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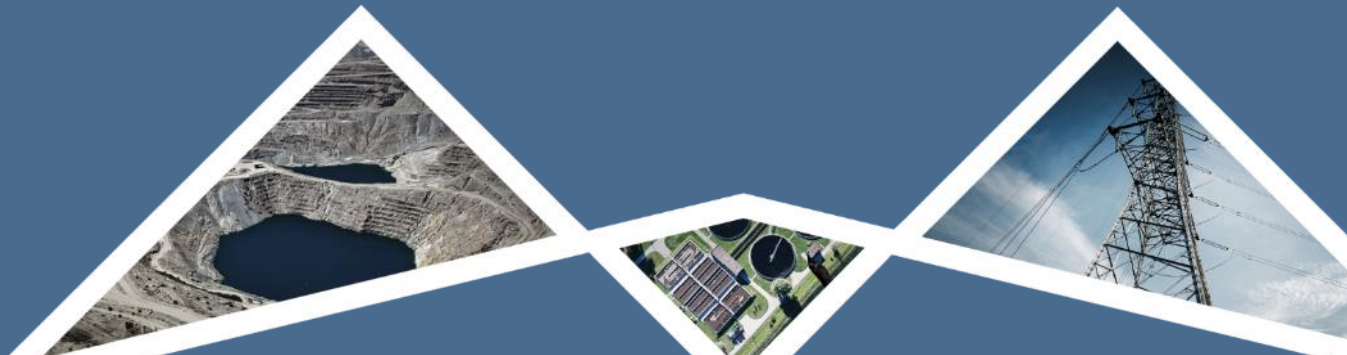
ENVIRONMENTAL MANAGEMENT PROGRAMME

PROPOSED HARMONY VALLEY TAILINGS STORAGE FACILITY PROJECT



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DOCUMENT CONTROL

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1 INTRODUCTION

1.1 REPORT STRUCTURE

This report is a new Environmental Management Programme (EMPr) for the proposed Valley Tailings Storage Facility (TSF) project and as such is compliant with the requirements of the National Environmental Management Act (Act 107 of 1998) (NEMA) Regulations. Table 1 below provides a summary of the NEMA requirements in terms of Appendix 4 of the Environmental Impact Assessment (EIA) Regulations (GNR 982)(EIA Regulations), and an indication in which section the supporting information and documentation can be found. This standalone EMPr for the Valley TSF should be considered as an addendum to the existing approved MR84 EMPr (DMRE Reference 30/5/1/2/2/84 MR).

Table 1: Report Structure

Environmental Regulation	Description	Section in Report
NEMA Regulation 982 (2014) Appendix 4		
Appendix 4(1)(1)(a):	Details of – i. The EAP who prepared the EMPr; and ii. The expertise of that EAP to prepare an EMPr, including a curriculum vitae;	Section 1.5
Appendix 4(1)(1)(b):	A detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description;	Section 3
Appendix 4(1)(1)(c):	A map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that should be avoided, including buffers;	Figure 2
Appendix 4(1)(1)(d):	A description of the impact management outcomes, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified though the environmental impact assessment process for all phases of the development including – i. Planning and design; ii. Pre-construction activities; iii. Construction activities; iv. Rehabilitation of the environment after construction and where applicable post closure; and v. Where relevant, operation activities;	Section 3
Appendix 4(1)(1)(f):	A description of proposed impact management actions, identifying the manner in which the impact management outcomes contemplated in paragraphs (d) will be achieved, and must, where applicable, include actions to –	Section 5

Environmental Regulation	Description	Section in Report
	i. Avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation; ii. Comply with any prescribed environmental management standards or practices; iii. Comply with any applicable provisions of the act regarding closure, where applicable; ands iv. Comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable.	
Appendix 4(1)(1)(g):	The method of monitoring the implementation of the impact management actions contemplated in paragraph (f);	Section 3.1
Appendix 4(1)(1)(h):	The frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f);	Section 3.3
Appendix 4(1)(1)(i):	An indication of the persons who will be responsible for the implementation of the impact management actions;	Section 3.1 and 3.5
Appendix 4(1)(1)(j):	The time periods within which the impact management actions contemplated in paragraph (f) must be implemented;	Section 5
Appendix 4(1)(1)(k):	The mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f);	Section 3.5
Appendix 4(1)(1)(l):	A program for reporting on compliance, taking into account the requirements as prescribed by the Regulations;	Section 2.4
Appendix 4(1)(1)(m):	An environmental awareness plan describing the manner in which – i. The applicant intends to inform his or her employees of any environmental risk which may result from their work; and ii. Risks must be dealt with in order to avoid pollution or the degradation of the environment; and	Section 2.7
Appendix 4(1)(1)(n):	Any specific information that may be required by the competent authority.	Specific information is provided in various sections of the EMPr line with DMRE comments

1.2 INTRODUCTION TO THE PROJECT

A new gold tailings deposition site is required for Harmony One Plant to replace the Free-State South 2 and St. Helena 4 Tailings Storage Facilities (TSF) by July 2024. Several alternative sites were identified and assessed

as possible suitable deposition sites for the tailings from Harmony One Plant but, apart from the Nooitgedacht site, which is the subject of a separate EIA, none were found feasible. Following a review of other possibilities for the One Plant's future tailings deposition, an option to utilise the space between the Free State North (FSN) 1 and FSN2 TSFs and portion of the footprint of the FSN4 TSF as shown in Figure 1 has been identified as a possible deposition site. The TSF will cover an area of approximately 163 ha. The proposed TSF will be located on Farm portions Rietpan 14 (0) and Ouders Gift 48 (0/RE).

1.3 DESCRIPTION OF THE PROPERTY

Table 2 indicates the farm portions that fall within the proposed project including details on the project location as well as the distance from the proposed project area to the nearest towns.

Table 2: Locality details

Farm Name	Rietpan 14 (0) and Ouders Gift 48 (0/RE)		
Application Area (Ha)	Approximately 163 Hectares.		
Magisterial District	Matjhabeng Local Municipality within the Lejweleputswa District Municipality (Free State Province).		
Distance and direction from nearest towns	Welkom is located 3,7km southeast and Odendaalsrus is located 3 km northeast of the proposed TSF site. The geographic coordinates at the centre of the site are: 27°54'59.44"S, 26°40'22.09"E.		
21-digit Surveyor General Code for Property on which Project is Located	**Farm Name:**	**Portion:**	**21 Digit Surveyor General Code**
	Rietpan 14	0	F03900000000001400000
	Ouders Gift 48	0/RE	F03900000000004800000

The locality and extent of the proposed TSF is shown in Figure 1 .

1.4 SENSITIVE AREAS

No "no-go" was identified within the proposed TSF area. The sensitivities related to hydrogeology (groundwater), visual, air quality and social impacts were excluded as their effects cannot be directly or accurately measured to ascertain sensitivity. Groundwater features are continuous in nature and their sensitivity or vulnerability dependant on various entities (e.g. water travel time, contamination migration, plume stability, soil, etc.) making it difficult to directly and accurately measure or assign sensitivity at project area level. Furthermore, social impacts pertain to the project cannot be allocated sensitivity criteria due to their variability. Lastly, the exclusion of visual and air quality sensitivity as part of the combined sensitivity map does not mean that there will be no visual sensitivities but indicates that the entire site and its surroundings is already visually impacted upon by similar activities as the proposed development, and thus the project area and its immediate surroundings cannot be assigned different levels of sensitivity. The only identified sensitive areas on site relate to the wetlands around the edges of the site. The sensitivity map is provided in Figure 2.

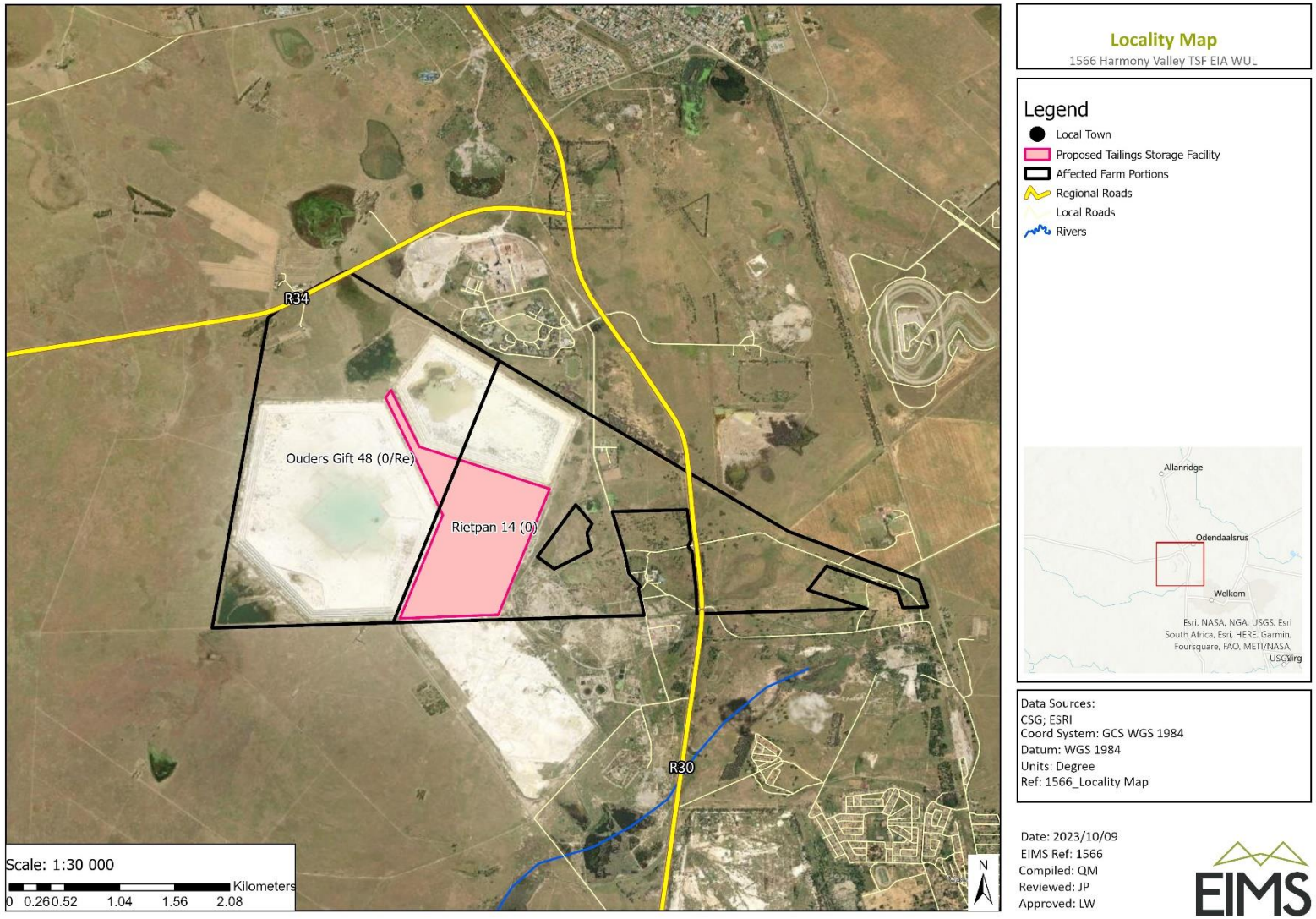

Figure 1: Locality Map

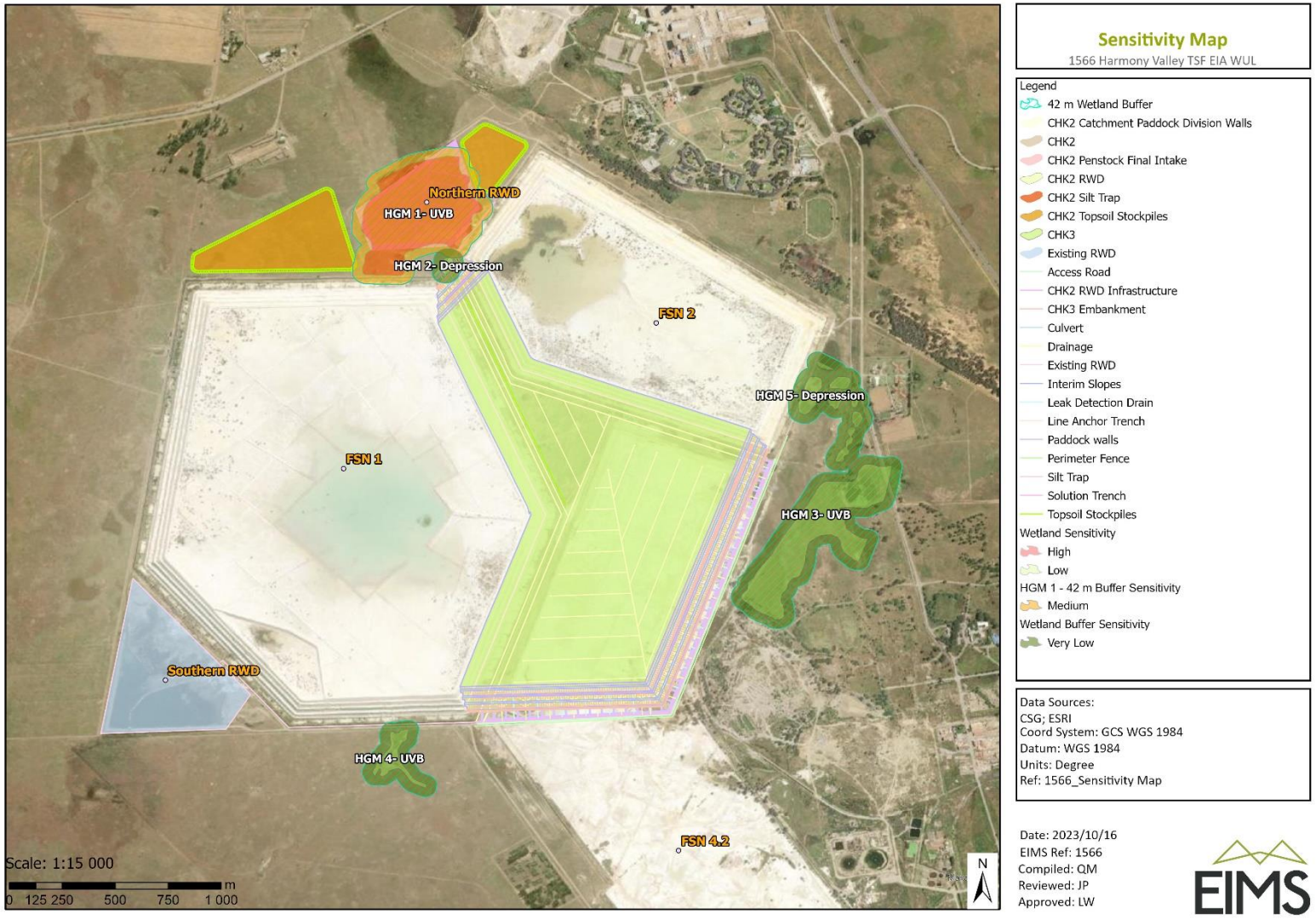

Figure 2: Sensitivity Map

1.5 DETAILS OF THE EAP

EIMS has been appointed by Harmony Gold Mining Company as the Independent EAP and to assist in preparing and submitting the EA application, Scoping and EIA Reports, and undertaking a Public Participation Process (PPP) in support of the proposed project. The contact details of the EIMS consultant who compiled this EMPr are as follows:

- Name of the consultant: John von Mayer
- Tel No.: 011 789 7170
- Fax No.: 011 787 3059
- E-mail address: valley@eims.co.za

1.5.1 QUALIFICATIONS OF THE EAP

In terms of Regulation 13 of the EIA Regulations (GN R. 982) as amended, an independent EAP, must be appointed by the applicant to manage the application. EIMS has been appointed by the Applicant as the EAP to assist with compiling the necessary reports and undertaking the statutory consultation processes, in support of the proposed Phase 3 Project. EIMS is compliant with the definition of an EAP as defined in Regulations 1 and 13 of the EIA Regulations, as well as Section 1 of the NEMA. This includes, *inter alia*, the requirement that EIMS is:

- Objective and independent;
- Has expertise in conducting EIA's;
- Comply with the NEMA, the environmental regulations and all other applicable legislation;
- Takes into account all relevant factors relating to the application; and
- Provides full disclosure to the applicant and the relevant environmental authority.

1.5.2 SUMMARY OF EAP'S PAST EXPERIENCE

EIMS is a private and independent environmental management-consulting firm that was founded in 1993. EIMS has in excess of 25 years' experience in conducting EIA's, including many EIA's for mines and mining related projects. Please refer to the EIMS website (www.eims.co.za) for examples of EIA documentation currently available. John von Mayer is a senior consultant at EIMS and has been involved in numerous significant projects the past 15 years. He has experience in Project Management, small to large scale Environmental Impact Assessments, Environmental Auditing, Water Use Licensing, and Public Participation.

2 ENVIRONMENTAL AND SOCIAL MANAGEMENT SYSTEM

Management of operational risk is a key consideration for mines operating within the social and economic context of South Africa. Operational risk is defined as the risk of loss resulting from inadequate or failed internal processes, people and systems or from external events. Operational risks and impacts are usually managed through the implementation of the Environmental and Social Management System (ESMS) and Health and Safety (HS) system. A ESMS is an important requirement for establishing and maintaining effective environmental management and should be undertaken during the planning phase of the Project. As such the Applicant shall be required to ensure all the aspects listed in this section are included as part of the ESMS existing on the mine. Adequate resources (people, financial and technical) need to be made available to ensure effective establishment, implementation, maintenance and continual improvements of the ESMS. The roles and responsibilities for these key environmental personnel should be clearly defined and communicated throughout the organisation. The ESMS should include the requirement to constantly monitor environmental performance and assess the adequacy of environmental resources provided for the mine. If required, the mine would need to procure further environmental resources to ensure the successful implementation of the ESMS and EMPr. The development and implementation of an ESMS will guide compliance with relevant regulatory and other requirements.

2.1 ESMS FRAMEWORK

The Valley TSF ESMS will be based on:

- The mine's corporate vision;
- South African legal requirements; and
- Mining best practice.

Ultimately an effective ESMS should provide for effective management of social and environmental risks and impacts whilst maintaining legal compliance and meeting international standards of best practise where these are feasible and appropriate. Harmony has an existing ISO ESMS in place which will be applicable to the Valley TSF project.

2.1.1 STAKEHOLDER ENGAGEMENT

Social impacts occur immediately in the planning phase of a project and as such it is imperative to start with stakeholder engagement as early in the process as possible. This report has been placed out for public review in order to encourage stakeholder engagement, in accordance with the relevant legislation. Stakeholder engagement is however required on an ongoing basis throughout the operation of the facility. As such, the mine will need to develop and implement a detailed Stakeholder Engagement Plan, designed to work as a living document for implementation over the entire LoM.

The following stakeholder engagement framework outlines the principles and objectives for stakeholder engagement during all phases of the mining operation.

- To identify and assess the processes and/or mechanisms that will improve the communication between local communities, the wider community and the mine;
- To improve relations between mine staff and the people living in the local communities;
- To provide a guideline for the dissemination of information crucial to the local communities in a timely, respectful and efficient manner; and
- To provide a format for the timely recollection of information from the local communities in such a way that the communities are included in the decision-making process.

This stakeholder engagement plan will assist Harmony outline their approach towards communicating in the most efficient way possible with stakeholders throughout the life of the project. Such a plan cannot be considered

a once off activity and should be updated on a regular basis to ensure that it stays relevant and to capture new information. The Stakeholder Engagement Plan should consist of the following components:

- Stakeholder Identification and Analysis – time should be invested in identifying and prioritising stakeholders and assessing their interests and concerns;
- Information Disclosure – information must be communicated to stakeholders early in the decision-making process in ways that are meaningful and accessible, and this communication should be continued throughout the life of the project;
- Stakeholder Consultation – each consultation process should be planned out, consultation should be inclusive, the process should be documented, and follow-up should be communicated;
- Negotiation and Partnerships – add value to mitigation or project benefits by forming strategic partnerships and for controversial and complex issues, enter into good faith negotiations that satisfy the interest of all parties;
- Grievance Management – accessible and responsive means for stakeholders to raise concerns and grievances about the project must be established throughout the life of the project;
- Stakeholder Involvement in Project Monitoring – directly affected stakeholders must be involved in monitoring project impacts, mitigation and benefits. External monitors must be involved where they can enhance transparency and credibility;
- Reporting to Stakeholders – report back to stakeholders on environmental, social and economic performance, both those consulted and those with more general interests in the project and parent company;
- Management Functions – sufficient capacity within the company must be built and maintained to manage processes of stakeholder engagement, track commitments and report on progress; and
- It is of critical importance that stakeholder engagement takes place in each phase of the project cycle and it must be noted that the approach will differ according to each phase.

2.1.2 GRIEVANCE MECHANISM

The proposed TSF is situated in a mining area where there are already high levels of impact and complex social dynamics. The communities are already exposed to a number of social and environmental impacts from different sources. The livelihoods of adjacent farmers have already been impacted on, and they do not have any trust in Harmony to manage new impacts, since they are of the opinion that current impacts are not managed well. They also feel that the mine does not listen to them and that participating in any processes is useless, since nothing will change. The impacted urban communities are poor and there are high levels of unemployment. There is likely to be a lot of competition for jobs. Given its proximity to other mining areas, it is not expected that the project will cause a significant influx of people into the area, as there are already people with some skills in the area that the mine could employ.

- From a social perspective, the construction of the TSF will mostly result in existing impacts continuing. The new development will not add significant social impacts. It must be considered that there will also be positive social impacts, such as skills development, CSI projects and SLP projects. Should the TSF not be allowed, these impacts will fall away.
- In order for the farming community to be comfortable with the construction of the TSF, it is critical that the mine and the farmers come to an agreement on how to deal with the issues between themselves and the mine. If the mine can resolve some of the current issues, it will assist with improving their social licence to operate.

- The mine will need to work hard on improving relationships with the community before the construction of the TSF start. This is not an easy task, due to the mistrust in the community. However, if the mine fails to do so, it may come at a great cost to them.
- Many of the issues between the mine and the community have historic roots and relate to some of the predecessors of the current mine, the failure of government on all levels to fulfil their mandate in terms of services and the current dire socio-economic conditions in South Africa.
- The following recommendations are made:
    - Any further impacts on the livelihoods of the farming community may cause permanent loss of livelihoods and should be carefully managed. The tipping point where the farmland can no longer provide the required ecosystem services is close, and it may result in displacement and legal struggles;
    - The mine must continue to invest in their Stakeholder Relations Division and revisit its current efficiency;
    - The mine must implement a community-friendly external grievance mechanism in conjunction with farmers and communities;
    - The mine must develop a community relations strategy to plan for and guide its involvement with the community. The strategy should include feedback mechanisms about aspects of concern to the community;
    - The mine should put measures in place to ensure the most effective local employment strategy, in conjunction with local leadership;
    - The mine must ensure that social requirements as specified in the mitigation measures are included in their contracts with sub-contractors; and
    - All agreements about water provision should be done in writing.

2.1.3 INTERNAL GRIEVANCE PROCEDURE

Harmony Gold Mining Company shall develop a detailed internal grievance mechanism designed to receive and facilitate resolution of workplace concerns and grievances raised by employees (and their organizations, where they exist). Employees must be informed of the grievance mechanism at the time of recruitment, and it must be made easily accessible to them. The mechanism should involve an appropriate level of management and address concerns promptly, using an understandable and transparent process that provides timely feedback to those concerned, without any retribution. The mechanism should also allow for anonymous complaints to be raised and addressed. The mechanism should not impede access to other judicial or administrative remedies that might be available under the law or through existing arbitration procedures, or substitute for grievance mechanisms provided through collective agreements.

2.2 DOCUMENT CONTROL

A document handling system must be established to ensure accurate updating of EMPr documents, and availability of all documents required for the effective functioning of the EMPr. The document handling system must be devised by the project proponent and/or Contractors and agreed upon by all key parties. Responsibilities must be assigned to relevant personnel for ensuring that the EMPr documentation system is maintained and that document control is ensured through access by and distribution to identified personnel.

- Supplementary EMPr documentation could include:
- EMPr implementation activity specifications;
- Emergency preparedness and response procedures;

- Incident reports;
- Training records;
- Records of chemicals or hazardous substances kept on site;
- Records of alien invasive plant control activities;
- Site inspection reports;
- Monitoring reports;
- Auditing reports; and
- Complaints received.

The ECO should be responsible for ensuring that the registration and updating of all relevant EMP documentation is carried out. It is usually the responsibility of the Project Manager to ensure that all personnel are performing according to the requirements of this procedure and to initiate the revision of controlled documents, when required by changes in process. Clear procedures must be specified at the beginning of the project for making changes to EMPr documents, circulating updated documents, and destroying obsolete versions. Documents must be revised as required by changing circumstances. Distribution lists and document change control sheets must be kept for all documents.

2.3 RECORD KEEPING

It is essential that an official procedure for control of records be developed to ensure records required to demonstrate conformity to environmental and social standards are maintained. Harmony is therefore required to develop and maintain a procedure for the identification, storage, protection, retrieval, retention and disposal of records as part of the ESMS. Records must be legible, identifiable and traceable.

2.4 AUDITING AND REPORTING PROCEDURES

Reporting procedures must be developed at the start of the project, for conveying information from the monitoring activities and to ensure that management is able to take rapid corrective action should certain thresholds be exceeded. Different reporting procedures to deal with may include:

- Inspections;
- Accidents and emergencies;
- Measuring performance indicators and interpreting and acting on the indicators;
- Records of monitoring activities to test the effectiveness of mitigation measures and impact controls, as well as for compliance auditing purposes; and
- Training programmes and evidence of appropriate levels/amount of skills/capacities created.

2.5 RESPONDING TO NON-COMPLIANCES

If the mitigation measures stated in the EMPr are not adequately implemented, or do not achieve the desired result, the authorities may stop the project until corrective actions have been taken and the desired environmental objective or target has been met. A system for dealing with non-compliances (i.e. incentives or disincentives for conformance and non-conformance with the EMPr requirements) must be employed to ensure that the EMPr is adequately implemented. The system to be used must be determined described in the EMPr before mining commences, included in the tender documents and contracts, and made clear to all project workers.

Non-compliance will be identified and managed through the following four key activities including;

- **Inspections** of the site and activities across the site;

- **Monitoring** of selected environmental quality variables;
- **Audits** of the site and relevant documentation as well as specific activities; and
- **Reporting** on a quarterly basis.

An environmental non-conformance and incident register must be prepared and maintained by the EO/ECO throughout the lifespan of the mine in order to monitor environmental concerns, incidents, and non-conformances. The register must include details of date, location, description of the NC or Incident, applicable environmental commitment/standard, corrective action taken, adequacy of corrective action, date rectified, etc.

Non-compliance with the EMPr or any other environmental legislation, specifications or standards shall be recorded by the EO/ECO in the non-conformance register. This register shall be maintained by the EO/ECO and will be sent to the Holder/EM on a regular basis (at least quarterly), and the Holder/EM shall ensure that the responsible party takes the necessary corrective actions. Non-conformances may only be closed out in the register by the EO/ECO upon confirmation that adequate corrective action has been taken. The register should be utilised to measure overall environmental performance.

2.6 ENVIRONMENTAL INCIDENTS

For the purposes of this project, an environmental incident can be divided into three levels, i.e. major, medium and minor. All major and medium environmental incidents shall be recorded in the incident register. Minor incidents do not need to be reported but require immediate rectification on site. Definitions and examples of environmental incidents are provided in Table 3 below.

Table 3: Description of incidents and non-conformances for the purpose of the project

Non-Conformance	Any deviation from work standards, practices, procedures, regulations, management system performance etc. that could either directly or indirectly lead to injury or illness, property damage, damage to the workplace environment, or a combination of these.
Major Environmental Incident	An incident or sequel of incidents, whether immediate or delayed, that results or has the potential to result in widespread, long-term, irreversible significant negative impact on the environment and/or has a high risk of legal liability. A major environmental incident usually results in a significant pollution and may entail risk of public danger. Major environmental incidents usually remain an irreversible impact even with the involvement of long-term external intervention i.e. expertise, best available technology, remedial actions, excessive financial cost etc. Major environmental incidents may be required to be reported to the authorities. The ECO shall make the final decision as to whether a particular incident should be classified as a Major incident. An example of a Major environmental incident would be a significant spillage (e.g. 500 litres) of fuel into a watercourse.
Medium Environmental Incident	An incident or sequel of incidents, whether immediate or delayed, that results or has the potential to result in widespread or localised, short term, reversible significant negative impact on the environment and/or has a risk of legal liability. A medium environmental incident may be reported to the authorities, can result in significant pollution or may entail risk of public danger. The impact of medium environmental incidents should be reversible within a short to medium term with or without intervention. The ECO shall make the final decision as to whether a particular incident should be classified as a Medium incident. An example of a Medium environmental incident would be a large spill of fuel (e.g. 20 – 50 litres) onto land.

Minor Environmental Incident	An incident or sequel of incidents, whether immediate or delayed, where the environmental impact is negligible immediately after occurrence and/or once-off intervention on the day of occurrence. An incident where there is unnecessary wastage of a natural resource is also classified as a minor environmental incident. An example would be leaking water pipes that result in the wastage of water. A minor environmental incident is not reportable to authorities. An example of a minor incident is day to day spills of fuel or oil onto the ground where the spill is less than one or two litres.

The following incident reporting procedures shall apply to this project:

- All environmental incidents shall be reported to the mine EO who shall ensure that the appropriate rectification is undertaken;
- The mine EO shall record all medium and major incidents in the incident register and advise on the appropriate measures and timeframes for corrective action;
- An incident report shall be completed by party responsible for the incident for all medium and major incidents and the report shall be submitted to the Mine Manager and mine EO within 5 calendar days of the incident; and
- The mine EO shall investigate all medium and minor incidents and identify any required actions to prevent a recurrence of such incidents.

In the event of an emergency incident (unexpected sudden occurrence), including a major emission, fire or explosion leading to serious danger to the public or potentially serious pollution of or detriment to the environment, whether immediate or delayed, the Applicant shall notify the relevant authorities in accordance with legal requirements (e.g. Section 30 of NEMA and Section 20 of the NWA). In the event of a dispute in terms of the classification of a such an incident, the Applicant shall engage the ECO to advise on the potential reporting requirements in terms of the above.

2.7 ENVIRONMENTAL AWARENESS PLAN AND TRAINING

Training is essential for ensuring that the EMPr provisions are implemented efficiently and effectively. Training needs should be identified, based on the available and existing capacity of site and project personnel (including the project proponent, Contractors and Sub- contractors) to undertake the required EMPr management actions and monitoring activities. It is vital that all personnel are adequately trained to perform their designated tasks to an acceptable standard. In addition to these parties, general environmental awareness must be fostered among the general workforce to encourage the implementation of environmentally sound practices. This ensures that environmental accidents are minimized and environmental compliance maximized. Environmental awareness could be fostered by induction course for all workers on site, before commencing work on site, as well as during regular “toolbox talks”. Workers should also be alerted to particular environmental concerns associated with their tasks for the area/habitat in which they are working. Courses must be given by suitably qualified personnel and in a language and medium understood by workers/employees.

2.7.1 MANNER IN WHICH EMPLOYEES WILL BE INFORMED OF ENVIRONMENTAL RISKS

The Human Resources Development Programmes of Harmony include appropriate training and skills development programmes as required by the workforce in support of operation specific business plans. Training is offered in portable skills, being competencies that will enable employees to find jobs elsewhere within the mining industry, or to become self-employed. Harmony Training Centre will continue to provide skills training to mine workers during their employment at the operation. This training will be fully accredited, ISO registered and all skills development Programmes will be unit standards-driven and thereby portable within the industry. The

Workplace Skills Development Plan is formulated; developed and implemented in line with the skills development plan as accorded by the Skills Development Act of 1997 and the Mining Qualifications Authority requirements.

All training, short courses and tertiary studies will adhere to the above-mentioned criteria and will be guided and aligned to affiliate processes inherent of managing downscaling and local economic development. These income-generating skills will be informed by the relative IDP/LED priorities of the relevant municipality and will be facilitated timeously.

There is a Mining Qualifications Authority accredited (Adult Basic Education and Training) ABET Programme in place for the operation offering both part and full-time classes. The venue where these are presented is appropriate and classrooms can adequately accommodate 20 learners per class.

Training initiatives have focused on the development of both technical and managerial skills of senior and middle management. At the operational level, training initiatives include mine management commitment to the ABET initiatives.

Broadly the Skills Development Plan for Harmony details the respective training that is being provided as per the requirements of the shaft business plans and articulates the measures that are in force to ensure that continued career progression of Historically Disadvantaged South Africans (HDSA's) into management levels and women in the mining industry.

As part of the training process, teams / parties are encouraged to:

- Promote and encourage inspections/reporting on environmental impacting incidents;
- Practice concurrent rehabilitation;
- Support regional environmental management awareness campaigns/programmes and systems; and
- Be aware of your actions on the environment.
- Initial environmental induction and periodic toolbox talks should be made a requirement for all contractors.

2.7.2 MANNER IN WHICH ENVIRONMENTAL RISKS WILL BE DEALT WITH

Environmental incident reporting is a vital part of communication for the Environmental Department at the mine. Employees are required to report any and all environmentally related problems, incidents and pollution, so that the appropriate remedial action can be implemented timeously. Rehabilitation and mitigation capacity resides within the various operational functions, i.e. surface engineering, metallurgical, etc. Where specific engineering or metallurgical capacity is lacking in-house, use will be made of external facilities. Further support for the Environmental Management function is derived from the various departments within the group. The Harmony incident reporting procedure is provided in Figure 3.

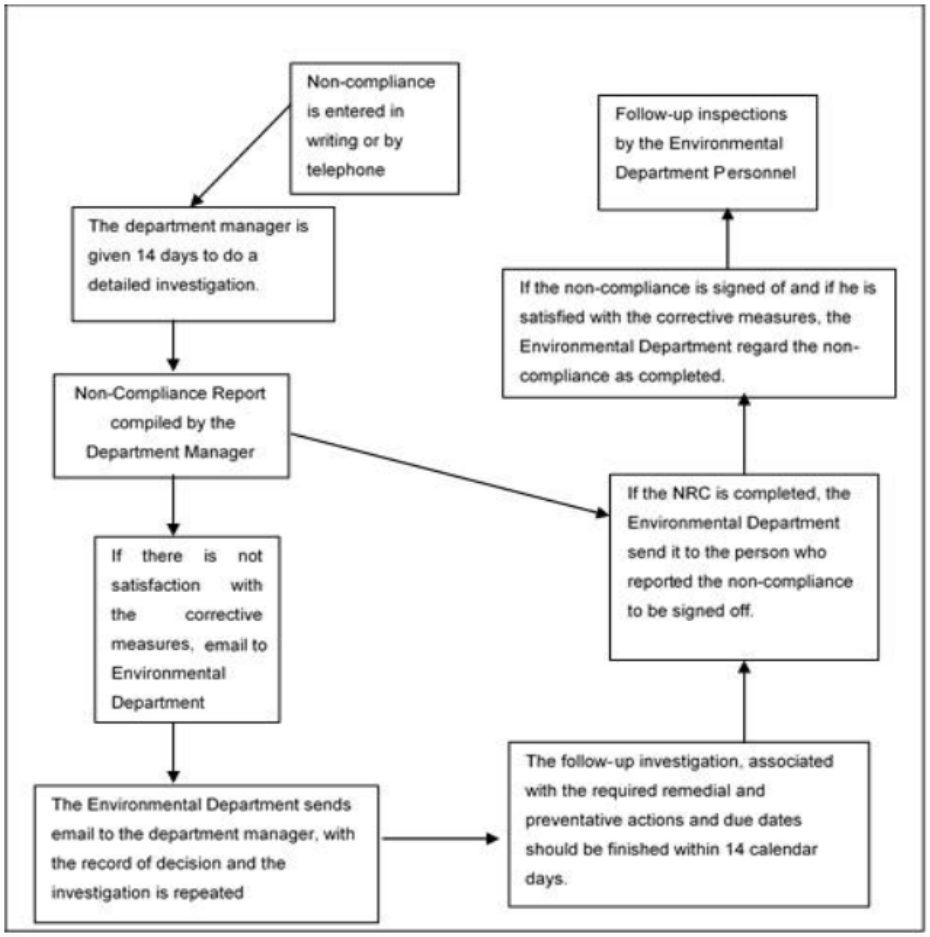

Figure 3: Incident Reporting procedure

Communication is a management responsibility. As mentioned before the Environmental Management Function (EMF) resides within the portfolio of risk Management. Structures and reporting mechanisms have been put in place to ensure that the Board is kept fully informed of environmental matters within the group.

2.7.3 EMERGENCY RESPONSE PLAN

Harmony Gold Mining Company must identify potential emergencies and develop procedures for preventing and responding to them. There are several options for dealing with high priority impacts and risks, as the paradigm has two components, probability and consequence. The design of control measures rest on the understanding the cause and effect. Best practise is to intervene with the ultimate factors were feasible, rather than treat the outcomes. Emergency response therefore has the option of reducing probability, or reducing the consequence, reducing the probability is the preferred option. Below are some common emergency preparedness approaches:

- Threat consequence if and when the risk eventuates, when the risk becomes an issue.
- Combine reducing the probability and treating the consequence.
- Offset environmental losses by investing in other assets.
- Not manage some of the risks because there are too many.
- Make provision to manage residual impacts or issues that arise because of shortcomings in risk identification and rating, avoidance and mitigation or because a rare event has occurred.

- Residual impacts are those impacts that despite reducing the probability and consequence might still occur. In these cases, parties will have to be compensated, pollution cleaned up and damage to the environment remediated.
- The Applicant shall be required to develop and implement an Emergency Preparedness and Response Plan prior to commencing work. The Emergency Preparedness and Response Plan should be based on a baseline Hazard and Risk Assessment and should provide for the following as a minimum:
- Risk assessment (identification of areas where accidents and emergency situations may occur, communities and individuals that may be impacted).
    - Response procedures.
    - Provision of equipment and resources.
    - Designation of responsibilities.
    - Communication and reporting (including that with potentially Affected Communities).
    - Periodic training to ensure effective response.
    - Periodic review and revision, as necessary, to reflect changing conditions.
- The Applicant must ensure that the Emergency Preparedness and Response Plan makes provision for environmental emergencies, including, but not limited to.
    - Fire Prevention.
    - Fire Emergency Response.
    - Spill prevention.
    - Spill Response.
    - Contamination of a water resource.
    - Accidents to employees.
    - Use of hazardous substances and materials, etc.

The Applicant must ensure that lists of all emergency telephone numbers/contact persons (including fire control) are kept up to date and that all numbers and names are posted at relevant locations throughout the lifespan of the project.

2.7.3.1 FIRE

Fires represent a significant risk to mining operations and require special attention in the Emergency Response Plan. Sparks generated during welding, spontaneous combustion, cutting of metal or gas cutting can result in fires. Every possible precaution shall therefore be taken when working with this equipment near potential sources of combustion. The Applicant must take all reasonable measures to ensure that fires are not started as a result of activities on site. No smoking is allowed near containers with flammable contents or at areas that are highly flammable. Smoking is only permitted at areas designated for smoking. No open fires are permitted on site and no burning of waste is to be allowed on site. The Applicant shall ensure that there is sufficient fire-fighting equipment available on site at all times. Such precautions include having an approved fire extinguisher immediately available at the site of any such activities. The Applicant is to ensure that he/she has the contact details of the nearest fire station in case of an emergency. Appropriate and correctly serviced equipment must be available for all activities that are likely to generate fire.

It is further anticipated that firebreaks will be required around the site perimeter. It is recommended that such fire prevention measures are implemented in consultation with adjacent landowners and where necessary that the Applicant coordinate fire prevention efforts with local Fire Protection Agency (FPA).

2.7.3.2 HEALTH AND SAFETY

The Applicant shall make allowance for the supply, erection, maintenance and removal of the information boards. Information boards shall also provide the name of the process managers, relevant contact person and contact number. This will ensure that the public access to request information and/or to lodge any complaints. The boards will essentially be to advise the public of the construction activities to be undertaken or being undertaken and to advise of the prohibition of entering demarcated "no-go" areas.

The Applicant must ensure that compliance with the Mine Health and Safety Act (Act No. 29 of 1996) and the Occupational Health and Safety Act (Act No. 85 of 1993) is strictly adhered to. All reasonable measures must be taken to ensure the safety of all site staff and the surrounding community is not compromised. No weapons may be brought onto the property by any person. Where fencing is temporarily affected, temporary security must be provided at all times until the fence is reinstated.

The Applicant must ensure that all vehicles using public roads are in a roadworthy condition, that drivers adhere to the speed limits and that their loads are secured and that all local, provincial and national regulations are adhered to. The Mine shall make provision for flagmen to regulate traffic and construction vehicles when necessary.

The Applicant must ensure that all accidents and incidents are recorded and reported to the EO/ECO. The Applicant must have easy access to all relevant emergency numbers for example, spill response teams, fire authorities, fire protection associations, medical emergency, nearest emergency rooms (hospitals) to the site, of both private and public hospitals. The Applicant must take all reasonable measures to ensure the health and safety of all employees, visitors and the public.

2.7.3.3 SPILL RESPONSE PROCEDURE

All employees, staff and labourers must be instructed regarding implementation of spill prevention measures and spill response procedures. In the event of a spill, the following general requirements shall apply, and the detailed spill procedure must cater for these requirements. Harmony has a spill response plan in place which should be utilized in case of spills occurring. In terms of the existing Harmony spill response plan the following general actions are recommended:

- Any oil, diesel, petrol, tailings (including slurry) or hazardous chemical spill, must be reported as an environmental incident (by any employee) to the person responsible for coordination of the Corrective action on site.
- The person that first noted the spill must take steps to prevent the spill from spreading and report it.
- Personal Protective Equipment (PPE) must be worn when handling oil, diesel, solvents or other chemicals as required by the Material Safety Data Sheet (MSDS).
- Consult the MSDS to determine the toxicity of the substance and which PPE must be worn.
- Should a spill occur, the person responsible must take the necessary steps to contain the spill to minimize the area affected and prevent contamination of a water source, e.g. storm water.
- Once contained, the spill should be cleaned up in a manner appropriate to the spill as in the table below.
- If harmful substances, other than oil, fuel or lubricant, are spilled into water the contaminated water must be contained and pumped to an area where it can either be rectified or correctly disposed of..

2.7.3.4 MEASURES TO CONTROL OR REMEDY ANY CAUSES OF POLLUTION OR DEGRADATION

The broad measures to control or remedy any causes of pollution or environmental degradation as a result of the proposed activities taking place are provided below:

- Limit the size of the area to be disturbed as far as is practically possible;

- Conduct regular TSF inspections in line with the regulatory requirements;
- Establish and maintain dirty and clean water systems in line with the regulatory requirements;
- Contain potential pollutants and contaminants (where possible) at source;
- Handling of potential pollutants and contaminants (where possible) must be conducted in bunded areas and on impermeable substrates;
- Ensure the timeous clean-up of any spills;
- Implement a waste management system for all waste stream present on site;
- Investigate any I&AP claims of pollution or contamination as a result of mining activities;
- Rehabilitate the proposed mining site in line with the requirements of the detailed rehabilitation and closure plan; and
- Implement the impact management objectives, outcomes and actions.

It is of critical importance that the broad measures to control or remedy any causes of pollution or environmental degradation are applied during all phases of the proposed TSF operation. This is essential and allows for the operation to be conducted in a manner that will allow for the post-closure goals and objectives to be met.

3 COMPLIANCE MONITORING

3.1 RESPONSIBLE PERSONS

This section includes details as to the roles and responsibilities of responsible persons.

Different parties have different responsibilities and roles in the implementation of the EMPr. A summary is included in Figure 4.

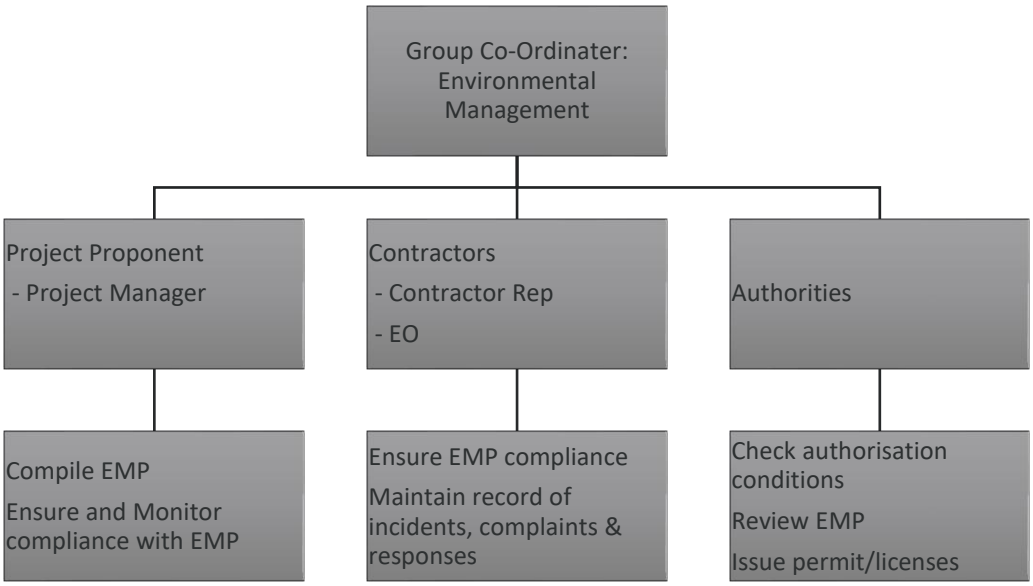

Figure 4: Responsibilities And Roles For Identified Actions

3.1.1 PROJECT PROPONENT

The Project Proponent is responsible for the following tasks:

- Appoint an Environmental Control Officer (ECO);
- Notify DMRE of changes in the mining operation resulting in significant environmental impacts;
- Assess the Contractors environmental performance during mining in consultation with the Environmental Control Officer;
- Ensure compliance with regulations.

Therefore, ultimately, the Project Proponent is responsible for the development and implementation of the EMPr and, where relevant, ensuring that the conditions in the authorisation are satisfied. Where mining activities are contracted out (e.g. to Contractors and Subcontractors), the liability associated with non-compliance still rests with the Project Proponent (unless otherwise agreed upon between the authorities, the Project Proponent and the contracting parties). The Project Proponent (and not the Contractor) is therefore responsible for liaising directly with the relevant authorities with respect to the preparation and implementation of the EMPr and meeting authorisation conditions.

3.1.2 CONTRACTORS

Each Contractor affected by the EMPr should appoint a Contractor's Representative (the title may vary), who is responsible for the on-site implementation of the EMPr (or relevant sections of the EMPr). The Contractor's representative can be the site agent; site engineer; a dedicated environmental officer; or an independent consultant. The Contractor must ensure that the Contractor's Representative is suitably qualified to perform the

necessary tasks and is appointed at a level such that she/he can interact effectively with other site Contractors, labourers, the ECO and the public. The Contractor's Representative ensures that all Sub contractors working under the Contractor abide by the requirements of the EMPr. Supporting specifications to this document are the SABS Codes of Practice 1200 - Standard Specifications for Civil Engineering Construction, any other regulations applicable to construction and all national and local bylaws.

The costs related to the implementation of the EMPr will be the responsibility of the Contractor. Each contractor shall appoint an approved Environmental Manager / Environmental Officer who shall be responsible for the implementation of the contractors EMPr obligations.

The Contractor is answerable to the Project Manager for all environmental issues associated with the project. Contractor performance will, amongst others, be assessed on health, safety and environmental management criteria. The Project Proponent must inform the Contractor of the EMPr obligations (which have ideally been integrated into the tender document), as well as environmental training to be undertaken by the Contractor in terms of these obligations. Contractors must communicate these obligations to their Sub-contractors and ensure that there is compliance.

The Contractor may appoint an Environmental Officer (EO), or officers, if more than one is required. Their primary role is to coordinate the environmental management activities of the Contractor on site. The EO may be required to perform the following roles:

- Support the ECO in monitoring by maintaining a permanent presence on site.
- Inspect the site as required to ensure adherence to the management actions of the EMPR.
- Complete Site Inspection Forms on a regular basis (weekly).
- Provide inputs to the regular (monthly) environment report to be prepared by the ECO.
- Liaise with the construction team on issues related to implementation of, and compliance with the EMPr.
- Maintain a record of environmental incidents (spills, impacts, legal transgressions etc) as well as corrective and preventive actions taken, for submission to the Project Proponent.
- Maintain a public complaints register in which all complaints are recorded, as well as action taken, for submission to the Project Proponent.

3.1.3 ENVIRONMENTAL CONTROL OFFICER

The ECO is appointed by the Applicant and should be independent from the Applicant and the Contractors. The ECO should have appropriate training and/or experience in the implementation of environmental management specifications. The ECO must preferably have a tertiary qualification in an Environmental Management or appropriate field. The ECO provides feedback to the Project Manager regarding all environmental matters. The ECO's key role is auditing the implementation of the EMPr. For the purposes of implementing the conditions contained herein, the Applicant should appoint the ECO well before the start of survey activities. The ECO is responsible for the auditing function as well as the clarification of environmental conditions contained in this EMPr to anyone working on the site.

3.1.4 AUTHORITIES

The authorities may be required to perform the following roles:

- Participate in a meeting(s) with the Project Proponent at the start of the EMPr process in order to reach agreement on the approach to the EMPr.
- Review the draft EMPr submission.
- Review Monitoring and Audit reports, if required.

- Review whether there is compliance by the Project Proponent and Contractor with the terms of the EMPr and permit/license conditions. Whenever necessary, the authorities should assist the Project Proponent in understanding and meeting the specified requirements.

The authorities may perform random controls to check compliance. In case of persistent non-compliance, the Project Proponent will be required to provide an action plan with corrective measures and have it approved by the authorities. The key authorities that should be involved are the Department of Mineral Resources and Energy (DMRE), and Department of Water and Sanitation (DWS).

3.2 METHOD OF MONITORING IMPACT MANAGEMENT ACTIONS

Harmony Gold Mining Company is required to develop an auditing and reporting procedure. The purpose of the auditing and reporting procedure is to clearly define the requirements for compliance monitoring and audits and the reporting of the information gathered. This section provides a framework for the detailed procedure which will be developed by the mine.

Different reporting mechanisms may include:

- Inspections;
- Reporting accidents and emergencies;
- Measuring performance indicators and interpreting and acting on the indicators;
- Records of monitoring activities to test the effectiveness of mitigation measures and impact controls, as well as for compliance auditing purposes; and
- Training programmes and evidence of appropriate levels/amount of skills/capacities created.

All monitoring and auditing must be accompanied by applicable records and evidence (e.g. delivery slips, photographic records, etc.). All reports must be retained and made available for inspection by the ECO, the Applicant and /or the Relevant Competent Authorities. All reports shall be signed by the relevant parties to ensure accountability. Harmony must use the audit report findings to continually ensure that environmental protection measures are working effectively on site through a system of self-checking. The framework for compliance monitoring and auditing is summarised in the sections below.

Table 4: Proposed framework for compliance monitoring and audits

Resource	Document	Implementation		Checking/Monitoring/Audit	
		Responsible Party	Frequency	Type	Reporting Frequency
Harmony Environmental Manager	ESMS Procedures	Harmony	As Required	Report Review	As Required
	EMP/EMPr	Harmony	As Required	Report Review	As Required
	IWULA	Harmony	As Required	Report Review	As Required
	NEMA EA	Harmony	As Required	Report Review	As Required
	Other Licences, Permits or Approvals	Harmony	As Required	Report Review	As Required
Harmony Environmental Officer	ESMS Procedures	Harmony	Weekly	Site Inspection	Weekly
	EMP/EMPr	Harmony	Weekly	Site Inspection	Weekly
	IWULA	Harmony	Weekly	Site Inspection	Weekly
	NEMA EA	Harmony	Weekly	Site Inspection	Weekly
	Other Licences, Permits or Approvals	Harmony	Weekly	Site Inspection	Weekly
Environmental Control Officer	ESMS Procedures	External ECO	-	Sample Audit	Monthly
	EMP/EMPr	External ECO	-	Sample Audit	Monthly
	IWULA	External ECO	-	Sample Audit	Monthly
	NEMA EA	External ECO	-	Sample Audit	Monthly

Resource	Document	Implementation		Checking/Monitoring/Audit	
		Responsible Party	Frequency	Type	Reporting Frequency
	Other Licences, Permits or Approvals	External ECO	-	Sample Audit	Monthly

3.3 MONITORING AND REPORTING FREQUENCY

The following auditing and reporting shall be required during construction:

- Weekly Compliance Reports: These reports must be prepared by the designated Mine EO or contractor EOA and must aim to monitor and report on-site environmental performance;
- Monthly Compliance Audits: These audits must be undertaken by the mine EO and must aim to monitor and report on compliance with the requirements of the relevant authorisations. licences and permits, the approved EMPr; and
- Quarterly Audit Reports: The ECO must compile quarterly compliance reports (audits) which are to be submitted to the applicant for his review and correction of non-compliance issues. It is the responsibility of the ECO to report any non-compliance, which is not correctly rectified.

3.4 EMPR AUDITING

Audits are required to be undertaken in terms of Regulation 34 of the National Environmental Management Act, Act 107 of 1998 (NEMA) Environmental Impact Assessment (EIA) Regulations, 2014. An EMPr audit report shall be submitted to the Department of Mineral Resources and Energy (DMRE) on an annual basis (each year of mining and before applying for closure). The holder of the mining right may appoint an independent qualified person for the monitoring and to compile a report, but the responsibilities remain the holders. The performance assessment will include:

- The period when the performance assessment was conducted;
- The scope of the assessment;
- The procedures used for conducting the assessment;
- Interpreted information gained from monitoring the EMPr (e.g. ECO reports);
- Evaluation criteria used during the assessment; and
- Results of the assessment are to be discussed and mention must be made of any gaps in the EMPr and how it can be rectified.

3.5 MECHANISMS FOR MONITORING COMPLIANCE

Table 5 below provides a summary of the functional requirements for monitoring that needs to be implemented, identifies who is responsible for the monitoring and the frequency of monitoring and reporting.

Table 5: Mechanisms for monitoring compliance

Source Activity	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency and Time Periods for Implementation
TSF Planning and Design	None	None		
TSF Construction	All Impacts Identified during the EIA	Site Inspections and checklists	Environmental Officer	Daily inspections and checklists
		Report Review and Development of Action Plans for Corrective Action	Environmental Manager	As Required
		Site Inspections and Audits	Environmental Officer	Weekly inspections
				Monthly Reports
			Environmental Control Officer	Monthly Audit Reports
			Independent Environmental Auditor	Annual Performance Assessment
TSF Operation	All Impacts Identified during the EIA	Site Inspections and checklists	Environmental Officer	Weekly inspections and checklists
		Report Review and Development of Action Plans for Corrective Action	Environmental Manager	As Required
		Site Inspections and Audits	Environmental Officer	Weekly inspections

Source Activity	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency and Time Periods for Implementation
				Monthly Reports
			Environmental Control Officer	Bi-Annual Audit Reports
			Independent Environmental Auditor	Annual Performance Assessment
Decommissioning Activities	All Impacts Identified during the EIA	Site Inspections and checklists	Environmental Officer	Daily inspections and checklists
		Report Review and Development of Action Plans for Corrective Action	Environmental Manager	As Required
		Site Inspections and Audits	Environmental Officer	Weekly inspections
				Monthly Reports
			Environmental Control Officer	Monthly Audit Reports
			Independent Environmental Auditor	Annual Performance Assessment
Rehabilitation	All Impacts Identified during the EIA	Report Review and Development of Action Plans for Corrective Action	Environmental Manager	As Required
		Site Inspections and Audits	Environmental Officer	Weekly inspections
				Monthly Reports
			Environmental Control Officer	Bi-Annual Audit Reports

Source Activity	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Monitoring and Reporting Frequency and Time Periods for Implementation
			Independent Environmental Auditor	Annual Performance Assessment
Closure - Aftercare and Maintenance	All Impacts Identified during the EIA	Report Review and Development of Action Plans for Corrective Action	Environmental Manager	As Required
		Site Inspections and Audits	Environmental Officer	Bi-Monthly inspections
				Bi-Monthly Reports
			Environmental Control Officer	Bi-Annual Audit Reports
			Independent Environmental Auditor	Annual Performance Assessment

3.6 REVIEW AND REVISION OF THE EMPR

It is important to note that this EMPr is made legally binding on the applicant at such time as the EMPr is approved by the decision-making authority. It is however also important to consider that the EMPr is a dynamic document which may require such alteration and /or amendment as the project evolves. Conditions under which the EMPr would require revision include:

- Changes in legislation;
- Occurrence of unanticipated impacts or impacts of greater intensity, extent and significance than predicted;
- Inadequate mitigation measures (i.e. where environmental performance does not meet the required level despite the implementation of the mitigation measure); and
- Secondary impacts occur as a result of the mitigation measures.

The Applicant in consultation with the ECO should be responsible for ensuring that the registration and updating of all relevant EMPr documentation is carried out. It shall be the responsibility of the Applicant/Mine Manager to ensure that all personnel are performing according to the requirements of this procedure and to initiate the revision of controlled documents, when required by changes in process or operations and shall notify the ECO of such changes.

It is recommended that a risk assessment protocol must be developed and implemented by the ECO which shall be utilised to evaluate the environmental risk associated with the potential proposed alterations and/or amendments. The results of the risk assessment must then be included in the submission to the competent authority for the amendment process. It is important to note that if alterations and/or amendments are required, these may only be affected with written approval from the competent authority and in accordance with the then-in-effect relevant legal processes. Harmony ESMS procedures will be updated and improved over time. The references made to procedures contained in the ESMS are subject to change as the system evolves and improves and the EMPr in such instances will change to align with the company system over time.

4 IMPACT MANAGEMENT OUTCOMES

This section of the EMPr provides the impact management outcomes identified for the Valley TSF project. The impact management objectives, including the standard to be achieved, are summarised in Table 6 below.

Table 6: Impact Management Outcomes

Activity	Potential Impact	Aspects	Phase	Objective / Outcome	Standard to be Achieved
Site establishment **Construction** **TSF Operation**	Erosion	Soils Biodiversity Air Quality	Construction Operation Decommissioning Rehabilitation and Closure	Minimise potential for further soil erosion. Avoid and control through preventative measures (storm water infrastructure, erosion control and monitoring)	CARA
Site establishment **Construction** **TSF Operation** **Water management**	Soil Pollution/Contamination	Groundwater Wetlands Soils Biodiversity	Construction Operation Decommissioning Rehabilitation and Closure	Avoid pollution through preventative measures (e.g. bunding, spill kits) Remedy through clean-up and waste disposal	Hazardous Substances Act NWA NEMA Duty of Care NEMWA Incident reporting procedures DWS minimum standards for waste disposal Hazardous Substances Act SANS 10206
Site establishment **Construction** **TSF Operations** **General decommissioning activities**	Damage/Disruption of Ecosystem Services	Land Use Biodiversity Wetlands	Construction Operation Decommissioning Rehabilitation and Closure	Prevent unnecessary clearance of vegetation, loss in habitat and disturbance of species. Control through implementation of EMPr mitigation measures (e.g. limit area of disturbance, training,	NEMBA TOPS

Activity	Potential Impact	Aspects	Phase	Objective / Outcome	Standard to be Achieved
				prevent damage caused by pipe leaks)	
Site establishment **Construction** **TSF Operation** **General decommissioning activities** **Post Closure Monitoring and Maintenance** **Water management**	Direct and indirect mortality of flora and fauna	Biodiversity	Planning and Design Construction Operation Decommissioning Rehabilitation and Closure	Prevent the injury, trapping or death of local fauna. Prevent unnecessary clearance of vegetation, loss in habitat and disturbance of species. Control through implementation of EMPr mitigation measures (e.g. limit area of disturbance, training, prevent damage caused by pipe leaks)	NEMBA TOPS
Site establishment **Construction** **General Surface Rehabilitation** **TSF operations** **General decommissioning activities** **Post Closure Monitoring and Maintenance** **Water management**	Introduction/invasion by alien (non-native) species	Biodiversity	Planning and Design Construction Operation Decommissioning Rehabilitation and Closure	Prevent proliferation of alien species. Control through implementation of EMPr mitigation measures (e.g. alien vegetation management plan) Avoid/Stop through preventative measures (e.g. limit extent of disturbance)	NEMBA TOPS Alien vegetation management plan

Activity	Potential Impact	Aspects	Phase	Objective / Outcome	Standard to be Achieved
Site establishment **TSF operations** **Post Closure Monitoring and Maintenance** **Water management**	Pollution of surface water resources	Wetlands	Construction Operation Decommissioning Rehabilitation and Closure	Protect watercourses and sources of water. Avoid pollution through implementation of preventative measures (e.g. Bunding, Hazardous materials management, Pollution prevention measures, storm water management) Control through implementation of mitigation measures (water treatment when required)	NWA GN704 NEMA Duty of Care NEMA Polluter Pays Principle DWS best practice guidelines Global Industry Standard for Tailings Management
Site establishment **TSF Operations** **General decommissioning activities** **Water management** **Post Closure Monitoring and Maintenance**	Pollution of groundwater/ decreased water quality	Groundwater	Construction Operation Decommissioning Rehabilitation and Closure	Avoid contamination of groundwater resources Avoid and control through implementation of preventative measures Control through implementation of mitigation measures (barrier system, monitoring and phytoremediation)	NWA GN704 NEMA Duty of Care NEMA Polluter Pays Principle DWS best practice guidelines Rehabilitation and closure plan
Site establishment **TSF Operations**	Loss and disturbance of	Wetlands	Construction Operation	Protect watercourses and sources of water.	NWA GN704

Activity	Potential Impact	Aspects	Phase	Objective / Outcome	Standard to be Achieved
General decommissioning activities **Water management**	wetland habitat		Rehabilitation and Closure	Avoid and control through implementation of preventative measures (e.g. limit area of wetland disturbance for wetlands around the edges of the site, maintain stormwater infrastructure)	NEMA Duty of Care NEMA Polluter Pays Principle DWS best practice guidelines Rehabilitation and closure plan
General decommissioning activities	General Environmental Pollution	Environmental Pollution	Operation Decommissioning Rehabilitation and Closure	Avoid pollution caused by fuel spillages and improper storage of materials. Avoid and control through implementation of EMPr mitigation measures (e.g. Spill prevention, Hydrocarbon Storage)	Hazardous Substances Act NWA MSDS OHSA MHSA NEMA Duty of Care NEMA Polluter Pays Principle NEMWA Incident reporting procedures DWS minimum standards for waste disposal DMR Code of Practice for Mine Residue Deposits
Site establishment **TSF operations**	Hydrocarbon spills/contamination	Environmental Pollution	Planning and Design Construction	Avoid pollution caused by fuel spillages and improper storage of materials	Hazardous Substances Act NWA MSDS

Activity	Potential Impact	Aspects	Phase	Objective / Outcome	Standard to be Achieved
Post Closure Monitoring and Maintenance **Water management**			Operation Decommissioning Rehabilitation and Closure	Avoid through preventative measures (e.g. bunding, spill kits) Remedy through cleanup and waste disposal	OHSA MHSA NEMA Duty of Care NEMWA Incident reporting procedures DWS minimum standards for waste disposal
Site establishment **Construction**	Discovery and preservation of fossils	Palaeontology	Operation	Avoid and control through implementation of preventative measures (e.g. chance find procedure) Modify through removal and curation of fossils	NEMA MPRDA NHRA SAHRA permitting requirements
Construction **TSF Operations** **General decommissioning activities**	Economic growth and Employment Opportunities	Socio-Economic	Construction Operation Decommissioning Rehabilitation and Closure	Maximise through optimisation of economic growth opportunities	SLP Commitments
Closure	Loss of jobs and economic opportunities	Socio-Economic	Construction Operation Decommissioning	Minimise impacts of job loss through skills development and livelihood restoration	SLP Commitments

Activity	Potential Impact	Aspects	Phase	Objective / Outcome	Standard to be Achieved
			Rehabilitation and Closure		
Construction **TSF Operations** **General decommissioning activities** **Rehabilitation and Closure** **Post-Closure**	Radiation and health Impacts	Health and Safety	Construction Operation Decommissioning Rehabilitation and Closure	Ensure safety of property, workers and people living in the vicinity Check through implementation of mitigation measures (radiation monitoring)	NRWMP OHSA MHSA SLP Commitments Grievance Mechanism Global Industry Standard for Tailings Management DMR Code of Practice for Mine Residue Deposits
Construction **TSF Operations** **General decommissioning activities**	Visual impact of light at night	Visual	Construction Operation	Avoid and control through implementation of EMPr mitigation measures (e.g. directional down lighting)	Security specifications
Construction **TSF Operations** **General decommissioning activities**	Visual impact of mine infrastructure, stockpiles and dust	Visual	Construction Operation Decommissioning Rehabilitation and Closure	Avoid and control through implementation of EMPr mitigation measures (e.g. dust suppression, mine planning and progressive rehabilitation)	Rehabilitation and Closure Plan
Construction **TSF Operations**	Fugitive emissions (Dust)	Air Quality	Planning and Design	Minimise and prevent dust and air pollution.	Road Traffic Act NEMAQA

Activity	Potential Impact	Aspects	Phase	Objective / Outcome	Standard to be Achieved
General decommissioning activities			Construction Operation Decommissioning Rehabilitation and Closure	Avoid through preventative measures (e.g. speed limit enforcement) Control through implementation of EMPr mitigation measures (e.g. dust suppression)	Dust regulations
Construction **TSF Operations** **General decommissioning activities**	Disturbing and/or nuisance noise	Noise	Planning and Design Construction Operation Decommissioning Rehabilitation and Closure	Reduce the impact of noise associated with the mining activities on the surrounding area. Avoid through preventative measures (e.g. communication with landowners, timing of activities) Control through implementation of EMPr mitigation measures (e.g. Noise abatement measures)	ECA noise regulations SANS 10103 OHSA MHSA

5 IMPACT MANAGEMENT ACTIONS: MANAGEMENT PROGRAMME

Table 7 below provides measures for management of the environmental aspects that are impacted on during the different phases of the project.

Table 7: Description of the proposed impact management actions.

Activities	Phase	Size and Scale of Disturbance	Mitigation Measures / Management Actions	Compliance with Standards	Time Period for Implementation
5.1 ENVIRONMENTAL MANAGEMENT SYSTEM					
General Mine Management	Planning and Design Construction Operation Decommissioning Rehabilitation and Closure	No direct physical disturbance	The mine shall develop an effective Environmental and Social Management System (ESMS) that is appropriate to the nature and scale of the project. The ESMS should include and provide for the following as a minimum: • Environmental Policy; • Ongoing Identification of risks and impacts; • Social and Environmental Management programs; • Organisational capacity and competency; • Emergency preparedness; • Stakeholder engagement; and • Monitoring and review.	Shall adhere to the ESMS developed to ensure compliance with the regulatory framework	Throughout LoM
General Mine Management	Planning and Design Construction Operation Decommissioning Rehabilitation and Closure	No direct physical disturbance	The mine shall ensure that Social and Environmental human resources have the knowledge, skills, and experience necessary to perform their work with competence and efficiency.	Shall adhere to the ESMS developed to ensure compliance with the regulatory framework	Throughout LoM
General Mine Management	Planning and Design	No direct physical disturbance	The mine shall appoint a suitably qualified and competent ECO who shall preferably be independent from the Applicant. The ECO must preferably have a tertiary qualification in an	Shall adhere to the ESMS developed to ensure compliance	Throughout LoM

Activities	Phase	Size and Scale of Disturbance	Mitigation Measures / Management Actions	Compliance with Standards	Time Period for Implementation
	Construction Operation Decommissioning Rehabilitation and Closure		Environmental Management or appropriate field. The ECO should have appropriate qualification and experience in the implementation of environmental management specifications. The ECO shall be tasked with auditing the mines environmental compliance on a regular basis (monthly). The Applicant shall provide the ECO with the necessary support to ensure that the environmental aspects relating to the development is adhered to.	with the regulatory framework	
General Mine Management	Planning and Design Construction Operation Decommissioning Rehabilitation and Closure	No direct physical disturbance	The mine must have a copy of this EMPr at the point of use and should be briefed by the Mine EO or ECO with regards to the use and implementation of the EMPr.	Shall adhere to the ESMS developed to ensure compliance with the regulatory framework	Throughout LoM
General Mine Management	Planning and Design Construction Operation Decommissioning Rehabilitation and Closure	No direct physical disturbance	The EMPr must be made binding on all sub-contractors (if utilised) operating on behalf of the Mining Right Holder.	Shall adhere to the ESMS developed to ensure compliance with the regulatory framework	Throughout LoM
General Mine Management	Planning and Design Construction	No direct physical disturbance	The mine shall ensure that all sub-contractors (if utilised) abide by the requirements of the EMPr through the inclusion of the EMPr and applicable environmental requirements in contractual agreements for all sub-contractors.	Shall adhere to the ESMS developed to ensure compliance	Throughout LoM

Activities	Phase	Size and Scale of Disturbance	Mitigation Measures / Management Actions	Compliance with Standards	Time Period for Implementation
	Operation Decommissioning Rehabilitation and Closure			with the regulatory framework	
5.2 EMERGENCY RESPONSE					
General Mine Management	Planning and Design Construction Operation Decommissioning Rehabilitation and Closure	Emergencies have the potential for large scale and high significance impacts	The mine shall develop and implement an Emergency Preparedness and Response Plan which shall include and provide for the following as a minimum: • Risk assessment; • Response procedures; • Provision of equipment and resources; • Designation of responsibilities; • Communication and reporting (including that with potentially affected communities) • Periodic training to ensure effective response; and • Periodic review and revision, as necessary, to reflect changing conditions.	Shall adhere to the ESMS developed to ensure compliance with the regulatory framework	Throughout LoM
General Mine Management	Planning and Design Construction Operation Decommissioning Rehabilitation and Closure	No direct physical disturbance	The necessary provisions (financial, resources, materials) shall be made in order to ensure compliance with the Emergency Preparedness and Response Plan.	Shall adhere to the ESMS developed to ensure compliance with the regulatory framework	Throughout LoM

Activities	Phase	Size and Scale of Disturbance	Mitigation Measures / Management Actions	Compliance with Standards	Time Period for Implementation
5.3 HEALTH AND SAFETY					
General Mine Management	Construction Operation Decommissioning Rehabilitation and Closure	Health and safety risks are classified as high significance due to the value of human life	The mine shall ensure that reasonable measures are taken to ensure the safety of all site staff, including induction training for all employees and visitors.	OHS and MHSA	Throughout LoM
General Mine Management	Construction Operation Decommissioning Rehabilitation and Closure	Health and safety risks are classified as high significance due to the value of human life	All staff and sub-contractors must be informed about any community concerns, especially during the construction phase. Toolbox talks can be used for this. Speed limits on the road to the mine must be enforced. People that do not adhere to the speed limits shall receive the appropriate disciplinary action.	OHS and MHSA	Throughout LoM
General Mine Management	Construction Operation Decommissioning Rehabilitation and Closure	Health and safety risks are classified as high significance due to the value of human life	The mine shall provide appropriate Personal Protective Equipment (PPE) to employees wherever required and in accordance with the risks associated with their activities.	OHS and MHSA	Throughout LoM
General Mine Management	Construction Operation Decommissioning Rehabilitation and Closure	Health and safety risks are classified as high significance due to the value of human life	The mine shall undertake safety audits to ensure compliance with: • Occupational Health and Safety Act (Act No. 85 of 1993) and associated regulations; and • Mine Health and Safety Act (Act 29 of 1996) as amended and associated regulations.	OHS and MHSA	Throughout LoM

Activities	Phase	Size and Scale of Disturbance	Mitigation Measures / Management Actions	Compliance with Standards	Time Period for Implementation
General Mine Management	Construction Operation Decommissioning Rehabilitation and Closure	Health and safety risks are classified as high significance due to the value of human life	The mine shall implement a safety reporting procedure to ensure that all accidents and incidents (safety and environmental) are recorded and reported to the Mine manager and EO.	OHS and MHSA	Throughout LoM
General Mine Management	Construction Operation Decommissioning Rehabilitation and Closure	Health risks are classified as high significance due to the value of human life	The mine shall develop and implement an infectious diseases management plan to address health issues with the workforce.	OHS	Throughout LoM
General Mine Management	Construction Operation Decommissioning Rehabilitation and Closure	Health and safety risks are classified as high significance due to the value of human life	Any containers in which hazardous substances (e.g. fuel, paints, solvents) are stored shall be clearly marked as to the contents therein (in accordance with OHSA regulations).	OHS and MHSA	Throughout LoM
General Mine Management	Construction Operation Decommissioning Rehabilitation and Closure	Health and safety risks are classified as high significance due to the value of human life	One of the key risks of a TSF is the safety and environmental implications in the event of dam failure. As part of the regular conformance monitoring the daily and weekly inspections according to the criteria specified in section 8.7.8.3 of the COP (JT_COP_GEN_002), allows for checking of signs of instability and/or structural failure.	OHS and MHSA	Throughout LoM

Activities	Phase	Size and Scale of Disturbance	Mitigation Measures / Management Actions	Compliance with Standards	Time Period for Implementation
			In the event of dam failure Harmony's slime dam emergency preparedness and emergency response procedure should be followed.		
General Mine Management	Construction Operation Decommissioning Rehabilitation and Closure	Health and safety risks are classified as high significance due to the value of human life	If a storm of more than 30 mm occurs in a 24-hour period then the emergency actions noted in Harmony's Mandatory Code of Practice for mine residue deposits should be followed (JT_COP_GEN_002).	OHS and MHSA	Throughout LoM
5.4 ENVIRONMENTAL AWARENESS					
General Mine Management	Construction Operation Decommissioning Rehabilitation and Closure	No direct physical disturbance	All employees and visitors to the site must undergo a visitors induction which shall include basic environmental awareness and site-specific environmental requirements (e.g. site sensitivities and relevant protocols/procedures). This induction should be presented or otherwise facilitated by the Mine EO wherever possible.	NEMA	Throughout LoM
5.5 LAND USE, SOCIAL AND SOCIO-ECONOMIC					
General Mine Management	Planning	No direct physical disturbance	Set up a communication forum with local farmers where representatives could voice concerns related to the mining activities. Communicate the mine's grievance mechanism (that forms part of the mine's Stakeholder Engagement Plan) to local stakeholders (e.g. through the local media), including how to access the grievance mechanism and the mine's commitment to address grievances lodged through this system.	Adherence to corporate policies	Prior to construction

Activities	Phase	Size and Scale of Disturbance	Mitigation Measures / Management Actions	Compliance with Standards	Time Period for Implementation
			Harmony must establish an environmental forum that include all the affected farmers - neighbouring and downstream. Results of water and dust monitoring must be shared with the public through the forum. If current water delivery points are affected by the placing of the new TSF new points must be determined with input from the farmers. These points must be easily accessible. If water pipes are required, the mine must provide and install the pipes.		
General Mine Management	Planning	No direct physical disturbance	The mine should put measures in place to ensure the most effective local employment strategy. The procurement policy for the mine should focus on utilising service providers from the local area so as to encourage the growth of businesses.	Adherence to corporate policies and compliance with legislation including Labour Act and Employment Act SLP Commitments	Throughout LoM
General Mine Management	Planning	No direct physical disturbance	Harmony should ensure a fair number of secondary economic opportunities are given to local contractors. A percentage of goods as determined by Harmony and the relevant stakeholders must also be procured locally. Services and goods must be procured locally as far as reasonably possible. Aspects of this positive impact will occur by default when the construction force lives locally, and they utilise local services and support local shops.	Adherence to corporate policies and compliance with legislation including Labour Act and Employment Act SLP Commitments	Throughout LoM
General Mine Management	Planning Construction Operation	No direct physical disturbance	Skills development plans must be focussed on skills that the mine needs, and that are also transferable. Support must be given to people after the training to ensure that their newly acquired skills can be implemented.	SLP commitments	Throughout LoM

Activities	Phase	Size and Scale of Disturbance	Mitigation Measures / Management Actions	Compliance with Standards	Time Period for Implementation
	Decommissioning Rehabilitation and Closure		The mine shall comply with the conditions of the SLP developed for the mine to ensure the socio-economic benefits of the mine are maximised.		
General Mine Management	Planning Construction Operation Decommissioning Rehabilitation and Closure	No direct physical disturbance	The mine shall comply with all relevant legislation pertaining to labour recruitment and employment.	Compliance with legislation including Labour Act and Employment Act	Throughout LoM
General Mine Management	Planning Construction Operation Decommissioning	No direct physical disturbance	A grievance register must be maintained by the mine to log grievances from landowners, communities, occupants and other Interested and Affected Parties, and response to such grievances. The grievance register should be provided to authorities at any point in time if so requested. The grievance register shall contain, at a minimum, the following information; • Date of the grievance being lodged, • Location relating to the grievance, • Contact details of the complainant, • Grievance description (detailed as possible), • Person receiving grievance, • Agreed corrective action, • Responsible party for corrective action, • Summary of actions taken (and date action was taken), • Status of grievance (open, closed-out, awaiting feedback etc.).	Shall adhere to the ESMS developed to ensure compliance with the regulatory framework	Developed as early as possible and implemented throughout LoM

Activities	Phase	Size and Scale of Disturbance	Mitigation Measures / Management Actions	Compliance with Standards	Time Period for Implementation
			The grievance mechanism must be communicated to all stakeholders and communities. The mine should communicate the mine's grievance mechanism through the local media and ensure that stakeholders know how to access the grievance mechanism. Grievances must be addressed timeously.		
General Mine Management	Planning Construction Operation Decommissioning	No direct physical disturbance	If investigations prove actual losses due to the activities performed by Harmony, Harmony will enter into discussions with the landowner. .	Shall adhere to the ESMS developed to ensure compliance with the regulatory framework	Commence in the planning phase and continue throughout the life of the project
General Mine Management	Planning Construction Operation Decommissioning	No direct physical disturbance	The Stakeholder Relations Manager should establish relationships with the surrounding farmers. This can include a yearly courtesy visit and sharing of environmental data to keep the farmers informed. All meetings should be recorded, and records must be included in the communication register. The mine management should also with engage with the farmers about water supply. The negotiations must be recorded.	Shall adhere to the ESMS developed to ensure compliance with the regulatory framework	Commence in the planning phase and continue through to the operation phase of the project
General Mine Management	Planning Construction Operation Decommissioning	No direct physical disturbance	Conduct a water census and repeat periodically as recommended by the relevant specialists. Keep the affected people informed about the census and monitoring results. Share water monitoring results with farmers once a year.	Shall adhere to the ESMS developed to ensure compliance with the regulatory framework	Use the design and planning phase to get communication channels in place

Activities	Phase	Size and Scale of Disturbance	Mitigation Measures / Management Actions	Compliance with Standards	Time Period for Implementation
General Mine Management	Planning Construction Operation Decommissioning	No direct physical disturbance	Harmony must investigate and where possible and feasible adopt and / or adapt the Global Industry Standard on Tailings Management for the existing and new TSF.	GISTM	Throughout the life of the mine
5.6 SITE ESTABLISHMENT					
Construction camp sewage management **Dust suppression** **Earthworks**	Construction	Construction impacts are temporary in nature and have a limited extent but may include significant impacts	The physical footprint of any construction or site camp shall be minimised and vegetation clearance should be kept to the minimum required area.	Shall adhere to the ESMS developed to ensure compliance with the regulatory framework OHSA MHSA NEMA MPRDA	Throughout construction
Fencing **Hazardous substances management** **Site security**	Construction	Construction impacts are temporary in nature and have a limited extent but may include significant impacts	All construction and/or site camps shall be enclosed with a fence. The mesh size should be small enough for the fence to act as a catch net for blown debris and as a demarcation of the site. The fence shall be maintained as required to ensure access control remains effective. All temporary fences erected shall be removed and the site restored on completion of construction, unless otherwise agreed in writing with the Applicant.	Shall adhere to the ESMS developed to ensure compliance with the regulatory framework OHSA MHSA NEMA	Throughout construction

Activities	Phase	Size and Scale of Disturbance	Mitigation Measures / Management Actions	Compliance with Standards	Time Period for Implementation
				MPRDA	
Soil Management **Truck and heavy machinery operation** **Utilization of portable toilets and generation of sewage** **Vegetation clearance**	Construction	Construction impacts are temporary in nature and have a limited extent but may include significant impacts	Site and construction camps must be kept in a clean, neat and tidy condition at all times. The Mine shall maintain good housekeeping practices and shall comply with the relevant HSE regulations in terms of materials storage. Stockpiles of construction materials may only be placed within demarcated areas within the construction camp. Laydown areas must be kept neat and tidy and free of litter or waste.	Shall adhere to the ESMS developed to ensure compliance with the regulatory framework OHSA MHSA NEMA NEMWA	Throughout construction
	Construction	Construction impacts are temporary in nature and have a limited extent but may include significant impacts	A waste storage area must be established within the site camp/construction camp that provides for appropriate and adequate waste storage and waste separation for recycling. All waste must be adequately contained to prevent ground and/or water pollution. The total volume of general waste stored shall not exceed 100m^3. In the case that a storage capacity exceeding this amount is required or planned for, the necessary waste permits must be obtained in accordance with the NEMWA beforehand.	Shall adhere to the ESMS developed to ensure compliance with the regulatory framework OHSA MHSA NEMA NEMWA	Throughout construction
	Construction	Construction impacts are temporary in nature and have a limited extent but may	The site camp/construction camp shall have adequate provision for the storage of hazardous waste (e.g. old oil filters, soil from spills etc.) and the waste shall be contained within closed containers to prevent the possibility of spillages.	Shall adhere to the ESMS developed to ensure compliance with the regulatory framework OHSA	Throughout construction

Activities	Phase	Size and Scale of Disturbance	Mitigation Measures / Management Actions	Compliance with Standards	Time Period for Implementation
		include significant impacts		MHSA NEMA MPRDA	
	Construction	Construction impacts are temporary in nature and have a limited extent but may include significant impacts	All fuel storage areas shall be bunded to contain at least 110 % of the volume stored and will comply with the relevant safety regulations. Fuel storage areas may not be located within 100m of the watercourse and the total volume of fuel stored on site may not exceed applicable thresholds in the listing notices without the necessary authorisation in terms of the NEMA. Fuel storage areas must be provided with an impervious surface with the provision to contain any potential fuel spillages during refuelling (e.g. a bunded, sealed concrete slab which drains to a sump/oil separator). No person smoke or take part in any activity that may results in sparks near fuels and other flammable substances to prevent ignition.	Shall adhere to the ESMS developed to ensure compliance with the regulatory framework OHSA MHSA NEMA	Throughout construction
	Construction	Construction impacts are temporary in nature and have a limited extent but may include significant impacts	All hazardous substances shall be stored within designated areas that comply with the relevant HSE standards (e.g. ventilation, access control, HSE signage, firefighting equipment etc.) and that provide for spill prevention and containment. It is recommended that a dedicated, bunded and fenced Hazardous Storage Area is provided within the construction camp for this purpose.	Shall adhere to the ESMS developed to ensure compliance with the regulatory framework OHSA MHSA NEMA NWA	Throughout construction
	Construction	Construction impacts are temporary in nature	Any site camps/construction camps shall be provided with portable fire extinguishing equipment, in accordance with all	Shall adhere to the ESMS developed to ensure compliance	Throughout construction

Activities	Phase	Size and Scale of Disturbance	Mitigation Measures / Management Actions	Compliance with Standards	Time Period for Implementation
		and have a limited extent but may include significant impacts	relevant legislation and this equipment must be readily accessible.	with the regulatory framework OHSA MHSA NEMA	
	Construction	Construction impacts are temporary in nature and have a limited extent but may include significant impacts	No open fires shall be permitted within the site camp/construction camp, except where approved by the responsible safety officer and EO/ECO and within a designated structure designed for that purpose. In such cases firefighting equipment must be readily available near the fire place and an appropriate safety representative should be present at all times during burning of the fire. All fires shall be fully extinguished after use.	Shall adhere to the ESMS developed to ensure compliance with the regulatory framework OHSA MHSA NEMA	Throughout construction
5.7 TERRESTRIAL BIODIVERSITY					
Site establishment **Maintenance and operation of site**	Planning and Design Construction Operation Decommissioning Rehabilitation and Closure	Impacts on flora may occur over a large area and has the potential to be of moderate significance	An Alien Invasive Plant Management Plan must be compiled and implemented. This should regularly be updated to reflect the annual changed in AIP composition.	NEMA NEMBA CARA	Development of plan as soon as possible and implementation throughout LoM
	Planning and Design	Impacts on flora may occur over a large	An experienced, qualified environmental control officer must be on site when construction begins to identify floral species that	NEMBA	Prior to commencement

Activities	Phase	Size and Scale of Disturbance	Mitigation Measures / Management Actions	Compliance with Standards	Time Period for Implementation
infrastructure and facilities **Post Closure Monitoring and Maintenance** **Storm water management** **Water management**	Construction	area and has the potential to be of moderate significance	will be directly disturbed and to relocate flora that are found during construction (this specifically includes any floral SCC); The mine shall ensure that the relevant permits are obtained to remove and relocate protected species (if required). Plan activities carefully so that only vegetation that needs to be impacted is impacted.	Threatened or Protected Species (TOPS) regulations National Forests Act	of activities or disturbance
	Planning and Design Construction	Impacts on flora may occur over a large area and has the potential to be of moderate significance	A qualified environmental control officer must be on site when activities begin. A site walk through is recommended by a suitably qualified ecologist prior to any activities taking place and any SSC or protected species should be noted. In situations where these species are observed and must be removed, the proponent may only do so after the required permission/permits have been obtained in accordance with national and provincial legislation. In the abovementioned situation the development and implementation of a search, rescue and recovery program is suggested for the protection of these species. Should animals not move out of the area on their own, relevant specialists must be contacted to advise on how the species can be relocated.	NEMBA TOPS regulations	Prior to commencement of activities or disturbance
	Construction Operation Decommissioning	Impacts on air quality have a moderate significance and may occur over a large area	Dust-reducing mitigation measures must be put in place and must be strictly adhered to. This includes the wetting of exposed soft soil surfaces. No non-environmentally friendly suppressants may be used as this could result in the pollution of water sources.	NEMA	Throughout LoM
	Construction	Impacts on fauna and flora may occur over a large area and has the potential to	The footprint area of the construction should be kept to a minimum. The footprint area must be clearly demarcated to avoid unnecessary disturbances to adjacent areas. Footprints of the roads must be kept to prescribed widths.	NEMA	Throughout construction

Activities	Phase	Size and Scale of Disturbance	Mitigation Measures / Management Actions	Compliance with Standards	Time Period for Implementation
		be of moderate significance	Laydown and construction preparation activities (such as cement mixing, temporary toilets, etc.) must be limited to already modified areas as far as possible and should take up the smallest footprint possible.		
	Construction Operation	Impacts on fauna and flora may occur over a large area and has the potential to be of moderate significance	A fire management plan needs to be compiled and implemented to restrict the impact fire would have on the surrounding areas.	NEMA NEMBA CARA Shall adhere to the ESMS developed to ensure compliance with the regulatory framework	Throughout LoM
	Construction Operation Decommissioning	Impacts on fauna and flora may occur over a large area and has the potential to be of moderate significance	Any materials may not be stored for extended periods of time and must be removed from the Project Area once the construction phase has been concluded. No permanent construction phase structures should be permitted. Construction buildings should preferably be prefabricated or constructed of re-usable/recyclable materials. No storage of vehicles or equipment will be allowed outside of the designated laydown areas.	Shall adhere to the ESMS developed to ensure compliance with the regulatory framework	Throughout LoM
	Construction Operation Decommissioning Rehabilitation and Closure	Impacts on flora may occur over a large area and has the potential to be a moderate significance	The clearing of vegetation must be minimised where possible. All activities must be restricted to within the authorised areas. Areas of indigenous vegetation, even secondary communities outside of the direct project footprint, should not be fragmented or disturbed further. All vehicles and personnel must make use of existing roads and walking paths as far as possible, especially construction/operational vehicles.	NEMA NEMBA CARA Shall adhere to the ESMS developed to ensure compliance	Throughout construction

Activities	Phase	Size and Scale of Disturbance	Mitigation Measures / Management Actions	Compliance with Standards	Time Period for Implementation
				with the regulatory framework	
	Planning and Design Construction Operation Decommissioning Rehabilitation and Closure	Impacts on fauna and flora may occur over a large area and has the potential to be of moderate significance	Areas that are denuded during construction need to be re-vegetated with indigenous vegetation according to a habitat rehabilitation plan, to prevent erosion during flood and wind events and to promote the regeneration of functional habitat. This will also reduce the likelihood of encroachment by alien invasive plant species. All grazing mammals must be kept out of the areas that have recently been re-planted.	NEMA NEMBA CARA	Throughout construction
	Planning and Design Construction Operation Decommissioning	Impacts on fauna has the potential to be a relatively moderate significance especially where threatened or protected species are impacted upon	Schedule activities and operations as far as possible during least sensitive periods, to avoid migration, nesting, and breeding seasons. Clearing and disturbance activities must be conducted in a progressive linear manner, always outwards and away from the centre of the Project Area and over several days, so as to provide an easy escape route for all small mammals and herpetofauna.	NEMA NEMBA CARA Shall adhere to the ESMS developed to ensure compliance with the regulatory framework	Throughout construction
	Planning and Design Construction Operation Decommissioning	Impacts on fauna has the potential to be a relatively moderate significance especially where threatened or protected species are impacted upon	The duration of the construction activities should be minimised to as short a term as possible, to reduce the period of disturbance on fauna. Noise must be kept to an absolute minimum during the evenings and at night to minimise all possible disturbances to reptile species and nocturnal mammals.	NEMBA TOPS Shall adhere to the ESMS developed to ensure compliance with the regulatory framework within the fra	Throughout construction

Activities	Phase	Size and Scale of Disturbance	Mitigation Measures / Management Actions	Compliance with Standards	Time Period for Implementation
	Construction	Small and localized	All construction waste must be removed from site at the closure of the construction phase.	NEMA,1998 Shall adhere to the ESMS developed to ensure compliance with the regulatory framework	Throughout construction
	Planning Construction	Impacts on fauna have the potential to be a relatively moderate significance especially where threatened or protected species are impacted upon	A qualified environmental control officer must be on site when activities begin. A site walk through is recommended by a suitably qualified ecologist prior to any activities taking place and any SSC or protected species should be noted. In situations where these species are observed and must be removed, the proponent may only do so after the required permission/permits have been obtained in accordance with national and provincial legislation. In the abovementioned situation the development and implementation of a search, rescue and recovery program is suggested for the protection of these species. Should animals not move out of the area on their own, relevant specialists must be contacted to advise on how the species can be relocated.	NEMA NEMBA	Pre-construction
	Planning and Design Construction Operation Rehabilitation and Closure	Small and localized	Precautions must be taken against the erosion damage that would be caused by unplanned pipe leaks.. Monitoring of the pipeline must be undertaken to detect leaks and monitoring should be undertaken at least once a week.	NEMA Shall adhere to the ESMS developed to ensure compliance with the regulatory framework	Throughout LoM
	Planning and Design	Pollution has the potential to pollute	A hydrocarbon spill management plan must be put in place to ensure that should there be any chemical spill out or over that it	NEMA	Throughout LoM

Activities	Phase	Size and Scale of Disturbance	Mitigation Measures / Management Actions	Compliance with Standards	Time Period for Implementation
	Construction Operation Decommissioning	the environment and can vary from localized to large scale impacts	does not run into the surrounding areas. The Contractor shall be in possession of an emergency spill kit that must always be complete and available on site. • Drip trays or any form of oil absorbent material must be placed underneath vehicles/machinery and equipment when not in use. • No servicing of equipment on site unless necessary. • All contaminated soil / yard stone shall be treated in situ or removed and be placed in containers. • Appropriately contain any generator diesel storage tanks, machinery spills (e.g., accidental spills of hydrocarbons oils, diesel etc.) in such a way as to prevent them from leaking and entering the environment. • Construction activities and vehicles could cause spillages of lubricants, fuels and waste material negatively affecting the functioning of the ecosystem. • All vehicles and equipment must be maintained, and all re-fuelling and servicing of equipment is to take place in demarcated areas outside of the Project Area.	NEMBA CARA Shall adhere to the ESMS developed to ensure compliance with the regulatory framework	
	Construction Operation Decommissioning	Impacts on fauna has the potential to be a relatively moderate significance especially where threatened or	It must be made an offence for any staff member to take any indigenous plant species out of any portion of the Project Area, or to bring any alien plant species into any portion of the Project Area. This is to prevent the spread of exotic or invasive species or the illegal collection of plants.	NEMA NEMBA CARA Shall adhere to the ESMS developed to ensure compliance	Throughout LoM

Activities	Phase	Size and Scale of Disturbance	Mitigation Measures / Management Actions	Compliance with Standards	Time Period for Implementation
		protected species are impacted upon		with the regulatory framework	
	Planning and Design Construction Operation Decommissioning	Impacts on fauna has the potential to be a relatively moderate significance especially where threatened or protected species are impacted upon	Pest control plan must be put in place and implemented.	NEMA NEMBA CARA Shall adhere to the ESMS developed to ensure compliance with the regulatory framework	Throughout LoM
	Construction Operation Decommissioning	Impacts on fauna has the potential to be a relatively moderate significance especially where threatened or protected species are impacted upon	Use environmentally friendly cleaning and dust suppressant products.	NEMA NEMBA CARA Shall adhere to the ESMS developed to ensure compliance with the regulatory framework .	Throughout LoM
	Construction	Impacts on fauna has the potential to be a relatively moderate significance especially where threatened or	Any holes/deep excavations must be dug in a progressive manner and shouldn't be left open overnight. Should any holes remain open overnight they must be properly covered temporarily to ensure that no small fauna species fall in. Holes must be subsequently inspected for fauna prior to backfilling.	NEMA NEMBA CARA Shall adhere to the ESMS developed to ensure compliance	Throughout construction

Activities	Phase	Size and Scale of Disturbance	Mitigation Measures / Management Actions	Compliance with Standards	Time Period for Implementation
		protected species are impacted upon		with the regulatory framework	
	Construction Operation Decommissioning	Impacts on fauna has the potential to be a relatively moderate significance especially where threatened or protected species are impacted upon	All construction and maintenance motor vehicle operators should undergo an environmental induction that includes instruction on the need to comply with speed limits, to respect all forms of wildlife. Speed limits must be enforced to ensure that road killings and erosion is limited Measures (for example; speed bumps and signs) must should be erected to enforce slow speeds.	NEMA NEMBA CARA Internal speed limits for haul roads and declared legal speed limits for public roads.	Throughout construction and operation
	Planning and Design Construction Operation Decommissioning	Impacts on fauna has the potential to be a relatively moderate significance especially where threatened or protected species are impacted upon	If fencing is required: wildlife-permeable fencing with holes large enough for mongoose and other smaller mammals should be installed, the holes must not be placed in the fence where it is next to a major road as this will increase road killings in the area.	NEMA NEMBA CARA	Throughout construction
	Construction Operation Decommissioning	Impacts on fauna has the potential to be a relatively moderate significance especially where threatened or protected species are impacted upon	All personnel and contractors are to undergo Environmental Awareness Training. A signed register of attendance must be kept for proof. Discussions are required on sensitive environmental receptors within the Project Area to inform contractors and site staff of the presence of protected species, their identification, conservation status and importance, biology, habitat requirements and	Induction training shall comply with ESMS Framework	Throughout construction and operations

Activities	Phase	Size and Scale of Disturbance	Mitigation Measures / Management Actions	Compliance with Standards	Time Period for Implementation
			management requirements in line with the Environmental Authorisation and within the EMPr.		
	Construction Operation Decommissioning	Impacts on flora and fauna may occur over a large area and has the potential to be of moderate significance	Contractors and employees must all undergo the induction and must be made aware of any sensitive areas to be avoided.	Induction training shall comply with ESMS Framework	Throughout construction and operations
	Construction Operation Decommissioning	Impacts on flora and fauna may occur over a large area and has the potential to be of moderate significance	A stormwater management plan must be compiled and implemented.	NEMA NEMBA CARA	Throughout LoM
	Construction Operation Decommissioning	Impacts on fauna has the potential to be a relatively high significance especially where threatened or protected species are impacted upon	No trapping, killing, or poisoning of any wildlife is to be allowed and signs must be put up to enforce this. Monitoring must take place in this regard.	NEMA NEMBA CARA	Throughout LoM
5.8 SOILS					
Site establishment	Construction	Small scale and localised	Vegetate or cover all stockpiles after stripping/removing soils. Vegetate or cover all stockpiles after stripping/removing soils. Natural re-vegetation of these areas for the first growing season	CARA NEMA	Throughout Construction and operations

Activities	Phase	Size and Scale of Disturbance	Mitigation Measures / Management Actions	Compliance with Standards	Time Period for Implementation
Construction **TSF operations**			is allowed, with further action to be determined thereafter, if needed.	In accordance with Rehabilitation and closure plan	
Decommissioning	Construction Operation Decommissioning	Pollution has the potential to pollute the environment and can vary from localized to large scale impacts	All contractors must have spill kits available and be trained in the correct use thereof. All contractors and employees should undergo induction which is to include a component of environmental awareness. The induction is to include aspects such as the need to avoid littering, the reporting and cleaning of spills and leaks and general good "housekeeping".	CARA NEMA In accordance with Rehabilitation and closure plan	Throughout Construction and operations
	Construction Operation Decommissioning	Pollution has the potential to pollute the environment and can vary from localized to large scale impacts	Have action plans on site, and training for contractors and employees in the event of spills, leaks and other impacts to the aquatic systems.	CARA NEMA In accordance with Rehabilitation and closure plan	Throughout Construction and operations
	Construction Operation	Small scale and localised	Monitor erosion on site on at least a monthly basis.	CARA NEMA In accordance with Rehabilitation and closure plan	Throughout Construction and operations
	Construction Operation Decommissioning	Pollution has the potential to pollute the environment and can vary from	Storage of potential contaminants should be undertaken in bunded areas.	CARA NEMA	Throughout Construction and operations

Activities	Phase	Size and Scale of Disturbance	Mitigation Measures / Management Actions	Compliance with Standards	Time Period for Implementation
		localized to large scale impacts		In accordance with Rehabilitation and closure plan	
5.9 POLLUTION PREVENTION					
Site establishment **Water management Infrastructure construction** **General Construction**	Construction Operation Decommissioning Rehabilitation and Closure	Pollution has the potential to pollute the environment and can vary from localized to large scale impacts	Any equipment that may leak, and does not have to be transported regularly, shall be placed on watertight drips trays to catch any potential spillages of pollutants. The drip trays shall be of a size that the equipment can be placed inside it. Daily inspections shall be carried out to ensure such spill prevention measures are in place and remain effective. Drip trays shall be cleaned regularly and shall not be allowed to overflow. All spilled hazardous substances must be collected and adequately disposed of at a suitably licensed facility.	NEMA Polluter Pays Principle NEMA Duty of Care NWA OHSA MHSA Shall adhere to the ESMS developed to ensure compliance with the regulatory framework	Throughout LoM
TSF operations **Maintenance and operation of site infrastructure and facilities**	Construction Operation Decommissioning	Pollution has the potential to pollute the environment and can vary from localized to large scale impacts	Appropriate measures must be implemented to ensure that rainwater does not run into areas containing cement, oil, diesel etc. as this could result in a pollution threat. Storage areas for these substances should be placed on high-lying ground.	NEMA Polluter Pays Principle NEMA Duty of Care NWA OHSA MHSA Shall adhere to the ESMS developed to ensure compliance	Throughout LoM

Activities	Phase	Size and Scale of Disturbance	Mitigation Measures / Management Actions	Compliance with Standards	Time Period for Implementation
General decommissioning activities				with the regulatory framework	
	Construction Operation Decommissioning	Pollution has the potential to pollute the environment and can vary from localized to large scale impacts	Servicing and maintenance of vehicles may only take place in a workshop area (subject to suitable spill prevention and containment measures). The workshop area should be lined with concrete or alternatively plastic under gravel. If emergency repairs are required elsewhere on site, this shall be undertaken with the necessary spill prevention measures in place.	NEMA Polluter Pays Principle NEMA Duty of Care NWA OHSA MHSA Shall adhere to the ESMS developed to ensure compliance with the regulatory framework	Throughout LoM
	Construction Operation Decommissioning	Pollution has the potential to pollute the environment and can vary from localized to large scale impacts	Cement and liquid concrete are hazardous to the natural environment on account of the very high pH of the material, and the chemicals contained therein. As a result, the Mine shall ensure that: • Concrete shall only be mixed on mortar boards or suitably lined areas, and not directly on the ground; • The visible remains of concrete, either solid, or from washings, shall be physically removed immediately and disposed of as waste (washing of visible signs into the ground is not acceptable); and • All excess aggregate shall also be removed.	NEMA Polluter Pays Principle NEMA Duty of Care NWA OHSA MHSA Shall adhere to the ESMS developed to ensure compliance with the regulatory framework	Throughout LoM

Activities	Phase	Size and Scale of Disturbance	Mitigation Measures / Management Actions	Compliance with Standards	Time Period for Implementation
	Construction Operation Decommissioning	Pollution has the potential to pollute the environment and can vary from localized to large scale impacts	All hazardous substances (e.g. fuel, grease, oil, brake fluid, hydraulic fluid) must be handled, stored and disposed of in a safe and responsible manner so as to prevent pollution of the environment or harm to people or animals. Appropriate measures must be implemented to prevent spillage and appropriate steps must be taken to prevent pollution in the event of a spill.	NEMA Polluter Pays Principle NEMA Duty of Care NWA OHSA MHSA Shall adhere to the ESMS developed to ensure compliance with the regulatory framework	Throughout LoM
	Construction Operation Decommissioning	Moderate significance and potentially a moderate scale disturbance	Hazardous substances shall be confined to specific and secured areas, and in such a way that does not pose any danger of pollution even during times of high rainfall. Hazardous storage areas shall be bunded (impermeable) with adequate containment (at least 110% the total volume stored) for potential spills or leaks. Bunded storage areas shall be either provided with an oil separator or sump. Waste from spillages will then be removed and recycled or disposed of responsibly.	NEMA Polluter Pays Principle NEMA Duty of Care NWA OHSA MHSA Shall adhere to the ESMS developed to ensure compliance with the regulatory framework	Throughout LoM
	Construction Operation	Moderate significance and potentially a	All fuel storage areas shall be bunded to contain at least 110 % of the volume stored and will comply with the relevant environmental and safety regulations. Fuel storage areas must	NEMA Polluter Pays Principle	Throughout LoM

Activities	Phase	Size and Scale of Disturbance	Mitigation Measures / Management Actions	Compliance with Standards	Time Period for Implementation
	Decommissioning	moderate scale disturbance	be provided with an impervious surface with the provision to contain any potential fuel spillages during refuelling (e.g. a sealed concrete slab which drains to a sump/oil separator). The applicant must ensure that employees and labourers do not smoke or take part in any activity that may results in sparks in the vicinity of fuels and other flammable substances to prevent ignition.	NEMA Duty of Care NWA OHSA MHSA Shall adhere to the ESMS developed to ensure compliance with the regulatory framework	
	Construction Operation Decommissioning	Moderate significance and potentially a moderate scale disturbance	Refuelling may only take place within a dedicated area inside the mine that is subject to appropriate spill prevention and containment measures Refuelling and transfer of hazardous chemicals and other potentially hazardous substances must be carried out so as to minimise the potential for leakage and to prevent spillage onto the soil. Drip trays should be utilised in relevant locations (inlets, outlets, points of leakage, etc.) during transfer to prevent such spillage or leakage. Any accidental spillages shall be contained and cleaned up promptly.	NEMA Polluter Pays Principle NEMA Duty of Care NWA OHSA MHSA Shall adhere to the ESMS developed to ensure compliance with the regulatory framework	Throughout LoM
	Construction Operation Decommissioning	Moderate significance and potentially a moderate scale disturbance	Any excess or waste material or chemicals should be removed from the site and should preferably be recycled (e.g. oil and other hydrocarbon waste products). Any waste materials or chemicals that cannot be recycled shall be disposed of at a suitably licensed waste facility.	NEMWA DWS minimum requirement for waste disposal	Throughout LoM

Activities	Phase	Size and Scale of Disturbance	Mitigation Measures / Management Actions	Compliance with Standards	Time Period for Implementation
	Construction Operation Decommissioning	Moderate significance and potentially a moderate scale disturbance	Hazardous waste may only be disposed of at a licensed hazardous waste disposal facility. A specialist waste contractor shall dispose of such waste and shall be required to provide waste manifests and safe disposal certificates. The 'cradle-to-grave' principle must be complied with.	NEMA Polluter Pays Principle NEMA Duty of Care NEMWA DWS minimum requirement for waste disposal	Throughout LoM
	Construction Operation Decommissioning	Potential health risks are considered high significance	All relevant personnel on site must be properly trained concerning the proper use, handling and disposal of hazardous substances applicable to their line of work. If required, advice shall be obtained from the manufacturer with regard to the safe handling and storage of hazardous materials.	MSDS specifications OHSA MHSA	Throughout LoM
	Construction Operation Decommissioning	No direct physical disturbance	The EO shall maintain a list of all hazardous materials that would be present on site. The EO shall develop and maintain a hazardous substance register for all hazardous materials that shall be kept on site during all phases of the project. The register shall be provided to the ECO upon request. Material Safety Data Sheets (MSDS) must be available on site at the point of use and readily accessible for all hazardous substances stored.	OHSA MHSA	Throughout LoM
5.10 WASTE MANAGEMENT					
Maintenance and operation of site infrastructure and facilities	Construction Operation Decommissioning	Waste has the potential to pollute the environment and can vary from localized to large scale impacts.	The mine shall develop and implement a waste management plan for the TSF which complies with the principles of the NEMWA and provides a mechanism for the effective management of waste throughout the LoM. This plan shall ensure the appropriate management of all solid waste, including construction debris (cement bags, wrapping material, timber,	NEMWA NEMA cradle to grave	Throughout LoM

Activities	Phase	Size and Scale of Disturbance	Mitigation Measures / Management Actions	Compliance with Standards	Time Period for Implementation
Site establishment **Construction** **TSF operations**			cans, wire, nails, etc.), waste and surplus food, food packaging, organic waste etc.	DWS minimum requirement for waste disposal Shall adhere to the ESMS developed to ensure compliance with the regulatory framework	
Maintenance and operation of site infrastructure and facilities	Construction Operation Decommissioning	Waste has the potential to pollute the environment and can vary from localized to large scale impacts.	The waste management system shall provide for adequate waste storage (in the form of waste skips and bins with lids), waste separation for recycling, and frequent removal of non-recyclable waste for permanent disposal at an appropriately licensed waste disposal facility. No waste material is to be disposed of on site.	NEMWA NEMA cradle to grave DWS minimum requirement for waste disposal	Throughout LoM
General decommissioning activities	Construction Operation Decommissioning	Waste has the potential to pollute the environment and can vary from localized to large scale impacts.	Waste generated on site should be recycled as far as possible and sold/given to interested contractors. Recyclable waste should not be stored on site for excessive periods to reduce risk of environmental contamination Refuse bins will be responsibly emptied and secured. Temporary storage of domestic waste shall be in appropriate receptacles.	NEMWA NEMA cradle to grave DWS minimum requirement for waste disposal	Throughout LoM
	Construction Operation Decommissioning	Waste has the potential to pollute the environment and can vary from localized to large scale impacts.	The Mine shall implement a waste removal regime that ensures waste skips do not exceed their capacity before being removed from site for disposal.	NEMWA NEMA cradle to grave	Throughout LoM

Activities	Phase	Size and Scale of Disturbance	Mitigation Measures / Management Actions	Compliance with Standards	Time Period for Implementation
	Construction Operation Decommissioning	Waste has the potential to pollute the environment and can vary from localized to large scale impacts.	Littering shall be strictly prohibited. The site shall remain in a neat and tidy condition at all times. If required, the mine shall make use of regular litter patrols to remove litter and ensure the site remains clean, neat and tidy.	NEMWA NEMA cradle to grave	Throughout LoM
	Construction Operation Decommissioning	No direct physical disturbance .	The mine shall maintain a waste register which shall be used to track all waste removed from site. Proof of appropriate waste disposal shall be kept on file at the site for auditing purposes.	NEMA cradle to grave	Throughout LoM
	Construction Operation Decommissioning	Waste has the potential to pollute the environment and can vary from localized to large scale impacts.	The mine will adopt a cradle-to-grave approach to ensure that the waste is removed and disposed of in the prescribed and correct manner.	NEMA cradle to grave	Throughout LoM
5.11 SEWAGE AND SANITATION					
Site establishment **General Construction**	Construction Operation Decommissioning Rehabilitation and Closure	Sewage has the potential to result in localized impacts of low to medium significance	There must be adequate provision for safe and effective sanitation (i.e. ablution facilities) at the mine and work sites and these shall conform to all relevant health and safety standards and codes. The Mine shall ensure compliance with the OHSA and MHSA in terms of sewage and sanitation (managed by safety department). Under no circumstances will pit latrines, french drain systems or soak away systems be allowed. Septic tanks are permitted on condition that they are closed units and are serviced regularly to prevent overflows. The Contractor should	NEMWA NWA NEMA cradle to grave	Throughout construction

Activities	Phase	Size and Scale of Disturbance	Mitigation Measures / Management Actions	Compliance with Standards	Time Period for Implementation
General Mine Management **TSF Operations**			inform all site staff to the use of supplied ablution facilities and under no circumstances shall indiscriminate excretion and urinating be allowed other than in supplied facilities. A minimum of one toilet must be provided per 10 persons.		
Maintenance and operation of site infrastructure and facilities	Construction Operation Decommissioning Rehabilitation and Closure	Sewage has the potential to result in localized impacts of low to medium significance	Portable toilets will be managed by reputable contractors and inspected daily for any potential leaks. The Contractor (or reputable toilet-servicing company) shall be responsible for the cleaning, maintenance and servicing of the toilets. Chemical toilets shall be emptied/serviced frequently to avoid offensive odours (at least weekly). Toilets must be kept in a clean, neat and hygienic condition.	NEMWA NWA NEMA cradle to grave	Throughout construction
General decommissioning activities	Construction Operation Decommissioning Rehabilitation and Closure	Sewage has the potential to result in localized impacts of low to medium significance	Toilets must be easily accessible. Toilets shall be placed outside areas susceptible to potential flooding and shall not be placed within 50m of any wetland or watercourse. Ablution facilities shall be located a sufficient distance from any offices or eating areas to prevent nuisance from offensive odours. Sanitary arrangements shall also be to the satisfaction of the ECO.	NEMWA NWA NEMA cradle to grave	Throughout construction
	Construction Operation Decommissioning Rehabilitation and Closure	Sewage has the potential to result in localized impacts of low to medium significance	Disposal of sewage from chemical toilets shall be in a safe and responsible manner and at an approved facility specifically for that purpose. Proof of sewage removal and disposal shall be kept on file for auditing purposes.	NEMWA NWA NEMA cradle to grave	Throughout construction
5.12 NOISE					
Site establishment	Construction Operation	Noise has the potential to result in low significance	Ensure that equipment is well maintained and fitted with the correct and appropriate noise abatement measures. Engine bay covers over heavy equipment could be pre-fitted with sound absorbing material. Heavy equipment that fully encloses the	SANS10103	Throughout LoM

Activities	Phase	Size and Scale of Disturbance	Mitigation Measures / Management Actions	Compliance with Standards	Time Period for Implementation
General Construction **TSF Operations**	Decommissioning	impacts to sensitive receptors at a small scale	engine bay should be considered, ensuring that the seam gap between the hood and vehicle body is minimised.	ECA Noise Regulations World Bank EHS guidelines OHSA MHSA	
General decommissioning activities	Construction Operation Decommissioning	Noise has the potential to result in low significance impacts to sensitive receptors at a small scale	Trucks, machinery and equipment will be regularly serviced to ensure acceptable noise levels are not exceeded. Quieter equipment will be sought where possible when purchasing new equipment. Silencers will be utilised where possible. Point sources will be enclosed where possible. Acoustic screens will be considered if I&AP complaints are received.	SANS10103 ECA Noise Regulations World Bank EHS guidelines OHSA MHSA	Throughout LoM
5.13 AIR QUALITY					
Site establishment **General Construction**	Construction Operation Decommissioning Rehabilitation and Closure	Impacts on air quality have a moderate significance and may occur over a large area	The mine shall comply with the National Dust Control Regulations, Promulgated under the National Environmental Management: Air Quality Act (Act 39 of 2004). If dust levels exceed the specified thresholds in terms of the dust control regulations, the Applicant shall appoint a suitably qualified specialist to identify sources of the excessive dust levels and to suggest suitable and reasonable mitigation measures.	NEMAQA Dust regulations	Throughout LoM
TSF Operations	Construction Operation Decommissioning	Impacts on air quality have a moderate significance and may	It is recommended that the current dustfall monitoring network be maintained and the monthly dustfall results used as indicators to tract the effectiveness of the applied mitigation measures. Dustfall collection should follow the American	NEMAQA Dust regulations	Throughout LoM

Activities	Phase	Size and Scale of Disturbance	Mitigation Measures / Management Actions	Compliance with Standards	Time Period for Implementation
General decommissioning activities	Rehabilitation and Closure	occur over a large area	Standard Testing Methodology (ASTM) method as per the National Dust Control Regulations . The ASTM method covers the procedure of collection of dustfall and its measurement and employs a simple device consisting of a cylindrical container exposed for one calendar month (30 ±2 days). The method provides for a dry bucket, which is advisable in the dry environment.		
	Construction Operation Decommissioning	Impacts on air quality have a moderate significance and may occur over a large area	Stakeholder forums provide possibly the most effective mechanisms for information dissemination and consultation. Management plans should stipulate specific intervals at which forums will be held and provide information on how people will be notified of such meetings. Given the proximity of the study site to the nearby communities and farmsteads, it is recommended that such meetings be scheduled and held at least on an annual basis. A complaints register must be kept at all times.	NEMAQA Dust regulations	Throughout LoM
	Construction Operation Decommissioning	Impacts on air quality have a moderate significance and may occur over a large area	Speed limits will be established and enforced on the mine to minimise dust generation. When haul trucks need to use public roads, the vehicles need to be cleaned of all mud and the material transported must be covered to minimise windblown dust.	NEMAQA Dust regulations	Throughout LoM
	Construction Operation Decommissioning	Impacts on air quality have a moderate significance and may occur over a large area	Machinery and equipment will be regularly serviced to ensure they are in proper working condition and to reduce risk of excessive emissions.	NEMAQA Dust regulations	Throughout LoM

Activities	Phase	Size and Scale of Disturbance	Mitigation Measures / Management Actions	Compliance with Standards	Time Period for Implementation
	Construction	Impacts on air quality have a moderate significance and may occur over a large area	During construction of the vegetative cover, earth and civil works are likely to generate vehicle and wind entrained dust from deposition of material on the TSF. Although the impact is likely to be site-specific, dust suppression techniques such as wetting roads, or application of dust palliatives, are required.	NEMAQA Dust regulations	Throughout LoM
5.14 PALAEONTOLOGY					
General construction or decommissioning activities **Infrastructure removal** **Site establishment**	Construction	Impacts on fossil resources are limited to the extent of the TSF area	If fossil remains are discovered during any phase of construction, either on the surface or exposed by excavations the Chance Find Protocol must be implemented by the ECO/site manager in charge of these developments. These discoveries ought to be protected (if possible, in situ) and the ECO/site manager must report to SAHRA (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za) so that mitigation (recording and collection) can be carry out by a palaeontologist. Preceding any collection of fossil material, the specialist would need to apply for a collection permit from SAHRA. Fossil material must be curated in an accredited collection (museum or university collection), while all fieldwork and reports should meet the minimum standards for palaeontological impact studies suggested by SAHRA.	NHRA	Throughout Construction
5.15 WETLANDS					
Site establishment	Construction	Impacts on wetlands are considered to be of medium	Make sure that the function of HGM 1 will be the same after the upgrades to the northern RWD are done. The RWD facility replacing HGM 1 should have the same vegetation surrounding	NWA GN704	Throughout LoM

Activities	Phase	Size and Scale of Disturbance	Mitigation Measures / Management Actions	Compliance with Standards	Time Period for Implementation
General Construction		significance and can range from localized to impacts which are large in extent	as currently present in HGM 1. Make sure that all the other HGM units and their buffers are avoided as far as possible to limit the impacts on them.		
TSF Operations **General decommissioning activities**	Construction	Impacts on wetlands are considered to be of medium significance and can range from localized to impacts which are large in extent	Restrict all non-essential activities (e.g. cement mixing and equipment storage) to outside of wetlands and their prescribed buffers for wetlands around the edge of the facility that will not be destroyed by the TSF construction. Request the wetland spatial data, load it onto a GPS and use it to mark out the positions where the proposed activities will take place. Demarcate the avoidance areas with wooden poles.	NWA GN704	Prior to construction and throughout construction
	Operation	Impacts on wetlands are considered to be of medium significance and can range from localized to impacts which are large in extent.	Contain wastewater in a RWD. Contaminated water must not be discharged into watercourses.	NWA	Throughout LoM
	Planning and Design	Impacts on wetlands are considered to be of medium significance and can range from localized to impacts which are large in extent	Construct as far as possible during winter when flow volumes are lowest, prioritise this for crossing sites. This will reduce impacts to wetlands due to soil poaching and vegetation trampling under peak saturation levels. Additionally, the risk of vehicles getting stuck and further degrading the vegetation integrity is lowest during this time.	NWA	Throughout construction
	Planning and Design	Impacts on wetlands are considered to be of medium significance and can	Try to reduce the disturbance footprint and the unnecessary clearing of vegetation on either side of the TSF facility when traversing wetlands.	NWA	Throughout construction

Activities	Phase	Size and Scale of Disturbance	Mitigation Measures / Management Actions	Compliance with Standards	Time Period for Implementation
		range from localized to impacts which are large in extent			
	Construction Operation Rehabilitation Decommissioning	Impacts on wetlands are considered to be of medium significance and can range from localized to impacts which are large in extent	Keep the TSF activities to the proposed site and only access the tailings facility from the existing northern access road or from the South to prevent greater loss to the wetlands northern parts.	NWA	Throughout construction
	Construction Decommissioning	Impacts on wetlands are considered to be of medium significance and can range from localized to impacts which are large in extent.	Mixing of concrete must under no circumstances take place in any wetland or their buffers. Scrape the area where mixing and storage of sand and concrete occurred to clean once finished.	NWA	Throughout construction
	Construction	Impacts on wetlands are considered to be of medium significance and can range from localized to impacts which are large in extent	Do not situate any of the construction material laydown areas within any wetland. No machinery should be allowed to be parked in any wetlands.	NWA	Throughout construction
	Planning and Design Construction	Impacts on wetlands are considered to be of medium significance and can range from localized to impacts which are large in extent	Flatten and lightly till (no deeper than 30 cm) excavated / cleared areas to encourage vegetation establishment as soon as possible. Ensure that topsoil is appropriately stored and re-applied during trench backfilling. Make sure that the soil is backfilled and compacted to accepted geotechnical standards to avoid conduit formation along the trench.	NWA	Throughout construction

Activities	Phase	Size and Scale of Disturbance	Mitigation Measures / Management Actions	Compliance with Standards	Time Period for Implementation
	Construction Operation Decommissioning Rehab and closure.	Impacts on wetlands are considered to be of medium significance and can range from localized to impacts which are large in extent.	Promptly remove all alien and invasive plant species that may emerge during construction (i.e. weedy annuals and other alien forbs) must be removed. The use of herbicides is not recommended in or near wetlands (opt for mechanical removal).	NWA	Throughout LoM
	Construction Rehab and closure	Impacts on wetlands are considered to be of medium significance and can range from localized to impacts which are large in extent.	Appropriately stockpile topsoil cleared from the project area for cover / rehabilitation of the TSF.	NWA MPRDA	Throughout construction
	Construction	Impacts on wetlands are considered to be of medium significance and can range from localized to impacts which are large in extent	Clearly demarcate construction footprint and limit all activities to within this area. Minimize unnecessary clearing of vegetation.	NWA NEMA	Prior to and throughout construction
	Construction Rehab and closure	Impacts on wetlands are considered to be of medium significance and can range from localized to impacts which are large in extent	Landscape and re-vegetate all denuded areas as soon as possible.	NWA MPRDA	After construction
	Construction	Impacts on wetlands are considered to be of medium significance and can	Install measures (e.g. sandbags) on downstream side of the footprint to trap sediment until the site has been constructed and vegetation has re-established.	NWA	Prior to and throughout construction

Activities	Phase	Size and Scale of Disturbance	Mitigation Measures / Management Actions	Compliance with Standards	Time Period for Implementation
		range from localized to impacts which are large in extent.			
	Construction	Impacts on wetlands are considered to be of medium significance and can range from localized to impacts which are large in extent.	Make sure all excess consumables and building materials / rubble is removed from site and deposited at an appropriate waste facility.	NWA	Throughout construction
	Construction	Impacts on wetlands are considered to be of medium significance and can range from localized to impacts which are large in extent.	Appropriately contain any generator diesel storage tanks, machinery spills (e.g. accidental spills of hydrocarbons oils, diesel etc.) or construction materials on site (e.g. concrete) in such a way as to prevent them leaking and entering the north-western seep identified in the wetland assessment.	NWA	Throughout construction
	Operation	Impacts on wetlands are considered to be of medium significance and can range from localized to impacts which are large in extent.	Regularly maintain stormwater infrastructure, pipes, pumps and machinery to minimise the potential for leaks. Check for oil leaks, keep a tidy operation, install bins and promptly clean up any spills or litter.	NWA	Throughout LoM
	Operation	Impacts on wetlands are considered to be of medium significance and can range from localized to impacts which are large in extent.	Conduct regular inspections along the TSF to ensure the integrity of the facility.	NWA	Throughout LoM

Activities	Phase	Size and Scale of Disturbance	Mitigation Measures / Management Actions	Compliance with Standards	Time Period for Implementation
5.16 IMPACTS ON TRANSPORTATION AND INFRASTRUCTURE					
Site establishment **General Construction**	Construction Operation Decommissioning	Impacts on transportation infrastructure and traffic can have a significant extent although typically low in significance	The mine shall ensure that the internal haul roads are adequately maintained, including monthly scraping and removal where required. Together with road maintenance, the storm water system to direct storm water that falls within the roads shall be kept maintained.	Road Traffic Act OHSA MHSA	Throughout LoM
TSF Operations **General decommissioning activities**	Construction Operation Decommissioning	Impacts on transportation infrastructure and traffic can have a significant extent although typically low in significance	On-site vehicles must be limited to approved access routes and areas (including turning circles and parking) on the site so as to minimise excessive environmental disturbance to the soil and vegetation on site, and to minimise disruption of traffic.	Road Traffic Act OHSA MHSA	Throughout LoM
	Construction Operation Decommissioning	Impacts on transportation infrastructure and traffic can have a significant extent although typically low in significance	In the case of dual or multiple use of access roads by other users, arrangements for multiple responsibility must be made with the other users. If not, the maintenance of access roads will be the responsibility of the Applicant. Road conditions must be assessed regularly for signs of damage.	Road Traffic Act OHSA MHSA	Throughout LoM
	Construction Operation Decommissioning	Impacts on transportation infrastructure and traffic can have a significant extent	All intersections with main tarred roads will be clearly signposted.	Road Traffic Act OHSA MHSA	Throughout LoM

Activities	Phase	Size and Scale of Disturbance	Mitigation Measures / Management Actions	Compliance with Standards	Time Period for Implementation
		although typically low in significance			
	Construction Operation Decommissioning	Impacts on transportation infrastructure and traffic can have a significant extent although typically low in significance	Road signs and safety features such as rumble strips will be maintained to ensure the writing is legible and the haul road crossings are visible to motorists.	Road Traffic Act OHSA MHSA	Throughout LoM
	Construction Operation Decommissioning	Impacts on transportation infrastructure and traffic can have a significant extent although typically low in significance	All construction and mining vehicles using public roads shall be in a roadworthy condition and their loads secured. They must adhere to the speed limits and all local, provincial and national regulations with regards to road safety and transport.	Road Traffic Act OHSA MHSA	Throughout LoM
5.17 VISUAL					
Site establishment **General Construction**	Construction	Visual impacts have an impact on the perception and sense of place in the area – visual impacts for the Valley TSF are expected to be of low significance.	Development footprints should be demarcated and clearing to occur within the demarcated areas. Ensure, wherever possible, natural indigenous vegetation and tall trees are retained and incorporated into the site rehabilitation.	In accordance with Rehabilitation and closure plan	Throughout LoM

Activities	Phase	Size and Scale of Disturbance	Mitigation Measures / Management Actions	Compliance with Standards	Time Period for Implementation
TSF Operations **Rehabilitation** **General decommissioning activities**	Construction	Visual impacts have an impact on the perception and sense of place in the area – visual impacts for the Valley TSF are expected to be of low significance.	All topsoil that occurs within the proposed footprint of an activity must be removed and stockpiled for later use. The construction contract must include the stripping and stockpiling of topsoil. Topsoil would be used later during the rehabilitation phase of disturbed areas and the waste facilities. The presence of degraded areas, which are not rehabilitated, will increase the overall visual impact.	In accordance with Rehabilitation and closure plan	Throughout LoM
	Construction	Visual impacts have an impact on the perception and sense of place in the area – visual impacts for the Valley TSF are expected to be of low significance.	Apply dust suppression methods to limit the dust generated during the establishment phase.	In accordance with Rehabilitation and closure plan	Throughout Construction
	Planning and design Construction Operation	Visual impacts have an impact on the perception and sense of place in the area – visual impacts for the Valley TSF are expected to be of low significance.	Before commencing operation, develop a post-closure rehabilitation plan to acceptable topographic and ecological conditions, particularly for the waste facilities.	In accordance with Rehabilitation and closure plan	Planning phase
	Construction	Visual impacts have an impact on the perception and sense of place in the area – visual impacts	Topsoil must be exposed for the minimum time possible to avoid prolonged exposure to wind and water erosion and to minimise dust generation. Should the topsoil stockpile be in place for more than 3 months, they should be hydroseeded with indigenous grasses.	In accordance with Rehabilitation and closure plan	Throughout LoM

Activities	Phase	Size and Scale of Disturbance	Mitigation Measures / Management Actions	Compliance with Standards	Time Period for Implementation
		for the Valley TSF are expected to be of low significance.			
	Construction	Visual impacts have an impact on the perception and sense of place in the area – visual impacts for the Valley TSF are expected to be of low significance.	Any soil must be exposed for the minimum time possible once cleared of vegetation to avoid prolonged exposure to wind and water erosion and to minimise dust generation.	In accordance with Rehabilitation and closure plan	Throughout Construction
	Construction	Visual impacts have an impact on the perception and sense of place in the area – visual impacts for the Valley TSF are expected to be of low significance.	Earthworks should be executed in such a way that only the footprint and a small 'construction buffer zone' around the proposed TSF are exposed. In all other areas, the naturally occurring vegetation should be retained, as well as tall trees, especially along the periphery of the site.	In accordance with Rehabilitation and closure plan	Throughout Construction
	Rehabilitation and Closure	Visual impacts have an impact on the perception and sense of place in the area – visual impacts for the Valley TSF are expected to be of low significance.	Where new vegetation is proposed to be introduced to the site, an ecological approach to rehabilitation, as opposed to a horticultural approach should be adopted. For example, communities of indigenous plants will enhance biodiversity, a desirable outcome for the area. This approach can significantly reduce long-term costs as less maintenance would be required over conventional landscaping methods as well as the introduced landscape being more sustainable.	In accordance with Rehabilitation and closure plan	Throughout LoM

Activities	Phase	Size and Scale of Disturbance	Mitigation Measures / Management Actions	Compliance with Standards	Time Period for Implementation
	Construction Operation Decommissioning Rehabilitation and Closure	Visual impacts have an impact on the perception and sense of place in the area – visual impacts for the Valley TSF are expected to be of low significance.	"Housekeeping" procedures should be developed for the project to ensure that the Project site and lands adjacent to it are kept clean of debris, garbage, fugitive trash, or waste generated onsite; procedures should extend to control of "track out" of dirt on vehicles leaving the active sites and entering the public domain.	In accordance with Rehabilitation and closure plan	Throughout LoM
	Construction Operation	Visual impacts have an impact on the perception and sense of place in the area – visual impacts for the Valley TSF are expected to be of low significance.	Install light fixtures that provide precisely directed illumination to reduce light "spillage" beyond the immediate surrounds of the site i.e. lights (spotlights) are to be aimed away from sensitive viewing areas. Avoid high pole top security lighting along the periphery of the site and use only lights that are activated on illegal entry to the site and minimise the number of light fixtures to the bare minimum, including security lighting.	In accordance with Rehabilitation and closure plan	Throughout Construction
5.18 RADIATION					
Site establishment **TSF Operations**	Operation Rehabilitation and Closure	The TSF radiation impact has a potentially moderate significance but will be restricted to the site and immediate surrounding areas	Where possible, concurrent rehabilitation of the TSF side slopes must commence after the first step-in. Capping	NRWMP ICRP	Throughout operations

Activities	Phase	Size and Scale of Disturbance	Mitigation Measures / Management Actions	Compliance with Standards	Time Period for Implementation
General decommissioning activities **Post Closure Monitoring and Maintenance**	Operation Rehabilitation and Closure	The TSF radiation impact has a potentially moderate significance but will be restricted to the site and immediate surrounding areas	Vegetation of exposed areas of the TSF and wind barriers to reduce wind erosion and/or the application of dust suppressants	NRWMP ICRP	Throughout operations
	Construction Operation Decommissioning Rehabilitation and Closure	The TSF radiation impact has a potentially moderate significance but will be restricted to the site and immediate surrounding areas	Implementation of a passive groundwater remediation system downstream of the TSF to capture the contaminant plume.	NRWMP ICRP	Throughout LoM
	Construction Operation Decommissioning Rehabilitation and Closure	The TSF radiation impact has a potentially moderate significance but will be restricted to the site and immediate surrounding areas	Implementation of radiation monitoring programme as described in Section 7.3.3 of this EMPr.	NRWMP ICRP	Throughout LoM
5.19 GROUNDWATER					
	Construction Operation	The TSF impact on groundwater has a potentially	The mine must take all reasonable measures to avoid and limit pollution of ground water resources as a result of site activities. Pollution could result from the release, accidental or otherwise,	NEMA Duty of care NWA	Throughout LoM

Activities	Phase	Size and Scale of Disturbance	Mitigation Measures / Management Actions	Compliance with Standards	Time Period for Implementation
General decommissioning activities **Maintenance and operation of site infrastructure and facilities** **TSF Operations** **Post Closure Monitoring and Maintenance**	Decommissioning Rehabilitation and Closure	moderate significance and at a local scale	of chemicals, oils, fuels, sewage, waste water containing organic waste, detergents, solid waste etc. The Applicant shall comply with the requirements relating to hazardous materials and spill management presented in this EMPr. The site should be maintained to be free draining. Where relevant, areas should be compacted/shaped.	GN704 DWS best practice guidelines Shall adhere to the ESMS developed to ensure compliance with the regulatory framework	
	Construction Operation Decommissioning	The TSF impact on groundwater has a potentially moderate significance and at a local scale	Rainfall runoff should be separated into clean and dirty water. Rainfall falling on the site should be allowed to drain quickly/freely.	NEMA Duty of care NWA GN704 DWS best practice guidelines Shall adhere to the ESMS developed to ensure compliance with the regulatory framework	Throughout LoM
	Construction Operation	The TSF impact on groundwater has a potentially moderate significance and at a local scale	In the event of pollution caused as a result of construction or operational activities, the responsible party, according to section 20 of the National Water Act (Act No. 36 of 1998) shall be responsible for all costs incurred by organisations called to assist in pollution control and/or to clean up polluted areas.	NEMA Duty of care NWA GN704 DWS best practice guidelines Shall adhere to the ESMS developed to ensure compliance	Throughout LoM

Activities	Phase	Size and Scale of Disturbance	Mitigation Measures / Management Actions	Compliance with Standards	Time Period for Implementation
				with the regulatory framework	
	Planning Operation Rehabilitation and Closure	The TSF impact on groundwater has a potentially moderate significance and at a local scale	For the Valley TSF application it is recommended that Phyto-accumulation and Hydraulic Control be further investigated. The main aim of such a study will be to find the most suitable tree species to absorb the chemicals of concern and to obtain the necessary permits from the authorities. It will take time for the tress to grow to a point where they are fully functional. It is therefore recommended that if this option is selected it be implemented as soon as possible.	NEMA Duty of care NWA GN704 DWS best practice guidelines Shall adhere to the ESMS developed to ensure compliance with the regulatory framework	Throughout LoM
	Planning Operation Rehabilitation and Closure	The TSF impact on groundwater has a potentially moderate significance and at a local scale	The following is recommended in terms of monitoring (refer to section 7.3.2): • A comprehensive bi-annual analysis of the dedicated monitoring boreholes. • Groundwater levels should be monitored monthly in the dedicated groundwater monitoring boreholes. • Rainfall should be monitored daily. • Samples should be submitted to a SANAS accredited laboratory. The following recommended parameters to be analysed for include: pH, Electrical Conductivity, Total Dissolved Solids, Total Alkalinity, Anions and Cations (Ca, Mg, Na, K, NO3, NH4, Cl, SO4, F, Fe, Mn, Al, Cr).	NEMA Duty of care NWA GN704 DWS best practice guidelines Shall adhere to the ESMS developed to ensure compliance with the regulatory framework	Throughout LoM

6 CLOSURE AND REHABILITATION

6.1 CLOSURE AND REHABILIATION GOALS AND OBJECTIVES

Apart from the short short-term objectives and strategies that will require implementation and monitoring over the full life of mine, even after closure of operation, The specific objectives that Harmony will adopt for rehabilitation and closure are to:

- Comply with national regulatory requirements;
- Protect the environment and public health and safety by using safe and responsible closure practices;
- Improve water quality;
- Establish self-sustaining vegetation that will stabilize the TSF;
- Develop end land uses that incorporate beneficial uses;
- Prevent health and safety risks to the surrounding community;
- Reduce the requirement for long-term monitoring and maintenance by establishing stable landforms;
- Enhance a positive socio-economic impact by achieving a sustainable land-use condition or alternatively as agreed upon with the applicable government regulator and affected communities; and
- Avoid or reduce costs and long-term liabilities to the company, government and public.

The closure of TSFs will involve their rehabilitation. Contour walls will be constructed, after which additives will be applied in order that favourable conditions for plant growth can occur. Once this has been achieved, vegetation will be planted on top and on the sides of the tailings to stabilise the tailings against wind and water erosion. When the vegetation has been established maintenance and monitoring of the tailings dam will take place. The maintenance will take place over a period of three years, while the monitoring will take place over a period of five years on a quarterly basis by analysing samples for pollutants.

The closure components which are applicable to the Harmony TSF include the following:

- Preparation and planning for closure- This includes all of the tasks leading up to the finalisation of the closure plan for implementation.
- Dismantling and removal of any on site infrastructure (apart from the TSF itself which will remain in perpetuity).
- Rehabilitation of access roads. It is anticipated that certain of these access roads will be retained as smaller local access to the site to allow for controlled access during closure and post closure monitoring and maintenance.
- Topsoil stockpiled during construction would be used later during the rehabilitation phase of disturbed areas and for TSF cover.
- Rehabilitation activities at the TSF side slopes and surface area, until the areas are self-sustaining.
- Management and rehabilitation of the soil stockpile areas.
- General surface rehabilitation- including soil amelioration and planting of vegetative cover for the affected natural areas, and planting of crops on the defined arable land areas.
- Removal of fencing - it is understood that the TSF area, including the soil stockpile areas, will be fenced during operations. This fencing will need to be removed at closure to avoid unnecessary post closure maintenance and management costs.

- Limit dust emissions such that dust emission regulations are met.
- Limit ingress and seepage from the tailings.
- Minimize erosion to an acceptable level.
- Management of water within the mine area- this will include the management and maintenance of surface water controls, as well as ongoing closure phase monitoring of the water resources. The management of polluted water into the post-closure phase will be included and dealt with as a residual and latent impact.
- Maintenance and aftercare- Maintenance and aftercare is typically applied during the closure period (i.e. once active rehabilitation and closure is completed). Typically, aftercare and maintenance includes general maintenance activities including, soil amelioration, ongoing monitoring, control of alien invasive, and stability and settlement actions. It should be noted that for the purposes of this report and the associated financial provisions, that the relevant monitoring and maintenance/ aftercare actions are included in the other closure components listed in the Closure Plan.

Table 8 provides procedures for the decommissioning, closure and rehabilitation of the affected site.

Table 8: Decommissioning, Rehabilitation and Closure Actions

Closure component	Planning (pre-commencement)	TSF Progressive Rehabilitation (~8 years)	Decommissioning and Rehabilitation (1-3 years)	Closure and post closure (~50-100yrs) - or until closure certificate is received.
Planning and preparation for Closure	- Develop Final Rehabilitation and Decommissioning Closure Plan (FRDCP) for consideration in the EA decision making. - Appointment of dedicated rehabilitation specialist to ensure ongoing implementation of rehabilitation and closure actions and plans. - Ensure that sensitive environmental areas and soil stockpile areas are clearly demarcated to prevent unnecessary disturbance. - Develop a change management procedure to manage the impact of any changes to the mine plan.	- Annual review and update to FRDCP- including review of monitoring data and updated risk assessment. - 3 yearly review and update of hydrogeological model. - Regular consultation with I&AP's on closure planning and rehabilitation progress, and any intrusive activities. - Application for EA, WML and/or WUL (as applicable to implement closure plan) for decommissioning and closure activities (at least 18 months prior to scheduled closure). - Regular awareness training on rehabilitation and closure commitments to all site staff and contractors- including sensitivity of flora and faunal species, noise control.	- Implementation of final FRDCP. - Develop a post closure water balance and Storm Water Management Plan (SWMP).	- Implementation of final FRDCP. - Implementation of SWMP.

Closure component	Planning (pre-commencement)	TSF Progressive Rehabilitation (~8 years)	Decommissioning and Rehabilitation (1-3 years)	Closure and post closure (~50-100yrs) - or until closure certificate is received.
	- Develop a site specific operational stormwater management plan.	- Implementation and assessment of environmental monitoring as defined in the FRDCP. - Implement a site specific operational stormwater management plan		
Dismantling and removal of any on site infrastructure	- Relevant financial provisioning.	Annual assessment of obsolete infrastructure or facilities which can be decommissioned and removed- update annual rehabilitation plan.	- Removal of all services, structures, machinery, and infrastructure unless these are specifically required for post-mining land-use, - All infrastructure should be broken down to natural ground level (apart from TSF). - Areas where infrastructure was demolished should be assessed through a risk based system to determine if there is any residual contamination of risk and appropriate remediation measures implemented. - Implementation of the waste management plan. - A waste and infrastructure hierarchical principal	Ongoing rehabilitation monitoring and maintenance until relinquishment.

Closure component	Planning (pre-commencement)	TSF Progressive Rehabilitation (~8 years)	Decommissioning and Rehabilitation (1-3 years)	Closure and post closure (~50-100yrs) - or until closure certificate is received.
			should be applied to all decommissioned infrastructure or wastes, as follows: Reduce, re-use, recycle, dispose. - Monitor and manage dust generated from decommissioning activities to relevant standards.	
Rehabilitation of access roads	Develop mine layout plan to utilise existing access routes where possible.	Restrict vehicular movements to designated access and haulage routes to avoid unnecessary soil compaction.	- Conclude final closure layout plan defining access roads required for ongoing monitoring, management and maintenance. - Retained access roads to be designed in accordance with relevant engineering standards and specifications- including specific management of stormwater. - Restrict vehicular movements to designated access and access routes to avoid unnecessary soil compaction. - Closure, decommissioning, and rehabilitation of all	- Ongoing rehabilitation monitoring and maintenance until relinquishment. - Restrict vehicular movements to designated access routes to avoid unnecessary soil compaction.

Closure component	Planning (pre-commencement)	TSF Progressive Rehabilitation (~8 years)	Decommissioning and Rehabilitation (1-3 years)	Closure and post closure (~50-100yrs) - or until closure certificate is received.
			access roads (incl associated structures, signage, culverts, etc) unless these are specifically required for post-mining land-use, post-mining SDF projects or have been requested by the post-mining landowner. - Revegetation. - Apply dust suppression (e.g. water sprays) where necessary.	
Rehabilitation of the TSF	- Long term material settlement factors. - Develop an Invasive Species Control and Eradication Plan.	- Manage erosion. - Monitoring of groundwater, air quality and radiation. - Assess findings of monitoring programmes - Develop and implement an Invasive Plant Species Control and Eradication Plan. - Prevent erosion (wind/water) through implementation of	- Post-closure Groundwater, air quality and radiation monitoring programmes - The implementation of the National Nuclear Regulator (NNR)-approved decommissioning plan.	- Post-closure Groundwater, air quality and radiation monitoring programmes . - Safety and stability checks.

Closure component	Planning (pre-commencement)	TSF Progressive Rehabilitation (~8 years)	Decommissioning and Rehabilitation (1-3 years)	Closure and post closure (~50-100yrs) - or until closure certificate is received.
		temporary control measures.		
Rehabilitation of soil stockpile areas	Ensure correct placement of soil stockpiles to: - Reduce surface water flows and velocities and associated erosion risks. - Minimise disruption and disturbance by mining or other activities. - Avoid identified wetland areas as far as possible.	- Stockpile footprints to be effectively demarcated to restrict activities which may disturb/ contaminate the stockpiles (e.g. vehicular movement). Compaction and contamination of the stockpiles must be prevented. - Once established the soil stockpiles must not be moved until soil placement for rehabilitation is undertaken.	- Stockpile footprints following removal of all soils for rehabilitation, must be landscaped (shaped and levelled) to natural contours , ripped to loosen all soil, and revegetated. - The rehabilitated area must be re-vegetated in accordance with the post closure mine plan and monitored for success. - Manage and remediate surface erosion.	- Ongoing rehabilitation monitoring and maintenance until relinquishment. - Manage and remediate surface erosion.
Fencing		Maintenance of fencing to control access to rehabilitated areas including wetland areas and associated buffers (e.g. by grazing animals, or vehicles).	- Removal of all fencing and barrier structures not required for post-closure management. - A waste and infrastructure hierarchical principal should be applied to all decommissioned fencing or materials, as follows:	Maintenance of fencing to control access to rehabilitated areas.

Closure component	Planning (pre-commencement)	TSF Progressive Rehabilitation (~8 years)	Decommissioning and Rehabilitation (1-3 years)	Closure and post closure (~50-100yrs) - or until closure certificate is received.
			Reduce, re-use, recycle, dispose. - Maintenance of fencing to control access to rehabilitated areas (e.g. by grazing animals, or vehicles).	
- Water management	- Develop numerical groundwater model. - Utilise model to define and assess extent and timing of mine affected water pollution plume. - Begin implementation of phyto-remediation measures (where investigations prove feasible)	- Continue monitoring including general water quality. - Update numerical groundwater model – every 3 years. - Amend the mine closure plan where necessary based on the results. - Implement and monitor the Groundwater Management Plan. - Installation, operation, and maintenance of phyto-remediation measures.	- Continue monitoring including general water quality and water levels in surrounding areas. - Update numerical groundwater model (including monitoring results) – every 3 years. - Amend the mine closure plan where necessary based on the results. - Implement and monitor the Groundwater Management Plan.	- Update and implement groundwater management plan. - Update numerical groundwater model. Specific attention to be placed on long term water liability assessment. - Amend the residual and latent impacts risk assessment and closure plan associated financial provisions. - Implement and monitor the Groundwater Management Plan. - Install plume interception boreholes and/or trenches as required.

Closure component	Planning (pre-commencement)	TSF Progressive Rehabilitation (~8 years)	Decommissioning and Rehabilitation (1-3 years)	Closure and post closure (~50-100yrs) - or until closure certificate is received.
				- Continue groundwater monitoring.
Social and economic change management	- Public review and comment on rehabilitation, decommissioning and closure planning. - Develop SLP in accordance with relevant regulations and guidelines, and in consultation with local municipality and other authorities.	- Regular consultation with I&AP's on closure planning and rehabilitation progress, and any intrusive activities. - Provide clear communication to the stakeholders to ensure awareness of the mine's limitations in terms of funding and that funding will cease upon mine closure. - Develop mechanisms to assist employees during the transition to closure. - Implement SLP obligations including defined skills development programmes focusing on non-mining supply links to facilitate easier transitioning to local suppliers and industries.	- Continued implementation of SLP obligations and commitments. - Implement approved retrenchment mechanisms as per the approved SLP. - Assist employees in accessing available and suitable employment opportunities with other mining companies or within the local agricultural sector.	

7 ENVIRONMENTAL MONITORING

7.1 FUNCTIONAL REQUIREMENTS OF MONITORING PROGRAMMES

The purpose of monitoring is not merely to collect data, but to provide information necessary to make informed decisions on managing and mitigating potential impacts. Monitoring therefore serves the following functions:

- Serve as early warning system to detect any potential negative impacts;
- To provide information to feedback into management controls to avoid, prevent or minimise potential negative impacts;
- Provide quantitative data that can serve as evidence for the presence of negative impacts or the lack thereof;
- Allows for trending, modelling and prediction of future conditions or potential impacts;

Based on the above, the mine must ensure that monitoring programmes comprise of the following (at a minimum) in order to obtain valuable environmental data;

- Environmental aspect monitoring must be a formalised procedure;
- All equipment used in monitoring must be correctly calibrated and serviced regularly;
- Samples required for analysis will be sent to an independent and accredited laboratory;
- Monitoring data must be stored;
- Data must be checked and interpreted and tending undertaken on a quarterly basis;
- Both the date and reports on environmental monitoring must be kept on record for the life of mine and where relevant provided to I&AP's; and
- The general and site-specific parameters to be monitored must be identified by an independent specialist, the authorities and where relevant I&AP's.

7.2 LIST OF ASPECTS THAT REQUIRE MONITORING PLANS

The list of aspects that require on-going environmental monitoring includes the following:

- Air quality;
- Radiation;
- Flora and fauna;
- Groundwater; and
- Post-closure.

As mines and the environment are both dynamic it is likely that future scenarios may require the monitoring of additional or unforeseen impacts. As such, the list provided is by no means conclusive and must instead be used as a guideline for the impacts that require monitoring.

7.3 MONITORING PLANS FOR ENVIRONMENTAL ASPECTS

The monitoring of various environmental aspects and the impact on them as a result of the proposed project shall take place by means of both quantitative and qualitative techniques in order to determine whether or not the requirements of the EMPr are being complied with. The importance and value of detailed environmental monitoring networks cannot be overstated.

Environmental monitoring serves as a tool to track compliance, assist with potential liability identification, and mitigation throughout the life of the proposed project. This is achieved through the provision of actual evidence-based monitoring and reporting thereof. In essence, monitoring is a continuous data-gathering, data interpreting, and control procedure that ranges from visual inspection to in-depth investigative monitoring and reporting.

7.3.1 AIR QUALITY

Source monitoring at operational activities can be challenging due to the fugitive and wind-dependent nature of particulate emissions. The focus is therefore rather on receptor-based performance indicators i.e. compliance with ambient air quality standards and dustfall regulations.

It is recommended that the current dustfall monitoring network (Figure 5) be maintained and the monthly dustfall results used as indicators to track the effectiveness of the applied mitigation measures. Dustfall collection should follow the American Standard Testing Methodology (ASTM) method as per the National Dust Control Regulations (NDCRs). The ASTM method covers the procedure of collection of dustfall and its measurement and employs a simple device consisting of a cylindrical container exposed for one calendar month (30 ±2 days). The method provides for a dry bucket, which is advisable in the dry environment. The cause of the high dustfall rates should be investigated and these levels should be reduced to be within compliance with the NDCR.

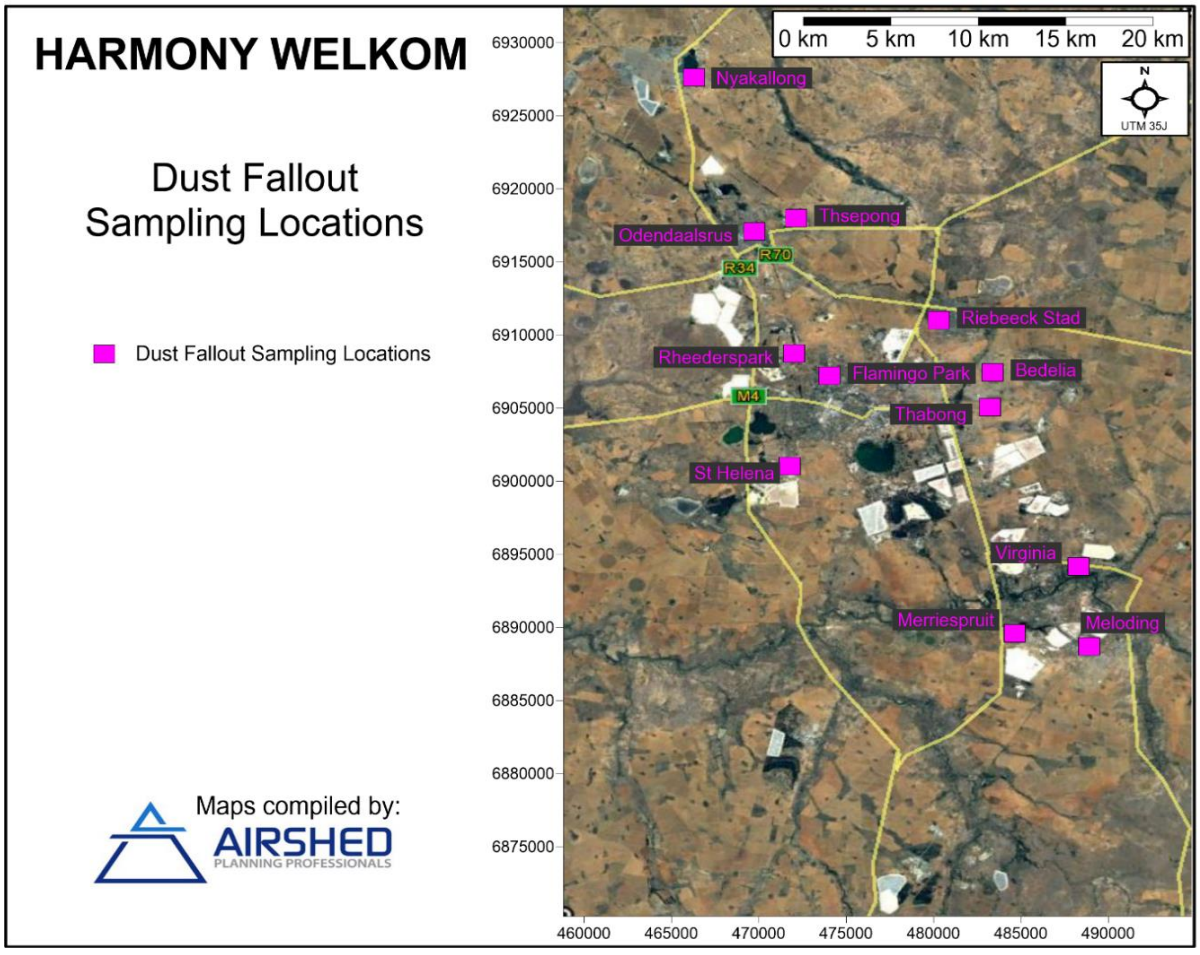

Figure 5: Harmony dust fallout sampling locations

7.3.2 GROUND WATER MONITORING

Effective groundwater monitoring systems consist of the following components:

- Groundwater quality monitoring system.
- Groundwater flow monitoring system.

- Data and information management system.

When designing the monitoring system, the following issues should also be taken into consideration:

- Potential or actual water use.
- Aquifer or catchment vulnerability.
- Toxicity of chemicals.
- Potential for seepage or releases.
- Quantities and frequency of release to the environment (point and non-point).
- Management measures in place to minimise risk.

Groundwater sampling should be done in accordance with industry standards. The sampling procedures are discussed in detail in:

- Weaver, J.M.C. 1992a. Groundwater sampling: A comprehensive guide for sampling methods (WRC Report No. TT 54/92). Pretoria: Water Research Commission.
- Weaver, J.M.C. 1992b. Groundwater sampling: An abbreviated field guide for sampling methods (WRC Report No. TT 56/92). Pretoria: Water Research Commission.

These sampling procedures should be adhered to.

Three additional borehole pairs (one shallow and one deep) are recommended as shown in Figure 6.

The following is recommended in terms of monitoring:

- Groundwater levels.
- Groundwater quality.
- Data should be stored electronically in an acceptable database.
- On the completion of every sampling run a monitoring report should be written. Any changes in the groundwater levels and quality should be flagged and explained in the report.
- A compliance report can be submitted to DWS once a year, if required.
- A comprehensive quarterly analysis of the dedicated monitoring boreholes.
- Groundwater levels should be monitored monthly in the dedicated groundwater monitoring boreholes.
- Rainfall should be monitored daily.

Samples should be submitted to a SANAS accredited laboratory. The following recommended parameters to be analysed for include:

- pH.
- Electrical Conductivity.
- Total Dissolved Solids.
- Total Alkalinity.
- Anions and Cations (Ca, Mg, Na, K, NO3, NH4, Cl, SO4, F, Fe, Mn, Al, Cr).

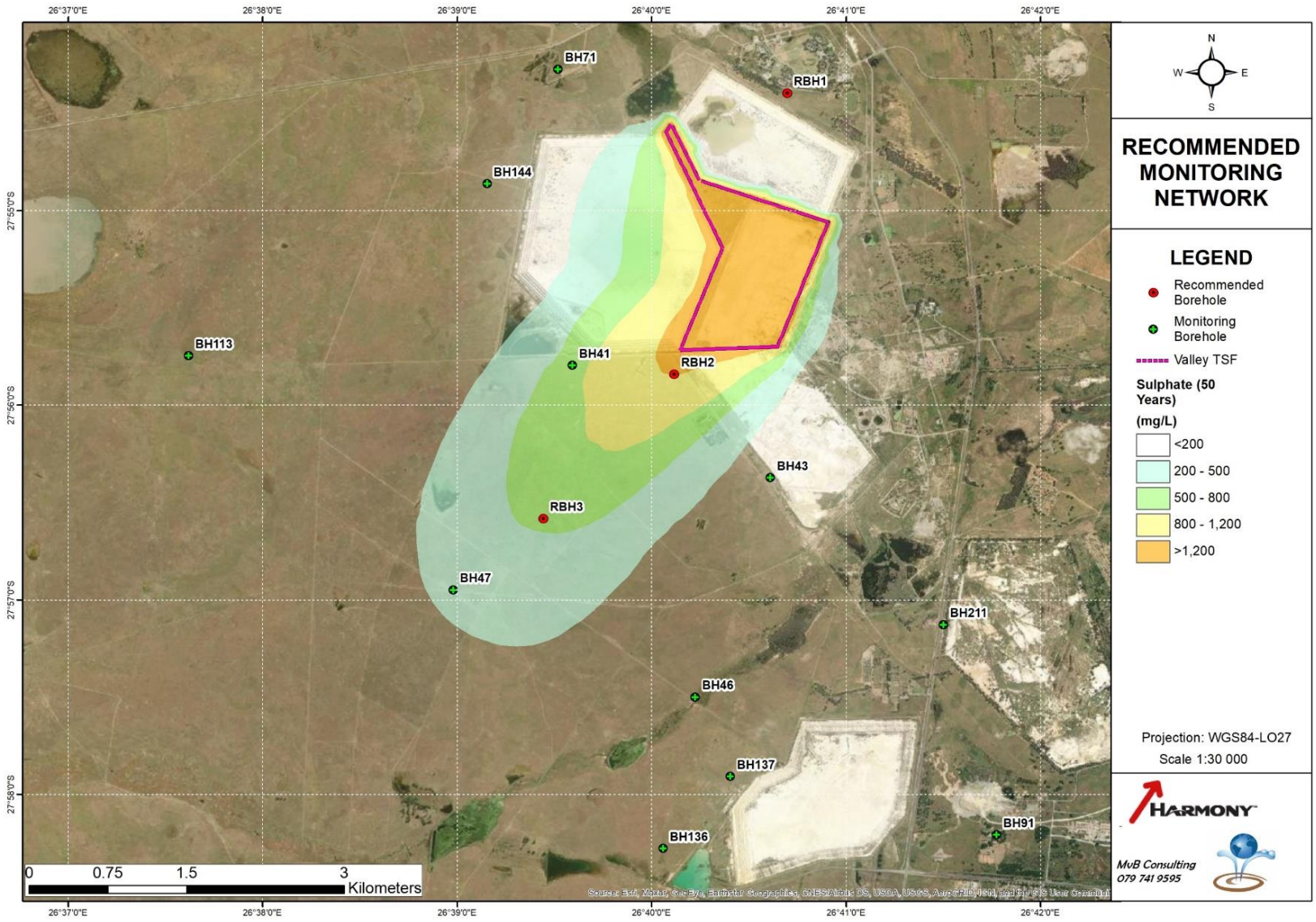

Figure 6: Recommended Groundwater Monitoring Network

7.3.3 RADIATION MONITORING

The following forms part of the radiation monitoring programme proposed for the Valley TSF:

7.3.3.1 BASELINE CHARACTERISATION

The purpose of the radiological baseline characterisation programme is to establish the radiological conditions observed at the site and surroundings before the commissioning of the project. No baseline characterisation has been done in the area yet. It should include, to the extent possible, soil, surface water and groundwater samples, as well as an airborne environmental radon survey in the area using Radon Gas Monitors (RGMs).

In addition to these sampling and analysis, it is proposed that a full gamma radiation and dose rate survey on a grid basis be conducted after site preparation and cleaning. Soil samples should again be collected for full-spectrum radioanalysis of the U-238, U-235 and Th-232 decay chains in the affected areas at locations that will be informed by the gamma radiation survey.

7.3.3.2 MONITORING PROGRAMME

The Projects TSFs fall within the scope of CoR-5 with an approved public Radiation Protection Programme (RPP), which makes provision for environmental monitoring and analysis to ensure that members of the public are sufficiently protection from releases into the environment. The responsibility for the implementation and execution of the monitoring programme lies with the Radiation Protection Function (RP Function) which may include legally appointed persons consisting of a Radiation Protection Monitor(s) (RPM), a Radiation Protection Officer (RPO), and a Radiation Protection Specialist (RPS).

The full-spectrum analysis is suitable for detailed dose analysis but is an expensive procedure with long lead times to perform the analysis, which is why less frequent intervals are proposed. The total uranium and thorium analyses are relatively inexpensive with fast turnaround times. These results will monitor variations in activity concentration over the monitoring period.

Large variations in the activity concentration over a short period are not expected in groundwater, as opposed to surface water, for example. Therefore, a less frequent sampling schedule is proposed for groundwater. The same principle applies to the sediment samples at the same locations as the surface water sample.

The RGMs monitor the variation in radon gas works in monitoring periods of 2 to 3 month, after which the RGMs is replaced with new RGMs for the next monitoring period. The dust fallout samples are generated quarterly but are used to generate an annual sample for the total U and Th analysis. The reason for this is that the volume of material collected in a dust bucket is too little for quarterly analysis.

Monitoring of surface water, sediments, groundwater, radon gas and dust fallout must be done in accordance with the relevant Harmony CoRs.

7.3.3.3 PROPOSED MONITORING POINTS

Most monitoring points proposed to be part of the monitoring programme coincide with the monitoring programme for the environmental pathways (e.g., soils surface water and groundwater). Considering the surface infrastructure that will be developed for the Projects, the following can be noted:

- The surface water monitoring locations should coincide with the existing surface water monitoring points currently included in the public RPP. The principle to be applied is that the monitoring locations should be upstream and downstream of the Projects area in potentially affected surface water streams, as well as upstream and downstream of potential discharge points.
- The sediment monitoring locations should coincide with the surface water monitoring points, applying the same principles.
- The groundwater monitoring points should coincide with the existing groundwater monitoring points. The principle to be applied is that the monitoring locations should be upstream and downstream of the Projects area, as well as upstream and downstream of specific surface facilities. The exact location will be determined by the availability of water-bearing boreholes in the specific area.

- The dust fallout monitoring locations should coincide with the monitoring points (dust buckets) proposed in Airshed AQIA (2023).
- The environmental radon monitoring locations do not have to coincide with specific locations. The principle to apply is that it should be widespread over the mining rights area, in the dominant wind direction where receptors are located, complemented with monitoring locations in what can be considered as background. The exact location is often influenced by whether a secured location is available to improve the recovery rate of the RGMs.

7.3.4 POST-CLOSURE MONITORING

Post-Closure monitoring requirements and frequencies are indicated in Table 9. Considering that a decommissioning plan of the proposed Valley TSF is not available at present but will be defined and implemented, the following activities were identified that may result in a radiological impact on the receptors during the post-closure phase:

- Implementation of the approved decommissioning plan;
- Exhalation of radon gas and the emission of particulates matter (PM10 and TSP) that contain radionuclides from the remaining facilities (e.g., TSF); and
- Leaching and migration of radionuclides from the remaining facilities (e.g., TSF).

The implementation of the NNR-approved decommissioning plan will result in a positive impact in the sense that all surface infrastructure that contained or that is contaminated with radionuclides is demolished, decontaminated (to the extent possible) and removed from the site and compliance with clearance criteria has been demonstrated.

A gamma radiation survey supplemented with full spectrum radioanalysis of soil samples will be performed at the infrastructure sites, followed by appropriate rehabilitation and clean-up operations for conditional or unconditional clearance from the regulatory authority. In addition, any area that may have become contaminated during or because of operational activities will also be rehabilitation and clean-up for conditional or unconditional clearance.

Table 9: Post closure monitoring requirements.

Aspect	Functional Requirement	Performance indicator/ target	Frequency	Reporting Mechanism	Adaptive management action
Groundwater	Standards: - SANS 5667-1:2008/ISO 5667-1:2006 Water Quality – Sampling Part 1: Guidance on the design of sampling programmes and sampling techniques. - SANS 5667-3:2006/ISO 5667-3:2003 Water Quality – Sampling Part 3: Guidance on the preservation and handling of water samples. - SANS 5667-11:2015/ISO 5667-11:2009 Water Quality – Sampling Part 11: Guidance on sampling of groundwater. - Use of SANAS Accredited analytical laboratory. Parameters: pH, Electrical Conductivity, Total Dissolved Solids, Total Alkalinity, Anions and Cations (Ca, Mg, Na, K, NO3, NH4, Cl, SO4, F, Fe, Mn, Al, Cr).	- Monitoring network must comply with the risk-based source-pathway - receptor principle. - Compliance with WUL water quality thresholds. - Trend analysis in relation to identified latent impact trigger.	Biennial	Biennial water quality report.	Undertake a final groundwater model update as and when the indicator parameters reach trigger values at dedicated plume monitoring boreholes. The revised groundwater model to be used to refine and revise the long term water management actions.
Radiation	The proposed radiological monitoring programme for the project includes recommendations for the monitoring of surface water, groundwater, sediment, environmental radon, well as dust fallout, including the frequency and type of analysis. Most monitoring points proposed to be part of the monitoring programme coincide with the monitoring programme for the environmental pathways (e.g., soils surface water and groundwater.	- Monitoring network must comply with the risk-based source-pathway - receptor principle. - Compliance with WUL water	Biennial	Biennial monitoring reports.	Under the responsibilities as outlined in the radiation function procedure, specific actions need to be taken the day the incident or accident is identified, while several actions need to be taken as soon as possible after the event. These include, amongst others: • Assessing the extent of physical damage to property, people, and the environment, as well as the extent of the contamination in and around

Aspect	Functional Requirement	Performance indicator/ target	Frequency	Reporting Mechanism	Adaptive management action
	Parameters: • Exhalation of radon gas and the emission of particulates matter (PM10 and TSP) that contain radionuclides from the remaining facilities (e.g., TSF).; and • Leaching and migration of radionuclides from the remaining facilities (e.g., TSF).	quality thresholds. - Trend analysis in relation to identified latent impact trigger.			where the event occurred using appropriate radiation survey equipment and taking water samples upstream and downstream of the incident, as appropriate; • Inform the NNR about the event, including the current situation and its development, measures are taken to protect workers and members of the public, and the exposures that have occurred and those expected to be incurred; • Initiate the clean-up process, with due consideration of the extent of the contamination, the potential radiological impact on workers and members of the public, and appropriate mitigation measures that can be implemented in the interim to contain the risks; and • Capture all relevant information in an Occurrence Report to be submitted to the NNR according to the Procedure for the Reporting of Occurrences, taking cognisance of how, when and where the event happened, corrective actions and clean-up operations, and the radiological impact on workers and members of the public.