of the flue gas emission, process emission and particulates should be done for each stack emission. Whenever stacks are not provided, the shop floor specific pollutant concentration should be reported. Chemical analysis of the particulate matter in the emission is to be done for organic content, metals, non-metals, silicates, radio-active substances etc.

Item No. 16 : Here state the total quantity of ventilation air handled by equipments such as roof extractors, evaporative coolers etc.

Item No. 18 : Here give detailed specifications (including efficiency) of the air pollution control system used or proposed to be used. Also furnish the lay out of the control systems with dimensions.

8

The accompanying form in triplicate to be submitted to –

Member-Secretary,
Meghalaya Pollution Control Board, Shillong

0335

EXPLANATORY NOTE FOR FILLING FORM 'A' AND THE ANNEXURE

The notes are given only for those items for which explanation is considered desirable. Other items are self-explanatory.

FORM A

(1) Here mention the names of the declared Area.
(2) Here mention the name of the owner of the land/premises if other than the applicant industry or factory. If the land (premises belong to the factory / industry), say self.
(3) Here mention the case as to which the consent is sought for.
(4) Here mention the local name of the river/stream tidal waters/sea, as may be applicable.

ANNEXURE TO FORM 'A' –

Outlet	means the arrangement for discharge of the effluent for which the consent is sought for.
Discharging	means the effluent going out of the outlet.
Existing	means that which is in operation at the time of applying for the consent.
New	means that which will be brought into operation in future.
Altered	means that which has been modified due to changes in quantity and / or quality of discharge arrangement and/or point of discharge etc.
Item 1	Here give the name of the person who is authorised by the Institution/Industry/factory/ local body etc., to transact their legal business.
Item 2	Here give the registered name of the institution/factory/Industry etc. under which the business is carried out.
Item 5	Here state the concerned institution such as M.I.D.C., C.L.D.C.O. etc. under whose administrative control the factory/Industry etc. set up.
Item 6	Applicable to only those area which are prohibited areas such as the Ordinance Factories, Mint etc.
Item 13 (B)	State the method of measurement of hourly/daily maximum quantity of effluents i.e., by flow meters, venturi meters, V notch, Sump measurements, or approximately estimated etc.
Item 16 (A)	If the effluent is treated, give separately the method of treatment and flow diagram of the treatment process.
Item 16 (B)	Here mention 'Yes' if any other authority such as the local body, M.I.D.C., or State Department has already approved the discharge of effluent either with or without treatment, at the time of establishment of factory/Industry.
Item 19	Here give the quantity of effluent of different types such as domestic, industrial or mixed etc. proposed to be or is let into stream/river, lands, lakes, sea etc. as may be applicable.
Item 22 (a)	Analysis to be furnished shall cover as many parameters as are expected to be found to the effluent. If some of the parameters are not expected to be found, say not applicable. If some of the parameters other than those listed under items are expected, the same may be mentioned at the end. The analysis report shall be separately furnished for domestic, industrial and combined effluents.
Item 22 (b)	Here toxicity means the which is established by bio-assay studies on fish as per procedure given in the standard methods.
Item 24	This item is meant to cover such highly Polluting substances which do not ordinarily find way in the effluents, but are required to be handled in the premises and which may, by accident, join the effluent in large quantities.

1

Price Rs. 100/-
(To be submitted in Triplicate)

FORM 'A'
APPLICATION FOR CONSENT FOR DISCHARGE UNDER SECTION 25/26 OF THE WATER ACT., 1974

Application for consent for discharge in (1) .....
.....
Area which is a "Water Pollution Prevention Area" .....
From : Date
.....
.....
.....

To,
The Member-Secretary
Meghalaya Pollution Control Board, Shillong.

Sir,

I / We hereby apply for CONSENT under the Water (Prevention & Pollution) Act. 1974 to make discharge for land / premises owned by (2) .....
.....

(3) (a) Sullage / Sewage via drains outfall sewers / treatment works
(b) Trade effluent via drains / outfall sewer / treatment works.
(c) Solid wastes into (4) —
(i) Stream ..... River

OR

(ii) On land for irrigation, bearing Survey No. ..... adjoining at a distance of ..... stream / river.

OR

(iii) Lake pond adjoining / at a discharge of ..... Stream/River

OR

(iv) Directly on land for open percolation into subterrianian strata of Survey No. ..... adjoining at a distance of ..... Stream/River

OR

(v). Tidal waters / estuarine waters known as .....

2. The Annexure, appendices, other particulars and plans in triplicate are attached herewith.
3. I / We further declare that the information furnished in the Annexure / Appendices, and plans is correct to the best of my / our knowledge.
4. I / We hereby submit that in case of change either of the point or the quantity or its quality a fresh application for CONSENT shall be made and until such CONSENT is granted, no change shall be made.

P.T.O.

3

5. I/ We hereby agree to submit to the Board, an application for renewal of CONSENT four month in advance fo the date of expiry of the consented period for outlet/discharge, if to be continued thereafter.
6. I / We undertake to furnish any other information within one month of its being called by the Board.

Yours faithfully,

Signature .....

Name of Applicant .....

.....

Address of applicant .....

.....

.....

Accompaniments :

- ❒ Details of Land (Revenue Survey number, Area, Location, etc.) including land documents, topographical map and site plan.
- ❒ Detailed Project Reports.
- ❒ Layout Plan of factory/premises showing water supply lines, storm drains, sewers for domestic and trade effluent, treatment plant and disposal facilities, etc.
- ❒ Detail of effluent treatment plant and disposal facilities, etc. including specifications and drawings along with flowsheet.
- ❒ Details of outlets and receiving course/land/well.
- ❒ Description of the manufacturing process with process flowsheet.
- ❒ Licenses and Certificates (SWA approval, Trading License, Mining License, NOC from Forest, NOC from Local Headman, etc.
- ❒ Consent Fee.
- ❒ Other relevant documents.

(Note - Strike out entries not relevent)

4

ANNEXURE TO FORM - A

Outlet / Discharge Existing / New / Altered

Note :- Any applicant knowingly giving incorrect information or suppressing any information pertaining thereto shall be liable to punishment under the Act.

While filling this Annexure the Applicant not concerned with any of the items shall state "Not concerned" against the relevant one.

1.	Full Name of Applicant with address	.... (Tel. No.) .....
2.	Full Name of land/premises/institute/factory/ industry/Local Body with address	.... (Tel. No.) .....
3.	Give revenue / city survey No. of land/premises for which the application is make stating District, Taluka and Villages.	District ..... Taluka ..... Town ..... Village ..... City Survey No. ..... Area in Hectares ..... Revenue Survey No. ..... Area in Hectares .....
4.	State month & year in which the land/premises/ Institute/factory/industry/was actually put into commission, or in proposed to be put into commission, or the month and year from which the local body is functioning.	
5.	State the Civil/Military Defence/Industrial Estate etc, under whose administrative jurisdiction the application's land/premises is situated	Collectorate ..... Corporation ..... Municipality ..... Village Panchayat/Cantonment ..... Defence Department ..... State Government ..... Prohibited Area .....

5

6. (a) State whether land/Premises/factory/industry has been declared as prohibited area.

(b) I yes, state the name of the authority and furnished a certified copy of the order under which the area has been declared as prohibited area.

7. Is the industry/factory for which application is made closed on Sunday/holiday. Yes/No

8. State working seasons per year for the industry/ factory. Full Year

From To
From To
From To
From To
_____ Every year

9. *(a)* Number of workers attending the factory

Shift No. 1	Shift No. 2	Shift No. 3
Hrs.	Hrs.	Hrs.

(b) Number of workers residing in this premises

10. *(For Local bodies only)*

(a) Present Population

(b) Population covered under regular sewerage facilities .....

(c) Population covered by conservency latrines

(d) Population having septic tanks/pits/privy facilities.

11. Give the list of raw materials such as metals, alloys, chemicals, oils, fuels, etc. used per month in Metric Tonnes :-

Sr. No.	Name of material	Quantity in MT per month
1.		
2.		
3.		
4.		
5.		
6.		

6

(b) Give the list of Names of Products and by Products manufactured per month in MT

Serial No.	Name of Product	Quantity in MT per month

12. State daily quantity of water in litres utilised -

USES

Domestic	Industrial	Agriculture	Other

13. (A) State the hourly maximum and daily maximum quantity of effluent arising from land which the application is made :

Premises for In Litres

	Hourly Maximum	Daily Maximum
(a) Domestic		
(b) Industrial		
(c) Agriculture		
(d) Other use		
(e) Total quantity of effluent		

(B) State how measurements for rate and quantity are carried out .....

14. State whether strom water drains are kept separate from Industrial/Domestic effluent drains. Yes / No

15. (a) Is domestic effluent allowed to get mixed in industrial effluent ? Yes / No

(b) If yes, state the ratio Domestic / Industrial

16. (a) Describe, if any, treatment for industrial or domestic effluent or one for combined effluent is made ? Yes / No
If yes, state the process of treatment in brief *(separately)*.

(b) Is the quality of effluent emanating either without or after treatment approved by any authority. Yes / No

(c) If approved, furnish the authority (Two certified copies to be served)

17. Is there any provision for disposal of

	Already made	Proposed to be made
(a) Domestic effluent in public underground water	Yes / No	Yes / No
(b) Industrial effluent in public underground water	Yes / No	Yes / No
(c) Give the name of public authority owing the sewer	Yes / No	Yes / No

7

18. Is there any provision for disposal of

	Already made	Proposed to be made
(a) Domestic effluent over land for irrigation	Yes / No	Yes / No
(b) Industrial effluent over land for irrigation	Yes / No	Yes / No
(c) Domestic effluent in the underground strata	Yes / No	Yes / No
(d) State the area of land used for (a) above in hectares		
(e) State the area of land used of (b) above in hectares		

19. (a) Give quantitative disposal of effluent in litres per day for the places mentioned below :–

	Domestic	Industrial	Mixed
(i) Stream / River			
(ii) On lands for irrigation			
(iii) On lands for percolation			
(iv) Lake/Pond			
(b) If disposed into Stream/River, State			
(i) Ratio of volume effluent to receiving water at the point of discharge during the driest & the monsoon periods.			
(iii) Maximum safe carrying capacity of Stream/River			

20. Is there any provision for equalizing or holding Lagoons for tanks to store the effluent during unfavourable stream or tidal conditions :-	Already made	Proposed to be made
(i) Domestic effluent		
(ii) Industrial effluent		
(iii) Combined effluent		

21. Is sufficient land available/can be made available in case of disposal of pumping effluent or land will have to be considered ? Yes / No

8

21. (a) Give details of composition of Domestic/Industrial/Combined effluents in respect of the following :-

Effluent	before	treatment	Effluent	after	treatment
At Max. Dis.	At Min. Dis.	At Ave. Dis.	At Max. Dis.	At Min. Dis.	At Ave. Dis.
(1)	(2)	(3)	(1)	(2)	(3)

(i) PH
(ii) Colour - Units
(iii) Temperature ^{0}C
(iv) Suspend solids
  (a) Total mg/1.
  (b) Fixed mg/1.
  (c) Volatile mg/1.
(v) Dissolved solids.
  (a) Total mg/1.
  (b) Fixed mg/1.
  (c) Volatile mg/1.
(vi) Total Volatile solids mg/1
(vii) (a) Ammoniacal Nitrogen mg/1.
  (b) Free Ammonia as NH_3.
(viii) Nitrates (mg/1) N.
(ix) Dissolved Oxygen mg/1.
(x) B. O. D. 5, days 20^{0}C mg/1.
(xi) C. O. D. mg/1.
(xii) Oil and Greases mg/1.
(xiii) Chloride, (as *Cl*), mg/1
(xiv) Phosphates (P), mg/1.
(xv) Phenolic compounds, (as Phenol), mg/1.
(xvi) Cyanides (as CN) mg/1.
(xvii) Sulphates (as SO_4) mg/1.
(xviii) Sulphades (as S), mg/1.
(xix) Sulphites (as SO_3), mg/1.
(xx) Insecticides mg/1.
(xxi) Total residual chlorine (as Cl_2) mg/1.
(xxii) Flouride (as F.), mg/1.
(xxiii) Boron (as B.) mg/1.
(xiv) Arsenic (as As) mg/1.
(xxv) Barium (as Ba.), mg/1.
(xxvi) Percent Sodium
(xxvii) Cadium (as Cd.) mg/1.
(xxviii) Copper (as Cu.), mg/1.
(xxix) Lead (as Pb.), mg/1.
(xxx) Chromium :-
  (a) as Cr. mg/1.
  (b) Hexa valency (as Cr.), mg/1.

9

(xxxi) Mercury (as Hg.), mg/1.
(xxxii) Nickel (as Ni.), mg/1.
(xxxiii) Selenium (as Se.), mg/1.
(xxxiv) Silver (as Ag.), mg/1.
(xxxv) Zinc (as Zn.), mg/1.
(xxxvi) (a) Iron (as Fe.), Maganese (as Mr.), mg/1.
(b) any other Metals, mg/1.
(xxxvii) Carbon Chloroform Extracts.
(xxxviii) (a) Pesticides (mg/1) (name)
(b) Herbicides (mg/1) (name)
(xxxix) Coliform organisms.
MPN. per 100ml. (monthly average)
(xE) Bioassay for Toxic constituents'
TL. 50 (96 hours).

Note :- *(i) Furnish a copy of the analysis report or representative samples carried out by a competent laboratory.*

(ii) Methods of determination as approved by the Board will be followed for determination of above mentioned parameters.

22. (b) Is the effluent toxic — Yes / No
(c) State if the industrial effluent is having — Yes / No
(i) Unpleasent smell — Yes / No
(ii) Irritating and / or harmful — Yes / No
(iii) Corrosive — Yes / No
(d) Is there any sudden change of temperature exceeding 10°C at any time.

23. (a) Are facilities available with the applicant for carrying out the following tests of the waste

Water	Existing	Proposed
(i) Physical	Yes / No	Yes / No
(ii) Chemical	Yes / No	Yes / No
(iii) Bacteriological	Yes / No	Yes / No
(iv) Toxicological	Yes / No	Yes / No

(b) If yes, details of equipment.

24. Has the Land/Premises, etc. for which application is made, open ?

Highly polluting matter.
Toxic Organic Inorganic Microbiological

25. State details for solid wastes

	Description	Quality Method of Collection	Method of disposal
Seasonal waste, spillage			
Rejected Materials.			

Signature .....

Name and Address of the applicant

on behalf of .....

.....

Name and address of the firm .....

.....

10

ANNEXURE 4: NOTIFICATION: FORESTS & ENVIRONMENT DEPARTMENT

GOVERNMENT OF MEGHALAYA
FORESTS & ENVIRIONMENT DEPARTMENT

NOTIFICATION

FOR. 76/99/16 Dated Shillong the 25th February 2000.

The Governor of Meghalaya is pleased to extend the lease granted to the Shillong Municipality by the Government of Assam, vide their order No. 2391-G-S-8 dated 19-05-1938, for 18 acres of land in Riat Khwan Forest Compartment No. 4 for the purpose of trenching ground of Municipal waste, and which has been in perpetual use till date for the said purpose, on the following conditions :

1) That the lease is regularised and extended for the period from 1956 to 2026 (Seventy years).
2) That the Shillong Municipality will pay Land Rent of Rs. 90/- per annum, which may be revised by the Government of Meghalaya, at any point of time.
3) That the area shall be used exclusively for dumping of garbage and management of waste.
4) That out of this allocated area, 11 acres can be used for setting of aerobic compost plant which will help in disposal of accumulated waste.
5) That the Municipality will construct an internal fire line to isolate the adjoining forests.
6) That the Municipality will demarcate the area by constructing proper fencing.
7) That the Municipality will not sublet the project plant or sub-lease the area allocated to any other organisation or individual.
8) That the Municipality will not fell or damage any tree standing in area.
9) That the Municipality shall not pose any further encumberance on the forest due to establishment and or running of the project.
10) That the Municipality and its staff shall observe the rules and acts applicable to the forests in Meghalaya.

Principal Secretary
Forests & Environment Department

FOR. 76/99/16-A **Dated Shillong the 25th February 2000.**

Copy Forwarded To

1. The Principal Chief Conservator of Forests, Meghalaya Shillong for his information and necessary action
2. The Chief Executive Officer, Shillong Municipal Board for his information and necessary action
3. The Chief Conservator of Forests (Territorial) / Conservator of Forests (Territorial) Khasi & Jaintia Hills / Divisional Forest Officer (Territorial) Khasi Hills Division for their information and necessary action.

By Orders etc.

Under Secretary to the Government of Meghalaya
Forests & Environment Department

LAND POSSESSION CERTIFICATE

This is to certify that an area of 18 acres in the Riat Khwan Reserve Forest, Compartment No. 4 has been allotted to the Shillong Municipality on lease for the period 1938 - 2026. The Municipality is allowed to implement the solid waste management scheme on 11 acres out of this holding without sub-letting or sub leasing it to any other private agency.

Principal Secretary
Forests & Environment Department

ANNEXURE 5: REA CHECK LIST OF SOLID WASTE MANAGEMENT

Screening Questions	Yes	No	Remarks
A. Project Siting Is the project area?		X	The proposed land fill area is 5.2503 Acres (Plot No-1).
• Densely populated?		X	
• Heavy with development activities?		X	
• Adjacent to or within any environmentally sensitive areas?		X	
• Cultural heritage site		X	
• Protected Area/ Reserve Forest	X		Plot No-1 is the part of Compartment no-4 of Riat Khwan Reserve Forest (It includes Plot No-1, Plot No-2 and Plot-3). The Government of Meghalaya Forest & Environment Department has extended the lease from 1938 to 2026 under letter no. FOR 76/99/16 dated 25th February 2000 to the Shillong Municipality for 18 Acres of land in Riat Khwan Forest Compartment No-4 for the purpose of trenching ground of Municipal waste.
• Wetland		X	Umiam Lake is approximately 3.0 km from proposed disposal site. Umiam Lake is a "potential Ramsar site". It is not officially a Ramsar designated Wetland; however project design will mitigate any impacts to water quality affecting the lake.
• Mangrove		X	
• Estuarine		X	
• Buffer zone of protected area		X	
• Special area for protecting biodiversity		X	
• . Bay		X	
B. Potential Environmental Impacts Will the Project cause…			
• Impacts associated with transport of wastes to the disposal site or treatment facility		X	
• impairment of historical/cultural monuments/areas and loss/damageto these sites?		X	
• degradation of aesthetic and property		X	

Screening Questions	Yes	No	Remarks
value loss?			
• nuisance to neighboring areas due to foul odor and influx of insects, rodents, etc.?		X	
• dislocation or involuntary resettlement of people		X	
• public health hazards from odor, smoke from fire, and diseases transmitted by flies, insects, birds and rats?		X	
• deterioration of water quality as a result of contamination of receiving waters by leacheate from land disposal system?		X	The Design consideration will take care of surface water pollution from leachate generation.
• contamination of ground and/or surface water by leachate from land disposal system?		X	The Design consideration will take care of surface water pollution from leachate generation.
• land use conflicts?		X	
• pollution of surface and ground water from leachate coming from sanitary landfill sites or methane gas produced from decomposition of solid wastes in the absence of air, which could enter the aquifer or escape through soil fissures at places far from the landfill site?		X	The Design consideration will take care of surface and ground water pollution from leachate coming from sanitary landfill sites or methane gas produced from decomposition of solid wastes.
• inadequate buffer zone around landfill site to alleviate nuisances?		X	
• social conflicts between construction workers from other areas and community workers?		X	No impact will take place, as habitation is not available near site.
• road blocking and/or increased traffic during construction of facilities?		X	
• noise and dust from construction activities?	X		Temporary noise and dust from construction activities will generate, regular sprinkling of water will minimise the dust pollution.
• temporary silt runoff due to construction?		X	The Design consideration will take care of temporary silt runoff due to construction.
• hazards to public health due to inadequate management of landfill site caused by inadequate institutional and financial capabilities for the management of the landfill operation?		X	Adequate institutional and financial capabilities for the management of the landfill operation will be provided to avoid hazards to public health.
• emission of potentially toxic volatile organics from land disposal site?		X	The Design consideration will take care of emission of potentially toxic volatile organics from land disposal site.
• surface and ground water pollution from leach ate and methane gas migration?		X	The Design consideration will take care of surface and ground water pollution

Screening Questions	Yes	No	Remarks
			from leachate and methane gas migration.
• loss of deep-rooted vegetation (e.g. tress) from landfill gas?		X	The loss of deep-rooted vegetation (e.g. tress) from landfill gas will be compensated with at least two times of tree plantation at suitable locations.
• explosion of toxic response from accumulated landfill gas in buildings?		X	The Design consideration will take care of explosion of toxic response from accumulated landfill gas in buildings.
• contamination of air quality from incineration?		X	The Design consideration will take care of contamination of air quality from incineration
• public health hazards from odor, smoke from fire, and diseases transmitted by flies, rodents, insects and birds, etc.?		X	The landfill is located sufficient distance from inhabitants. The sanitary operations of the landfill will improve health conditions of the public.
• health and safety hazards to workers from toxic gases and hazardous materials in the site?		X	The Design consideration will take care of health and safety hazards to workers from toxic gases and hazardous materials in the site.

	should be categorized as an A project.
X	**should be categorized as a B project**
	should be categorized as a B Project in an environmentally sensitive area
	should be categorized as a C project
	should be categorized as an A/B Project because (give reason)
	requires additional information for classification

ANNEXURE 6: PHOTOGRAPHS OF EXISTING SOLID WASTE DISPOSAL SITE