

EXECUTIVE SUMMARY

(English)

for

Proposed New Project of Common Bio Medical Waste Treatment Facility (CBMWTF) with Incinerator (Rotary Kiln) capacity of 75 kg/hour, Autoclave capacity of 150 Liters/Batch, Shredder capacity of 75 kg/hour and ETP capacity 20 KL/Day

by

**State Investment Programme
Management and Implementation Unit
(SIPMIU)**

at

**Solid Waste Management Resource Centre,
Zemabawk, Aizawl, Mizoram.**

As per 7(da) of Schedule to EIA Notification dated 14th September, 2006 Category B

EIA Consultant




ENPRO Enviro Tech and Engineers Pvt. Ltd.

**(QCI-NABET Accreditation vide Certificate No.: NABET/EIA/1922/
SA 0125 valid till 12th January, 2022)**

306, Royal Park, Adajan Road, Surat - 395 009, Gujarat, INDIA

Ph.: +91-261-27896130, **Fax:** +91-261-2786129

e-mail: enpro.eia@gmail.com, enpro.eia@enpro.co.in

ENPRO Enviro Tech and Engineers Pvt. Ltd.			
Client	SIPMIU, Government of Mizoram		
Project	Draft Rapid EIA Report		
Report No	EP/REIA/35	Rev.	0
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EXECUTIVE SUMMARY

1. INTRODUCTION

State Investment Programme Management and implementation Unit (SIPMIU), Aizawl is one of the divisions of Urban Development & Poverty Alleviation (UD&PA) Department, Government of Mizoram to carry out and implement urban development projects in the field of water, solid waste management, waste recovery, sewage etc.

State Investment Programme Management and implementation Unit (SIPMIU), Aizawl, Government of Mizoram proposes to establish a new Common Bio Medical Waste Treatment facility at garden P/P no. 77 of 2005 (5000 m² area) in existing Solid Waste Resource Management Centre, at Airfield veng, Tuirial, Aizawl, Mizoram. The site is situated at Latitude: 23°44'44.13"N, Longitude: 92°47'56.53"E.


The entire land of existing Solid Waste Resource Management Centre is allotted to the secretary of the government of Mizoram, UD&PA by the land revenue and settlement department, Mizoram on lease basis. The total plot area is 1,29,548 sq.m. out which 5000 sq.m. area is proposed for CBMWTF. The proposed site has been visited by Mizoram State Pollution Control Board for carrying out CBMWT facility. SIPMIU has also obtained valid Environment Clearance for management of solid waste through landfill treatment for Aizawl city in the year 2013 vied file number 10-73/2010-IA.III dated 9th January 2013 from Ministry of Environment & Forest. Existing land filling facility for treatment of solid waste is being operated in the same land on plot area of 7900 m².

In addition to that, in order to assess the potential environmental impacts arising due to proposed CBMWTF and related activities, promoter has assigned the work of EIA study to M/s. ENPRO Enviro Tech & Engineers Pvt. Ltd. (ENPRO), Surat to prepare Draft EIA Study report for proposed common bio medical waste treatment facility. The proposed project falls under Category B1 and project activity 7(da) as per EIA notification 2006, as amended time to time. ENPRO Enviro Tech and Engineers Pvt. Ltd. (ENPRO) is NABET Accredited (NABET/EIA/1922/SA 0125 valid till 12th January, 2022) under this sector. ENPRO has made MOU with NABL accredited laboratory M/s. Qualissure Laboratory Services for carrying out baseline monitoring during this period of 1st December 2020 to 28th February 2021. ENPRO team visited site and carried out ground survey for the various aspects to be covered in EIA Report.

2. PROJECT DESCRIPTION

2.1 Need of the Project

Common Bio-Medical Waste Treatment Facilities (CBMWTFs) offer advantage to health care establishments through more efficient treatment and disposal of BMW and through 'Economies of Scale' (significant decrease in cost of treatment per kilogram). As per the guideline for CBMWTF, one CBWT facility will cover 75 km area and 10000 number of beds. Currently, there is no CBMWTF within 75 km radius of proposed project site in Aizawl, which has around 75 health care facilities (HCFs) with 2191 no. of beds and estimated BMW generation of about

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767 kg/d (considering 350 g/bed/d). Own management and treatment of this waste by private Hospitals, Nursing Homes and Clinics is technically as well as economically not viable.

There is considerable scope for improvement in the management of biomedical waste generated in Mizoram. The following table highlights the gap present in the prevailing system:

Gaps in the Biomedical Waste Management in Mizoram:

Sr No	Description	Units
1	Number of beds	3295
2	Total amount of waste being produced, (Considering 350 gm/bed/day)	1153
3	Total amount of waste being treated	Nil
4	No. of beds being not covered	3295

(Source: SIPMIU)


There is no common bio medical waste treatment facility available in the state of Mizoram for proper treatment and disposal of Bio Medical Waste. At present the BMW is being treated through deep burial facility. Aizawl is the capital of the state and most popular place within the area. There is now a need to establish a new CBMWTF in Aizawl district which can cater, collect and treat BMW from nearby area as well. Hence, the proposed new facility will play a vital role in safe handling, treatment and disposal of the generated Bio-Medical Waste from the nearby areas in Aizawl district of Mizoram.

2.2 Location & Study Area

Proposed project shall be located at garden P/P no. 77 of 2005 (on 5000 m² area) in existing solid waste resource management land, Zemabawk town, Aizawl, Mizoram.

SALIENT FEATURES IN STUDY AREA OF PROPOSED PROJECT

Particulars	Details	Approx. Distance from Project Site
Geographical Co-ordinates	Latitude: 23°44'44.13"N, Longitude: 92°47'56.53"E	-
Village / City / Industrial Area	Tuirial Village	2.6 Km
District	Aizawl	21 Km
Nearest Human Settlement	Tuirial Village	2.6 Km
Nearest Water body	Tuirial River	740 meters
Nearest Highway	NH-306	690 meters
Nearest Railway station & Railway line	Bairabi Railway Station	56.3 Km
Nearest Airport	Lengpui	21 Km
Protected Area / Sanctuaries / Ecologically Sensitive Area	None	
CRZ applicability	No	-
Densely Populated Area	Aizawl	21 Km


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Seismic Zone	Zone V	-
Nearest High Flood Level	0.77 km 145 meters	-
High Tide Line	0.76 km 143 meters	-
Low Tide Line	0.78 km 142 meters	-
Elevation	313 Meters	-


Note: All the above mentioned distances are aerial distances from the project site.

2.3 Salient Features of the Proposed Project

Proposed Project Capacity:			
Sr. No.	Equipment	Number	Capacity
1	Induction Plasma Pyrolysis	1	75 kg/h
2	Autoclave	1	150 L/batch
3	Shredder	1	75 kg/h
4	Effluent Treatment Plant	1	20 KLD
-			
Proposed Capacity of Effluent Treatment Plant		Flow rate: 7 KLD Design Capacity: 20 KLD	
Cost of Proposed Project		Rs. 10.38 Crores	
Allocation for CER Activities		Rs. 20,76,000 for next 5 yrs. for required activities such as: i) Basic Health Care Facilities in Villages ii) Community RO Plant iii) Vocational skill development program in different villages iv) Modification and development of concrete roads in villages v) Sanitation campaign and public toilet provision in Villages	
Estimated Manpower Required		Proposed Project will generate direct and indirect employment during construction and operation phase. It is estimated to generate nearly 60 employments on temporary basis during construction phase and 65 (20 Skilled, 30 Semi-skilled and 15 un-skilled) employments on permanent basis during operation phase.	
	Phase of Project	Type of Labour	No. of Employees
	During construction	Contractual	45
	During commissioning	Contractual	15
	During operations	Managerial	06
		Skilled	14

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		Un-skilled	45
		Total	65
		-	
Area of Land	5000 m ² - for proposed project		
Area of Green-Belt	1655 m ² (33.10 %)		
Water Requirement - Total	20 KLD (9.5 KLD Fresh + 10.5 KLD Recycled)		
	Domestic	4 KLD	
	Gardening	7.5 KLD	
	Industrial	8.5 KLD	
	Incinerator/Scrubber	6 KLD	
	Floor Washing	1.5 KLD	
	Vehicle Washing	1 KLD	
Source of Water -	Recycled	10.5 KLD	
	Fresh	9.5 KLD (from Bore well)	
Waste water Generation	10.6 KLD		
	Industrial	7 KLD	
	Domestic	3.6 KLD	
Mode of Treatment	Industrial	Sent to Effluent Treatment Plant and treated wastewater will be reused for Vehicle washing and incineration scrubber.	
	Domestic	Sent to Packaged STP and will be reused into gardening within plant premises.	
Power Requirement	Project will consume 200 KVA power		
Source of Power Supply	New LT line through state electricity board		
Emergency Power Supply	1 Nos. D.G. Set – 150 KVA		
Fuel Requirement			
	LDO for DG Set	20 Litres/Hr	
Sources of Gaseous Emissions	Incinerator - 75 kg/hr D.G. Sets - 1 no. – 150 KVA (stand-by)		
Air Pollution Control Measures	High Pressure Drop Venturi scrubber and packed bed scrubber followed by ID Fan and stack height of 30 m		
Solid / Hazardous Waste Generation	<ul style="list-style-type: none"> Ash from incinerator - 250 kg/day ETP Sludge - 50 kg/day Plastic Waste after Autoclave and shredding – 100 kg/day Glass and metallic body implants After Autoclave – 50 kg/day Metal Sharps after Autoclave and Shredding – As generated Waste oil – 10 kg/day Used Batteries – As generated 		

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Solid / Hazardous Waste Disposal Management	<ul style="list-style-type: none"> • Ash from incinerator - Send to TSDF site for secured landfilling • ETP Sludge - Sent to TSDF site for secured landfilling • Plastic Waste after Autoclave and shredding -Send to Authorized Recyclers • Glass and metallic body implants After Autoclave – Sent to Authorized Recyclers • Metal Sharps after Autoclave and Shredding - Sent to foundry for metal recovery / TSDF site • Waste Oil - Send to Authorized Recyclers • Used Batteries – Send to Authorized Recyclers
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2.4 Process Description


A. Incineration System

The waste generally passes through the incinerator on a belt into the Primary Chamber through the charging door. The primary chamber is lined with refractory and insulation bricks of IS 8 & IS-2042 standards. The air required for volatilization is supplied through an air duct and introduced through equally placed nozzles. Airflow is controlled with the help of air dampers provided. The primary chamber is fitted with a fuel oil burner, which has necessary instrumentations to function automatically. A forced draft fan is used to provide for combustion/volatilization air. This fan also supplies air required for the dilution of flue gases before venturi scrubber. The combustion air is controlled to have minimum turbulence, restricting fly ash. The fly ash collected in Primary Chamber is removed from the dashing door. Inside primary chamber a min. of 800 °C ± 50 °C temperatures is maintained.

The volatiles/gases emitted from the primary chamber pass through the neck of the secondary chamber, which is also lined with refractory and insulation bricks. The secondary chamber will be designed to ensure the flue gas residence time of min. two seconds is provided. The secondary chamber will operate at a temperature of 1050 °C ± 50 °C. The gases will be completely burnt and safe gases then shall be let out of the incinerator unit.

The volatile matter has a low flash point and hence gets liberated in the primary combustion chamber. This is later burnt in the secondary chamber at a high temperature and in the presence of excess air in the secondary chamber. Fixed carbons are the non-volatile portion of the waste and are completely incinerated in primary chamber only. The moisture present in the waste is evaporated in the primary chamber and passes through the secondary chamber and gets releases as super-heated water vapor. Sterilized ash and non-combustible material remains in the primary chamber. To prevent them from flying out along with gases, non-turbulent conditions are maintained in the primary chamber. Depending upon the type of waste destroyed in the incinerator the sterile ash content ranges between 5-10 %.

The flue gases then pass through the downstream air pollution control system, consisting of high pressure drop Venturi Scrubber for removal of particulate matter and partially acidic


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gases by absorption with caustic solution and removal of balance acidic gases in packed bed scrubber. Then gases are let out through an I.D. fan followed by 30m height stack.

Technical Specifications of Incinerator is presented in below table.


TECHNICAL SPECIFICATION OF INCINERATOR

Incinerator		
1	Brand Type & Model	"ALFA-THERM"/similar controlled air Oil Fired Incinerator Model DSS series
2	Type of Waste	Biomedical Waste
3	Burning Capacity	75 kg/hr
4	Auxiliary Fuel	Diesel
5	Type of Burner Operation	Monoblock fully automatic burners
6	Temperature	
	➤ Primary Chamber	800 ± 50°C
	➤ Secondary Chamber	1050 ± 50°C
Primary Chamber		
1	Type	Static Solid Hearth
2	Material of Construction	Mild Steel, 5mm thick
3	Refractory thickness	115 mm thick
4	Material	Refractory bricks confirming to IS-8
5	Temperature resistance	1400°C
6	Insulation thickness	115 mm thick
7	Material	Insulation bricks confirming to IS-2042
8	Waste Charging	Automatic through Hydraulic Ram Pusher.
9	Ash Removal	Manual
Secondary Chamber		
1	Type	Static Solid Hearth
2	Material of Construction	Mild Steel, 5mm thick
3	Refractory thickness	115 mm thick
4	Material	Refractory bricks confirming to IS-8
5	Temperature resistance	1200°C
6	Insulation thickness	115 mm
7	Material	Insulation bricks confirming to IS-2042
8	Residence time for flue gases	2 seconds
Emergency Flue gas Evacuation System		
1.	Type of Operation	Automatic pneumatic control damper
2.	MOC	Mild steel
3.	Refractory	50 mm thick castable
4.	Insulation	80 mm thick castable
Air Cooled Flue gas cooler with cooling Fan		
1.	MOC	Mild steel
2.	Type	Shell and tube type
3.	MOC of Tubes	Carbon steel
4.	Design Temperature	900°C

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Venturi Scrubber		
1	Type	High Pressure Drop Type
2	Material of Thickness	Stainless Steel 316L, 5mm thick
3	Refractory Thickness	115 mm thick
4	Material	Refractory bricks confirming to IS-8
5	Temperature resistance	78-80°C
6	Scrubbing Media	Water with 5% Caustic
Packed Bed Scrubber		
1	MOC	Mild Steel rubber lined
2	Water re-circulation pump with motor	Provided
3	Interconnecting piping	PPR
4	Packing media	Intalox Saddles/Pall rings
5	Interconnecting ducting	Mild Steel Rubber lined
6	Scrubbing Media	Water
I.D. Fan		
1	Type	High Pressure Centrifugal type
2	MOC	Stainless Steel Impeller and Mild Steel Rubber lined casing
3	Drive	Belt Driven
Combustion Fan		
1	Type	Centrifugal
2	Modulation	Manual damper control
3	MOC	Mild Steel / SS316
4	Drive	Direct drive
Burners		
1	No. of burners	As per standard design of incinerator
2	Type	Monoblock fully automatic
3	Fuel	Diesel
4	Make	"Alfa-Therm"/Similar
Control Panel		
1.	Type	PLC Based
2.	PLC Make	Omron/Schneider
3.	MOC	CRCA Sheet
4.	Finishing & Painting type	Powder coated
5.	Audio – visual alarm system	Provided
Height of chimney 30 m		
1	MOC	Mild Steel
2	Type	Self supporting
3	Height	30 m from ground level
4	Other Standard Accessories	Aviation lamp, lightening arrestor, stack drain, inspection platform, sampling port
5	Paint	The chimney is painted externally with two coats of heat resistant aluminum paint
6	Ladder	To be provided

(Source: SIPMIU)

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B. Autoclave

An autoclave is a specialized piece of equipment designed to deliver 121°C temperature under 15 psi pressures to a chamber, with the goal of decontaminating or sterilizing the contents of the chamber. Microorganisms which contribute to infection do not survive beyond 80 °C. Decontamination is the reduction of contamination to a level where it is no longer a hazard to people or the environment. To ensure safety and quality control, all bio-hazardous materials and items contaminated with potentially infectious agents should be decontaminated before use or disposal. All bio-medical wastes like plastic baggage, syringe, cotton etc. should be sterilized in autoclave as per pollution norms. However, waste that is treated using an autoclave is still recognizable after treatment and therefore it must be shredded to allow for disposal with general waste.

TECHNICAL SPECIFICATIONS OF AUTOCLAVE


Description	Specification
Item	Horizontal high-speed steam sterilizer cylindrical
Capacity	150 ltrs/batch
Chamber Material	Stainless steel SS -304
MOC of Door	Stainless steel
Door Ring	Stainless steel SS -304
Jack Material	Stainless steel SS -304
Outer Cover Material	Stainless steel SS -304
Back Plate	Stainless steel SS -304
Digital Alaram System	Provided
Vaccum system with pump	Provided
Temperature Controller	Provided
Heating for steam	Electrical heaters
Material loading trays	2 Nos. Stainless Steel

(Source: SIPMIU)

C. Shredding

Shredding is a process by which wastes are de-shaped or cut into smaller pieces so as to make the waste unrecognizable. Shredder has non-corrosive sharp blades capable of shredding plastic waste, sharps, bottles, needles, tubing and other general waste. The low speed two shaft system is effective for shredding hard and solid waste.

The disinfected waste shall be segregated into HDPE, PP, rubber, latex, glass and metal. The segregated materials shall then be shredded completing the process of disinfection and ensuring non-recycling of the waste materials for medical/food-grade purposes. Shredder is used for cutting small pieces (10-25 mm) of plastic, agro waste, paper in appropriate size as per pollution norms. In the system, 5 blades will be provided out of which 3 will be movable and 2 fixed blades. It thus reduces the volume of the treated waste significantly.

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TECHNICAL SPECIFICATIONS OF SHREDDER


Description	Specification
Model	MT -75
Type	Medium Series Twin shaft shredder
Cutting Chamber	442 X 545 mm
Hopper Size	692 X 795 mm
Shaft	2 Nos Hexagonal Shaft
Electrical Load	20 HP, 15 Kw
Operation	3 phase /415 walt/Operates on 60% of rated power
Motor Make	ABB/Siemens/Bharat Bijlee
Gear box Type	Planetary Type
No. of Gear box	1 No.
Gearbox Make	Brevini (Itlay)/RR (Itlay)
Drive	Electrical
Material of Construction	High Wear Resistant Impoted Alloy Shaft: EN-9 Hopper-Mild steel Paint-Epoxy
Safety Feature & Others	Auto Reserve System VFD {Variable Freequency Drive (ABB Schneider/Siemens make)} Overloaded relays, Limit Switch interlocking Emergency Stop Button Manual Reversal Switch
Machine size & weight	Length:3000 mm Width:1700 mm Height:2300 mm Weight: Approx 2.5 Tons

(Source: SIPMIU)


3. Description of Environment

Baseline environmental status in the study area was studied for the various environmental attributes, as delineated in TOR, between **1st December 2020 to 28th February 2021** at different locations, including the proposed project site. The water (surface and ground), soil, air and noise samples have been collected and analysed by NABL accredited Qualissure Laboratory Services. ENPRO Enviro Tech and Engineers Pvt. Ltd. has entered into MOU with Qualissure Laboratory Services to carry out baseline environmental monitoring. However, some of the parameters of the ambient air are analysed by ENPRO team in their NABL approved and MoEF recognized laboratory. All the samples were collected, preserved and analysed as per the standard procedures / methods.


Sr.	Environmental Attributes	Baseline Status
1.	Ambient Air Quality	6 stations - at proposed project site & nearest residential area

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Sr.	Environmental Attributes	Baseline Status
	Observation - PM ₁₀ PM _{2.5} SO ₂ NO _x CO NH ₃ HC VOC PAH	16.0 – 68.0 µg/m ³ 5.0 – 24.0 µg/m ³ 4.8 – 8.9 µg/m ³ 12.0– 20.8 µg/m ³ 0.32– 0.442 µg/m ³ 10– 16.8 µg/m ³ Not Detected (ND) Not Detected (ND) Not Detected (ND)
	Inference	All results (average) were found within NAAQ permissible limits
2.	Meteorological Status	Meteorological data for period of 1st December 2020 to 28th February 2021 was collected by NABL approved laboratory of Qualissure Laboratory Services.
	Observation	Winter season Pre-dominant wind – South to North Calm condition– 26.1 % Average wind speed – 3.6 m/s Maximum wind speed – 8.8 m/s Temperature range – 6.8 to 31.3 °C Relative Humidity range – 17 to 84 %
	Inference	<ul style="list-style-type: none"> • Nearest residential area is Tuirial village which is 2.6 km from proposed project site.
3.	Water Quality	Surface water samples were collected from 2 different sources – 1) Tuirial River 2) Chite River Ground water samples were collected from 8 different locations – 1) Thingsulthliah Village (Tubewell) 2) Seasong Village (Tubewell) 3) Tuirial Village (Handpump) 4) Aizawl City (Handpump)
	Observation	<p>Surface Water: Surface water samples SW1 is of Tuirial river and SW2 is of Chite river water. Although the samples conform to the CPCB-1979 and the Bureau of Indian Standards, 1982 limits (Surface water), BOD being higher, requires conventional treatment of water followed by disinfection, in case of drinking water use.</p> <p>Ground water: GW1 & GW2 are tube well samples and GW3 & GW4 are handpump samples. Except in GW3, coliform is present. E. Coli is also present in GW2 and GW4 samples. Hence, boiling, chlorination, disinfection or UV treatment of water is essential before drinking.</p>

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Sr.	Environmental Attributes	Baseline Status																																			
	Inference	Surface water sources need treatment of water followed by disinfection, in case of drinking water use. Ground water sources need boiling, chlorination, disinfection or UV treatment of water is essential before drinking.																																			
4.	Noise Quality	Noise levels were measured at 6 locations in study area including proposed project site																																			
	Observation	Equivalent noise level of villages varied from 52.7 – 55.1 dB [A] and 41.2 - 47.4 dB [A] during day and night time respectively.																																			
	Inference	All results were within CPCB permissible limits																																			
5.	Soil Quality	Soil samples were collected from 6 locations of study area including proposed project site																																			
	Observation - Physical	Soils are predominantly sandy clay loam. pH ranged from 5.52 to 7.38 at 25 °C Electrical Conductivity ranged from 16.55 to 28.87 mS/cm Exchangeable Sodium content ranged from 94.22 to 188.0 mg/kg soil. Exchangeable Potassium content ranged from 180.6 to 264 mg/kg soil.																																			
	Chemical																																				
	Inference – Physical & Chemical	The pH of soil samples ranges from moderately acidic to neutral. The soil texture is predominantly sandy clay loam. Soil is mostly low in Calcium.																																			
6.	Land Use / Land Cover	Satellite IRS P-6 LISS III images were obtained from National Remote Sensing Centre (NRSC) Hyderabad. Land use / land cover mapping was carried out for 10 km radius area with proposed project site at centre.																																			
	Observation	- <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Sr. No.</th> <th>LULC Class</th> <th>Area (Ha)</th> <th>Area (%)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Water Bodies</td> <td>2868.31</td> <td>9%</td> </tr> <tr> <td>2</td> <td>Agricultural Forest</td> <td>12980.44</td> <td>41%</td> </tr> <tr> <td>3</td> <td>Dense Mixed Jungle</td> <td>5673.13</td> <td>18%</td> </tr> <tr> <td>4</td> <td>Built Up</td> <td>3234.13</td> <td>10%</td> </tr> <tr> <td>5</td> <td>Dense Scrub</td> <td>1558.00</td> <td>5%</td> </tr> <tr> <td>6</td> <td>Bamboo Forest</td> <td>1100.00</td> <td>3%</td> </tr> <tr> <td>7</td> <td>Road</td> <td>2766.75</td> <td>9%</td> </tr> <tr> <td>8</td> <td>Open Scrub</td> <td>1612.00</td> <td>5%</td> </tr> </tbody> </table>	Sr. No.	LULC Class	Area (Ha)	Area (%)	1	Water Bodies	2868.31	9%	2	Agricultural Forest	12980.44	41%	3	Dense Mixed Jungle	5673.13	18%	4	Built Up	3234.13	10%	5	Dense Scrub	1558.00	5%	6	Bamboo Forest	1100.00	3%	7	Road	2766.75	9%	8	Open Scrub	1612.00
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5	Dense Scrub	1558.00	5%																																		
6	Bamboo Forest	1100.00	3%																																		
7	Road	2766.75	9%																																		
8	Open Scrub	1612.00	5%																																		

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Sr.	Environmental Attributes	Baseline Status		
		Total	31792.75	100%
	Inference	It is clearly seen that the area is mostly covered with Agricultural forest - 41%. Dense Mixed Jungle - 18%, Dense Scrub - 5%, Open Scrub - 5%, Bamboo Forest - 3% are the other green areas. Around the agricultural fallow edges, human settlements (built-up area) occupies about 10% of study area. About 9% of the area is covered by water bodies like Sonai/Tuirial river flowing from S to N, Muithi Lui, Sele Lui, Suibai Lui, Sakel Lui. 9% of the area is covered by roads connecting the various built-up areas.		
7.	Ecology and Biodiversity	Study was carried out in core area and in buffer area in a scientific manner and ecological pursuance, validating primary data using secondary data. Biological assessment of study area was done to identify ecologically sensitive areas and to identify the presence of any Rare or Endangered or Endemic or Threatened (REET) species of flora or fauna in the study area.		
	Observation:	The proposed project site a Government land with no vegetation cover. The project site consists of Barren / uncultivable / waste land. Few shrubs and weed species are present near project site. The entire area is with terrestrial vegetation is without any agriculture land and it was devoid of any ecologically sensitive biological resources. No REET species present in the core zone. No migratory corridors or breeding grounds for faunal species present here. No major faunal species are observed here. The most commonly seen flora in the project site are <i>Trema orientalis (Belphaur)</i> , <i>Acrocarpus fraxinifolius (Nganbawm)</i> , <i>Musa sylvestris, Toona ciliate (Tei)</i> . And herbs such as <i>Clerodendrum glandulosum, Solanum americanum, Ageretum conizoyides, Vermonia cinerea</i> are present. There is a presence of Tuirial RRF within study area.		
	Inference	The ratio between abundance and frequency was used to interpret the distribution pattern of species (Whitford, 1949). Distribution pattern of species in the study area is identified as random distribution as the value of A/F ratio is 0.036 . The Shannon indices value of buffer zone is 2.78 indicates moderate diversity within the study area. Population size and Dominance of the species is 6.4% (which means no individual or few tree species are occurred continuously in the study area) and		

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		Evenness is around 94% (Indicates the species are evenly distributed in core and buffer zones).
8.	Geology	Geologically, the study area is occupied by shale, siltstone, sandstone and other semi-consolidated formations of denude-structural hills belonging to Surma Formation of Miocene age. According to the Geological Survey of India, Mizoram terrain is, an immature topography, and its physiographic expression consists of several almost north-south longitudinal valleys containing series of small and flat hummocks, mostly anticlinal, parallel to sub-parallel hill ranges and narrow adjoining synclinal valleys with series of topographic highs. The general geology of western Mizoram consists of repetitive succession of Neogene sedimentary rocks of the Surma Group and Tipam Formation such as sandstone, siltstone, mudstone and rare pockets of shell limestone. The eastern part is the Barail Group.
	Hydrology	The entire area of Aizawl district is occupied by semi-consolidated formations of denude-structural hills belonging to Surma Formation of Miocene age. The low linear ridges are characterized by low permeability and infiltration capacity. It acts as run-off zone. The moderate linear ridges, which occupy the major portion of the district, comprise of hard and compact sandstone, shale, siltstones and alternations of Surma Group of rocks. This unit is also characterized by very low permeability and infiltration capacity that acts as run-off zone. Ground water potential is low. The linear rolling valleys with limited areal extend are underlain by shale, sandstone and siltstone alternations. No ground water abstraction structures are noticed in the area of study. As such, shallow ground water structures may be feasible in suitable locations of the valley portions, with the occurrence of ground water less than 3 to 5 m below ground level.
	Inference	The entire district is occupied by hill ranges with very steep slopes that are more than 20%. Moreover, no details about the recharge potential in this hill region is available. As per Ground Water Estimation Committee-1997 (GEC-97), these hilly areas are not taken into account for resources computation. Due to lack of data especially on watershed basis, the smallest administrative unit, i.e. the R. D. Block has been taken as the unit of computation. Water level trend is also not


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		<p>available due to lack of ground water abstraction structures, hence the annual ground water recharges of all the assessment unit have been computed by Rainfall Infiltration Factor Method.</p> <p>The estimated gross annual dynamic groundwater resource is 3.86 mcm while net annual ground water draft is 0.14 mcm. The stage of groundwater development is 3.94 %. Natural discharge during non-monsoon season is negligible. Future provision for domestic and industrial use is 0.27 mcm and for irrigation use, it is 3.21 mcm. With this limited data, ground water development in Aizawl district can be categorised under the 'SAFE' category.</p>
9.	Socio-Economic Status	The primary data were collected from the selected number of villages within the 10 km of the study area.
	Observation	A total of 16 villages (1 uninhabited) and one urban town fall fully or partially in the radial distance of 10 km from the proposed project site. The proposed CBMWTF to be setup by SIPMIU shall be located inside the Aizawl Solid Waste Management Centre at Airfield Veng, Tuirial, Mizoram. All the project area is largely rural covering 47% of villages (1 is uninhabited village) from Tlangnuam (part) taluka and 53% villages (including 1 town) from Thingsulthliah (part) taluka of Aizawl district of Mizoram state. Thus, macro level study has been carried out in the radial distance 10 km for both the talukas of Aizawl district.
	Inference	The study area in radial distance of 10 km comprises of 100 % of the area covering two talukas of Aizawl district of Mizoram state. The study area population is 28.6% of Mizoram state and 78.5% of Aizawl district. The decadal population growth rate of the study area is second highest after Tlangnuam (part) talukas. This shows there is in-migration of the population in Aizawl district for livelihood.

4. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Impact identification matrix has been developed by establishing cause-effect relationship between activities of proposed project and various environmental attributes.

Since the entire treated effluent will be recycled back to the industries for reuse in washing and incineration scrubber, there will be reduction in the fresh water requirement. Hence no major impact has been envisaged on the water resources in quantitative terms.

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There will be no discharge of waste water into any water body or surface body/land, so there is insignificant effect on surface water and ground water quality.

High pressure drop Venturi Scrubber will be provided for removal of particulate matter and partial acidic gases by absorption with caustic solution, followed by packed bed scrubber for removal of complete acidic gases from flue gas. Modelling of pollutant emission (TSPM, HCL, NO_x) was carried out using AERMODCloud™ Version 18 Rev. 86 to assess incremental ground level concentration within study area. Incremental ground concentration due to proposed project was found **insignificant Negative** in study area.


There shall be an insignificant effect on ecology, biodiversity, geology and hydrogeology aspects. Due to construction of CBMW there is irreversible effect on land use pattern. Excavated soil shall be reused for development of green belt at project site. Project site shall have 33 % green belt cover. Impact identification matrix has been developed which indicates insignificant negative impact on environmental attributes due to proposed project activities.

5. ENVIRONMENTAL MONITORING PROGRAMME

For the proposed project, monitoring activity is mainly envisaged for ambient air quality parameters, water quality, water quality, soil quality, noise levels and to collect data to keep a check on performance of CBMW facility. An effluent quality-monitoring programme will be put in place by the CBMW facility, which includes location of monitoring, frequency of monitoring and specification of parameters to be monitored in line with Central Pollution Control Board (CPCB) guidelines.

ENVIRONMENTAL MONITORING PARAMETERS & FREQUENCY

Sr. No.	Item / Attribute	Parameters	Frequency & Responsible Party
1.	Ambient Air quality	Particulate Matter [PM _{2.5}] & [PM ₁₀], Sulphur Dioxide [SO ₂], HCl, Nitrogen Dioxide [NO _x] and Carbon Monoxide [CO], VOC	Once in 3 months at project site and at Villages within 10 KM radius (6 stations) By External Lab
2.	Process Gas Emission from Stack (Incineration)	PM, HCl, NO _x	Once in 3 months by External Lab
		HF, Total Organic Carbon	Once in 3 Months by External Lab
		Dioxin & Furan	Once in a year by External Lab
3.	Emission from Stack (Incineration)	CO, O ₂ (Or as added in future by CPCB)	Online monitoring (CEMS) connected to CPCB / SPCB server
4.	Workplace Monitoring	PM _{2.5} , PM ₁₀ , SO ₂ , NO _x , Noise, Temperature, Humidity.	Once in 3 Months by External Lab. Or In house by EHS Exe./ Sr. Chemist
5.	Ground Water	As per IS 10500	Twice in a year (except monsoon)
6.	Wastewater	pH, EC, Turbidity, TDS, Calcium, Magnesium, Total Hardness, Total	Monthly by external lab

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		Alkalinity, DO, COD, BOD Chlorides, Sulphates, Phosphate, Ammonia, Nitrite, oil & grease, Bioassay test (Heavy Metals if required)	
		pH, COD, TDS, BOD, Flow	Daily by internal lab (Or Online as per future guideline of CPCB)
		Flow at inlet and outlet	Online monitoring on continuous basis provided with recorder
7.	Noise	Equivalent Noise Level - dB (A) (At least 1 hr. continuous)	Once in 3 Months by external lab
8.	Soil	pH, EC, Moisture, Organic matter, N, P, K, SO ₄ ⁻² , Cl ⁻ , Ca ⁺² , Mg ⁺² & Na ⁺	Once in a year
9.	Hazardous Waste	General Parameters	Once in a year by External Lab.
10.	Greenbelt	Number of Plantation (Unit), Number of Survived Plants/Trees, Number of Poor Plant/Trees	Throughout Year at regular interval: In House by EHS Executive & other EMC members
11.	Employee Medical/Health Check-up	As per statutory provision & requirement	Yearly through Approved Medical Officer & Doctor as per OHS Plan
12.	STP	pH, COD, TDS, BOD, Flow, DO, TSS	Daily by internal lab


In addition to above table, preventive maintenance plan covering all the equipment's shall be prepared and strictly followed by maintenance staff. All the details shall be maintained in log-book for efficient implementation.

6. ADDITIONAL STUDIES

6.1 Hazard Identification, Risk Assessment and Mitigation Measures

Identification of hazards at the proposed site indicates the characteristics of hazardous wastes that pose potential for an emergency situation. At the proposed SIPMIU site, following type of hazardous wastes may be involved during the operation of facility, which can create potential emergency situation in the event of spillage and accidental release of hazardous wastes from the site:

- Wastes produced by hospitals
- Laboratories

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- Health care sub centre

These wastes include both infectious ("red bag") medical wastes as well as non-infectious, general housekeeping wastes. The emission factors presented here represent emissions when both types of these wastes are combusted rather than just infectious wastes.

Hospitals, laboratories and health care sub centre and other disinfectants, anti-neoplastic agents, heavy metals (e.g. Mercury), etc. These wastes are hazardous in nature and if properly segregated and managed can be transported to hazardous waste management facility for treatment/ storage/ disposal.

Commonly referred to as Clinical and pathological Wastes and include: isolation wastes (refuse associated with infectious patients), cultures and stocks of infectious agents and associated biological, human blood and blood products, pathological wastes, contaminated sharps, amputated body parts, placenta and others.

Risk Assessment is a structured approach to identifying and understanding the risks associated with Storage and Handling of Hazardous/toxic chemicals. The assessment starts by taking into account an inventory of hazardous chemicals stored, likelihood of leakage/spillage associated with it and selecting the worst case scenario for consequence estimation. **Qualitative Risk Assessment** has been carried out by using methodology called HIRA-Hazards Identification & Risk Assessment.

Qualitative Risk Assessment has been carried out for the following areas:


1. Other Operational Activities Carried Out at Site

- Biomedical Waste transportation from generation site to Bio-Medical Waste Treatment Facility (SIPMIU) site
- Weighing and Sampling of Waste
- Incineration
- Autoclave
- Shredding
- ETP

Waste Storage Area & Incinerator Area have been identified the potential for major hazards.

All possible precautionary measures shall be taken on-site and structures to prevent any hazard. Suitable fire extinguishers along with fire and smoke detection alarm system shall be provided at various places in the plant and laboratory.

CBWM staff will be trained for safe handling of ETP chemicals and operation of treatment units. All personnel working at CBMW will be provided with necessary personnel protective equipment (PPEs). Periodical medical check-up shall be done for all employees at least once in a year.

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A proper Emergency and Disaster Management Plan shall be in place and shall be accessible to the security staff and all the key personnel. The roles and responsibilities of all the key personnel shall be clearly identified and addressed to the key personnel.

7. PROJECT BENEFITS

Proposed project will help in attaining better hygienic conditions, as Bio-Medical waste shall be disposed of in scientific manner instead of dumping along with solid waste.

The proposed project is expected to yield a positive impact on the socio economic environment. It helps to sustain the development of this area including further development of physical infrastructural facilities. The beneficial impact of proposed project on the civil amenities will be substantial after the commencement of project activities.

The project will lead to direct and indirect employment opportunity. Employment is expected during construction and operation period, waste lifting and other ancillary services. A major part of this labour force will be mainly from local villagers. This project will help in improving income of local villagers who will get direct and indirect employment.

Proposed Project will generate direct and indirect employment during construction and operation phase. It is estimated to generate nearly 60 employments on temporary basis during construction phase and 65 (20 Skilled, 30 Semi-skilled and 15 un-skilled) employments on permanent basis during operation phase.


8. ENVIRONMENTAL MANAGEMENT PLAN

Guidelines for Management, Operation and Maintenance of plant issued by Central Pollution Control Board (CPCB) will be followed to operate plant effectively and efficiently. Maintenance schedule of plant is planned, considering stand by storage facility, availability of manpower, availability of maintenance tools, safety equipment and other required facilities. Preventive maintenance schedule for plant machineries will be prepared and strictly followed on regular basis for effective and efficient operation of plant. Training will be imparted to plant operating staff as well as waste transporters on regular basis.

Operator shall follow an SOP mentioning operation of bio medical waste facility and also shall inform prescribe authority about occupiers who are not sending segregated Bio Medical waste as per rules. Operator shall maintain all the records for operation of incinerator, shredder and autoclaving.

Occupiers who are giving waste, will be allowed to inspect site and see whether operator is carrying out treatment properly or not. Facility shall supply non-chlorinated plastic coloured bags to authorized occupier if required and shall collect bio-medical waste during holiday period as well.

In case for any reason if it becomes necessary to store waste beyond such a period, the occupier shall be trained to take appropriate measures to ensure that the waste does not adversely affect human health and the environment. Occupier should inform prescribed authority along with the reasons for doing so.

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8.1 Environmental Management Cell

The overall management of the project will be looked after by Managing Director. The technical and scientific staff will be appointed under General Manager.

- Qualified and experienced personnel in the field of environment pollution control shall be recruited as a plant in-charge for overall responsibility for plant operation and for looking after Environment, Health and Safety aspects of the plant. Plant in-charge will be responsible for collection, transportation and receipt of waste at site.
- HR Manager, Plant in-charge and Environmental Manager will report to General Manger and will support for better implementation of EMP.
- Environmental Manager who is also responsible for Environment, Health and Safety will look after all statutory compliances associated with plant operation and environmental Manager will be directly reporting to General Manger.
- Lab In-charge will be reporting Environmental Manager and will be responsible for implementation of Environmental Monitoring Plan.
- Plant Operators will be reporting to plant in charge as well as Shift in-charge and will be responsible for operation and maintenance of the facility in each shift of operation.