

WASTE MANAGEMENT PLAN

1 INTRODUCTION

1.1 Scope

This Waste Management Plan (WMP) details the methods to be adopted Marampa Mines Limited (MML) for the routine management of wastes, hazardous and nonhazardous, generated during the course of its operations activities within Sierra Leone for its MML Project. This document covers collection, storage, treatment, and transport and data management on the MML Mine site, at Thofayim and concentrate haulage between these two sites as well as to the export bulk carrier.

The overall purpose of the WMP is to ensure that waste resulting from MML activities are managed in a way that protects the natural environment, the health and safety of personnel, and the community. Waste management will be strictly controlled by all MML sites/facilities.

Wastes generated by contractors working directly for MML and working under its permits are required to follow the requirements of this WMP. Wastes generated by service contractors working for MML are encouraged to likewise implement a waste minimisation policy and to responsibly handle their own waste streams. MML reserves the right to audit contractors in order to verify that waste disposal is achieved in a responsible manner.

This plan does not cover mine waste rock, tailings or dredged sediment management.

The control of air emissions is covered in other project documents (e.g. Monitoring Plan, Environmental Management Plan) that comprise the project HSE Management System.

1.2 REVIEW AND UPDATE

The MML Environment Manager is the owner of this Plan and is responsible for its maintenance.

As the project progresses and matures, this WMP will be updated and reissued for use on an annual basis or sooner when:

Changes or updates to Sierra Leone legislation or regulations occur;

The project's environmental aspects/impacts profile changes including project expansion, modifications in process, expansion of project footprint or other aspects with the potential for significant impacts on the environment; New Sierra Leone legislation or regulations regarding waste management

New waste management practices/options become available; and

Lessons learned from incidents and non-compliances.

Key outcomes from review and audit activities will be incorporated into the WMP to ensure that waste minimisation opportunities are identified, to help establish goals and objectives, and to improve the MML waste management strategy.

1.3 ROLES AND RESPONSIBILITIES

MML recognises that it has a responsibility to ensure that any waste it produces is handled safely and in accordance with legal requirements. MML will implement appropriate measures so that waste is stored and disposed of responsibly and in particular will undertake the following.

Prevent anyone keeping, depositing, disposing or removing MML waste without permission, ensuring that waste is only handled or dealt with by approved individuals or businesses.

Ensure materials are properly packaged for transportation and that waste containers are appropriately labelled for storage and transportation purposes.

Ensure records are kept (for a minimum of 2 years) of wastes produced and disposed of.

Ensure Material Safety Data Sheets (MSDS) records are kept for all hazardous material and accompany the waste during transportation.

1.3.1 *Specific Responsibilities*

Table 1-1 outlines the specific responsibilities for implementing this WMP. In the absence of the specified party, the designated delegate will perform the same functions. Additional responsibilities may be assigned throughout the WMP.

Table 1-1: Roles and Responsibilities

Responsible Party	Responsibilities
General Manager HSE	<ul style="list-style-type: none">• Ensure that the WMP is developed and implemented in compliance with pertinent regulatory requirements;

Responsible Party	Responsibilities
Environment Manager	<p>Develop the WMP to ensure it remains in compliance with pertinent regulatory requirements and other relevant standards and conventions;</p> <p>Ensure the WMP is regularly reviewed and updated as required, including new waste streams and management options as they arise;</p> <p>Provide technical oversight and assist MML departments and contractors with technical advice to implement the WMP;</p> <p>Submit waste disposal records and status reports as appropriate to MML Management, and Sierra Leone authorities as required;</p> <p>Ensuring that appropriate staff are trained in waste management;</p> <p>Ensure any issues arising from the undertaking of waste management activities are addressed in a timely manner and in accordance with EPA and MML requirements;</p> <p>To investigate the suitability of new waste disposal contractors, waste management/treatment/disposal facilities and waste receivers before use, and undertake periodic HSE audits for verification;</p> <p>Ensure that the project and its contractors/subcontractors operate in accordance with the requirements of this WMP;</p> <p>Ensure that personnel on site undergo environmental and waste management awareness as part of the project induction/orientation;</p> <p>Will ensure that the management of wastes within MML operations sites and disposal from these sites, will be carried out in a controlled and monitored manner; and</p> <p>Ensure effective communication of the appropriate aspects of the WMP with all internal/external (where applicable) stakeholders.</p>
HSE Staff	<p>Support the WMP at the operational level on a daily basis;</p> <p>The collection, compilation and analysis of performance statistics to ensure compliance;</p> <p>Liaise with operational management & personnel to ensure that duties and commitments in support of this WMP are expedited efficiently and in a timely manner;</p> <p>Maintain relevant Material Safety Data Sheets (MSDS's), with copies in the site clinic;</p> <p>Inspecting and auditing, including waste storage, segregation, labelling, containment, transport and disposal.</p> <p>Investigating and reporting any non-compliance;</p> <p>Ensuring that all waste transporters and disposal sites meet acceptable standard before use; and</p>

Responsible Party	Responsibilities
	<ul style="list-style-type: none"> • Ensure waste is not disposed of to an unauthorised location.

Responsible Party	Responsibilities
Procurement, Materials & Commercial Department	<p>Communicate this plan to any and all contractors/subcontractors used by MML, including new/renewed contracts;</p> <p>Ensure that compliance with Project permitting documents and other guidelines are a requirement for all contractors.</p> <p>Main contractors should develop a waste management plan that is bridged to and complies fully with the MML waste management plan, which is the permitting document;</p> <p>Ensure new chemicals (including hydrocarbons, pesticides, cleaning agents, etc) are assessed for potential waste issues prior to purchase;</p> <p>Maintain relevant Material Safety Data Sheets (MSDS's) for chemicals, with copies in the site clinic and HSE department; and</p> <p>Maximise use of "return to sender" or reusable containers from suppliers.</p>
All Department General Managers and Managers	<p>Each Department Manager shall have awareness of the environmental aspects and impacts of all on-site activities under their control or influence;</p> <p>Provide the necessary resources (financial, manpower et al.) to satisfactorily implement this WMP;</p> <p>Ensures appropriate waste containment units are available at all facilities and stored appropriately;</p> <p>Communicate this procedure to any and all contractors/subcontractors used by MML, including new contracts; and</p> <p>Ensure that any breach of the WMP is reported and investigated.</p>
Contractor Site Manager or on site representative	<p>Responsible for technical performance and compliance with this WMP;</p> <p>Ensure waste is not disposed of to an unauthorised location.</p> <p>Develop and maintain their own waste management systems that are compliant with this WMP;</p> <p>Report waste data to MML as outlined in this WMP; and</p> <p>Identify personnel for waste management.</p> <p>Ensure that environment, health and safety regulatory requirements are met and that WMP requirements are properly implemented and in a timely manner;</p> <p>Ensures appropriate waste containment units are available at all facilities and stored appropriately;</p> <p>Ensure information on new waste streams are communicated to MML HSE department;</p> <p>Reporting to the MML HSE department any non-compliance;</p> <p>Investigating any breach of this WMP; and</p> <p>Maintain relevant Material Safety Data Sheets.</p>
Responsible Party	Responsibilities

Responsible Party	Responsibilities
All employees (MML staff and contractors)	Shall ensure that waste generated throughout MML operations and activities are effectively and responsibly managed and disposed of in accordance with this WMP; Support waste reduction and management initiatives of the company; and Are encouraged to suggest ways to minimise waste generation.

14 DEFINITIONS

The following definitions apply to this document.

Chemicals

Refers to any hydrocarbon, acid, alkali, paint, glue, cleaning agent, thinner, additive, flocculent, disinfectant or other substance used by the Project, regardless of state (i.e. liquid, solid, gas) and includes waste products produced by their use.

Wastes

Any substance or object which constitutes scrap (broken, worn out, contaminated), effluent (e.g. sewerage), unwanted surplus or otherwise spoiled materials which MML requires to be disposed.

Hazardous Waste

Hazardous wastes are materials that can potentially be harmful to human health and/or could potentially damage the natural environment if not managed and disposed of appropriately. They exhibit one or more of the following characteristics; ignitability, corrosivity, reactivity, toxicity, mutagenic, teratogenic, infectious, irritant, carcinogenic, bioaccumulate / biomagnify, flammable, explosive.

In addition to hazardous waste special categories of hazardous waste include:

Biohazards such as medical waste, (sharps such as syringes or scalpels; and soft's such as soiled medical dressings).

Radioactive waste such as found in certain instrumentation.

Non-Hazardous Waste

Wastes that do not exhibit any hazardous properties are classified as nonhazardous. These may be inert or potentially biodegradable and include a range of materials that may be recycled or can safely be disposed in a landfill. Categories of non-hazardous waste or inert waste are further classified according to their source.

Waste Type

A specific waste with the same origin and characteristics, such as paper or oil.

Waste Stream

A mix of compatible waste types that will be managed in a similar way will form a waste stream.

Material Safety Data Sheet (MSDS):

A document, written in English, containing information to enable the recipient of a substance or product to take the necessary measures, relating to the protection of health and safety at work and relating to the protection of the environment.

1.5 LINKED DOCUMENTS

This HSE Management System document should be read in conjunction with the following:

MML Environmental Management Plan

MML Environmental Monitoring Plan

Individual contractor waste management plans and related bridging documentation

2 LEGAL FRAMEWORK & POLICY

2.1 NATIONAL REGULATORY ENVIRONMENT

The Local Government Act of 2004 decentralised certain functions to local Councils. This includes “*initiate and maintain programmes for the development of basic infrastructure and provide works and services in the locality*” (Section 20(2c)). This includes waste management at a local level but does not directly affect how MML will manage its wastes.

The Protection from Radiation Act of 2001 requires all users to obtain a license from the Radiation Board to own, purchase, acquire, import, export, use or dispose of irradiating devices, radioactive materials or other sources of ionizing radiation.

MML will obtain the necessary permits for any radioactive source and ensure that a Return of Exported Radioactive Isotopes agreement is established with the supplier. This aspect is also covered under the MML Mine Closure Plan. The Sierra Leone Maritime Administration Act 2000 empowers the Sierra Leone Maritime Authority to regulate marine pollution. As Sierra Leone is a signatory to MARPOL, MML maritime activities shall comply with MARPOL.

It is the policy of MML to fully comply with all applicable national legislation and appropriate international conventions governing its activities, services and operations.

2.1.1 *The Environment Protection (Mines and Minerals) Regulations*

The Environment Protection Regulations (2013) do not specifically require a waste management plan be created but they do require the following:

Eighth Schedule – Environmental Code of Practice

The holder of a mineral right shall ensure that at all times throughout the operation any emissions to air, water or land are kept to an absolute minimum and at levels that pose no risk whatsoever to the health of workers, local inhabitants or wildlife

Drilling mud and all other reagents shall be recycled without discharge to the environment

Tenth Schedule: Environmental Management Plan Standards:

Specific and tailored commitments must be identified in the plan based on site assessments and international best practice including:

Air: micro-climate, dust, odours, point source contaminants

Water: natural watercourses, sewerage effluent quality and control iii. Waste: liquids and solids

2.2 WASTE RELATED INTERNATIONAL CONVENTIONS

2.2.1 MARPOL Convention

Sierra Leone is a signatory to the MARPOL Convention (Marine Pollution Convention).

The MARPOL Convention initially comprised *Regulations for the Prevention of Pollution by Oil (Annex I)* and *Regulations for the Control of Pollution by Noxious Liquid Substances in Bulk (Annex II)*. Another four annexes have subsequently been added. Ratified parties must accept Annexes I and II, but the other four are voluntary; Annex V is the most pertinent dealing with waste. Sierra Leone has ratified all Annexes.

Waste management by the marine concentrate haulage contractor shall be in compliance with the following:

Transshippers and tugs to develop a shipboard waste management plan that is bridged to and complies fully with the MML waste management plan, which is the permitting document;

Waste segregation area required on board and bins/containers to be in place;

No disposal of solid rubbish anywhere into the sea or rivers;

No shipboard incineration;

Waste engine oil to be burned in main engines as fuel or sent to shore for disposal;

Cooking oil must not be discharged into the sea; either ship to shore for disposal or burn as fuel in engines;

Oil sludge plus any other oily contaminated materials (e.g. filters, etc) to be shipped to shore for disposal in appropriate facility. Ship to have dedicated sealed containers for shipping wastes to shore; and

Food scraps to be sent to shore for disposal (e.g. landfill) at Thofayim, or when within SL estuary below Pepel, discharged after comminuting to pass through a 25-mm mesh. No discharge into Port Loko Creek or in the Sierra Leone Estuary above Pepel.

Sewerage to be treated in MARPOL compliant system prior to discharge, with effluent to comply with parameters listed in table 2-1 or sent ashore for treatment. No discharge into Port Loko Creek or in Sierra Leone Estuary above Pepel.

Bilge to be sent to shore for treatment at Thofayim or, when within the Sierra Leone Estuary below Pepel, discharged after treatment to achieve 15mg/l. No discharge into Port Loko Creek or in Sierra Leone Estuary above Pepel.

Where vessels cannot comply with this WMP, the specified waste will be sent to shore for treatment.

Table 2-1: MARPOL Annexe IV sewerage treatment discharge standards

Parameter	Guideline Value
pH	6 - 8.5
BOD5 (mg/l)	25
COD (mg/l)	125

TSS (mg/l)	35
Thermotolerant (Faecal) Coliform number	100
Chlorine residual** (mg/l)	0.5

2.2.2 *Basel Convention*

The Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (Basel Convention) aims to protect human health and the environment against the adverse effects resulting from the generation, management, movement and disposal of hazardous waste. Sierra Leone has ratified the Basel Convention.

The Convention obliges producers of hazardous waste to dispose of their waste in an environmentally responsible manner close to where it is generated. Strong controls on the movement, storage, transport, treatment, reuse, recycling, recovery and final disposal of hazardous waste are imposed. The Convention regulates the transboundary movement of hazardous waste using the Prior Informed Consent Procedure such that shipments without prior consent are illegal.

Transboundary movements are generally approved, if:
the state of export does not have the capability of managing or disposing of the waste in an environmentally sound manner, or
the receiving state has appropriate, environmentally sound facilities, and agrees to accept the waste.

2.2.3 *Bamako Convention*

Sierra Leone is a signatory to the 1991 Convention on the Ban of the Import into Africa and the Control of Transboundary Movement of Hazardous Wastes within Africa (Bamako Convention). This convention is supplementary to the Basel Convention and covers movement of hazardous waste into or between signatory African countries. The Convention has many provisions virtually identical, or analogous, to the Basel Convention provisions.

As Sierra Leone has ratified this convention it will apply between other signatory African nations and Sierra Leone with regards to the movement of wastes.

2.2.4 *Other Conventions*

The Vienna Convention for Protection of the Ozone Layer & Montreal Protocol (1987) with Copenhagen Amendments (1992) on Substances that Deplete the Ozone Layer apply in Sierra Leone.

United Nations Convention on the Law Of the Sea UNCLOS (1989); Protection And Preservation Of The Marine Environment Part XII.

2.3 MML WASTE MANAGEMENT GUIDELINES

2.3.1 *Waste Hierarchy*

Wastes resulting from MML activities will be managed to ensure protection of the natural environment and the health and safety of personnel and the community. Waste management activities will be performed in accordance with the following waste hierarchy principles:

Reduce the quantity of waste generated. This will be achieved by optimising purchasing process and design requirements, thereby minimising the amount of waste generated in the first place.

Re-use materials/containers where possible or return to suppliers where surplus to requirements.

Recycle waste materials where practicable (e.g. oils, metal, paper) to reduce the quantity of wastes landfilled. This requires segregation of wastes at source as far as practicable.

Recover as much as possible, such as energy within materials.

Responsible disposal of waste to landfills or alternative following appropriate treatments to reduce hazards and long term impacts on the environment.

Waste minimisation and the application of these principles shall be addressed by the Contracts and Procurement Department and taken into consideration when reviewing shipping, storage and disposal method throughout the project life span.

Disposal of all waste must be justified by demonstrating that recovery, reuse or recycle is not reasonably practicable. Long-term containment must be assured for any oily and hazardous waste which cannot be rendered non-hazardous (Figure 1). In addition to these objectives, MML will monitor waste management activities and document results.

2.3.2 *MML Waste Strategy*

MML's Waste Strategy requires the following:

Develop and implement a WMP, ensuring that maximum effort is given to waste prevention, reduction, reuse and recycling.

Annual performance targets and objectives that the project will be expected to meet as a minimum. These include:

- > 95% of all scrap metal produced will be recycled;
- Audit waste management annually; and
- Maximise waste recycling opportunities as far as practical.

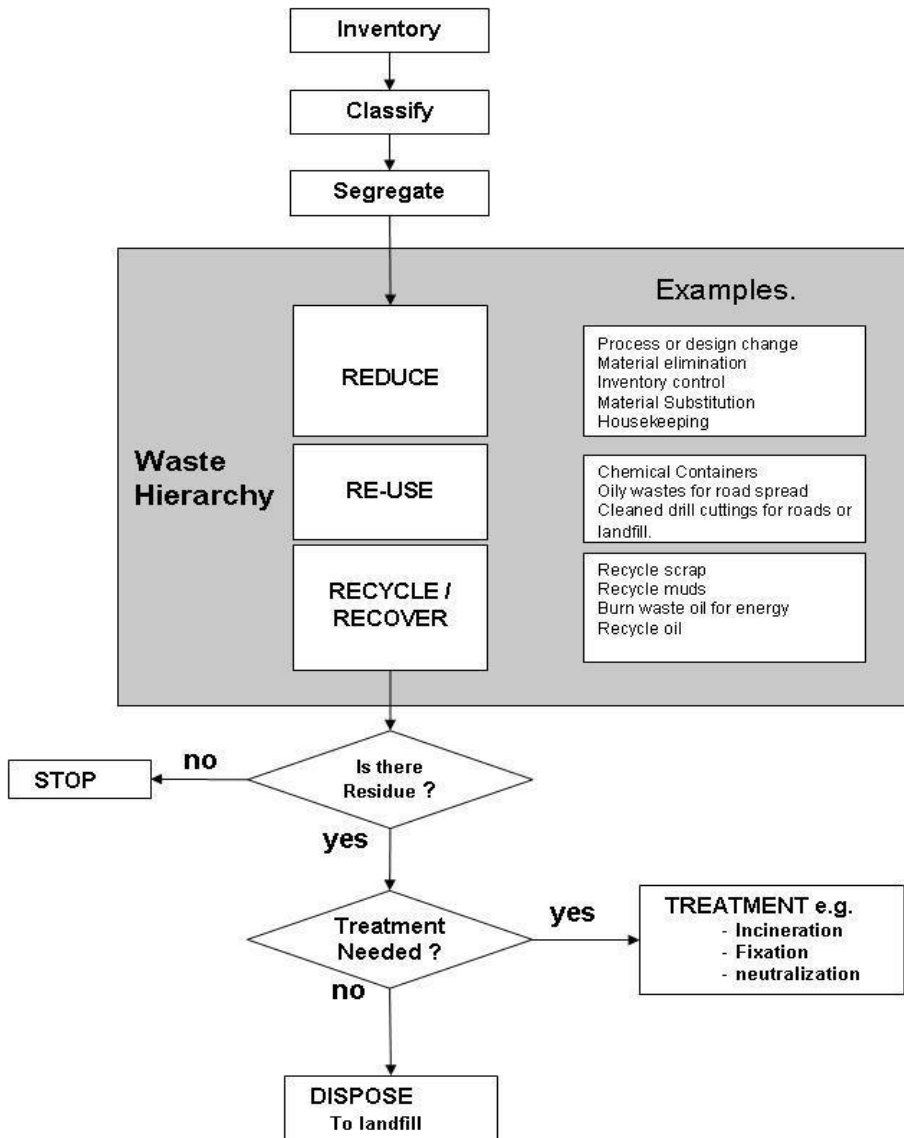
Priority should be given to the management of wastes at source or as close to source as practicable. Waste management solutions should be identified on an international level only when appropriate technologies cannot be identified in-country;

MML will purchase products in a manner that minimises waste generation; and

The HSE department will carry out internal audits, monitoring and spot checks on procedures, working practices and facilities, to ensure compliance with legislation and the WMP.

Figure 2-1: Waste Reduction Disposal and Decision Tree

Waste Reduction Disposal and Decision Tree



3 WASTE CHARACTERISTICS

3.1 WASTE TYPES AND QUANTITIES

The waste types that MML expect to produce from its operations are listed below. All wastes are classified as either non-hazardous (Table 3-1) or hazardous (Table 3-2) to facilitate their safe collection, storage, transport and management by MML sites and waste contractors.

The waste types listed are those that MML can reasonably expect to be generated in the course of normal operations. However other waste types may be generated throughout the course of the Project. Any additional waste type that is generated that lies outside of this WMP, will be assessed and incorporated into the management plan.

The composition of the various waste streams generated will vary over time as a direct result of both changes in the project and improvements in available waste management infrastructure in Sierra Leone.

Estimated or indicative quantities (t/yr) to be produced are also included in the tables below. This is a list of expected wastes types and quantities. The actual waste types and quantities generated at any particular time may change over the life of the operation; for example during large modification work or during maintenance shutdowns. Facilities will be established (e.g. balance tanks, banded storage areas) to cater for such fluctuations in volume as necessary.

Table 3-1: Non-Hazardous Wastes: Description and Quantities

Type	State	Source/Description	Estimated Quantity (t/yr)
Glass	Solid	Drink bottles and food jars.	10.0-12.0
Cooking grease	Sludge	Used cooking oil and grease from oil separator in main kitchen	4.0-6.0
Metals (non-contaminated)	Solid	All ferrous and non-ferrous metals from construction and operations phases plus demolished infrastructure from previous operators. Mixed metals may include copper cable, steel plate, aluminium drink cans, food cans, mill balls.	150.0-350.0
Paper and cardboard	Solid	Magazines, office paper, newspaper, cardboard packing (not contaminated with oil, grease, chemicals, etc)	30.0-50.0

Type	State	Source/Description	Estimated Quantity (t/yr)
General plastic	Solid	Bottles and mixed plastics such as packing materials. All plastic types (i.e. 1 to 7) are included.	15.0-20.0
Residual mixed waste	Solid	General domestic waste that may contain food scraps, plastics, cans, bottles, textiles, paper and office bin waste.	50.0-65.0
Filters	solid	Water filters and dust filters	3.0-6.0
Wood	Solid	Pallets, crates, furniture, form work.	30.0-50.0
Concrete	Solid	Removal of old infrastructure from previous operators	0.0-250.0
Tyres	Solid	Light vehicle, trucks and equipment	200.0-225.0
Industrial rubber and plastic	Solid	Conveyor belt replacement from mine site, Thofayim and transhipper. HDPE pipe (tailings, water transfer). Rubber liners from process plant (cyclone spigots, shuts, valves, pumps). Process plant polyurethane screen panels	30.0-50.0
Food waste	Solid	Scraps from kitchens	80.0-100.0

Table 3-2: Hazardous Wastes: Description and Quantities

Type	State	Source/Description	Estimated Quantity (t/yr)
Batteries	Solid	All battery types - alkali, lead acid, lithium ion.	0.35-0.5
Chemicals, various	Liquid	Small amounts of various solvents, paints, cleaners left over in containers or no longer required.	0.2-0.3
	Liquid	Boiler reject water and conditioner water	15.0-20.0
Chemical drums	Solid	Plastic & metal drums that contain residual wastes such as oil, solvent, cleaners or paint.	Included in metals/plastics

Type	State	Source/Description	Estimated Quantity (t/yr)
	Liquid	Effluent from drum washing plus residual contents.	Included in Chemicals
Aerosol cans	Solid	Aerosol cans that may contain pesticide, paint, thinner, etc plus propellant.	0.05-0.1
Medical/clinical	Solid	Swabs, dressings, old medicine, sharps.	0.35-0.45
Oil contaminated materials	Solid	Oily rags, used spill absorbent, hydraulic hoses, used grease, contaminated sediments	35.0-55.0
Used PPE	Solid	Used PPE may be dirty or contaminated with oil.	4.0-6.0
Hydrocarbons, used	Liquid	Engine oil, lubricants, parts cleaning agent.	300.0-400.0
	Sludge	Sludge from RME180	600-800
Bulbs and fluorescent tubes	Solid	Fluorescent tubes & bulbs	0.05-0.1
Oily water	Liquid	Oil contaminated water from bilges on tugs.	10.0-15.0
	Liquid	"Produced" water from fuel pre-treatment	50-80
Electrical goods & instrumentation	Solid	Old computers, televisions, instrumentation, fridges, air conditioners, and electrical goods.	1.0-1.2
Sewerage	Solid	Sludge post treatment	30.0-50.0
	Liquid	Liquid effluent	55,000-65,000
Filters	Solid	Oil filters, fuel filters.	8.0-12.0
Radiation sources	Solid	Densitometers at decommissioning only	0.5 including casing - once off generation only

3.1.1 Waste Sources

Waste will be generated by a number of areas/activities of the operation;

- Marampa Mine site including:
- Mining operations and road maintenance.
- Process plant maintenance.
- Maintenance of buildings and mobile plant.
- Camp and accommodation.
- Administration block.
- Power house.
- Warehouse.
- Concentrate export haulage route
- Concentrate road haulage to Thofayim – maintenance of mobile plant, small power plant, offices and accommodation.
- Thofayim maintenance of equipment and plant.
- Barging of concentrate to export bulk carrier – maintenance of mobile plant and accommodation.
- Transshippers

3.1.2 Unidentified or New Wastes

Any unidentified waste or new waste stream should be quarantined at site in the designated area. The Environment Manager should be consulted in the event that new waste streams are identified to ensure that all relevant risks are assessed and appropriate storage and disposal options are provided. Any unidentified wastes will be treated as hazardous and quarantined until full investigation of risks is carried out and final disposal option is identified.

Classification of an unknown waste may require sampling and testing to confirm presence or otherwise of hazardous components. Personnel are to adhere to Personal Protective Equipment requirements.

3.2 WASTE STREAMS

Individual waste types will be allocated to waste streams based on compatibility and commonality of waste management option (e.g. landfill). A waste stream may comprise a single waste type, such as medical waste, that should not be mixed with other waste streams, or a combination of compatible wastes with the same management option (e.g. General waste stream may be comprised of glass, plastics, food scraps and other non-hazardous wastes).

MML has identified 19 waste streams that will need to be managed during the construction & operational phases of the project. As further management options develop, further waste streams may be identified that require additional segregation (e.g. paper, food). The waste streams are listed below and further detail is provided in Section 5.

- General Waste (GEN/WST)
- Kitchen Grease/Oil (GEN/KIT)

- Metals (GEN/MET)
- Wood (GEN/WOD)
- Bulk Landfill (GEN/LDF)
- Food (GEN/FOD)
- Hazardous Waste – Batteries (HAZ/BAT)
- Hazardous Waste – Electronic (HAZ/ELE)
- Hazardous Waste – Flammable Liquids (HAZ/FLM)
- Hazardous Waste – Oil (HAZ/OIL)
- Hazardous Waste – Oily Solids (HAZ/SOL) 12. Hazardous Waste – Oily Sediments (HAZ/SED)
- Hazardous Waste – Chemicals (HAZ/CEM)
- Hazardous Waste – Containers (HAZ/CNT)
- Hazardous Waste – Fluorescent Lights (HAZ/FLU)
- Hazardous Waste – Sewerage (HAZ/SEW) 17. Hazardous Waste – Oily Water (HAZ/WAT)
- Hazardous Waste - Medical Waste (HAZ/MED)
- Hazardous Waste - Radioactive wastes (HAZ/MED)

4 WASTE HANDLING - SEGREGATION, TRANSPORT & STORAGE

The purpose of this section is to identify the specific requirements for the storage and transport of wastes.

The storage and transport of all wastes shall comply with MML chemical handling procedures, which will outline controls required to reduce risk to ALARP (As Low As Reasonably Practicable) for any hazards associated with the transport, handling, use and storage of chemical substances.

4.1 SEGREGATION

As far as practicable, waste shall be segregated at source to facilitate its efficient and safe handling, transport and disposal. Segregation shall be based on type (e.g. hazardous or non-hazardous, compatibility), physical characteristics (e.g. liquid, solid, sludge), waste stream and the most appropriate waste management options (see Section 5) available to MML at the time.

It should be noted that unless a specific waste type can be recycled /reused / recovered, it will not necessarily be segregated from other waste types. For example, most plastics have no recycling option currently in Sierra Leone and thus will be sent to the General Waste stream for management. Section 6 has further details on the management of the waste streams.

At designated locations, waste collection points shall be established with appropriate collection receptacles for the waste type being collected. Each receptacle/collection area shall have the appropriate coloured placards/signs as listed in Table 4-1.

Table 4-1: MML Waste Management Colour Coding

Colour	General Description	Waste Streams
Grey / Black	Hydrocarbons	Hazardous Waste - Oil Hazardous Waste - Oily Solids Hazardous Waste - Oily Sediments
Brown	Paper & wood	Paper, cardboard, wood
Colour	General Description	Waste Streams
Blue	Plastics	Plastics

Green	Non-hazardous and segregated	Bulk Landfill Wood Kitchen Grease/Oil, Tyres Metals (separated ferrous & non-ferrous) Glass Food Scraps
Red	Hazardous Wastes	Hazardous Waste - Batteries Hazardous Waste - Electronic Hazardous Waste - Flammable Liquids Hazardous Waste - Chemicals Hazardous Waste - Containers Hazardous Waste - Fluorescent Lights Hazardous Waste - Sewerage Hazardous Waste - Oil Water
Yellow	Special Hazardous Wastes	Medical Waste (first-aid sources) Radioactive waste (densitometers)

4.2 STORAGE

Both hazardous and non-hazardous wastes will be stored in designated and appropriately segregated storage areas, i.e. both at the point of origin and storage area. Storage of waste materials will be carried out in accordance with the material's MSDS.

Waste materials shall be stored in a manner to prevent:

- Accidental spillage or leakage;
- Loss due to wind or storms;
- Contamination of soils, waterways and groundwater;
- Corrosion or wear of containers;
- Loss of integrity from accidental collisions or weathering;
- Theft by people; and
- Scavenging by animals.

Bulk storage areas will be banded to ensure 120% containment of the single largest tank within the secure storage area or 25% of the total volume being stored in the event of 200l or smaller drums being used. Any subsequent drainage water shall be routed for treatment (phase separation) through an oily water separator.

An inventory will be kept of all stored waste materials.

4.2.1 Container Suitability and Labelling

Waste storage containers will be appropriate in terms of volume, composition, and shape and access for the material that is being stored. Only containers in good condition will be utilised. Bungs and lids will be securely fastened or other forms of covering shall be provided. Containers used shall be inert in relation to their content, clearly labelled, indicating the characteristics of the content and data on toxicity and/or potential contaminant.

Liquid wastes will only be transported in sealed drums or tanks that are fit for purpose.

Waste containers shall be:

- clearly labelled - to describe the contents using the appropriate waste labels
- in good condition and are not leaking
- appropriate to the waste they contain
- appropriately sealed (e.g. with a lid or bung)
- not emitting any harmful gases or generating heat
- The following points shall also apply:
 - For safety reasons, hazardous wastes should NOT be mixed; only one waste stream may be placed in any one container;
 - Solid and liquid wastes shall not be mixed;
 - No containers will be used that are susceptible to reaction with the wastes, which may lead to the release of harmful substances; and
 - Any unidentified waste should be contained separately.

4.3 TRANSPORT

Waste shall be transported in a safe and efficient manner, in accordance with the associated MSDS information.

Waste will be transported so that no waste will escape the bin/container/skip it is being transported in. This includes:

The use of nets over waste skips;

Ensuring all liquids are transported in sealed tanks/ drums. All lids are to be sealed tightly and checked prior to transport;

No vehicles containing hazardous waste may be parked and left unattended; and

Spill kits available on vehicles transporting hazardous liquid waste outside of the Marampa Mines area, i.e. between Thofayim and Marampa Mine site.

4.3.1 Collection Vehicles

Waste collection vehicles shall, as a minimum, comply with MML's vehicle policy. Vehicles shall:

- be fit for purpose;
- have regular maintenance checks and servicing, fully documented and logged;
- not leak fuel or oil;
- have road legal tyres exceeding minimum tread requirements; and
- comply with all Sierra Leonean vehicle laws and MML minimum vehicle standards including registration and insurance.
- Vehicle drivers/operators shall be adequately trained in vehicle operation and the handling of MML wastes. Training records shall be maintained to demonstrate that all drivers are suitably qualified and trained.

4.4 PPE

All personnel handling waste shall wear appropriate PPE as a minimum:

- when loading materials, including coveralls, high visibility vests, steel toe-capped boots, protective gloves, eye protection and hard hats;
- when loading / transferring liquid wastes goggles or face visor should be worn; and
- when loading / transferring hazardous liquids a chemical splash suit should be worn.

4.5 SPILL RESPONSE

For any spill, the priorities in order are:

- Protection of People;
- Protection of the Environment;
- Protection of Assets; and
- Protection of Reputation
- The following immediate actions should be taken in the event of a spill:
- If safe to do so, control the source of the spill.
- Notify Supervisor of incident, regardless of size.
- Spill source and cause
- Type of material
- Size and location
- Injuries
- Hazards
- Ensure liquid hazardous wastes do not contaminate water courses
- Do not flush oil down drains
- Use small dams formed from soil, sandbags, sorbents to project inlets and drains.
- Seal drain gratings with plastic bags and sand

Avoid driving over contaminated areas as it will increase the penetration rate and spread pollution

The area supervisor is to initiate emergency response planning for spills. All loss of containment of wastes, either during storage, transport or disposal shall be immediately reported to the MML HSE department as per the Incident Notification procedure and to help with spill clean-up and assessment of impacts.

5 WASTE TREATMENT

5.1 TREATMENT OPTIONS

Tables 5-1 and 5-2 provide a summary of the waste treatment methods approved by MML for each waste stream and type.

Recognising that there are limited waste treatment options available, a number of acceptable management alternatives may be listed for a specific waste stream. MML will continue to explore potential improvements in its waste management and disposal, including improving the potential to reuse and recycle wastes produced by the operation along with waste reduction strategies.

Wastes from MML shall be processed as soon as practicable, allowing for the accumulation of the minimum batch quantity necessary for treatment. Materials for recycling may be stored pending accumulation of a practicable and economic quantity for transport to the end user (e.g. recycling company).

Other than in compliance with this plan, no wastes shall be discharged from vessels owned or operated on behalf of MML.

5.1.1 *General Waste*

General Waste comprises a mix of non-hazardous wastes such as kitchen waste (e.g. food packaging/wrapping, glass bottles, food scraps), general domestic waste (e.g. glass, mixed paper, food scraps, plastics) and plastics (e.g. bottles, packaging) that will be sent to a designated Landfill facility to be constructed within the MML mining lease area. The site will be secured and no scavenging will be allowed. Further details on the MML landfill is include in Appendix 7.1.

On no account will any untreated hazardous waste materials be land-filled. In order to reduce the reliance on landfill, MML will explore the potential to recycle suitable wastes as far as practicable.

As there is no plastic recycling company in Sierra Leone this waste type will be sent to the Landfill as part of the General Waste stream or incinerated.

Paper waste will initially be sent to the Landfill as part of the General Waste Stream or incinerated. In order to reduce the reliance on these facilities, MML will target recycling of this waste as a priority at its sites. As there is no paper recycling company in Sierra Leone, the main option for MML will be to use waste paper in the rehabilitation program as part of a composting program.

Mixed waste may also contain food scraps, especially from offshore activities plus residual food on containers.

Smoke detectors will also be disposed of to landfill in an undamaged state. The amount of radioactive material (americium-241) in each detector is extremely small (~37 kBq or 1µCi), and from environmental and public health perspectives their disposal to landfill does not represent any hazard. The radioactive material is securely bound in a metal foil within the detector and the amount of naturally occurring alpha-emitting radioactivity in normal soils is equivalent to 10 smoke detectors in every cubic metre. The dispersal of smoke detectors, even in large numbers, through refuse land-fill sites is not significant in comparison. Smoke detectors will therefore not be collected and concentrated but dispersed through the landfill facility unless recycling facilities are available in country. This is consistent with the approach taken internationally. Under no circumstances should smoke detectors be incinerated or broken up into component parts on site.

5.1.2 Metals

Metals shall be segregated at source and sent for recycling. This includes metal tins from kitchens. A metal recycler will be sought to collect metal waste for recycling offsite.

5.1.3 Wood

Wood shall be segregated at source and used in the mine site rehabilitation program as both organic material to build up the soil and for erosion control (e.g. stakes for silt fence and erosion matting) after removal of the nails.

Suitable wood in good condition will be stored for later reuse on other tasks such as formwork, building refurbishment or dunnage. Any wood contaminated with oil or chemicals shall be placed in the Hazardous Waste – Oily Solids waste stream.

In the event of surplus wood waste, MML will provide suitable wood (after nails removed) to the surrounding community for use as firewood in place of them cutting down trees.

5.1.4 Food

At the mine site, food scraps shall be sent to a local piggery for recycling. Food scraps will be segregated at source and sent daily to the piggery or more often as is required. Food waste will also be used for composting as and when required.

Food scraps generated offshore will be macerated to <25mm in size and discharged when the vessels are within the Sierra Leone Estuary below Tasso Island. No discharge is to occur within the Port Loko Creek or in the Sierra Leone Estuary above Tasso Island. Where this is not undertaken they will be shipped to shore for disposal as General Waste.

5.1.5 Kitchen Grease/Oil

Kitchen grease and oil will be incinerated.

5.1.6 Bulk Landfill

Concrete, conveyor belt, rubber liners, process screens and tyres will comprise the bulk landfill waste stream. These materials will be co-disposed of to the waste rock dumps and buried at least 10m from the final dump surface. There are currently no recycling companies in Sierra Leone that can receive these wastes and the cost of exporting this bulky material exceeds any benefits obtained (e.g. GHG associated with fuel etc). Used tyres may be used for creating fenders at Thofayim Terminal as well as to create traffic buffers along the haul road. MML will evaluate whether used tyres can be placed in a monofill for potential later recovery should tyre recycling be practical in the future.

5.1.7 Hazardous Waste - Flammable Liquids

Hazardous flammable liquids shall be stored on site and incinerated.

MML has an incinerator with the following characteristics:

- A two chamber batch waste incinerator capable of handling 50kg to 100kg/batch. The second chamber shall have a minimum temperature of 850°C and residence time of 2 seconds.

Further details on the MML incinerator are included in the appendices (see Section 7.2.)

5.1.8 Hazardous Waste - Oily Solids

Hazardous oily solids shall be stored on site and incinerated.

5.1.9 Medical Waste

Medical Waste shall be incinerated on site.

5.1.10 Hazardous Waste - Containers

In order to minimise the quantity of waste containers produced, MML will work with its suppliers to maximise the use of reusable containers such as tanktainers (e.g. 40' container tank), tote tanks and IBCs. This will markedly reduce the quantity of waste produced.

20L and 200L containers/drums designated as waste shall be drained of their contents at point of origin to minimise waste and risk of spillage. Drained contents will be used or sent to the appropriate waste stream.

Steel containers can be sent to the metal recycling stream and plastic drums to the General Waste stream.

Certain containers may be suited for reuse by MML operations for storage of materials. Approval for use is required from the HSE department

No steel or plastic drums or other containers in which chemicals were stored shall leave the control of MML unless they have been rendered unusable. No steel or plastic drums shall be

given to local communities for reuse under any circumstances as this may lead to potentially contaminated containers being used inappropriately (e.g. as water containers).

5.1.11 Hazardous Waste - Oil

As a base case, MML shall incinerate waste oil and sludge on site. However, MML will actively exploring recycling options.

5.1.12 Hazardous Waste - Electronic

There are currently no waste management facilities for electronic waste in Sierra Leone. MML will store its electronic waste until such time as an appropriate waste management strategy has been developed.

Only those electrical items that contain computerised systems would be considered hazardous. In most cases, removal of the circuit board will allow the unit to be sent to either landfill or for metal recycling as non-hazardous wastes.

The hazardous components of the electronic waste (e.g. motherboards, memory chips) shall not be sent to landfill.

MML will also consider refurbishing computer components for donation to a reputable NGO or similar organisation.

5.1.13 Hazardous Waste - Oily sediments

MML does not currently expect to create significant quantities of oily sediments. The main sources shall be from oily water separators at the fuel farm and wash bays and small spills associated with maintenance of equipment in the field. There are currently no waste management facilities for treatment of oily sediments in Sierra Leone. Current treatment options, such as lime stabilisation and burial, are not best available practicable treatment technology and will not be used by MML.

MML will use either bioremediation or incineration for this waste stream. The decision will be made at the time to ascertain quantity and degree of contamination.

Bioremediation will be undertaken within a bunded area or landfarm.

Contaminated materials will be placed in this and mixed with fertiliser (i.e. NPK, sewage sludge) and aerated on a regular basis. Analysis of oil content will be undertaken after four weeks to verify success of treatment and any bioremediated soil used will be placed on the topsoil stockpile. Landfarms will not be operated between July and September to minimise potential for mobilisation of contaminants during the height of the wet season. During the wet season, sediments will therefore need to be stored if they cannot be incinerated.

5.1.14 Hazardous Waste – Chemicals

Only minor quantities of waste chemicals will be produced on the mine site; primarily sulphuric acid from old lead-acid batteries. Laboratories will be fitted with lime pits to neutralise any effluent before reporting to the sewerage treatment system.

Sulphuric acid from lead acid batteries shall be neutralised via lime. The resulting precipitate (CaSO_4) will be sent to the tailing storage facility for disposal.

The majority of other waste chemicals will be trace quantities of cleaning agents (e.g. hypochlorite) that can be used for their original purpose.

A quantity of conditioned water will be produced as part of the maintenance for the boiler at the powerhouse. The conditioned water will contain:

- Hydrazine – 0.01kg/t water
- Sodium hydroxide – 2kg/t water
- Tri-sodium phosphate – 2kg/t of water
- Sodium carbonate – 2kg/t of water
- Between 6-15t of conditioned water will be created per annum. This water will be neutralised and then analysed for compliance prior to disposal (i.e. use as dust suppression water).

5.1.15 Hazardous Waste – Fluorescent lights

Used fluorescent tubes and bulbs shall be kept in a dedicated sealed steel drum. No other waste is to be mixed with these. The bulbs will be broken up in the sealed drum, which will then be filled with concrete. Once set, the encapsulated fluorescent tubes will be sent to landfill. MML will also explore the potential to import low mercury tubes that can be sent to landfill.

5.1.16 Hazardous Waste – Batteries

Lead acid batteries: the acid shall be drained and neutralised prior to storage. Lead acid batteries shall either be sent to an approved battery recycler in Sierra Leone or will be exported to an appropriate facility.

5.1.17 Hazardous Waste – Sewerage

Offshore

Both transshipment vessels and tugs shall only discharge treated sewerage in the Sierra Leone estuary below Pepel after it has been passed via a MARPOL compliant treatment system. No discharge to the Port Loko Creek or above Pepel in the SL Estuary. If any ship on contract to MML cannot meet these requirements then they shall use a holding tank and ensure sewerage is treated on shore.

Onshore

MML has a packaged sewerage treatment plants from WPL in the UK (<http://www.wpl.co.uk/>) to treat sewerage effluent on the mine site. Further details on the

MML sewerage treatment systems are included in Appendix 7.3 Sewerage sludge shall be used for rehabilitation of the mine site as an organic fertiliser after being treated in a land farm. Sewerage sludge may also be used for bioremediation of any oil contaminated sediments.

5.1.18 Hazardous Waste - Oily Water

Both transshipment vessels and tugs shall only discharge treated bilge in the Sierra Leone estuary below Pepel after it has been passed via a MARPOL compliant treatment system. No discharge to the Port Loko Creek or above Pepel in the SL Estuary. If any ship on contract to MML cannot meet these requirements then they shall use a holding tank and ensure bilge is treated on shore.

Pre-treatment of the RME180 produces oily water that helps to wash impurities from the fuel prior to use. The resulting "produced water" will be passed by an oily water separator before discharge to environment. Water discharged from water treatment plants will comply with the EPA-SL standards for mine site effluents.

5.1.19 Hazardous Waste - Radioactive Sources

When the process plant is decommissioned, the densitometers that are installed in the process plant, which have a small Cs137 source, will need to be disposed of. These units were purchased with a return to provider agreement so that the source will be returned to the original provider for disposal. Any additional densitometers will be purchased with similar arrangements. An example of a return to provider agreement is provided in Section 7.4.

Table 5-1: Management of Non-Hazardous Waste Streams Produced by MML

Waste Stream	Waste Types	Source	Management Option	Comments
1. General Waste	Mixed office/domestic waste containing glass, paper, all plastics, packaging and food scraps from kitchen	All areas, but mainly Administration block, warehouse and camp/mess areas. Lesser amounts from maintenance and plant site.	Sent to landfill	Glass soft drink/beer bottles - return for recycling. Recycling options for Plastic and Glass to be evaluated and if identified, segregate at source from General Waste and recycle.
	Laboratory glassware and bottles	Mine site metallurgy & EHS laboratories	Glassware to be triple rinsed, crushed and sent to General Waste stream.	• Any chemical residuals to be managed as hazardous waste
	Papers, magazines, office paper, packaging, cardboard boxes, etc.	Main source will be Administration block, warehouse and camp/mess areas with some from maintenance of equipment.	Sent to landfill or incinerate	• Evaluate use as mulch in rehabilitation of mine site. Once approved, segregate at source and recycle. Paper and cardboard waste will be stored in 1m ³ bulk bags.
2. Kitchen Grease/Oil	Used cooking oil and galley grease from oil separators	Main mess at Marampa Mine site plus galley on board vessels.	Residue from grease traps and oil to be stored in drums and incinerated.	• Potential to on sell cooking oil

Waste Stream	Waste Types	Source	Management Option	Comments
3. Metals	Ferrous and non-ferrous parts including engine parts, structural steel, offcuts,	Main source will be from maintenance of plant and equipment at the Mine site and Thofayim. Minor amounts from mess/camp area.	Sent for recycling	<ul style="list-style-type: none"> • Service provider to be sourced
	Food tins	Main mess at Marampa Mine site	Segregated at camp & consolidated into main scrap metal storage	<ul style="list-style-type: none"> •
	Aluminium drink cans	Camp and mess	Segregated at source and recycled	<ul style="list-style-type: none"> • Evaluate supplying local micro smelters that utilise Al cans for manufacturing.
4. Food	Food scraps	Tugs/Transshippers	Food scraps generated offshore will be macerated to <25mm in size and discharged in SL estuary below Pepel or sent to shore for management.	<ul style="list-style-type: none"> • No discharge to Port Loko Creek or in SL estuary above Tasso Island.
	Food scraps	Main mess at Marampa Mine site.	Send to piggery in Lunsar as fodder for farm animals.	<ul style="list-style-type: none"> • MML to plan towards transition to composting for rehabilitation requirements.
5. Wood	Pallets, furniture, scraps from building maintenance, dunnage, crates.	All areas, but mainly warehouse and lesser amounts from maintenance.	Wood will be segregated and either reused in building or used in mine site rehabilitation program (e.g. organic material, erosion control).	<p>Protruding nails are to be removed.</p> <p>If wood is contaminated with oil it should be incinerated.</p> <p>Wood with no operational reuse value can be supplied to community for use as firewood after nails removed.</p>

Waste Stream	Waste Types	Source	Management Option	Comments
Waste Stream	Waste Types	Source	Management Option	Comments
	Trees	Clearing of land for mining or other activities	Liaison with local communities to recover as far as practicable felled trees for use as firewood or building materials. Residual material to be used for mine site rehabilitation, erosion control and mulch.	• Safe access for community to work areas and working in vicinity of machinery will need attention by Safety personnel
6. Bulk Landfill	Waste concrete, old conveyor, old rubber liners form pumps and shuts, old process screens, and scrap tyres	Mine site haul trucks, road maintenance vehicles (water trucks, graders), light vehicles, auxiliary equipment (e.g. forklifts), conveyors (Mine site, Thofayim, transhipper), plant site, and concentrate haulage trucks	Co-dispose to mine site waste rock dump and bury at least 10m below final surface. Some tyres may be used for creating fenders at Thofayim as well as to create traffic buffers along the haul road.	• MML will evaluate whether used tyres can be placed in a monofill for potential later recovery should tyre recycling be practical in the future.

Table 5-2: Management of Hazardous Waste Streams Produced by MML

Waste Stream	Waste Types	Source	Management Option	Comments
1. Hazardous Waste - Batteries	Lead acid, lithium ion, etc	Lead acid from mobile plant and light vehicles.	Batteries to be drained of acid and sent for recycling. Low Hg alkali batteries will be sent to landfill as part of general waste.	Acid from lead-acid batteries - see chemical waste stream No battery is to be broken up to recover the metal. Only whole batteries are to be sent for recycling
2. Hazardous Waste - Electronic	Old computers, screens, instrumentation, electrical boards, white goods with motherboards,	Mainly associated with offices but also instrumentation from plant and mobile plant	Electrical waste shall be stored until sufficient quantity has been accumulated for export to a registered waste recycling facility.	Note that most general electrical goods can have motherboards removed (if any) and then sent as scrap metal for recycling. Consideration will be given to providing refurbished computer equipment to NGO. Note some white goods and instruments may contain a mercury switch which will also need removing and sent to Hazardous Waste - Fluorescent Lights.
3. Hazardous Waste - Flammable Liquids	Solvents, thinners, paints and other flammable liquids chemicals	Mainly sourced from maintenance of mobile and fixed plant	Flammable Liquids to be stored on site and incinerated	

Waste Stream	Waste Types	Source	Management Option	Comments
Hazardous Waste - Oil	Used engine oil, hydraulic oil, etc	Mainly sourced from maintenance of mobile and fixed plant	Incinerated	MML to assess use of waste oil as ANFO MML to assess option for use as fuel in dryer or boiler.
5. Hazardous Waste - Oily Solids	Filters, oily rags, absorbents, gloves, dried paint, oily sludge	Mainly sourced from maintenance of mobile and fixed plant	Oily solids to be stored on site and incinerated	Metal recovered to be recycled. Incineration ash to be stabilised and landfilled. MML to evaluate whether oily sludge can be mixed with bitumen and used in road sealing.
6. Hazardous Waste - Oily sediments	Small amounts of oil contaminated sediments associated with maintenance, oily water separators and small spills.	Mainly sourced from maintenance of mobile and fixed plant	Oily sediments to be land farmed to facilitate biodegradation of oils	• Incineration also an option if required
7. Hazardous Waste - Chemicals	Laboratory waste, acid residue	Laboratory and maintenance (lead acid batteries)	Acids to be neutralised via lime pits	• Unused chemicals shall be returned to supplier and use of tote tanks and other re-usable containers results in minimal residual chemicals being produced.
	Conditioned water and boiler blow down water	Power house	Neutralised to neutral pH, analysed and used for dust suppression	• Assess ability to reuse

Waste Stream	Waste Types	Source	Management Option	Comments
8. Hazardous Wastes - Sewerage	Sewerage (black and grey water)	Tugs/transhippers	Treated on vessel in compliance with MARPOL and discharged in SL estuary below Tasso Island. If MARPOL compliant treatment system is not available, then blackwater to be stored in tank and shipped to shore for treatment.	No discharge to Port Loko Creek or in SL estuary above Tasso Island.
	Effluent	Onshore - Marampa Mine site and Thofayim	Sewerage treatment plant	
	Sludge	Onshore - Marampa Mine site and Thofayim	Sludge from the sewerage treatment plants will be recovered and landfarmed as part of the mine site rehabilitation program.	High organic and nutrient loading will aid mine site rehabilitation

Waste Stream	Waste Types	Source	Management Option	Comments
9. Hazardous Wastes - oily water	Bilge	Tugs/transhippers	Treated on vessel in compliance with MARPOL and discharged in SL estuary below Tasso Island. If MARPOL compliant treatment system is not available, then bilge to be stored in tank and shipped to shore for treatment at Thofayim.	• No discharge to Port Loko Creek
	Produced water	Powerhouse from pretreating RME180 with steam	Produced water to pass via oil-water separator and then discharged. Recovered oil returned to fuel tanks.	
10. Medical Waste	Swabs, dressings, out of date medicine, syringes, etc	Mine site clinic	Medical waste to be incinerated	
11. Hazardous Waste - Fluorescent Lights	Fluorescent tubes & bulbs	ALL	Bulbs and fluorescent tubes to be stored until sufficient quantity has been accumulated. Tubes to be broken and encapsulated in concrete prior to landfill.	MML will evaluate the potential to use low Hg tubes that can be sent to landfill. Hg switches also placed in this waste stream.

Waste Stream	Waste Types	Source	Management Option	Comments
12. Hazardous Waste Containers	Steel drums that may contain trace hydrocarbons and other chemicals.	Mainly sourced from maintenance of mobile and fixed plant, with minor amounts associated with cleaning products.	Drums to be drained, rinsed, crushed and recycled - Metals. Any recovered liquid to be stored and treated as either as Hazardous Waste - Chemicals or Hazardous Waste - Flammable liquids.	Rinsed drums to be crushed/shredded or otherwise rendered unusable on site. Recovered residual hydrocarbons to be recycled as Waste Oil.
	Plastic drums that may contain hydrocarbons and other chemicals		Drums to be drained, rinsed, crushed and sent to landfill - General Waste. Any recovered liquid to be stored and treated as either as Hazardous Waste - Chemicals or Hazardous Waste - Flammable liquids.	Recovered residual thinners, solvents or paints to be incinerated. MML will explore potential for bulk lubricants to avoid use of drums.
	Old paint cans that may contain residual paint		Residual paint to be dried in can and cans incinerated	• Recovered metal to be recycled post incineration.
	Empty or near empty aerosol cans		Storage in hazardous waste facility (either contractor or MML).	Cans should be fully used prior to being sent to landfill. Recycling. Empty can, puncture to depressurise and send to metal recycler. Recover liquids and store in hazardous waste facility. Recovered hydrocarbons to be recycled. Incinerate. Recovered paints and solvents to be incinerated.

Waste Stream	Waste Types	Source	Management Option	Comments
13. Hazardous Waste - Radioactive Sources	Used densitometers with Cs source	Will only occur at plantsite decommissioning	Have return to provider agreement in place when units are purchased	<ul style="list-style-type: none"> • No disposal to landfill

5.2 WASTE EXPORT REQUIREMENTS

MML may export certain waste types where the available management technology is not available in Sierra Leone or is not practicable.

The approval process for the shipment of wastes to other countries is governed by the Basel Bamako Conventions (to which Sierra Leone is a signatory) which requires approval to be sought from the exporting and importing countries and also those countries through which the waste must transit. The general policy of most governments is that wastes should not be imported for disposal unless the exporting country does not have, and cannot reasonably acquire, the technical capacity and necessary facilities to dispose of the waste in question in an environmentally sound manner.

The basic approval process required by both the Basel and Bamako conventions is described briefly below.

Firstly, the generator or exporter of the wastes must notify the competent authorities of the States of import and transit of the proposed trans boundary movement of hazardous or other wastes. The notification must contain specific information which is detailed within the conventions, although this can also be found on transit documents prepared by each country. The notification package is the completed notification form accompanied with information such as:

- the source, composition and quantity of the waste for disposal, the producer's identity and, in the case of waste from various sources a detailed inventory of the waste and, if known, the identity of the original producers;
- the arrangements for routing and for insurance against damage to third parties;
- the measures to be taken to ensure safe transport and, in particular, compliance by the carrier with the conditions laid down for transport by the Member States concerned;
- the identity of the consignee of the waste, the location of the disposal centre and the type and duration of the authorisation under which the centre operates. The centre must have adequate technical capacity for the disposal of the waste in question under conditions presenting no danger to human health or to the environment;
- the operations involving disposal; and
- guarantees that specify that the disposal and recovery operation is carried out in an authorized centre and complies with the requirements for environmentally sound management.

In addition to the Basel/Bamako Convention notification, transit documents or waste transfer notes, must be completed and must accompany any transfer of waste between different holders. These documents contains enough information about the waste to enable anyone coming into contact with it to handle it safely and either dispose of it or allow it to be recovered within the law.

Once the State of import receives the official notification, it must respond to the notifier in writing, consenting to the movement with or without conditions, denying permission for the movement, or requesting additional information. The notifying organisation will either be MML or a designated waste contractor exporting the waste on behalf of MML. A copy of the final response of the State of import is to be sent to the competent authorities of the other States concerned.

Waste cannot be exported until MML has received written confirmation that: a) the notifier has received the written consent of the State of import; and

b) the notifier has received from the State of import, confirmation of the existence of a contract between the exporter and disposer specifying environmentally sound management of wastes in question.

Each State of transit must also acknowledge the notifier that they have received the notification.

The disposer must inform both the exporter and the competent authority of the State of export when it receives the wastes and also when disposal has been completed. The Competent Authority is the body that has responsibility for administering the requirements of the Basel Convention (in the UK this is the Environment Agency for England and Wales).

These wastes will be exported in a timely manner following all international export procedures.

5.3 WASTE CONTRACTORS

MML mining will either handle its waste management program itself or contract out all or part of its waste management program to a contractor.

MML will work to identify waste management contractors in Sierra Leone and assess whether the service on offer are of benefit to MML. However, it should be noted that for some wastes types, MML will not actively support development of certain waste treatment facilities in Sierra Leone as they are either highly specialized or the quantity of the particular waste that MML produces does not warrant establishment of such facilities (e.g. vacuum distillation plant for mercury recovery).

5.3.1 Contractor Requirements

Once the waste management industry develops in Sierra Leone, only those waste management contractors that meet the appropriate standards and are approved by the MML HSE Department shall be used to manage MML waste.

Waste management contractors shall:

Obtain and maintain all required permits for their facilities and operations.

○ As a minimum this shall include an EPA permit to manage the wastes for which they have been awarded a contract (if applicable).

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Provide a copy of their current EPA permit to the MML HSE Department; • Details of all waste treatment methods, including safety protocols;

Provide the names, contact details, location, or any other information as requested to MML of any sub-contractors the waste management contractor may use; ○ The contractor shall not utilise any sub-contractor or third party for the recovery, disposal, treatment or management of MML's wastes, including recycling of wastes or residues, which does not have a valid EPA permit or is not otherwise permitted by the appropriate authority.

Accompany MML HSE personnel in inspecting the sites of any subcontractors or third party. MML shall advise the contractor in writing as to whether the subcontractor or third party is approved for use

Ensure that waste shall only be treated by, or disposed via, MML approved methods;

Ensure that waste shall not be dumped at any location and shall not be forwarded to non-approved sub-contractors;

Submit a Monthly Waste Report (See Section 6)

Provide documentation confirming receipt of waste and quantities involved using the MML Waste Transfer Note system;

Report to MML any infringements of disposal standards or any HSE issues of concern; and

Monitor discharges to the environment and report to MML monthly.

6 REPORTING & RECORDS

6.1 REPORTS

The quantity of each waste stream produced and disposed of shall be reported on a monthly basis. This will include the quantity of wastes reused, recycled or recovered.

Specific reporting requirements for the incinerator are included in Appendix 7.2.

Specific reporting requirements for the sewerage treatment plant are included in Appendix 7.3.

6.2 WASTE TRANSFER NOTES

When wastes are sent off site to a third party contractor to manage, waste transfer notes (WTN) are fundamental to ensuring that wastes are transferred from the generator, through the transportation chain to the disposer and provide a record of due diligence and duty of care. The WTN tracks the waste stream from the point of origin to the deposit location. WTN's will accompany all waste consignments originating from Marampa Mines site operations. Appendix 7.5 provides an example of a WTN.

Each WTN shall have:

A unique identifying number for tracking purposes;

Generating Source/Operational Site details;

Brief description of the waste bulk;

Total quantity of each waste received – weight (metric t or kg) or volume (L or m³) or units (for drums). All wastes received by the Contractor from MML shall be quantified by Contractor;

Container description, e.g. 4m³ open skip, 200L drum, 4m³ sealed skip, 1m³ pod, etc;

Transporter

Designated treatment/disposal facility

Relevant dates and times from pick-up, transport modes whiles in transit;

Name and signature of Contractor representative collecting the waste from the port/MML site;

In the case of wastes passed on to a third party/sub-contractor for treatment and/or disposal, a waste transfer note (WTN) shall be raised documenting this transfer;

The total wastes sent to external contractors, for either disposal or recycling/reuse, shall be recorded for each waste type, including WTN.

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6.3 AUDITS, INSPECTIONS AND MONITORING

Audits of the waste management system shall be conducted annually to ensure compliance with this plan. Audits shall include any waste management contractor that receives wastes from MML as well as contractors working for MML.

Regular inspections of waste management practices shall also be undertaken by HSE management on a regular basis.

Monitoring of emissions and effluent are described in the Environmental Monitoring Plan

APPENDICES

7.1 MML LANDFILL

The MML landfill will be managed in such a manner as to minimise potential direct impacts and long-term liabilities. The landfill shall only be used for managing non-hazardous wastes as listed in Section 5.

No hazardous wastes shall be sent to the landfill. If any hazardous wastes are found in the landfill then this shall be investigated as an environmental incident and appropriate measures taken to remove the hazardous waste.

7.1.1 Location:

The criteria for locating a landfill are:

At least 100m from watercourses, lakes or community water sources.

In lateritic material

Not in a water logged area or where the water table is at or immediately below the maximum depth of the landfill

The location of all landfill sites must be recorded and included in the GIS data base as a minimum. This includes all pillar points.

7.1.2 Management

Soil cover and compaction. The deposited waste shall be regularly covered with soil (lateritic material) to minimise pests, windblown litter and scavenging. During this process the dozer should also run over the waste to improve compaction.

During the dry season, soil cover may need to be placed more regularly to prevent wind blown materials.

Placement of waste – the working area shall be minimised at all times to maximise use of the facility and minimise waste exposed at any one time.

Litter fence – a fence shall be erected to trap any windblown litter, especially plastics and paper.

Litter that has escaped the landfill must be collected and returned to the landfill.

A vegetation screen shall be encouraged around the site to both minimise wind and to improve aesthetic impacts.

Runoff control – the area surrounding the landfill shall be landscaped to prevent runoff from entering the landfill void.

An access road shall be maintained for ease of access for collection vehicles, inspections of the site and maintenance

Inspections – The HSE Department shall inspect at least weekly the landfill area to ensure it is being managed as per standards, including type of wastes being disposed and presence of escaped litter

There should be no open burning of the waste in the landfill.

MML has an incinerator for burning wastes.

If pests are present at the landfill, then other means shall be used to control them.

Security – To minimise scavenging, the landfill should be included as part of the routine security patrols.

Storage – no waste should be stored at the landfill. Materials should be placed directly onto the working face of the landfill, compacted and buried.

7.2 MML INCINERATOR

MML has a hazardous waste incinerator with the following characteristics:

A two chamber batch waste incinerator capable of handling 100kg/batch;

Diesel is used as the fuel supply for the incinerator. If available in country, low sulphur diesel should be used;

Temperature in the first chamber ranges from 800-1050°C;

Temperature in the second chamber ranges from 950-1200°C;

The retention time in the second chamber is 2 seconds;

The incinerator should be operated in accordance with the manufacturer's procedures and should be maintained in accordance with the manufacturers recommended maintenance schedule;

Equipped with temperature probes and data loggers which will enable temperatures in areas of interest such as the primary combustor, secondary chamber to be recorded;

Equipped with sampling ports to enable discharge monitoring of air emissions if required; and

Equipped with a waste oil injection system.

For the incinerator, the following records shall be kept for each month.

The quantity of each waste stream (Refer to Section 3.2) received and burnt at the incinerator

Note: A scale shall be used to measure the weight of all materials charged to the incinerator.

For liquids, the amount shall be estimated when transferring the waste into the waste oil injection unit tank

The hours of operation for the incinerator each day (hours)

The quantity of diesel fuel used per month (litres/month)

Sulphur level of diesel used should also be reported.

Quantity of ash produced (kg/month).

Note any residual metals in the ash shall be separated and sent to recycling. Weight to be recorded.

Weight of ash to be recorded after separating metals.

Results of any TCLP test-work on disposed ash.

Method by which ash was disposed.

Results of any stack emission measurements or any ash sampling data collected during the period.

Training in the use of the incinerator will include:

Provision of procedures and checks for all mechanical equipment;

System safety including identification of hazards that the operator should recognize and PPE requirements;

Waste characterisation and how waste composition can affect operation of the equipment/processes;

Loading limitations, including materials that should NOT be managed in a particular piece of equipment (e.g. aerosol cans in incinerator)

Start-up procedures and the normal operation cycle;

Operation, maintenance schedule, troubleshooting procedures and adjustment of the equipment to maximise performance; and

Clean out procedures.

7.3 MML SEWERAGE TREATMENT SYSTEM

There is a network of sewerage pipes to collect black and grey water from facilities and direct it to collection pits. From the collection pits, the sewerage will either flow directly to the sewerage treatment plant or be transferred via suction trucks.

Raw sewage will be directed into the primary section of the treatment plant where it is anticipated 30% of the BOD load will settle out. The primary settlement section is equipped with baffles to prevent any floating scum entering the biological phase of the treatment. This section is equipped with:

A forward feed system that lowers the level during periods of low flow to provide a balancing volume for possible surges in the influent.

Fixed de-sludging points

Inlet flow control

The primary tank will be constructed with a hopper bottom arrangement that will allow sludge to settle, and periodically be removed through a timed actuated valve arrangement to a separate sludge storage tank.

After primary settlement the influent flows under gravity to the biological treatment modules. This section is of the submerged bed aerated filter type and is split into several chambers each filled with high voidage plastic media. Whilst passing through these chambers both carbonaceous and nitrifying processes take place. Air to oxidise the influent and to scour excess biomass from the filter media is introduced continuously below each chamber by a series of diffusers. Each diffuser is capable of being removed for maintenance without the necessity to shut down the plant.

Following biological treatment, the effluent flows into the final settlement tank where the excess biomass settles out. This section is equipped with an airlift sludge and scum return which is arranged to periodically and automatically transfer settled humus sludges to the primary section for co-settlement with the primary sludges.

To treat the sludge, Robust Aerobic Digesters have been included in the system that are designed for both storage and sludge reduction. Design criteria per person:

Flow (l/day) - 180

BOD (g/d) - 60

NH₃ (g/d) - 8.0

Influent parameters:

Peak flow to treatment: 1.41 l/sec.

Max BOD concentration: 333.3 mg/l

Max NH₃ concentration: 44.4 mg/l

pH 7-9

No toxic substances or biological inhibitors to be present in the influent

Effluent Discharge (95% ile)

BOD₅: 20 mg/l

Suspended solids: 30 mg/l

Ammonium nitrogen: 10 mg/l

MML will use the volume of potable water produced as the proxy for the quantity of sewerage discharge.

Effluent quality will be monitored monthly and will include pH, TSS and BOD (or COD as surrogate), total N, total P and total coliform bacteria. Oil and grease content will be measured once every six months.

7.4 RADIATION SOURCE RETURN TO PROVIDER AGREEMENT EXAMPLE



Head Office
148 Edison Ave
Nuthall, SH
Roadway, 2067
Gauteng, South Africa

P.O. Box 1515
RANDBURG
2122
South Africa

☎ +27 (11) 462 0222
☎ +27 (11) 462 0615
e-mail: sales@process-auto.com
www.process-auto.com

ISOTOPE RETURN ACCEPTANCE

QD: 819/00/12

PLEASE CONTACT SENDER, SHOULD INFORMATION NOT BE CLEAR

OUR REF	SO34952	DATE	17 th July 2013
TO	MARAMPA MINE-RPO	FROM	PROCESS AUTOMATION PTY LTD, SOUTH AFRICA
FAX NO	+232 22 234 253	FAX NO.	+27 (11) 462-0615
TEL NO	+232 78 121 123	TEL NO	+27 (11) 462-0222
ATT.	REGINALD GARRICK rgarrick@londonminings.com	SENDER e-mail	JANET COOKE pa-eng@process-auto.com

RE: RETURN OF EXPORTED RADIOACTIVE ISOTOPES

Type	Activity (mCi)	Equipment	Customer Order No.	P.A. Order No.	Isotope Serial No.	DoH Authority No.
Cs137	31	DENSITY GAUGE	4900002150	SO34952	9853CO	0501/1E/13/1167
Cs137	31	DENSITY GAUGE	4900002150	SO34952	7927CO	0501/1E/13/1167
Cs137	30	DENSITY GAUGE	4900002150	SO34952	9843CO	0501/1E/13/1167
Cs137	30	DENSITY GAUGE	4900002150	SO34952	9842CO	0501/1E/13/1167
Cs137	10	DENSITY GAUGE	4900002150	SO34952	8771CO	0501/1E/13/1167
Cs137	10	DENSITY GAUGE	4900002150	SO34952	8775CO	0501/1E/13/1167
Cs137	5	DENSITY GAUGE	4900002150	SO34952	8870CO	0501/1E/13/1167
Cs137	5	DENSITY GAUGE	4900002150	SO34952	9061CO	0501/1E/13/1167
Cs137	5	DENSITY GAUGE	4900002150	SO34952	9667CO	0501/1E/13/1167
Cs137	6	DENSITY GAUGE	4900002150	SO34952	9666CO	0501/1E/13/1167
Cs137	6	DENSITY GAUGE	4900002150	SO34952	9059CO	0501/1E/13/1167
Cs137	5	DENSITY GAUGE	4900002150	SO34952	9888CO	0501/1E/13/1167
Cs137	6	DENSITY GAUGE	4900002150	SO34952	8887CO	0501/1E/13/1167


This letter serves as a formal undertaking to accept the return of the above exported nuclide(s), in the event that **MARAMPA MINE** no longer has a need or use for said nuclide(s).

Responsibility for transportation of the source holders (complete with isotopes) to Process Automation lies with the client, who must ensure that Process Automation has adequate notice of such return in order to arrange the necessary Customs ITAC permission, and our Dept. of Health (Radiation Control) Import Authority. An Export Permit will also be required from your government Radiation Control body.

The cost of disposal will be quoted for at the time that return is required, and an official order must be placed by yourselves before we are able to accept the return.

Please do not hesitate to contact me should you have any queries.

Kind Regards


Janet Cooke / Sue Turner
E-mail: pa-eng@process-auto.com

Directors: D.J. Fourie (Managing), N.C. Maduna, M.L. Nylamp, W. Pillay (Alt.)

7.5 MML WASTE TRANSFER NOTE (WTN): EXAMPLE ONLY

SL MINING - WASTE TRANSFER NOTE			
WASTE CONSIGNMENT INFORMATION			
WASTE TYPE REFERENCE CODE:		CONSIGNMENT REFERENCE (DATABASE GENERATED)	
WASTE ORIGINATION POINT:		ESTIMATED WEIGHT, VOLUME, or NUMBER:	

WASTE CONTAINER TYPE:		WASTE CONTAINER ID:	
WASTE CONSIGNMENT PHYSICAL DESCRIPTION			
WASTE TRANSPORTATION INFORMATION			
WASTE ORIGINATOR COMPANY		NAME/POS:	DATE <u>STAMP</u> & SIG:
WASTE TRANSPORTER COMPANY #1 (*)		NAME/POS:	DATE <u>STAMP</u> & SIG:
WASTE TRANSPORTER COMPANY #2 (*)		NAME/POS:	DATE <u>STAMP</u> & SIG:
FINAL DISPOSAL POINT (§):		NAME/POS:	DATE <u>STAMP</u> & SIG:
(*) ADD TRUCK REGISTRATION NUMBER OF MARINE VESSEL NAME			
(§) FINAL 'FATE' OF WASTE (e.g. landfill, recycling, onward sale etc.)?			
WASTE CONSIGNMENT <u>FINAL</u> DISPOSAL WEIGHT			
WASTE COMPANY:	WEIGHT/VOL:	NAME/POS & DATE <u>STAMP</u> /SIG:	
MML CLOSE OUT			
NAME & POSITION:		DATE <u>STAMP</u> & SIGNATURE	