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Environmental Management Plan for the Storage and Handling of Swakop Uranium's Chemicals and Reagents at the Manica Logistics Centre Warehouse and Rennies Container Terminal

SLR Project No.: 734.19008.00036

Report No.: 3

April 2016

MANICA NAMIBIA
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ENVIRONMENTAL MANAGEMENT PLAN FOR THE STORAGE AND HANDLING OF SWAKOP URANIUM'S CHEMICALS AND REAGENTS AT THE MANICA LOGISTICS CENTRE WAREHOUSE AND RENNIES CONTAINER TERMINAL

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ACRONYMS AND ABBREVIATIONS

Below a list of acronyms and abbreviations used in this report.

Acronyms / Abbreviations	Definition
AMSL	Above mean sea level
BID	Background Information Document
DEA	Directorate of Environmental Affairs
EIA	Environmental Impact Assessment
EMA	Environmental Management Act
EMP	Environmental Management Plan
IAP	Interested and Affected Party
IBC	Intermediate bulk container
km²	square kilometres
km/h	Kilometre per hour
m	Metre
M^2	Square metres
MET	Ministry of Environment and Tourism
MSDS	Material Safety Data Sheet
Ramsar	Ramsar sites are wetlands of international importance, designated under the Ramsar Convention.
SEA	Strategic environmental assessment

ENVIRONMENTAL MANAGEMENT PLAN FOR THE STORAGE AND HANDLING OF SWAKOP URANIUM'S CHEMICALS AND REAGENTS AT THE MANICA LOGISTICS CENTRE WAREHOUSE AND RENNIES CONTAINER TERMINAL

1 INTRODUCTION

1.1 BACKGROUND

Swakop Uranium (Pty) Ltd (Swakop Uranium) is in the process of constructing and developing a uranium mine in their Mining Licence Area (ML 171), called the Husab Mine. The mine and processing plant are located in the northernmost part of the Namib Naukluft National Park (NNNP) in the Erongo Region of Namibia, approximately 70 km north-east of the Walvis Bay port. As per the project schedule the processing plant is planned to be commissioned in May/June 2016.

Swakop Uranium decided to store the reagents at existing facilities outside of the port (most likely for the first couple of years). The facilities (and associated activities) relating to the storage of the reagents inside the port (which was assessed as part of a separate EIA process – SLR, 2015) can therefore be seen as (a possible) 'phase 2 project'. As part of 'phase 1' Swakop Uranium has contracted Manica Group Namibia (Pty) Ltd (Manica) to transport the reagents and chemicals from the port, where it will be off-loaded from the ships, to their existing Manica Logistics Centre (MLC) Warehouse and Rennies Container Terminal for temporary storage, before being transported to the Husab Mine Site. The MLC warehouse and Rennies Container Terminal are both located inside the industrial area in Walvis Bay. The local setting of Manica's storage facilities within Walvis Bay is shown in Figure 1-1.

An application will therefore be submitted by Manica to the Ministry of Environment and Tourism (MET) for a decision in terms of the Environmental Management Act, 7 of 2007 for the proposed listed activities at the port and the their storage facilities (refer to section 1.3 of the Scoping Report). SLR has been appointed by Manica to manage the EIA process.

This document is the Environmental Management Plan (EMP) that has been developed as an outcome of the EIA Scoping (including assessment) process for the storage and handling of Swakop Uranium's chemicals and reagent at the Manica facilities.

An interim EMP has been prepared at the end of 2015 and submitted to the Environmental Commissioner (Ministry of Environment and Tourism), due to the fact that some of the reagents (i.e. sulphur in break bulk) as per previously fixed contracts are en-route to Walvis Bay or have already arrived prior to the EIA scoping process being finalised. This EMP will however supersede the "Interim EMP".

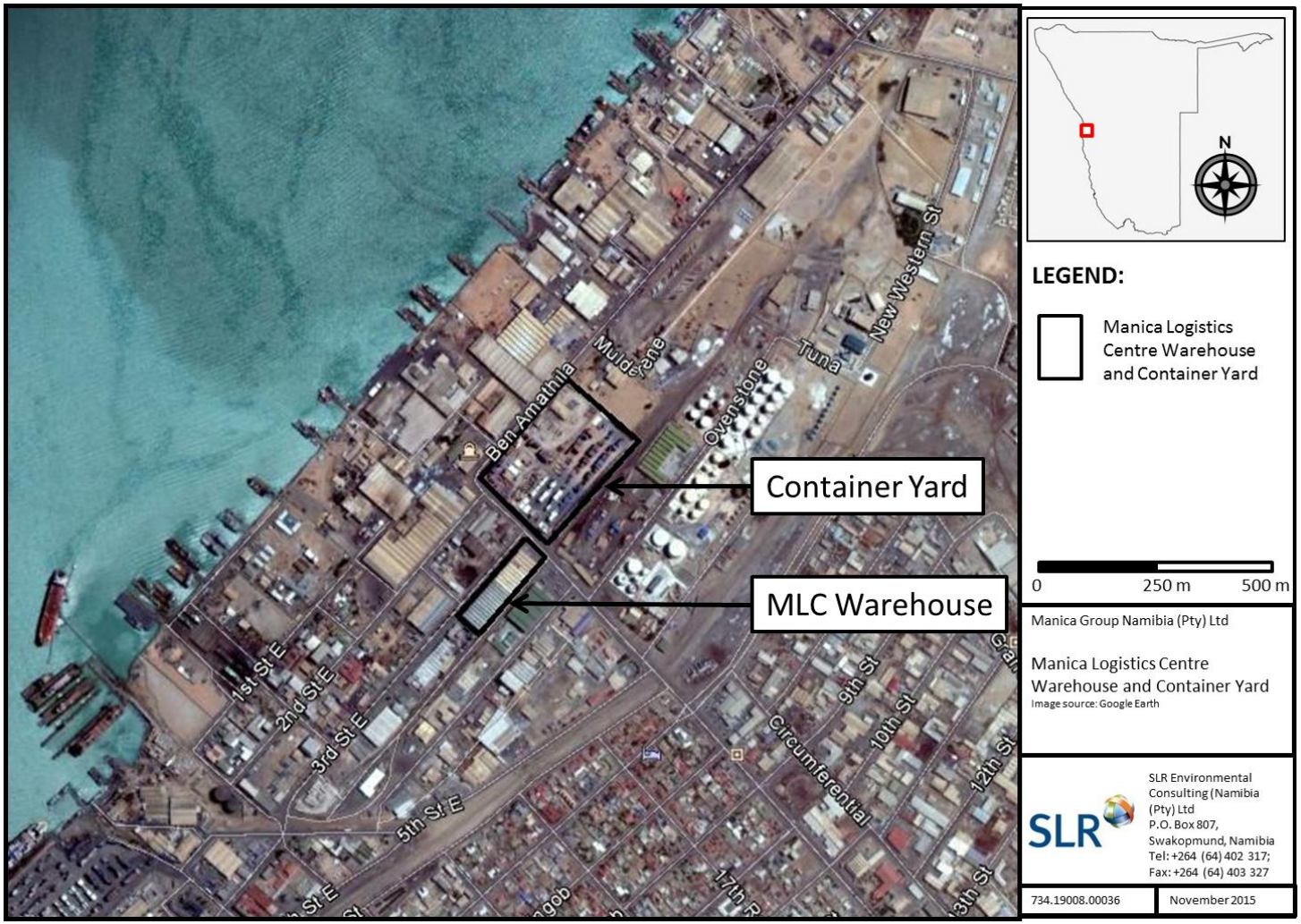

FIGURE 1-1: LOCALITY OF THE MANICA STORAGE FACILITIES IN THE WALVIS BAY CONTEXT

1.2 PROPOSED ACTIVITIES AND FACILITIES

1.2.1 REAGENTS AND CHEMICALS

The table below provides a list of the reagents and chemicals, with proposed quantities, that will be stored at the MLC Warehouse and Rennies Container Terminal for further transportation to the Husab Mine Site (at full production of the Husab Mine processing plant).

TABLE 1-1: REAGENTS TO BE STORED AT THE MANICA FACILITIES

	QUANTITIES in tonnes (ANNUALLY)	SHIPPING MODE	STORAGE LOCATION
Sulphur	**189 000**	**Bulk & Break Bulk**	**Rennies Container Terminal**
Pyrolusite	**43 846**	**Break Bulk**	**Rennies Container Terminal**
Ferrous Sulphate	**93 480**	**Break Bulk**	**MLC Warehouse**
Grinding Media (SAG Mill)	**6 000**	**Container**	**MLC Warehouse**
Grinding Media (Ball Mill)	**9 000**	**Container**	**MLC Warehouse**
Flocculant	**1 324**	**Container**	**MLC Warehouse**
Coagulant	**3 356**	**Container**	**MLC Warehouse**
Sodium Carbonate	**2 405**	**Container**	**MLC Warehouse**
U IX Resin	**323**	**Container**	**MLC Warehouse**
Extractant	**21**	**Container**	**MLC Warehouse**
Modifier	**11**	**Container**	**MLC Warehouse**
Sodium Hydroxide	**2 321**	**Container**	**MLC Warehouse**
Diatomaceous Earth	**17**	**Container**	**MLC Warehouse**
Lime	**37**	**Container**	**MLC Warehouse**
Activated Carbon	**41**	**Container**	**MLC Warehouse**

For further details on these reagents and chemicals, please refer to Section 4.1.1 to 4.1.14 of the EIA Scoping (including assessment) Report for the storage and handling of Swakop Uranium's Chemicals and Reagents at the Manica Facilities. The Material Safety Data Sheets have been included in Appendix A. The hazard classification for the various reagents and chemicals are summarised in the table below.

TABLE 1-2: HAZARD SUMMARY

Reagents	Hazards to humans (third parties and biophysical environment)	Hazardous / non-hazardous classification
• Pyrolusite (Manganese dioxide)	• Harmful to ingestions and inhalation system • Oxidising; harmful with possible long-term effects	• Hazardous

Reagents	Hazards to humans (third parties and biophysical environment)	Hazardous / non-hazardous classification
• Activated carbon	• Might be slightly irritant with eye contact; Excessive ingestion may cause nausea or gastrointestinal discomfort.	• Non-hazardous
• Flocculent	• The flocculant (MF 333 as per submitted data) does not require a hazard warning • If wet, slip potential	• Non-hazardous
• Coagulant	-	• Non-hazardous; According to the reagent submitted by Swakop Uranium; other coagulants might be hazardous.
• Extractant	• Toxic • Dangerous to the environment • Flammable	• Hazardous
• Grinding media	• Slip potential	• Non-hazardous
• Modifier	• Irritant to ingestions and inhalation system • Highly flammable	• Hazardous
• Sodium Carbonate	• Irritant to eyes and skin as well as ingestions and inhalation system	• Non-hazardous
• Sodium Hydroxide	• Causes severe burns • Short exposure could cause serious temporary and/or permanent injury	• Hazardous
• Iron Exchange (U IX) Resin	• The resin should not require a hazard warning • Slip hazard	• Non-hazardous
• Diatomaceous Earth	• Irritant • Very Hazardous with inhalation (long term)	• Hazardous
• Ferrous Sulphate	• Irritating to eyes and skin • Harmful to ingestions and inhalation system • Non-flammable	• Hazardous
• Sulphur	• Irritating to eyes and skin • Harmful if swallowed • Flammable and dust explosion risk	• Hazardous
• Lime	• Potential burns to eyes and skin of operators on the quay or ship.	• Hazardous

1.2.2 SHIP OFF-LOADING AND TRANSFER OF REAGENTS AND CHEMICALS

The reagents and chemicals will arrive on the ships (at the relevant bulk handling facilities' berth) in either break bulk or in containers (or in the case of sulphur bagged and later bulk), as summarised in Table 1-3 below.

TABLE 1-3: SHIPMENT SIZE AND TYPE OF REAGENTS

Reagents	Shipment size tonnage		Containers		Shipment comments
	Bulk	Break Bulk	Container tonnage	Number of containers per month	
Pyrolusite		5 000			Nine shipments per year
Activated Carbon			3		Once a year
Flocculant			110	5.52	Might be once or twice per month depending on shipping line.
Coagulant			280	13.98	
Extractant			2		Once a year
Grinding Media (SAG mill)			500	20	Might be once or twice per month depending on shipping line.
Grinding Media (Ball mill)			750	30	
Modifier			1		Once a year
Sodium Carbonate			200	10.02	Might be once or twice per month depending on shipping line.
Sodium Hydroxide			193	9.67	
U IX Resin			27	1.35	
Diatomaceous Earth			1		Once a year
Ferrous Sulphate		10 000			Nine shipments per year
Sulphur		60 000			4 shipments
	30 000				Every two months
Lime			208	0.75	1 container every 6 weeks

With reference to the above mentioned table, the reagents will be off-loaded from the ship and transferred to the Manica facilities as follows:

- In break-bulk from ship

  With the exception of the bulk sulphur described below (in bulk from ship), all of the reagents and chemicals will either be stored in containers or in one ton bags (or fourteen ton bags for the Sulphur)[1] that will be off-loaded from the ships with cranes onto the quay side containers will be transported and placed into stacks by Namport. All bagged and containerised reagents will be transported with flatbed trucks to either the MLC Warehouse or Rennies Container Terminal where they will be off-loaded from the trucks with forklifts or Reach Stackers for temporary storage prior to be transported to the Husab Mine Site.

- In bulk from ship

  Initially, prilled sulphur, in the form of small pellets approximately 4 - 5mm in diameter, will arrive on ship in one ton bags and offloaded from ship via on-board crane on the quay side and then loaded onto flatbed trucks for transportation to the Rennies Container Terminal (break-bulk from ship).

  In year 2-3 the bulk sulphur, in the form of small pellets approximately 4 - 5mm in diameter, will be bagged inside the port on the quay side as it gets offloaded from the ship. This will be carried out using a modified "Grab and Hopper Discharge System".

- In containers from ship

  The reagents/chemicals that will be stored in containers will be off-loaded from the ships with cranes onto Namport haul trucks after which containers will be placed into a container stack. Containers will be loaded to trucks and transported to the Manica facilities where the reagents will be unpacked with forklifts for storage. Most of the reagents will be bagged while some will arrive in 1 m^3 intermediate bulk container (IBCs) (flow bins) and pallet boxes.

The movement of the trucks from the discharge berth to the MLC Warehouse and Rennies Container Terminal will occur periodically whenever a shipment arrives in the port. The two storage facilities are located at the following addresses:

TABLE 1-4: MLC WAREHOUSE AND RENNIES CONTAINER TERMINAL ADDRESSES

Site	Location
Rennies Container Terminal	Cnr of Ben Amathila Avenue & 18th Road, Erf 2968
Manica Logistics Centre	3rd Street East, Erf 1492

The trucks from the discharge berth (and back) will follow the main road through the port area and port exit. Two different route options will be utilised depending on destination and the time of day:

- Off peak hours

[1] Swakop Uranium investigated the option of 14 ton bags for the Sulphur. Therefore, the initial consignments of Sulphur to be stored at the Rennies Container Terminal will either be in 1 ton or 14 ton bags. The decision however still needs to be finalised by Swakop Uranium.

The trucks from the discharge berth (and back) will follow the main road through the port area and port exit. The trucks will exit the port directly onto 3rd Street East and follow a direct route to both of the proposed storage facilities. Once on 3rd Road, the trucks are not required to turn at all on route to the Rennies Container Terminal and will only require a single turn to enter the MLC warehouse.

All trucks travelling to the MLC Warehouse will follow this route.

- Peak hours

  The trucks from the discharge berth (and back) will follow the main road through the port area and port exit. The trucks will exit the port directly onto 3rd Street East and will then turn left onto 14th road. They will then turn right onto 2nd Street East, right onto 18th Road and then left into the Rennies Container terminal.

Shipments of bulk sulphur are expected to arrive every two months whilst other chemical shipments are expected to arrive once or twice a month but in smaller quantities.

The transporting operation between the port and the storage facilities is planned to be conducted on a 24/7 basis for break bulk reagents when the ships are in berth at the port. Containerized cargo will be moved during daylight hours only

1.2.3 STORAGE AT THE MLC WAREHOUSE AND RENNIES CONTAINER TERMINAL

Other than the Sulphur and Pyrolusite, all the reagents and chemicals listed in Table 1-1 will be stored in the MLC Warehouse. The Sulphur and Pyrolusite will be stored in bags in the open inside the Rennies Container Terminal boundaries.

1.2.4 TRANSFER OF REAGENTS AND CHEMICALS TO THE HUSAB MINE

All bagged reagents and chemicals will be loaded onto interlink flatbed trucks by forklifts or cranes and transported to the Husab Mine Site as and when required. Ten interlink flatbed trucks will be used for the transport from the Manica facilities to the mine. The Grinding Media will however (most likely) be transported by a side tipper truck or in containers.

The total number of additional trips generated was calculated to a rounded figure of 40 per day. The transporting operation is planned to be conducted on a 24/7 basis. Where possible, transportation at night will be avoided.

Details on the monthly/daily deliveries to the Husab mine and transport routes are included in section 4.2.3 of the EIA Scoping (including assessment) Report.

1.2.5 CONSTRUCTION PHASE

No construction will be required as both the MLC warehouse and Rennies Container Terminal already exist. However certain modifications are required as presented in the risk assessment (Appendix J of the

Scoping Report) and this EMP to ensure the risks associated with the storage of the reagents and chemicals are addressed.

1.2.6 SPECIFICATION AND OTHER INFORMATION OF THE MODIFIED GRAB AND HOPPER DISCHARGE SYSTEM FOR THE BULK SULPHUR TO BE BAGGED ON THE QUAY SIDE

The grab will be designed specifically for the discharging of sulphur only. The unique characteristics of the grab will be considered at length and particular attention will be paid to the following areas:

- Bucket volume: 16 m^3.
- Bucket closing: a slightly heavier than normal grab for increased closing forces will ensure that the grab closes tightly every time.
- Bucket sealing: will be ensured by the unique combination of an underhanging bottom lip and side bucket seals.
- Totally enclosed clamshell bucket so that the product cannot be blown off the top of the grab.
- Entrapment areas: particular attention will be paid to the shape and finish of the bucket and its superstructure. It will have smooth surfaces with no sharp edges or ledges to collect sulphur on the outside of the grab.
- Low friction paint to be used on the bucket to further reduce chances of carrying cargo on the outside of the grab.
- Touch down opening: the grab will have to be rested in the specially designed hopper before it will open. This will ensure a gentle release of cargo and will eliminate dust.
- Adjustable opening speed: the bucket opening speed can be adjusted to ensure the optimal opening time for dust prevention.
- Robust and durable construction will ensure alignment of bucket seals for the life span of the grab.

By designing and building the hoppers as one system, the grab can be used as a ‘plug’ to prevent the escape of dust when the product flows into the hopper. Instead of landing the grab on heavy rails located near the top of the hopper the rails are eliminated and the sides of the hopper are suitably strengthened and rubber lined so that when the grab lands in the hopper it fits snugly and seals the void below.

Air will be displaced when the grab is opened but the gate valve used will be airtight and special vents will channel the air in a controlled manner to exhaust outlets located below the dust suppression foggers. This, in conjunction with the high sided windshields, dust suppression foggers (sprinklers), retractable outlet chute and enclosed discharge area will ensure that dust will be eliminated. Specifications include:

- Spillage guards/wind deflectors will be fitted around the top edge of the hopper to ensure that the grab opens in a controlled environment.
- Dust suppression mist curtain: the grab will drop below this mist curtain before it opens. The mist is essentially a fog which will not wet the grab and cause particles to stick to the outside.

- Hopper/grab fit: this will form a plug in the hopper beneath which the grab will discharge its contents.
- Heavy duty rubber landing pad will ensure a good seal between grab and hopper and also eliminate the risk of fire due to any friction between the grab and hopper.
- Vents below the grab will exhaust displaced air in a controlled manner and release it back into the top of the hopper.
- Hydraulically operated gate outlet valve will ensure an airtight seal below the grab.
- Hopper outlet chute will lower the product in an enclosed and controlled manner into the bag and prevent dust from falling cargo.
- The bag has a sleeve which will have a tight fit onto the outlet of the hopper to prevent spillage.
- A weighing system will be fitted to prevent over filling of the bags and avoid spillage.

2 MANAGEMENT AND MITIGATION MEASURES

The measures required to manage and/or mitigate the potential impacts are detailed in this section. Only the operational phase is addressed below, as no construction is required (except for certain modifications required as presented in the risk assessment, also covered in the section below); and the activities and impacts associated with the decommissioning phase are not relevant as the Manica facilities will not be decommissioned upon termination of the contract with Swakop Uranium.

2.1 OPERATIONS PHASE

2.1.1 TRAFFIC – INSIDE AND OUTSIDE THE PORT

The project will generate two main streams of traffic during operations as follows:

1. The movement of trucks from the discharge berth to the warehouse and Rennies Container Terminal during offloading of a shipment. This movement will occur periodically whenever a shipment arrives in the port.
2. The daily movement of trucks from the Manica facilities to and from Husab Mine. This movement will occur throughout the year.

Secondary streams of traffic will be the movement of personnel which is considered to be negligible in this case.

The transportation of the reagents / chemicals between Walvis Bay and the Husab Mine Site were already previously assessed and approved by the MET. However, due to the fact that the current traffic numbers between Walvis Bay and the Husab mine can be better quantified and the exact route to be followed (specifically inside the town of Walvis Bay) is now confirmed, the potential road traffic impacts have been re-assessed (cumulatively) (as part of the SU port facility EIA process) and compared to the 2011 EIA assessment findings. The management and mitigation measures stipulated in the 'Husab Mine and Associated Linear Infrastructure EMP' (as amended in 2013) associated with traffic related impacts remains valid. The measures provided in this section are therefore in addition to the existing 2013 EMP.

The primary areas of potential conflict identified caused by additional project generated traffic were identified and are listed below:

1. At the 3rd street intersection with Anna Mupetami road (18th Street), the right turn movement of heavy vehicles into Anna Mupetami road. Traffic moving across Anna Mupetami road towards and from the Rennies Container Terminal was also identified as a possible conflict zone, although these traffic flows are generally low.
2. The right turn movement of heavy vehicles from the C28 (D1984) onto the B2.

The following measures are required with regard to the management of traffic-related impacts:

- Proper care should be taken when crossings railways in the vicinity of the site.

- All drivers must adhere to the speed limit of Namport, while travelling inside the port.
- Ensure implementation of a detailed safety code of conduct for transport contractor; to be closely monitored with penalties enforced if necessary.
- Ensure the trucks keep their distance from one another, to allow other road users to pass safely.
- Install tracking devices in trucks to monitor speed and location.
- Ensure that an Emergency Response Plan is in place, in event of an accident. The Manica Emergency Response Procedure (OHS-P-001) outlines what must be done in the event of an accident.
- Assisting in road safety campaigns during December holidays.
- Scheduling of trips to the mine to miss the peak hour traffic in Anna Mupetami Street.

The following measures are not specifically for Swakop Uranium/Manica to implement as it is the responsibility of the Roads Authority/Walvis Bay Municipality. However, Swakop Uranium/Manica must engage with the Roads Authority or Walvis Bay Municipality to inform them about the project and the importance of implementing these measures.

- Upgrading of the Anna Mupetami/3rd Street intersection to a signalized intersection.
- Based on limited information available and taking into consideration the economic importance of the C28 route it is our opinion that upgrading of the route to bitumen standards will be feasible in the long term due to decreased road user and maintenance costs.

2.1.2 STORAGE AND HANDLING OF REAGENTS AND CHEMICALS: THIRD PARTY HEALTH AND SAFETY - HEALTH AND SAFETY IMPACTS AND FIRE AND EXPLOSION RISKS

With reference to Scoping (with assessment) Report, the hazardous chemicals/reagents that were assessed are:

- Pyrolusite (Manganese dioxide)
- Extractant
- Modifier
- Sodium Hydroxide
- Diatomaceous Earth
- Ferrous Sulphate
- Sulphur
- Lime

The following scenarios could lead to hazardous reagents/chemicals being released (spilled), potentially impacting third parties health and safety:

1. A bag or container being dropped or damaged on the quay side during ship-offloading and breaking open (or in the case of bulk sulphur being off-loaded by the modified grab and hopper – the volume of the grab bucket released).
2. A damaged bag(s) or Intermediate Bulk Container (IBC) spilling its content along the route while being transported between the port and the Manica Facilities
3. A bag or container being dropped or damaged during off-loading at the Manica facilities.
4. A bag, IBC or pallet box being damaged by the forklift or the sun if stored under direct sunlight for long periods at the facility.

In the very unlikely event of a (large) fire, it shall be assumed that more than one reagent is burning and that the packing material will most likely be involved in the fire. A fire is not a controlled chemical reaction (especially with a variety of reagents and chemicals and packing material); therefore, the release of toxic, corrosive combustion gases, vapours and dusts is likely.

The risk of fires or explosions during handling and transport of the reagents and chemicals is very low (especially considering that the two flammable liquids would have a flash point of app. 100ºC) as long as the containers are in an undamaged state, have not been exposed due to damage to the containers by to excessive UV-radiation (sun) and the shelf life of the chemical is not expired. The flammable reagents and chemicals will only ignite if the containers have been damaged and there are sparks or heat created (mechanical or electrical) in the vicinity of the reagents and chemicals.

The following reagents/chemicals pose a fire risk and very low explosion risk:

- Extractant
- Modifier
- Sulphur

The following chemical/reagents are not flammable and were not assessed in the scoping report. However, certain risks were highlighted and relevant management and mitigation measures are stipulated below:

- Ferrous sulphate - in case of a surrounding fire there is a risk of thermal decomposition, for temperatures above 600ºC, this may release toxic and corrosives oxides of sulphur (sulphur trioxide).
- Pyrolusite enhances combustion of other substances. It decomposes at temperatures of above 553ºC resulting in manganese(III)oxide and oxygen, which further increases the fire hazard.

This section details management measures pertaining not only to the hazardous reagents and chemicals, but all of the reagents and chemicals proposed to be handled and stored by Manica at their facilities.

2.1.2.1 Management measures relating to all reagents and chemicals (but more specifically the hazardous reagents/chemicals) to be handled and stored

- Regular housekeeping and safety inspections/audits to be conducted by management personnel to ensure continuous compliance with safe operating procedures and safety standards.
- "Firewatch" staff will be identified and trained.
- Full building Inspections will be carried out by Safety Reps as part of a monthly program. Daily walk-rounds must be carried out to identify any potential issues
- The reagents and chemicals shall only be stored in original containers being undamaged and sealed.
- Containers, bags, etc. must be handled carefully and stored accordingly to the manufacturer's specifications.
- Damaged containers, bags, etc. shall be sealed/repaired immediately with appropriate material.
- Broken/damaged bags must be correctly handled & repaired to avoid contamination of the road and other third parties' facilities.
- A Standard Operating Procedure (SOP) must be developed for bag and container handling.
- After truck discharge, bags must be inspected to ensure they are not damaged in transit to site and no reagents/chemicals have or will be released.
- The storage of hazardous substances indoors (MLC Warehouse) will be carried out in well ventilated, coo and dry.
- Should deterioration of bags occur due to UV light or any other cause, the bags shall be sealed/repaired immediately with appropriate material.
- Storage shall be carried out in facilities with appropriate bunding, specifically relating to the liquids.
- Ensure systems are in place to maintain stringent housekeeping standards.
- Employees must receive initial training prior to commencing work with hazardous substances and be adequately supervised until they are trained and found competent.
- Provide annually rigorous re-fresher safety training to employees to ensure that they remain familiar with the dangers associated with the various hazardous chemicals and reagents. In-house training program being developed for employees.

- Manica and/or Swakop Uranium will arrange insurance policies with adequate cover to protect third parties against incidents for which Manica and/or Swakop Uranium is legally liable and such policies will be in line with best practice for Namibian mining/ processing/ and exporting companies.
- Keep the Swakop Uranium chemicals/reagents away from the other products being stored in the MLC warehouse to avoid any contamination. (refer to specific hazardous substance storage prohibitions below).
- The off-loading area at the Rennies Container Terminal should have a wall or other type wind-screen (with minimum height of 6 feet) between them and the neighboring facilities. This will act as a wind-break reducing the potential for material to be entrained and blown outside of the facility boundary.
- Temporary wind screens should be stored on site to be placed around a spill to further reduce the wind speeds and reduce the potential for wind-blown material in the event of a spill.
- Ensure controls are in place, such as, but not limited to:
    - regular inspection is undertaken of NamPort lifting gear on quayside;
    - correct inspection of bags prior to filling by dockside personnel is undertaken;
    - there are suitable off-loading procedures;
    - there is control of ignition sources on quayside during unloading of sulphur.
- Manica to undertake an audit of transportation operations to ensure that proper controls are in place.
- A sprinkler system / deluge system must be installed. It is at the discretion of the client whether or not to install a live connection to the police / fire services, but the important aspect is that a fire / smoke can be detected by the system and any fires put out.
- Manica to ensure that there is segregation of incompatible materials (further details to follow in sections 2.1.2.1 to 2.1.2.12).
- Manica to ensure an offsite emergency plan is generated with relevant emergency responders.
- Manica to ensure an onsite emergency plan is generated.
- Clear channels of communication must be opened between Manica and the various Municipal Departments responsible for the health and safety of the residents of Walvis Bay. The Emergency Response Plans and Risks Assessments must complement and correlate with the existing Municipal plans and structures.
- No foodstuffs will be stored within this facility.

When considering upgrade of the fire detection and prevention measures in the warehouse, it is understood that sprinkler system is installed within part of the warehouse. It is possible that this can be utilised after inspection and maintenance to allow storage of the chemicals and substances most at risk from fire, or from which the most risk to the local population and environment can arise, within the section of the warehouse protected by the sprinkler system.

As mentioned above, a sprinkler or deluge system is required. A detailed assessment of the existing fire suppression system (sprinkler system) within the warehouse is required to determine whether it is capable of being made functional. If the existing sprinkler system is not functional the assessment is to determine what needs to be done to fix the existing system or if it cannot be fixed the assessment should define what will replace it. In either case, whether the existing system can be utilised or a new system installed, the fire detection and suppression system used must conform with international standards. Whether the existing sprinkler system can be utilized or a new system installed, the final fire detection and suppression system implemented must include an alarm system to warm workers in the warehouse of the danger of the fire. Depending on the system to be implemented, the designer of the system must give consideration to the following (and other relevant) standards, as appropriate:

- ISO 6182 - parts 1 to 8 ('Automatic sprinkler systems')
- ISO 7240 - part 1 to 29 (Fire detection and alarm systems)
- ISO 12239 (smoke alarms)

In addition, it is necessary to ensure the segregation of incompatible chemicals within the warehouse (see further details below).

2.1.2.2 Sulphur

Handling and storage requirements:

- Ensure systems are in place to maintain stringent housekeeping standards
- Ensure procurement and handling of ONLY premium sulphur pellets.
- Non aggressive handling must be ensured.
- Employees must receive initial training prior to commencing work with sulphur and be adequately supervised until they are trained and found competent.
- Provide annually rigorous re-fresher safety training to employees to ensure that they remain familiar of dangers associated with potential sulphur explosions.
- Regular housekeeping and safety inspections/audits to be conducted by management personnel to ensure continuous compliance with safe operating procedures and safety standards.
- The "grab and hopper" system will be design to be enclosed and a zero spillage operation will be implemented as per NamPort's requirements.

- The bags shall be stored undamaged in clean, dry and well ventilated areas away from strong oxidisers (like Pyrolusite and manganese dioxide), ignition sources, combustible materials and heat. In this regard there should be proper signage and some distance (minimum 10 m) between the areas where the Sulphur and Pyrolusite are stored at the Rennies Container Terminal. The mitigation in this instance is isolation from the strong oxidisers.
- The sulphur bags shall not be stored in a confined space
- Avoid dust formation
- Ensure firefighting and emergency responds procedures are in place
- Eliminate sources of ignition
- Final design and equipment selection will be to ensure explosions are prevented.
- Detailed design to identify all parts of process chain where static, friction or other sources of ignition is generated.
- Insulate heat sources and eliminate sparking.
- Ensure procurement and handling of ONLY premium sulphur pellets.

In case of an incident/spill:

- A spillage shall be collected (with shovel) avoiding unnecessary dust formation. The spillage container shall be of a suitable material and sealable.
- All staff will receive training in spill response protocols. Should a spill occur, cleanup teams will be assembled immediately. Appropriate equipment to rapidly carry out the cleanup must be readily available at all times.
- Clean-up procedures to be put in place. The following shall amongst other be included in the procedure:
    - Any sulphur contamination of the access routes must be cleaned up immediately.
- In the event of a fire, Sulphur will release acidic gaseous oxides (mainly Sulphur Dioxide and Sulphur Trioxide). These may cause damage to vegetation and have the potential to cause harm to the respiratory tract. A large Sulphur fire may give rise to a plume of acidic smoke that may affect the local population. In the event of a fire a small fire may be extinguished by covering the Sulphur in earth or similar material. Do not use a jet of water to extinguish a Sulphur fire. A fog, mist or spray of water may be used to extinguish a Sulphur fire.

Sulphur fires:

The risk for sulphur fires is slim and should be reduced to almost zero by following the guidelines as set out in the New Zeeland approved code of practice for the Prevention of Sulphur Fires and Explosions, as

published by their Department of Labour: Occupational Safety and Health Service 1993 or a similar approach.

A fire within the Rennies Container Terminal may arise from internal or external ignition sources, or from the mixing of sulphur and Pyrolusite (se further details below). Sulphur and Pyrolusite must be kept apart in storage and transit. Manica to develop an emergency plan for sulphur fires to include (amongst others):

- Inform the Walvis Bay Emergency response teams (i.e. Fire Brigade) immediately in the event of any sulphur fire.
- Fire fighters to make sure that the fire will not rekindle until the sulphur mass has been sufficiently cooled;
- to keep the surrounding vicinity of the fire well cool after the fire has been extinguished to prevent re-ignition;
- fully trained and competent personnel to operate the mobile equipment fleet
- Truck drivers to be trained on how to deal with sulphur fires. Emergency contact numbers will be available in all trucks.
- Material safety data sheets will be available at the warehouse and in all trucks. Trem Cards (Transport Emergency Cards**)** will also be kept in all transport vehicles.
- A detailed emergency action plan to be developed by Manica in conjunction with the Walvis Bay Municipality. This emergency action plan must also include a worker and third party evacuation plan.
- Carry out mock drills regularly (6 monthly intervals as a minimum).
- Provide neighbouring operations with lines of communication with Manica in order to enable then to contact them in case of emergencies or when queries arise.
- The evacuation procedure must include requirements relating to the time it takes to extinguish a fire as well as the area of sulphur that is burring, as follows:
    - Evacuate people at least 400m from the facility if the fire is not extinguished within one hour, or if the area of the sulphur that is burning is bigger than $25m^2$.
    - Evacuate people at least 1km from the facility if the area of the sulphur that is burning is bigger than $900m^2$ or if the fire is not extinguished within 3 hours.

2.1.2.3 Sodium hydroxide

Handling and storage requirements:

- Sodium hydroxide must be stored away from acidic substances in the original container.

In case of an incident/spill:

- Exposure to water shall be avoided as far as possible to prevent dissolving of the reagent.
- Exposed sodium hydroxide (i.e. spills etc.) will be covered with waterproof covers in order to prevent exposure to water
- Water spillages shall be first diluted and then carefully neutralised (with a diluted acid). The neutralisation reaction is very exothermic. Therefore, temperature control is crucial for the neutralisation reaction.
- The Sodium hydroxide must be contained and windblown particles (dust) prevented.
- Third parties must be kept away from spillage and/or informed of the health risk and impacts, where relevant.

2.1.2.4 Pyrolusite (Manganese dioxide)

Handling and storage requirements:

- The Pyrolusite, being an oxidiser, shall not be stored or transported together with flammable reagents/chemicals (i.e. any contact with flammable, combustible or explosive reagents and chemicals has to be prevented). This would include sulphur, carbon, isodecanol (modifier) and Alamine 336.
- In this regard there should be proper signage and a partition (and some distance) between the areas where the Sulphur and Pyrolusite are stored at the Rennies Container Terminal.
- Contact with reagents and chemicals being sensitive to oxidation (without fire hazard) like Ferrous Sulphate have to be avoided.
- Store in a cool, dry and well-ventilated place in order to prevent dust accumulation.

In case of an incident/spill:

- The Pyrolusite must be contained and prevented from being blown by the wind and/or third parties informed of the health risk and impacts minimised or prevented.
- Dust control is crucial, preventing contact of manganese dioxide with other flammable or explosive dusts, vapours or liquids. Dust control on spillages will be achieved through suppression with water.

- Should there be severe dust formation the surrounding neighbours (taking wind direction into considering) have to be informed and evacuated, if required - only in excessive situations.
- In the event of spills, it shall not be absorbed in combustible absorbents like sawdust or others (fire and explosion hazard). Spilled substances shall be swept and disposed in covered containers, ensuring that the Pyrolusite is moist (water spray).

2.1.2.5 Extractant

Handling and storage requirements:

- The reagent has to be stored preventing contact with (strong) oxidising reagents, acids and alkali substances as far as possible. Reagents to avoid would be ferrous sulphate (acidic), pyrolusite (oxidiser) and sulphur, sodium hydroxide (alkali) and sodium carbonate (alkali).
- All sources of ignition (heat, spark or flame) have to be avoided, precaution has to be taken to prevent static discharges (grounding). Earthing of electrical equipment and control of ignition sources is must take place.
- If stored on site for a couple of days, the exhaust of the ventilation system shall have an appropriate filter not to release the Alamine 336 vapours (if present) into the environment.

In case of an incident/spill:

- Extractant spillages must be contained and third parties kept away from the spillage, thereby preventing impacts on third parties.
- Suitable absorbent material should be available during handling and transport.
- Appropriate firefighting media would be foam (alcohol resistant), water spray or powder. For safety reasons water jet cannot be used. In case of a fire, the contaminated firefighting water shall be contained and not be discharged into the environment or the sewer system.
- Small spills shall be absorbed with suitable absorbent material; large spills shall be pumped off (attention must be paid to flammable liquid, explosion proof equipment mandatory). The spillage (with or without absorbent) shall be transferred in appropriate sealable containers and disposed of at the Walvis Bay Hazardous Waste site.
- Due to the hazards associated with the reagent, appropriate protective equipment shall be used.

2.1.2.6 Modifier

Handling and storage requirements:

- The storage of Isodecanol must be in well-ventilated, dry, cool and shaded area. Proper control on smoke and heat detection must be taken. The reagent shall be stored in undamaged and closed original containers.
- Storage has to be according to the manufacturers' specifications in undamaged and original containers. Avoid all sources of ignition (heat, spark or flame). Precaution has to be taken to prevent static discharges (grounding). Earthing of electrical equipment and control of ignition sources is must take place. In case of fire, the containers have to be cooled.
- Isodecanol has to be stored preventing contact with (strong) oxidisers like pyrolusite (oxidiser).

In case of an incident/spill:

- Small spills shall be absorbed with suitable absorbent material; large spills shall be pumped off (attention flammable liquid, explosion proof equipment mandatory). The spillage (with or without absorbent) shall be transferred in appropriate sealable and disposed of at the Walvis Bay Hazardous Waste site.
- Due to the hazards associated with the reagent, appropriate protective equipment shall be used.
- For small fires dry powder would be suitable for extinguishing, for large fires alcohol foam (alcohol resistant foam), water spray or fog would be suitable (see below General remarks on fire).

2.1.2.7 Diatomaceous Earth

Handling and storage requirements:

- The packaging of the product shall be in a way that release of dust of diatomaceous earth is prevented. The integrity of the container has to be ensured with each handling step and storage shall be in a cool, dry, shaded and ventilated (dust filters for ventilation) area.
- Diatomaceous earth should be stored away from oxidising agents such as Pyrolusite.

In case of an incident/spill:

- In the event of spills, water will be used for dust suppression.

2.1.2.8 Ferrous Sulphate

Handling and storage requirements:

- Excessive heat and oxidising products (manganese dioxide) shall to be avoided.

In case of an incident/spill:

- Ferrous Sulphate spills must be contained and prevented from being blown by the wind and/or third parties informed of the health risk and impacts minimised or prevented.

- Spillages have to be covered, collected and placed into closable and suitable containers for disposal.
- Water is not suitable for dust suppression since ferrous sulphate is very soluble in water (water mist might be an alternative if no suitable cover is available).
- Water spillages shall be neutralised with sodium carbonate (soda ash) or sodium bicarbonate or calcium hydroxide (lime) to a pH of approximately 7.

2.1.2.9 Granular Activated Carbon

Handling and storage requirements:

- All sources of ignition (heat, spark or flame) shall be avoided. Precaution has to be taken to prevent static discharges (grounding).
- Storage containers shall be stored in clean, dry and well ventilated areas away from strong oxidisers (like manganese dioxide), ignition sources, combustible materials and heat.

In case of an incident/spill:

- Spillages (broken containers for example) shall be disposed avoiding dust generation (product can be wetted with water fog). Spilled material shall be collected in appropriate containers for disposal or possible reuse.
- To extinguish carbon fires foam, water fog/mist or dry powder would be suitable.

2.1.2.10 Flocculant

Handling and storage requirements:

- All sources of ignition (heat, spark or flame) shall be avoided. Precaution has to be taken to prevent static discharges (grounding).
- Stored away from strong oxidising agents (pyrolusite) strong acids, and strong alkalis (sodium hydroxide).
- The flocculant should be stored in a dry location. Extreme temperatures should be avoided.

In case of an incident/spill:

- Spillages of the dry powder can be contained with dust binding material (might not be necessary for small quantities) and then transferred with appropriate tools (shovel) into suitable and sealable disposal canisters.
- Any unnecessary contact with water has to be avoided. When polyacrylamide spillages are wetted with water, very slippery hydration products will be formed.

2.1.2.11 Coagulant

The coagulant, as far as the data provided, is a non-hazardous reagent, which could be used (in a very similar form) for the treatment of potable water. The reagent is not explosive, not flammable, and not hazardous for water.

In case of a spillage the reagent shall be absorbed with a liquid binding material, which shall be transferred into appropriate containers and the area shall then be cleaned with (warm) water. In case of large spills it is possible to pump the spillage into suitable containers before absorbents are applied.

2.1.2.12 Ion exchange resin

This resin is not classified as hazardous to either humans or the environment, except the slip hazard. In case of ion exchange resin, the product is supplied in a form that does not bear the risk of dust explosion. However, the build-up of fine dust, due to inappropriate handling, could lead to the risk of dust explosions. Therefore, all sources of ignition (heat, spark or flame) shall be avoided. Precaution has to be taken to prevent static discharges (grounding).

The material should be stored and handled in accordance with the suppliers recommendations to avoid the potential for dust.

2.1.2.13 Lime

Lime, is an alkaline substance which will react with strong acids, and will react with water exothermically (producing heat). Lime should be stored away from acids and kept dry.

2.1.3 SOILS

Should hydrocarbon leaks and spills occur (from vehicles and/or machinery) this could result in contamination of the site(s). The following measures will be implemented in order to manage this potential impact:

- All machinery and vehicles will be adequately maintained so as to prevent leaks and spills.
- Should any leaks and hydrocarbon spills occur, these will be contained and cleaned up immediately and disposed of at the Walvis Bay Hazardous waste facility.
- Carefully manage the storage and handling of hydrocarbons and other hazardous materials.
- Ensure that surface runoff is controlled and impacts on water resources are prevented.
- Spill kits will be readily available (i.e. in vehicles or close to transfer positions).

2.1.4 WATER (SURFACE AND GROUNDWATER)

The measures presented in sections 2.1.2 and 2.1.3 are also relevant to this section, as impacts on groundwater and surface water (and the sea) could also be avoided/minimized.

The following measures will be implemented in order to manage the potential impacts associated with the storage of the reagents in the Rennies Container Terminal (i.e. outside area):

- The area in which the sulphur and pyrolusite will be stored will be bounded by bunding and will have an impermeable surface/liner.
- An additional measure would be to place the bags which are stored outside at the Rennies Container Terminal onto wooden pallets to raise them above the ground, to protect them from storm-water generated in the area.
- Weighted covers (tarpaulin or plastic sheeting) to be placed over the bags to prevent rainfall from falling onto the product and possible contact rainwater ponding below the bags after storms.
- Any spillage on site to be cleaned up as soon at seen, to prevent rainwater contact.

The following measures will be implemented in order to manage the potential impacts associated with the storage of the reagents in the MLC Warehouse:

- Ensure the roof and floor of warehouse are in sound condition. In terms of this, the section of the Warehouse Roof that is damaged, needs to be fixed. Furthermore, repairs to warehouse infrastructure, if leaks are found.

Storm-water protection measures should be investigated, with the initial investigation being a survey of levels at both sites with respect to the street level. If it is found that the floor level in the warehouse or the ground at the container site are less than 300 mm above the street level, plans should be made for the construction of a berm surrounding the site, to prevent inflow of storm-water generated in the surrounding streets. In the Rennies Container Terminal a survey should be undertaken to identify if there are any high or low parts of the site, and if identified a policy should be implemented such that the Swakop Uranium reagents products are only stored in the higher parts, to reduce the risk of product damage from storm-water generated on site during intense storms.

2.1.5 BIOPHYSICAL ENVIRONMENT

Under normal (operating) conditions there will be no release of any of the chemicals/reagents into the environment, as it will all be contained. During the off-loading from the ship; transportation to the Manica storage facilities; unpacking; storing; or loading onto interlink flatbed trucks, incidences or accidents may occur where some of the chemicals/regents are spilled. In all these incidences, the spilled reagents/chemicals could end up in the sea.

Management and mitigation measures (in additional to those presented in section 2.1.2 and 2.1.4):

- Clean-up procedures to be put in place.
- Ensure that the transport route is regularly checked for spillages.
- The area in which the sulphur and pyrolusite will be stored will be bounded by bunding and will have an impermeable surface/liner.
- Ensure that all staff operating on site receive training regarding the requirements of this EMP and the Manica Emergency Response Plan.

2.1.6 SOCIO ECONOMIC IMPACTS

Emissions from the operations could result in the contamination of the neighboring sites and their products, thereby impacting them economically. The management and mitigation measures in the preceding sections will be implemented in order to manage this risk.

2.1.7 NOISE

In order to protect the amenity of the local residents some good site practice methods should be employed and are described below:

- Machinery would be subject to regular maintenance.

2.1.8 AIR QUALITY

Exhaust emissions, chemical and reagent emissions as well as dust generation could occur during the off-loading from the ships or during stacking in the warehouse or transport to and from the warehouse. Dust and emissions from the chemicals and reagents will be managed through the implementation of the management measures included in Section 2.1.2. Exhaust emissions and dust generated by vehicles on site will be managed as follows:

- Vehicles will be well maintained so as to minimise exhaust emissions.

3 RESPONSIBILITIES

This section describes the roles and responsibilities for implementing the actions plans contained in this EMP.

3.1 MANICA GENERAL MANAGERS, MANAGERS AND OPERATIONS MANAGERS

The General Managers, Managers and Operations Managers have overall responsibility for environmental management on the storage and handling of the chemicals and reagents and associated facilities and for ensuring this EMP is implemented. To assist them, Manica will have a Safety, Health and Environmental (SHE) Officer (i.e. responsible person) that will be dedicated to managing and monitoring the environmental issues associated with the activities.

3.2 SHE RESPONSIBLE PERSON(S)

The SHE Responsible Person will be responsible for assisting the General Managers, Managers and Operations Managers in all environmental issues, and specifically to ensure that the commitments as set out in this EMP are implemented

In addition to the above, the SHE Responsible Person is responsible for ensuring that all persons involved comply with this EMP.

The SHE Responsible Person will be responsible for the following aspects related to compliance of this EMP:

- Regular inspections and auditing compliance to this EMP and any other relevant legal requirements e.g. permits, authorisations, conditions of the Environmental Clearance Certificate.
- Conduct environmental awareness training during induction training and on an ad hoc basis thereafter.
- Ensure compliance to this EMP and permits and authorisations issued to Manica by relevant authorities. Ensure responsibilities and target dates are developed for each one of the commitments in this EMP. This will be through one of the following mechanisms:
    - Design requirements; or
    - Specific work instructions and procedures; or
    - Action plans (as required by the Integrated Management System).
- Ensure that contractor staff is controlled through the implementation of appropriate security measures.
- Carefully manage the storage and handling of hydrocarbons and other hazardous materials.
- Monitor for excessive dust and noise and implement control measures if necessary.

- Implement a waste management strategy.
- Monitoring of maintenance equipment and machinery.
- Ensure the maintenance of hygienic conditions of sanitation facilities.
- Implement an environmental awareness plan.
- Installation of emergency plans (fire, evacuation etc.) and first-aid procedures.
- Control of traffic safety and road conditions.
- Ensure that surface runoff is controlled and impacts on water resources are prevented.

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APPENDIX A: MATERIAL SAFETY DATA SHEETS

RECORD OF REPORT DISTRIBUTION

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