1 TITLE PAGE

COP : Code of Practice

Mine residue deposits

Noligwa Gold Plant

MANDATORY CODE OF PRACTICE ON MINE RESIDUE DEPOSITS

This Code of Practice was drawn up in accordance with Guideline DMR 16/3/2/5-A1 issued by the Chief Inspector of Mines on 30 November 2000

DMR Mine Code number: 13105

Operation Reference Number: MN_COP_GEN_002

Effective Date: 31 May 2001

DMR Date First Issued: 30 November 2000

Revision Dates: Revision 1: June 2018

Revision 2: July 2018

Revision 3: November 2020

Revision 4: November 2021

Next Revision Dates: Nov 2024

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Ha	Hectare (1 Ha =10 000 m^2)
Area	m^2
Density	kg/ m^3
Length	cm, m or km
Mass	kg or tonnes
Volume	m^3
Kg	Kilogram

µm	micrometre
mm	millimetre
m	metre
t/m^3	tons per cubic metre
tpm	tons per month
kPa	kilo Pascal
°C	degree Celsius

6 STATUS OF MANDATORY CODE OF PRACTICE

6.1 This mandatory COP was drawn up in accordance with Guideline DME 16/3/2/5-A1 issued by the Chief Inspector of Mines;

6.2 This is a mandatory Code of Practice in terms of section 9(2) and 9(3) of the MHSA;

6.3 This Code of Practice is used during accident investigation / inquiry to ascertain compliance and also to establish whether the Code of Practice is effective and fit for purpose;

6.4 The current revision of the **Code** is 03 and supersedes all previous revisions and similar codes on the Mine. The current version of the **COP** was drafted by Jones & Wagener Consulting Civil Engineers in association with Harmony Gold Mining Company Limited Noligwa Operations, and Intasol Tailings Pty Ltd. The **COP** is specific to Harmony Noligwa Operations tailings dams including deposition onto the **Deposits.**

All managerial instructions or recommended procedures (Voluntary Code of Practices) and standards on the relevant topics complies with the Code of Practice and reviewed to ensure compliance.

The **COP** shall remain in force should the Mine be closed temporarily or change ownership.

Mitigating and Management of the COVID-19 outbreak in the mining Sector - COP Reference number. Annexure 12 gives more detail with regards to specific controls and measures to mitigate and manage COVID-19

7 MEMBERS OF THE DRAFTING / REVIEWING COMMITTEE

7.1 Yes, the employer did consult with the health and safety committee on the preparation, implementation and revision of this **COP**. Consultation letter is referenced in Annexure 13.

7.2 After consultation with the employees in terms of the MHSA, the employer did appoint a committee responsible for the revision and drafting of the **COP**. Appointment letter is referenced in Annexure 14.

The **Code of Practice** was originally drafted by:

Table 7-1: Original Drafting Committee

Designation	Name
Harmony Gold Mine	
Plant Manager – Central	Mr C Stotter
Plant Manager – Saaiplaas	Mr J Bester
Plant Manager – One Plant	Mr J Whillier
Plant Manager – Target	Mr M Brönn
Environmental	Mrs D Benson
Other	
Professional Engineer	Mr RA Cooper
Operations Manager, ECMP	Mr K Kirchner

7.3 The members of the drafting committee are listed giving their full names, designations, professional qualifications, affiliations and experience. The members of the drafting committee for the current revision of the **COP** are included in Table 7-2.

Distribution List

The complete **COP** and related documents may be examined by any affected person.

A registered trade union with members at the plant, or a health and safety committee at the plant, is provided with a copy of the **COP** upon written request to the manager. A register is kept of such persons or institutions with copies of the **COP** to facilitate updating of such copies.
The list of those to be issued with updated versions of the **COP** can be seen in Table 7-3.

The latest revision of the **COP** was drafted and/or reviewed by:

Table 7-2: Current Revision and Drafting Committee (this COP)

Full Name	Designation	Qualifications	Affiliations	Experience	Signature
HARMONY					
Colin du Plessis	Plant Manager	NHD Ext Met.	ECSA	34 Years	
Thinus Coetzee	Plant Engineer	B. Eng Mechanical	ECSA	10 Years	
Isak Lelimo	Chief Safety Officer	BSc Chemistry B. Tech - Safety Management	None	25 Years	
Lourens Christian Myburgh	Occupational Hygienist	Advance MEC Diploma in Public Health/Occupational Hygiene	MVS	15 Years	
Johan Steyn	CES – Metallurgical Operations	N5 Engineering studies		34 Years	
Carlo Geel	Environmental Manager	BSc (Microbiology + Biochemistry), Masters – Env. MGT, MBA in Business Administration 26 years' experience in environmental management, mining/prospecting (18 years) water governance and regulation, forestry, water quality management and petrochemical R&D		27 Years	
Pule Mabalane	Safety Officer	SOC 3	None	16 Years	
Petrus Bester	UASA H&S Structure	N2	UASA	29 Years	
Marius Botes	Solidarity H&S Structure	N2	Solidarity	33 Years	
Teboho Khumalo	H&S Structure	L4	NUM	07 years	
INTASOL TAILINGS					
Lorenzo van Vuuren	Operations Manager	B.Sc. Microbiology, MRD101 & 201		10 years	
Tewie Wessels	Site Manager	Matric		03 years	
JONES & WAGENER ENGINEERING AND ENVIRONMENTAL CONSULTANTS					
Ljiljana Nedeljkovic	Professional Engineer	B.Eng., PrEng, Specialist Consultant in mining and industrial waste		25 years	

Table 7-3: Distribution List

Department
Metallurgical Plants
Metallurgical and Engineering Training Centres
Safety Officer
All Unions
Operating Contractors on the Tailings Dams
Appointed **Professional Engineer**

8 GENERAL INFORMATION

8.1 Location and brief description of mine

Noligwa Gold Plant is located in the vicinity of Orkney and Klerksdorp, near the Vaal River on the Free State – North West Province border. GPS Coordinates (S 26°57'47.5", E°26'46"46.6)

Noligwa Gold Plant consists of the following areas: Mispah TSF and Moab MOD

8.2 Name of mine and name of owner

Table 8-1: Names of Mines and Owner

Name of Sections Included:	Noligwa Gold Plant
Name of Owner:	Harmony Gold Mining Company Limited

8.3 Telephone and telefax numbers (and area code in parentheses) and e-mail address

Table 8-2: Contact Details

Postal	Physical	Contact Numbers
P O Box 2 Randfontein 1760 South Africa	Randfontein Office Park Corner of Main Reef Road and Ward Avenue Randfontein, South Africa	Telephone: (011) 411 2000 Facsimile: (011) 692 3879 corporate@harmony.co.za

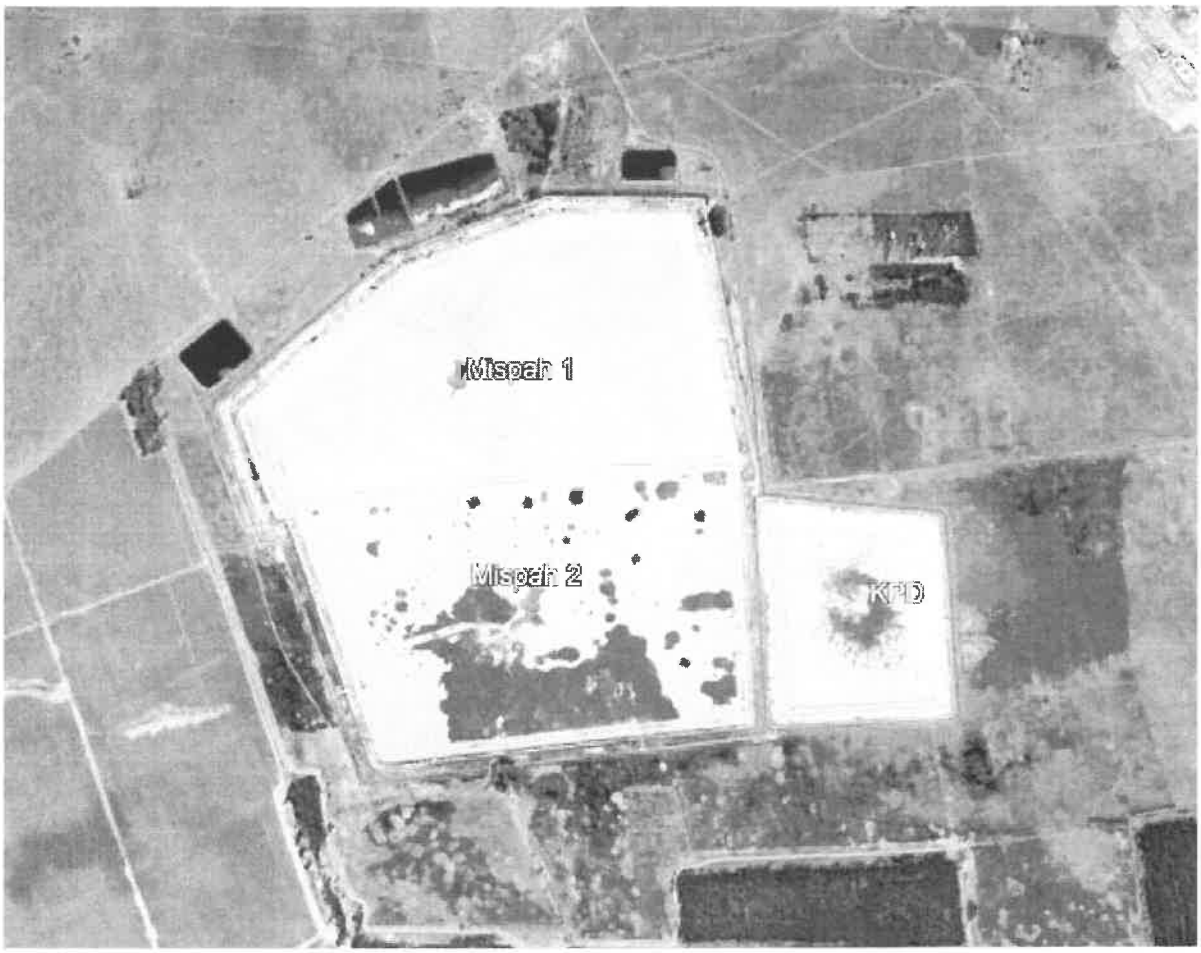


Figure 8-1: Locations of Tailings Dams

8.4 Magisterial district in which the mine is located

Harmony Gold's Noligwa plants and MRDs are located within the Orkney Magisterial districts.

8.5 Commodities produced

The main commodity produced is gold with Uranium as by product.

8.6 Design run of mine tonnage per month

The dry tailings tonnage per month per plant is given in [Table A3 1 in Annex 3 on page 21.]

8.7 Identification and listing of each MRD

The identification and listing of each of the MRDs is given in [Table A3 2 in Annex 3 on page 21.]

8.8 Metallurgical process including methods of transport and placement with respect to MRD's

Although all of Harmony Gold's Metallurgical Plants utilise the same milling process, namely run-of-mine milling, the treatment process varies depending on the plant. There are two treatment processes utilised namely:

- Carbon in Leach
- Carbon in Pulp

The following paragraphs are a brief description of the two processes.

Carbon in Leach (CIL)

Ore is normally transported from the shafts to the plant silos via conveyor belts, trucks or rail transport. The ore is then milled in either ROM (run of mine) or SAG (semi autogenous grinding) mills or a combination of both. The mills are operated in a closed circuit with cyclones, which classify the milled product. The ore that is fed to the mills are milled down to a P100 of –20mm before it is pumped to a cyclone(s) where the majority of the -75□m particles are recovered from the pulp. The cyclone underflow is fed back to the mill for regrinding while the cyclone overflow is fed to either linear or vibrating screens for the removal of woodchips.

The underflow of the woodchip screen(s) is either pumped or gravity fed to the thickener(s). Lime is also added to the woodchip screen underflow that is fed to the thickener(s) to increase the pH of the slurry as well as to assist with the settling in the thickener. Flocculent is added to increase the rate of settling inside the thickener. The clear water overflow from the thickeners is re-used in the plant as both wash and process water. The thickened pulp is pumped to the CIL section.

At the CIL section the thickener underflow is screened again to remove any remaining woodchips as well as any other unwanted material. Sodium cyanide is then added to the pulp before it is pumped to the leach tanks. In the more modern plants oxygen is also added to the leach tanks to assist with the dissolution of the gold, but in some of the older plants compressed air is used as a supply of oxygen, but also to agitate the slurry. In the modern plants where oxygen is used in the leach tanks, mechanical agitators are used to agitate the slurry.

In the CIL circuit the carbon that adsorbs the dissolved gold, moves counter current to the pulp stream. Carbon is added in the last tank of the leach train and pumped up stream until it reaches the first tank in the leach train. The gold concentration on the carbon increases as it moves up in the leach train so that the carbon in the first tank has the highest loading. Carbon is removed from the first tank in the leach train and pumped to the elution circuit for removal of the gold from the carbon.

At the elution section the carbon is separated from the pulp utilising a vibratory screen. The carbon overflows from the screen into the acid wash column while the pulp either gravitates or is pumped back to the CIL circuit. The carbon is then acid washed with a hydrochloric acid solution to remove calcium from the carbon before it is transferred to the elution column. In some plants, one column acts as both the acid wash and elution column. In the elution column the gold is stripped from the carbon using a cyanide caustic solution to condition the carbon before hot water (>110 °C) is passed through the column to strip the gold of the carbon. The barren carbon is then regenerated and returned to the last tank in the CIL circuit.

The pregnant solution (electrolyte) is pumped through an electrowinning circuit where the gold is plated onto cathodes utilising electroplating technology. The plated gold is removed from the cathodes on a regular basis. The gold sludge is then dried and either smelted into bullion bars or dispatched as sludge to Rand Refinery.

After the gold has been dissolved from the pulp the slurry is pumped to the plant's tailings dam(s).

Carbon in Pulp (CIP)

In a CIP plant the only difference is that the CIL circuit is divided into two different sections, namely a leach and an adsorption circuit. In the leach circuit the gold is dissolved before the slurry reports to the adsorption section. The adsorption section operates exactly the same as a CIL circuit except for the fact that the gold concentration profile in adsorption circuit is much steeper than in a CIL section.

The only reason for using the different circuits is that a CIL circuit is used when there are pregnant solution robbers, i.e. woodchips or carbonaceous material in the circuit, and the gold needs to be adsorbed as soon as it goes into dissolution.

Appointments

Specific appointments in terms of the **MHSA** are included in the Approvals and Appointments [Table A3-3 in Annex 3, pg. 22.]

9 TERMS AND DEFINITIONS

For the purpose of this Code of Practice the following terms and definitions and technical terms used that is not known or require absolute clarity shall apply:

Active	Means the status of an operational **Deposit**
Catchment paddocks	Means the bunded area on the perimeter of the tailings dams to contain any contaminated run-off and material eroded off the side slopes;
Competent person	Means a person: (a) is qualified by virtue of his knowledge, training, skills and experience to organise the work and its performance (b) is familiar with the provisions of the MHSA (including applicable subordinate legislation) which apply to the work to be performed; and (c) has been trained to recognise any potential or actual danger to health or safety in the performance of the work
COP	Code of Practice
CIL	Carbon in Leach
CIP	Carbon in Pulp
COVID-19	**A potentially severe respiratory illness caused by a coronavirus and characterized by fever, coughing, and shortness of breath.**
Closure	The point in the life cycle of a mine or any part thereof when a certificate in terms of section 12 of the Minerals Act or Regulation 2.11 of the Minerals Act Regulations has been issued in respect of that mine or any part thereof

Decommissioning	The process followed, after deposition of the mine residues, to ensure that the MRD is secured against becoming an unacceptable health and safety hazard and a source or cause of further potentially significant residual environmental impacts
Deposit	means **Mine Residue Deposit (MRD)**, which is defined in this **COP** as a Tailings Storage Facility (TSF)
DMRE	Department of Mineral Resources and Energy
DRP	Disaster Recovery Plan
Dormant	a Facility upon which deposition is temporarily suspended during the operational phase, with the intention of depositing again in the future;
EMPR	Environmental Management Programme Report
EPP	Emergency Preparedness Plan
Freeboard	the vertical distance measured from the mean operating pool level to the lowest embankment crest elevation
Hazard	Source of or exposure to danger
ICMI	International Cyanide Management Institute
MHSA	Mine Health and Safety Act, 1996 (Act No. 29 of 1996)
Mine residue	Any waste rock, slimes or tailings derived from any mining operation or from processing of any minerals; it includes the part of the material that remains or results after processing to extract those constituents or parts which are extracted at the time, but excludes material used for backfill in underground mines and overburden removed in the course of open cast mining
Minerals Act regulation	A regulation in force in terms of item 4 of Schedule 4 of the MHSA
MOD	Means Marginal Ore Dump, which is a dump or heap consisting of waste rock from mining activity, usually projecting above the natural ground surface, but may also occupy in part or wholly the space of a pre-existing excavation
MPRDA	Minerals and Petroleum Resources Development Act
MRD	Mine Residue Deposit, which is a dump, heap, pile filling or tailings dam consisting of mine residue, which usually projects above the natural ground surface but may occupy the space of a pre-existing excavation
NWA	National Water Act
Professional engineer	A competent person registered as a professional engineer or as a professional technologist with the Engineering Council of South Africa
Regulation	Regulation made under section 98
Risk	A likelihood that occupational injury or harm to persons will occur
ROM	Run of Mine

RWD	means the dam into which decant water is discharge and retained before being returned to the plant for re-use.
SAG	Semi Autogenous Grinding
SABS	South African Bureau of Standards
SANS	South African National Standards
SIMRAC	Safety in Mining Research Advisory Committee
Suitably Qualified Person	Means any or any combination of a **person's** formal qualifications, prior learning; relevant experience or the capacity to acquire within a reasonable time the ability to do the **job**.

10 RISK MANAGEMENT

10.1 In line with Harmony's commitment to a healthy and safe working environment for employees and members of the public, and in order to comply with the requirements of the Mine Health and Safety Act, a Baseline risk assessment (INTS-BLRA- Mispah) of the working places was conducted to identify potential occupational hazards and assess the risk to which employees may be expose while they are at work. Baseline Risk assessment is referenced in Annexures 5 & 6.

10.2 The significant risks identified in the risk assessment process are dealt with having regard to Section 11(2) and (3) of the MHSA. As far as reasonably practicable, the plant attempts to eliminate the risk, thereafter control the risk at source, minimise the risk and thereafter, insofar as the risk remains, to provide personal protective equipment and to institute a programme to monitor the risk. Addressed by in the Baseline risk assessment mentioned in 10.1 above.

10.3 In addition to section 5(2), the Baseline risk assessments (INTS-BLRA- Mispah) conducted identified hazards and risks to which persons who are not employees at the Operation are exposed to. Controls were implemented to ensure that as far as reasonably practical, such persons will not be exposed to hazards which could affect their health and safety.

11 RISK ASSESSMENT

11.1 Risk Assessment

A detailed discussion of Harmony Gold Mining Company Limited Noligwa Gold plant baseline information as well as **Risk** assessment can be found in [Annex A5, pg.26.]

11.2 Safety Classification

A detailed discussion of Harmony Gold Mining Company Limited, Noligwa Operation safety classification can be found in [Annex A7, pg. 50.]

12 ASPECTS ADDRESSED IN THE COP TO ENSURE MANAGEMENT OF SIGNIFICANT RISK RELATING TO MRD'S

This COP and related procedure (INT-SWP-013) identifies clear instructions and directions regarding the technical design and specifications for MRD's and includes a description of the management plan for managing the significant risks relating to MRD's identified by the risk assessment process as depicted in procedure (INT-SWP-013)

12.1 Reference material

A detail discussion on the reference material can be found in [Annex A9.1, pg. 55.]

12.2 Technical Reports

A detailed discussion on the technical reports can be found in [Annex A9.2.1, pg. 55.]

12.3 Characteristics of the MRD

A detailed discussion on the characteristics of the Mine Residue Deposits can be found in [Annex A9.3, pg.57.]

12.4 Site Selection

A detailed discussion on the site selection can be found in [Annex A9.4, pg.57.]

12.5 Design

A detailed discussion on the design of Mine Residue Deposits can be found in [Annex A9.5, pg.58.]

12.6 Construction and Operation

A detailed discussion on the construction and operation of Mine Residue Deposits can be found in [Annex A9.6, pg.59.]

12.7 Maintenance and Repair

A detailed discussion on the maintenance and repair of Mine Residue Deposits can be found in [Annex A9.9, pg.67.]

12.8 Modifications to an existing MRD

A detailed discussion on the modifications to existing Mine Residue Deposits can be found in [Annex A9.10, pg. 68.]

12.9 Decommissioning

A detailed discussion on the decommissioning of Mine Residue Deposits can be found in [Annex A9.11, pg. 68.]

12.10 Inspections by Mine Personnel

A detailed discussion on the inspection of Mine Residue Deposits by mine personnel can be found in [Annex A9.12, pg. 68.]

12.11 Audit Inspections by Professional Engineer

Audit inspections by a **Professional Engineer** of **Mine Residue Deposits** classified as high or medium **Risk** and reporting thereon is required at the following frequency:

Table 12-1: Qualification of the responsible personnel

1	2	3	4
Safety classification	**Operational deposit**	**Decommissioned and/or Dormant deposit**	**Qualification of auditor**
High hazard	Annually	Annually	**Professional Engineer**
Medium hazard	Every two years	Every two years	**Professional Engineer**
Low hazard	Every three years	Every five years	Suitably qualified person

A detailed discussion on the audit inspection of **Mine Residue Deposits** by a **Professional Engineer** can be found in [Annex 0, pg.68.]

12.12 Emergency Preparedness

A detailed discussion on the emergency preparedness around Mine Residue Deposits can be found in [Annex A9.14, pg. 69.]

12.13 Recommissioning

A detailed discussion around the re-commissioning of Mine Residue Deposits can be found in [Annex A9.11, pg.68.]

PART D: IMPLEMENTATION

1 IMPLEMENTATION PLAN

1.1 Noligwa Gold Plant will be responsible for the implementation and maintenance of this Code of Practice and management systems. This Code of Practice serves to ensure that consistent environmental and safety standards are implemented and that the liabilities potentially associated with residue disposal are kept within acceptable limits. The implementation plan for this COP was compiled to ensure provision for issues such as organisational structures, responsibilities of functionaries and programs and schedules to ensure proper implementation of the COP and related procedures.

1.2 Information related to implementation is depicted in the table below:

Action required	Responsible person	Completion date
Baseline Risk Assessment conducted	Plant manager	March 2020
Issue based Risk assessment conducted	Intasol personnel	March 2020
Procedures drafted	Intasol personnel	March 2020
Manager to appoint responsible persons to monitor and enforce compliance with the COP	Plant Engineer	November 2020
Consultation with Unions	Plant manager	November 2020
Approval of COP from Unions	Health & Safety Structure	November 2020
Approval by HOD's	Plant manager	November 2020
Publish on Intranet	Legal coordinator	November 2020
Submit copy to DMR	Legal coordinator	November 2020
Distribute/communicate to all relevant parties concerned	Safety/Training Officer	December 2020

2 COMPLIANCE WITH THE COP

The following measures shall be implemented to monitor and ensuring compliance with the COP;

- Daily inspections by dam operators
- Weekly inspections by TSF Foreman, plant Manager and Engineer
- Quarterly team inspections
- Quarterly inspections by safety Officer
- Annual inspections by Professional Engineer
- Internal Audits
- External Audits

3 ACCESS TO THE COP AND RELATED DOCUMENTS

3.1 The COP and related documents are readily available at Legal Admin for examination by any affected person electronically or hard copy. Supervisors have access to these documents on the web site of Noligwa Gold Plant.

3.2 The registered trade unions are part of the drafting/ reviewing committees and involved in the signing off and implementation of the COP. This ensures employees, trade unions and management are participants in the health and safety of all employees at Noligwa Gold Plant.

A register is kept of such person or institutions with copies of the COP, to facilitate updating of such copies. The signed off COP is communicated to the relevant parties, through the Mine Health and Safety Committee, Task Teams, Managers, Supervisors and Health and Safety representatives.

3.3 The Plant Manager ensures that that all employees are fully conversant with those sections of the Code of Practice relevant to their respective areas of responsibilities, by providing training of the COP to all employees.

ANNEXURE 1 - REFERENCES

1. Mine Health and Safety Act, 1996 (Act No. 29 of 1996).
2. Minerals Act, 1991 (Act No. 50 of 1991).
3. Practical Guide to the Risk Assessment Process, SIMRAC Tripartite Working Group on Risk Assessment, 1997.
4. South African Bureau of Standards: Code of Practice, Mine Residue, SABS 0286: 1998.
5. Guidelines for Environmental Protection, Volume 1/1979 (Revised 1983 and 1995): The Engineering Design, Operation and Closure of Metalliferous, Diamond and Coal Residue Deposits, Chamber of Mines of South Africa, March 1996, and any Addenda published subsequently.
6. Aide-Mémoire for the Preparation of Environmental Management Programme Reports for Prospecting and Mining, Department of Mineral and Energy Affairs, 1992.
7. Handbook of Guidelines for Environmental Protection, Volume 2/1979: The Vegetation of Residue Deposits against Water and Wind Erosion. Chamber of Mines of South Africa, July 1979.
8. National Water Act (Act No 36 of 1998).
9. Requirements for the purification of wastewater or effluent. Government Notice No. R991, Government Gazette, 18 May 1994.
10. Mineral and Petroleum Resources Development Act, 2002, (Act 28 of 2002), Regulations
11. International Cyanide Management Code For The Manufacture, Transport and Use of Cyanide In The Production of Gold, 2006, The International Cyanide Management Institute.
12. Guideline for the Compilation of a Mandatory Code of Practice on Mine Residue Deposits. DME Reference Number: DME 16/3/2/5 – A1: Section 9(2) of the Mine Health and Safety Act, 1996 (Act No 29 of 1996): Mine Deposits, Department of Minerals and Energy, 2001.

ANNEXURE 2: RECORD OF AMENDMENTS

Date revised	Revision number	Amendment
June 2018	001	First Draft
July 2018	001	Final
May 2020	002	• Change revision date. Numbering and content rectified in terms of the DMR guideline. Update legal appointments, • Risk assessment, tonnage deposition. Cross referencing introduced in electronic format of document. General corrections and format changes.
November 2020	003	• Adding COVID 19 issues to the COP • Included Annexure 12 dealing with COVID 19
November 2021	004	• Added the Consultation with unions brief and appointment of review committee as annexures.

Table A2-1: Revision Table

ANNEXURE 3: GENERAL INFORMATION

A3.1 Design Run-of-Mine Tonnage Per Month

Table A3-1: Design Run of Mine Tonnage

Plant	Location	Telephone No	Run of Mine (tpm)	Status	Metallurgical Process
Noligwa	Orkney	(018) 782 9111	120 000	**Active**	**ROM/CIP**
Mispah	Orkney	(018) 782 9111	130 000	**Active**	**ROM/CIP**

A3.2 Identification and Listing of Each MRD

Table A3-2: Identification and Listing of MRDs

Section	Name	DME Reg No.	Avg Deposition Rate(tpm)	Status
Noligwa Plant	Mispah 1 TSF	Mispah 1 TSF	107 000	**Active**
Mispah Plant	Mispah 2 TSF	Mispah 2 TSF	159 000	**Active**
Noligwa Plant	Kopanang Pay Dam	Kopanang Pay Dam	0	**Dormant**

A3.3 Appointments

The responsible persons for the various Harmony Gold Mines Plants, Surface Operations and other organisations are listed in the table below, and where indicated, are appointed as subordinate managers in terms of the **MHSA**.

Table A3-3: Legal Appointments

Designation/Appointment		Name
Harmony Gold Mines		
Manager Metallurgy	4.(1)	Mr Elias Pobe
Plant Manager - Noligwa Plant	3(1)(a)	Mr Colin du Plessis
Plant Engineer - Noligwa Plant	2.13.1	Mr Thinus Coetzee
Chief Safety Officer	2.17.4	Mr Isak Lelimo
Safety Officer	2.17.1	Mr Hans Mabalane
Environmental Manager	N/A	Mr Carlo Geel
Tailings Dam Contractor – INTASOL Tailings		
Deposition Manager – Mispah TSFs	2.6.1	Mr. Tewie Wessels
Deposition Manager - Dormant dam	2.6.1	Mr. Tewie Wessels
Consulting Professional Engineer – Jones and Wagener Engineering & Environmental Consultants		
Professional Engineer - (Technical)	2.6.1	Ms Ljiljana Nedeljkovic

ANNEXURE 4: RISK MANAGEMENT

Harmony Noligwa Plant is committed to the systematic management of all its residue **Deposits** in a consistent, environmentally sustainable and safe manner. The management of the residue **Deposits** is fully integrated with mining and process operations. The **Risk**s associated with the residue **Deposits** are managed such that they do not increase the **Risk** to which employees and public are exposed.

The **Risk**s associated with residue disposal should compare favourably with **Risk** from other industries and should be maintained as far as possible below limiting values. The management of residue disposal should be so organised as to lead to ever-improving levels of safety and environmental performance.

Contingency planning should be in place for unforeseen events and accidents. Good practice based on international and local experience, adapted for site-specific conditions, should be implemented.

Residue disposal policy objectives will be achieved through sound management, good engineering, quality assurance and appropriate qualification and training of all personnel. Residue **Deposits** should be managed in terms of a documented management system that is accessible to all users.

Residue should be managed over its full life cycle. The cycle begins when the disposal of residue first becomes a possibility and ends when the residue disposal facility is closed. This means that the management system must apply to a range of activities including planning, design, operation and post closure care and maintenance.

Each operation will be responsible for the implementation and maintenance of their code of practice and their own management systems. This code of practice serves to ensure that consistent environmental and safety standards are implemented across the Harmony operations and that the liabilities potentially associated with residue disposal are kept within acceptable limits.

Policies, strategies and philosophies of residue disposal, while not explicitly required by the Guideline, are discussed in the following section.

A4.1 POLICIES, STRATEGIES AND PHILOSOPHIES

A4.1.1 Strategies for Residue Disposal

A4.1.1.1 Lifecycle management

The management system for the residue **Deposits** must cover the entire lifecycle of the **Deposit** from conception to **Closure,** and must be regularly updated to ensure adequate capacity for residue disposal. The plans must include the identification of new sites for future disposal.

A4.1.1.2 Financial Provision

An annual budget provision and review must be carried out to ensure that the lifecycle management plan can be implemented. The budget should include costs of ongoing operation, capital costs for new development and **Closure** provisions.

A4.1.1.3 Landform

The **Deposit** must be constructed to ensure the outer face is stable at all times including after **Closure**. The **Deposit** must also be constructed in an environmentally sustainable manner.

A4.1.1.4 Environmental management

The **Deposits** shall be operated, maintained and closed so as to minimise the environmental impact as far as practical.

- Clean water shall be diverted around the **Deposits** to prevent contamination of the water
- Contaminated water shall be retained at source and either be returned to the plant or be allowed to evaporate
- No residue shall be deposited or be allowed to spill off the designated footprint
- No waste other than that for which the (Active) **Deposit** is intended shall be disposed on the **Deposit**
- The consumptive use of water shall be minimised
- The retention of water on a **Deposit** shall be reduced to a minimum and excess water removed and stored in a safe manner
- Where applicable the **Deposits** shall be operated and maintained in compliance with the requirements of the International Cyanide Management Code. [Ref 11 – See Annex 1]

A4.1.1.5 Closure

The **Deposits** must be operated in a manner in which **Closure** of the **Deposit** is always considered and **Closure** costs are minimised. **Closure** of the **Deposits** shall be in accordance with the **Closure** design were applicable.

A4.1.1.6 Resources

Adequate resources must be made available for the operation of the **Deposits** including suitably trained and qualified personnel, equipment and materials.

A4.1.2 Philosophy of Residue Deposit Operation

The following philosophies have been formulated for the operation of the residue **Deposits** to ensure the stability, safe operation and legal compliance of the **Deposit**.

A4.1.2.1 Residue Delivery

Residue is delivered from the plants to the tailings dams by means of pipelines. Sufficient delivery points must be available to provide flexibility to overcome blockages or other delivery problems. The pipelines must be inspected and maintained on a regular basis to identify/prevent spillage.

A4.1.2.2 Residue Deposition

Residue must be deposited on the **Deposit** in a manner to ensure the stability of the outer face and to control the volume of water on the **Deposit**.

A4.1.2.3 Water Decant

Supernatant water on tailings dams must be decanted such that the volume of water stored in the tailings dams is kept to an absolute minimum and such that no solids are removed off the dam with the decanted water.

Penstock outfall pipes should be maintained or sealed when deposit is classified as dormant or decommissioned.

A4.1.2.4 Freeboard

The minimum legal **Freeboard** is determined by the more stringent requirement as set out by either regulation GN 704 from the National Water Act, Act 36, or regulation 527(73) from the Mineral and Petroleum Resources Act, Act 28. Thus, the minimum legal **Freeboard** must be equal to the greater value of the water level rise that is caused by a 1:50 year 24hr storm event plus an additional 800mm (GN 704), or a 1:100 year 24hr storm event plus an additional 500mm (Reg 527(73)). The water level rise for these two scenarios will be re-calculated annually by the appointed Consulting Engineers for each TSF based on a survey of the dam basin while assuming that no water is being decanted during the storm event.

Legal **Freeboard** to be managed on the tailings storage facility by means of the correct deposition methodology. Legal **Freeboard** will be used as the official measure of compliance on a tailings storage facility.

A4.1.2.5 Under drains

Under drains outlets are to be maintained to ensure the drains remain functional for the life of the **Deposit**. Jet rodding and camera inspections of drainage pipes should be conducted as required.

A4.1.2.6 Safety

Sufficient and adequate safety equipment must be provided on the **Deposit** where applicable to ensure the safety of the operating personnel and employees.

Such equipment includes:

- Personnel protective equipment;
- Access catwalks and platforms;
- Walkways;
- Warning signs;
- Weather shelters;
- Life Buoy;
- Strike Alert;
- Pac 7000/8000.

A3.1.2.7 Access

Adequate access must be maintained to all parts of the **Deposits** for operation, maintenance and inspection.

ANNEXURE 5: RISK ASSESSMENT

The **Risk** assessment for the MRDs must be performed prior to commencing operations and updated whenever there is a change in circumstances that may have a significant impact on **Risk**s.

The **Risk** assessment planning and implementation process must be according to the SIMRAC Guideline, [Ref 3 – See Annex 1]

For those **Deposits** requiring **Risk** assessments, all significant hazards are to be identified and their associated **Risk**s assessed as far as reasonably practical such that these **Risk**s can be managed through specific operating procedures.

The **Risk**s are to be ranked as per the matrix included in Figure A5-1.

Risks are rated in the following categories:

- High **Risk**
- Medium **Risk**
- Low **Risk**

High **Risk** situations are defined as those which cannot be tolerated under any circumstances and for which immediate emergency action is required. A high-**Risk** situation may warrant closing down of the deposit or evacuation of people living downstream depending on the circumstances. This level of **Risk** is taken in the most serious light.

Medium **Risk**s require immediate attention but do not necessarily require emergency actions. These **Risk**s must be targeted for continuous improvement. Sometime will normally be available to plan and implement mitigation measures. These **Risk**s must be targeted for continuous improvement.

A low **Risk** represents all **Risk**s that do not require any further attention. Although these **Risk**s do exist they are highly unlikely to manifest themselves and therefore require no further attention.

The **DMR** Guideline [Ref 1 – See Annex 1] is unclear regarding **Risk** management and **Risk** assessments. However, it can reasonably be interpreted to mean that a **COP** must include two main types of **Risk** assessment:

- **Risk** assessments pertaining to the MRDs themselves
- **Risk** assessments pertaining to the personnel involved with day to day operations of the MRDs (Occupational Health and Safety)

Both types of **Risk** assessment must cover the hazards during the operational and post-**Closure** phases. Future events which can give rise to increased **Risk**s must be considered where appropriate.

Taking cognisance of the foregoing, the **Risk**s have been divided into three categories as follows:

Category	Pertaining to:	Covered in:
Occupational health and safety	Personnel	Section 0
Post **Closure** impacts	**Deposits**	Section 0
Safety of **Deposits**	**Deposits**	Section 0

	1	2	3	4	5	6	
1	L	M	M	H	H	H	A
2	L	M	M	M	H	H	B
3	L	M	M	M	M	H	C
4	L	L	M	M	M	M	D
5	L	L	L	M	M	M	E
6	L	L	L	L	L	L	F
	1	2	3	4	5	6	
Frequency	Highly Unlikely	Rare	Low Likelyhood	Possible/ Probable	Can Occur	Frequent	
Probability	Not Expected to Occur	Not During Life	Could Occur	Possibly Will Occur	Could Occur Regularly	Expected to Occur	
Frequency (Lifetime)	1:1 000 000	1:100 000	1:10 000	1:1 000	1:100	1:10	
	Probability of Failure						

Consequence	Aspects				
	Safety	**Health**	**Environmental Acceptability**	**Legal**	**Social Acceptance**
Catastrophic	Loss of Life	Acute Illness	Acute affects at regional scale	Cessation of use & Criminal Prosecution	International pressure resulting in cessation of use
Very Severe	Disability	Chronic Illness	Acute affects at local scale	Prosecution and threat to continue land use	Severe national and local pressure threat to cease use
Severe	Severe injury to multiple parties	Serious illness	Long term impairment of fitness of use	Prosecution and fine	Threatening local pressure and/or national interest
Moderate	Isolated injury	recoverable illness	Recoverable impacts to fitness of use	Threat of prosecution for continued non complience	Local pressure and/or local negative press
Low	Minor injuries	minor illness	Temporary impacts	Non complience witrhout regulatory response	Minor local reaction and complaints
Very Low	No impact	No impact	No impact	No impact	No impact

KEY

H	High Risk
M	Medium Risk
L	Low Risk

Figure A5-1: Risk Rating Matrix

A5.1 Occupational Health and Safety

A baseline occupational health and safety **Risk** assessment shall be performed in accordance with **SIMRAC** [Ref 3 – See Annex 1] Safety procedures shall then be drafted to manage the **Risk**s based on the assessment. The implementation and enforcement of the procedures must then be managed by means of ongoing safety audits, which will:

- Assess whether the site operations are in accordance with the procedures
- Identify any changes which may require alteration to the procedures
- Appraise the procedures to ensure that they are sufficient and adequate

The **Risk** assessment and safety audits are to be carried out by an assessment team appointed by the particular Plant Manager. The team members must include personnel responsible for the daily operations from Harmony Gold Mine, the Operating Contractor and the appointed safety representatives. The members must be shown to be competent for the required task. The safety audit must be documented in a concise and clear manner.

The baseline **Risk** assessment for occupational health and safety contemplated above is included in [Annex 5]

A5.2 Post-Closure Impacts

Post-**Closure** impact **Risk**s include:

- Access
- Stability of the **Deposit**
- Erosion
- Environmental impacts including seepage and dust

The **Risk**s shall be assessed during the operation of the **Deposits** such that the **Deposits** are constructed in a way to minimise the post-**Closure** impacts.

A5.3 Safety of Deposits

All **MRDs** are to be classified as outlined in **Annex 0** (Safety Classification). All high and medium hazard MRDs shall have an appropriately qualified **Professional Engineer** appointed to assess the **Risk**s posed by the MRDs in consultation with the relevant mine and operating contractor personnel. The **Risk** analysis for low hazard dams shall be carried out by a suitably qualified person who is not necessarily a **Professional Engineer**.

The **Risk** shall be assessed and managed in terms of the surveillance responsibilities detailed under [Section 0 on pg.64.]

A5.3.1 Safety of Deposits Baseline Risk Assessment

The appointed **Professional Engineer** or suitably qualified person responsible for the safety of the **Deposits** shall carry out a baseline **Risk** assessment of the **Deposits**.

The level of detail must be based on the safety classification for the particular **Deposit**. A qualitative **Risk** assessment will suffice for **Deposits** that classify as low or medium hazard whilst more comprehensive (quantitative) assessments will be required for **Deposits** that classify as high hazard.

The assessments shall include:

- Identification of potential structural failure mechanisms;

- Interpretation of piezometer reading trends;
- Stability analysis on all piezometer cross-sections;
- Stability analysis on any potential problem areas as considered necessary;
- **Freeboard** analysis;
- Visual audit;
- Assessment of drain flow trends.

A5.3.2 On-going Audits

The appointed **Professional Engineer** or suitably qualified person responsible for the safety of the **Deposits** will undertake ongoing audits of the **Deposits** in terms of an annual assessment.

Included in the assessment shall be:

- Interpretation on a monthly basis of:
    - Piezometer reading trends with reference to "trigger" levels (where installed)
    - Drain flow readings (where installed)
    - **Freeboard** measurements
- Quarterly visual audits

Requirements for the audits are detailed in Sections 0, 0 and 0.

Compliance audits in terms of the **ICMI** Cyanide Code will be conducted every three years by external auditors approved by **ICMI**.

A5.4 Baseline Information

A5.4.1 Environmental Baselines

The environmental baselines are included in the **EMPR**s specific to the particular sections and which can be found in the office of the Noligwa Operations' Environmental Manager.

A5.4.2 Deposit Characterisation

A5.4.2.1 Geotechnical Characterisation

The geotechnical parameters have been obtained by laboratory testing of residue. The characteristics are included in Table A5-1. It is expected that the characteristics will vary from time to time due to the consistency of the ore body and treatment process.

Table A5-1: Geotechnical Characteristics - Tailings

Property	Tailings
Specific gravity	2.7t/m^3
Typical grading	70% -75µm
Angle of friction	31 °
Cohesion	0kPa

Average Deposited in situ dry density	1.35t/m^3

A5.5 Design and Construction Records

The following design and investigation reports are available on record.

- AA8/92/4353 – *Geotechnical Investigation for Slimes Dam M – Vaal Reefs* – November 1992
- AA10/92/4354 – *Vaal Reefs Slimes Dam M, Summary Design Report* – November 1992
- AA4/96/4934 – Risk Assessment of Mispah Slimes Dam – January 1996
- FW03/05/108 – *Geotechnical Report for Extension to Mispah Tailings Dam, Vaal River Operations* – July 2005
- FWA01/06/115 – *Mispah Extension Tailing Dam, Design Report, Vaal River Operations* – January 2006
- JW103/18/G853-00 – *Mispah Tailings Storage Facility No.1 – Western Flank – Geotechnical Investigation Factual Report, Harmony Gold Mining* – May 2018

A5.6 Legal Framework

The following statutes are relevant to residue disposal and the **Deposits**:

- The Minerals and Petroleum Resources Development Act (Act 28 of 2002)
- The National Water Act (Act 36 of 1998)
- The Atmospheric Pollution Prevention Act (Act 45 of 1965)
- The Environmental Conservation Act (Act 73 of 1989)
- The Health Act (Act 63 of 1977)
- The Minerals Act (Act 50 of 1991)
- The Mines Health and Safety Act (Act 29 of 1996)
- The Nuclear Energy Act (Act 46 of 1999)
- The Soil Conservation Act (Act 76 of 1969)
- The Conservation of Agricultural Resources Act (Act 45 of 1983)
- The International Cyanide Management Code, 2006 (ICMI)

ANNEXURE 6: BASELINE RISK ASSESSMENT

Risk Assessment Title	**Baseline – Deposition**		
Business Area	**Vaal Reef Operations**	**Risk Assessment No.**	**INTS-BLRA- (Mispah)**
Site	**Harmony – Mispah TSF**	**Version Date**	**March 2020**
Type	**Baseline**	**Version No.**	**2.0**
Original Date of RA	**May 2018**	**Revision Date**	**March 2022**
Reason for assessments	**New Equipment / Engineering / Post Incident / Organizational / Other**		

Drafting committee

No.	Name	Occupation	Signature
1	L. van Vuuren	Operational Manager	
2	T. Wessels	Site Manager	
3	D. Khoza	Operational Supervisor	

Responsibility	Duties	Date	Signature
Client representative	Peruse (examine)the Risk Assessment		
	Sign Acceptance		
Facilitator	Facilitate the exercise		
	Sign Acceptance		

Type key: Safety – S: Health – H: Health - E: Environmental – BI: Business Disruption - MD: Material Damage or Other Consequential Losses – L&R: Legal and Regulatory – R/S/C: Impact of reputation, Social, Community

No	Item / Step (Task)	Hazard / Impact (What can go wrong)	Most probable cause (What)	What could happen (Effects)	Type	C		R	Existing control (controls that are in place)			R
1	**Legal and Client Compliance**	• Prosecution by Regulating Authorities. • Cancellation of Contract. • Prosecution by the Client.	• No knowledge /disregard of the MHS Act. • No knowledge /disregard of the National Environmental Management Act. • No knowledge/disregard of the Basic Condition of Employment Act. • No control system in place. • Un-licensed/qualified operators.	• Personal Injuries. • Fatalities. • Negative Environmental Impact. • Company may lose Credibility with client and in the Business Sector. • Company may lose the trust of the employees.	S, H BI L&R	4 4 4		1SH 1SH 1SH	• Registration with Department of Labor. • Internal SHEQ Audits. • Legal Liability Training for Managers. • Medical surveillance. • Client Induction – incorporated in routing form. • Site Specific Induction. • Appointed and Qualified LDV & TMM operators.			1SH 1SH 1SH
2	**Medical Surveillance**	• Occupational Diseases exposure. • Personal Injuries. • Fatalities. • Loss of Quality of life. • Poor fatigue management	• Failure to undergo pre-employment medical. • Failure to attend annual medical examination. • Failure to follow through on Special medical surveillance.	• Medically unfit employees. • Poor work performance. • Late diagnosis and treatment of	S, H BI L&R	4 4 4		1SH 1SH 1SH	• Employees do pre-employment medical before commencing with any work.			1SH 1SH 1SH

			• Failure to attend exit medical examination. • No Noise, Dust or Illumination Surveillance. • Work force not strong enough to prevent excessive overtime. • Overtime not controlled.	Occupational Diseases. • Personal injuries. • Fatalities.					• Employees undergo annual medicals. • Employees undergo special medical surveillance as illness is identified. • Employees undergo exit medical at end of service. • Employees to clock or fill in clock card daily. • Overtime request to be completed for employees that need to work overtime.			
3	**Training & Appointment of responsible personnel**	• Incompetent personnel • Untrained personnel	• Client do not give training to the contractor. • Client not monitoring the contractors. • Client not checking for competence of contractor. • Contractor not controlling sub-contractors.	• Legal implications • Dismissal of contractor by client • Dismissal of sub-contractor by contractor • Personal injury • Fatalities	S, H BI R, S, C	4 4 4			• MH&S Act • OHS Act • Client control system in place • Contractor control system in place			

4	**LDV (bakkies) driving on site and Public roads**	• Vehicle Theft. • Vehicle Hi-jacking. • Vehicle Collisions. • Vehicle Breakdowns. • Tyre Bursts/Flat Tyres. • Fire. • Environmental pollution. • Employees run over.	• Crime. • Poor road conditions. • Incompetence of other road users. • Unsafe access routes. • Operator intoxicated (alcohol/drugs). • Talk on cell phone while driving. • Distracted while driving. • Not familiar with the surroundings. • Not adhering to road traffic rules. • Operators fail to use safety devices (seat belts). • No Pre-use inspections conducted. • No Vehicle Maintenance. • Tyres in a poor condition. • Employees not observing for moving vehicles. • Vehicles driving too fast.	• Personal injuries. • Fatalities. • Production loss. • Property damaged.	S, H E BI R, S, C	3 2 2 2			• Only drivers with valid driver's license can be allowed drive. • Zero tolerance on alcohol and drugs. • Adhere to all traffic and road signs. • Speed limit of 20km/h on TSF. • Speed limit of 40km/h on site • Strictly no talking on cell phones when driving. • Daily pre-start checklist on all vehicles. • Drivers to use safety belts. • Manufacturers Maintenance plan adhered to. • Clearly marked and maintained site roads. • Fire Extinguishers in vehicle.			

									• All drivers to be appointed by the client.			
5	**TMM operations – TLB** **TMM operations – TLB(Cont)**	• Vibration. • Noise >85db. • Unauthorized Operator • Human & TMM Interaction. • TMM Theft. • TMM Collisions. • TMM Breakdown. • TMM Roll over. • TMM Sinking. • Fire. • Environmental pollution. • Employees run over. • TMM operator. • Slopes and Gradients.	• Unapproved machine used. • Vibration cushioning devises not serviceable. • Machine not locked out when not in use. • Keys not kept secure. • Not inspecting the work area beforehand. • Operator not trained and found competent with valid license and operator permit. • Poor road conditions. • Unsafe access routes. • Mechanical breakdowns. • Driver intoxicated (alcohol/drugs). • Not concentrating when operating. • Talk on cell phone while operating. • Not familiar with surroundings. • Drivers fail to use safety devices (seat belts). • Not adhering to the safe operating distances. • Operating at incorrect angles/method causing roll over. • Electrocution.	• Vibration exposure. • Noise exposure. • Personal injuries. • Fatalities. • Production and Financial loss. • Property damaged.	S, H BI M&D L&R	4 4 4 4			• Only drivers with valid driver's license and operators permit can operate TMM. • Zero tolerance on alcohol and drugs. • Speed limit of 20km/h on dams • Speed limit of 40km/h on site. • Strictly no talking on cell phones when operating. • Daily pre-start checklist. • Operators to use safety belts at all times when operating. • Lock out of TMM when not in operation. • Manufacturers Service plan adhered to.			

			• Safe Operating procedure not followed. • Poor/lack of supervision. • Poor/lack of training. • Poor/Lack of Communication. • No Pre-use inspections. • No Vehicle Maintenance plan. • Operator not found competent by the client.						• Clearly marked and maintained site roads. • Site Specific Traffic management plan. • Fire Extinguishers in vehicle. • PPE provided & training.			
6	**TMM operations - Excavator** **TMM operations – Excavator (Cont)**	• Vibration. • Noise > 85db. • Unauthorized Operator • Human & TMM Interaction. • TMM Theft. • TMM Collisions. • TMM Breakdown. • TMM Roll over. • TMM Sinking. • Fire. • Environmental pollution. • Employees run over. • TMM operator. • Slopes and Gradients.	• Unapproved machine used. • Vibration cushioning devises not serviceable. • Machine not locked out when not in use. • Keys not kept secure. • Not inspecting the work area beforehand. • Operator not trained and found competent with valid license and operator permit. • Poor road conditions. • Unsafe access routes. • Mechanical breakdowns. • Driver intoxicated (alcohol/drugs). • Not concentrating when operating. • Talk on cell phone while operating.	• Vibration exposure. • Noise exposure. • Personal injuries. • Fatalities. • Production and Financial loss. • Property damaged.	S, H BI M&D L&R	4 4 4 4			• Only drivers with valid driver's license and operators permit can operate TMM. • Zero tolerance on alcohol and drugs. • Speed limit of 20km/h on dams/site. • Speed limit of 40km/h on site • Strictly no talking on cell phones when operating. • Daily pre-start checklist. • Operators to use safety belts			

			• Not familiar with surroundings. • Drivers fail to use safety devices (seat belts). • Not adhering to the safe operating distances. • Operating at incorrect angles/method causing roll over. • Electrocution. • Safe Operating procedure not followed. • Poor/lack of supervision. • Poor/lack of training. • Poor/Lack of Communication. • No Pre-use inspections. • No Vehicle Maintenance plan. • Operator not found competent by the client.						at all times when operating. • Lock out machine when not in operation. • Manufacturers Service plan adhered to. • Clearly marked and maintained site roads. • Fire Extinguishers in vehicle. •PPE provided & training.			
7	**Access ways/Walkways and Ramps**	• Gradients. • Uneven surface. • Slippery surface. • TMM's Rolling over • Vehicle collisions • Personnel and Vehicle Interaction.	• Weather conditions. • Pipe leaks. • Ramp Gradient too steep. • Vehicle Engine stalling. • No Vehicle Maintenance. • Brakes failing. • Poor/Lack of road maintenance.	• Personal injuries. • Fatalities. • Production and Financial loss. • Property damaged.	S, H MD BI	4 3 3				• Only drivers with valid driver's license or operators permits allowed to be operating LDV/TMM's. • Zero tolerance on alcohol and drugs abuse. • Adhere to all site traffic rules and Speed limit			

									of 20km/h on the TSF and 40km/h on site roads. • No talking on cell phones when driving. • Pre-start vehicle checklist on all vehicles. • Vehicle Maintenance plan followed. • TMM Operators to use safety belts always when operating. • Site Roadway maintenance. • Employees appointed by the client. • Operators appointed by the client.			
8	**Cont-Access Paths/Ramps**	• Unauthorized access • No/Inadequate signs • No or poor access ways	• No security • Vandalism • Erosion • Lack of maintenance	• Trespassers • Loss/damage to property • Injuries / fatalities • Slipping, tripping and falling injuries • Vehicle damage • Unable to maintain dam	S, H MD BI	4 3 3			• Signboard around and on TSF. • Demarcated walkways • Security patrols • Construct & maintain standard walkways/Path/ Ramps			

									• Demarcate areas • Site maintenance. Maintenance to be continually done in area where deposition/ Decanting is taking place			
9	**Walkways (Bridges)**	• Falling into trench. • Unstable hand rails. • Drowning. • Walkway collapsing.	• No handrails. • Poor construction. • Lack of housekeeping. • Lack of maintenance	• Personal injury. • Lost time injury. • Possible fatality. • Production loss.	S	3		13H	• Site specific induction. • Daily inspections			
10	**Personal Protective Equipment**	• No PPE available. • Not wearing PPE. • PPE stolen/lost. • No PPE maintenance. • Poor Quality. • Incorrect PPE for the task.	• PPE not issued. • No stock available or stock control. • Inadequate/Sub-standard PPE. • Not wearing issued PPE. • Abuse of PPE. • Orders outstanding. • Suppliers out of stock. • No training in use of PPE.	• Personal injuries. • Occupational Diseases. • Legal implications. • Production and Financial loss. • Damage to Property.	S, H MD	3 1		13H 4L	• Stock control – on register. • Alternative suppliers. • Quality control. • Contractor disciplinary code in place. • PPE provided & training. • Green area talks. • Training on use of PPE.			2L
11	**Tools and equipment.**	• Broken or Damaged Tools. • Broken or Damaged Equipment. • Homemade Tools. • Theft/loss.	• Employees not trained. • No pre-use inspections. • Lack of maintenance. • Lack of storage space. • Abuse of tools.	• Personal injuries. • Production and Financial loss. • Damage to Property.	S MD	3 2		5L	• Good housekeeping practices. • Maintenance and inspections			3L

		• Poor Quality.	• Tools not issued. • No stock available or stock control. • Inadequate/Sub-standard Tools. • Theft of the tools.						on tools and equipment. • Adequate training provided. • Adequate supervision. • Awareness training. • Disciplinary actions against abusers. • Quality Control • Training			
12	**Valve Operation.**	• Slip/trip and fall. • Spills. • Incorrect or homemade tools used. • Theft. • Snakes & Spiders. • Slurry damaging the valves. • Slurry spraying in eyes	• Slippery surface when wet. • Leaks causing spillage. • Poor housekeeping. • Valve spanner slipping or breaking. • Poor maintenance on valves. • Climbing over pipes. • Valves not closed properly. • Gasket or valve damage	• Personal injuries. • Lost time injuries. • Production loss. • Property damage. • Financial loss. • Environmental pollution. • Damage to valves.	S, H E	3 3			12H 12M	• Correct tools to be used (Valve spanner) • Correct PPE provided. • Training on opening and closing valves. • Daily inspections. • Site Induction. • Job Specific training. • Wear provided PPE			
13	**Receiving slurry from the plant**	• Burst pipes • Valve leaks • Blockages / pipe chokes • Flanges leak • Illegal miners	• Sub-standard pipes • Wear and tear • Weather conditions • Defective valves • Poor maintenance • Vandalism • Inconsistent pumping	• Injuries • Damage to property • Spillages • Environmental Pollution • Damage to dam wall • Legal consequences • Production loss	S, H BI MD	4 2 2			16H	• SHEQ Monthly inspections • Communication between Intasol and Client • Daily inspections & reporting			14H 5L 5L

			• Improper operation of valves • Incorrect tightening of bolts & nuts									
14	**Day wall free board & beach free board**	• Insufficient freeboard • Accumulation of water / rainwater on dam • Water ponding in areas on the dam	• Inconsistent qualities of slime • Excessive rate of rise • Incorrect deposition procedures • Lack of supervision • Insufficient delivery points • Poor material • Too low densities for day wall building. • Not enough deposition on the day wall.	• Damage to outer walls • Dam failure • Environmental Pollution • Flooding of surrounding areas • Loss of Life • Legal consequences • Raised phreatic levels.	S, H MD BI	4 3 3			• Hazard Management System (HMS) recorded and maintained. • Tipping procedures followed • Safe Work procedures • Training • Daily Inspections • Penstock decanting procedures • Drain cleaning (jet rodding)			
15	**Penstock system**	• Tower fails or blocked • Persons falling into inlet • Possible accumulation of HCN gas fumes at penstock • No cages/ incorrect placement of cage • Leaning cage tower • Pool wall inaccessible/ poor packing standards • No/poor condition wings	• Unequal pressures from slime • Poor quality rings/sleeves • Obstruction by foreign objects/reeds. • Skewed rings • Lack of inspections • No safety cages • Unauthorized persons • Lack of knowledge • Incorrect operating procedures • Lack of training	• Water accumulates on dam • Possible loss of dam wall • Legal consequences • Possible penstock failure • Fatality / Injury • Penstock Operation Impaired • Damaged rings • Tower integrity impaired	S, H MD BI	4 3 3			• WAD continuously monitored by the client. • Client's emergency procedures. • Monitor tower integrity • Use only good quality rings • Rectify deviations with offset rings • If fails: Emergency procedures as determined by			

									Operations Manager • Platform constructed to Standard • Safety Cages Installed • Employee instructed during SWP training not to move beyond railing around safety cages • Signs • Safe Working Procedures • Training & Supervision • Daily inspections			
16	**Penstock system (Continue)**	• Platform non-existent/ too high/ too low/ damaged • No or incorrect signage • No / Incorrect Procedures/ Training/ Incompetence • Non-existent, too high or too low, damaged • Accumulation of HCN gas at the penstock. • No access to the penstock tower. • No penstock rings available. • Penstock rings damaged. • Corrosion of penstock cage.	• Lack of safety equipment • Rings - handling & colour coding • Combination of chemicals at Penstock • Non-compliance to standards • Poor planning • Delayed delivery • Improper placement of cages • Sub-standard cages • Insufficient freeboard • Excessive water • Substandard walls • Incorrect safe work procedures • Lack of communication	• Possible collapse of tower • Penstock inaccessible • Unauthorized access • Damage to equipment • Injury/Fatality	S, H MD BI	4 3 3			• Risk awareness • Design specific to dam requirements • Build and maintain per standard procedures • Regular inspections by management • Quality Standards • Standard signs • Replaced immediately if damaged or missing.			

			• Theft by illegal miners. • Decant Procedures not followed • Not wearing PPE						• Buddy System			
17	**Catwalk**	• No catwalk platform. • Too high from the ground level. • Too low on the ground level. • Damaged/Substandard Handrails • Construction Standards & Procedures compromised	• Non-compliance to specification • Lack of training • Lack of communication • Accumulation of large quantities of water at the penstock.	• Penstock inaccessible • Operation Impaired • Water accumulation at the penstock • Possible loss of dam wall • Legal consequences	S MD	3 2			• Built and maintained to specifications • Operated according to Safe Work Procedure • Training & Supervision • Daily inspections • Report deviations immediately • Catwalk build according to Operational Standard • Kick plates installed according to operational standard			5L
18	**Drainage system (Bench Drains)**	•System non-operational/ blocked •No berm penstocks installed •Berm penstock silted/ fails •Berm penstock drains pipes damaged or collapsed.	•Incorrect operational procedures •High rainfall •Poor management practices •Incorrect decanting procedures •Lack of Inspections •Spillage •Vegetation encroachment	•Environmental Pollution •Damage to side walls •Legal consequences •Loss of water from closed system •Wash a way's	S E MD	3 3 3			• Operational Standards • Safe work procedures • Training & Supervision • Regular inspections			

19	**General**	• Slime contains hazardous chemicals ❖ Sodium Cyanide ❖ Lime • Seismic events • No emergency procedures • Poor or no communication (Intasol / Client) • Theft/crime/hijacking • Illegal miners	• Sudden spike in Plant's reagent concentration • Mining process • Legal Non-conformance • SHE System breakdown • Lack of information • Misunderstandings • Socio-economic Environment • Attitude • Lack of Personal awareness • No PPE	• Possible human contact/consumption resulting in fatality or injury • Possible pollution of environment • Chemical burns • Poisoning • Possible loss: Dam • Possible loss: Penstock • Aggravation of outcomes of incident • Misunderstanding • Production delays • Damage to equipment & property • Theft of equipment / property	S, H BI E	4 4 4			• Reagent concentration of slime checked on regular basis by Client • Cyanide first aid training for workers • Stability tests carried out annually • Emergency planning and procedures drawn up/reviewed annually • Responsible persons appointed • Training & Drills • Client issued Two-way radios to relevant persons • Cell phones where possible • Quarterly Meetings with client • Risk Assessment's • Emergency Procedures • Induction • Self-awareness • Correct PPE's to be used			

20	**Depositing onto the day-wall**	• Overtopping • Rat holes • Slipping and falling • Untrained employees • Erosion gullies • Possible HCN gas at tipping point • Employee getting stuck in mud. • Employee falling into wet tailings.	• Lack of knowledge or skill • Poor wall structure • Rain storm • Site conditions • Lack of planning • Poor slurry densities • No/incorrect PPE • Sudden spike in the plant processes of WAD above 50ppm • Wet tailings	• Injuries • Production loss • Fatalities • Damage to property • Legal consequences • Financial loss because of repairs that must be carried out	S, H BI E	4 4 4			• SHE Monthly inspection • Certificates of Fitness • Production loss • Spillages • Site specific induction • Supervision • Plant continuously monitor WAD levels pumped from the plant • Buddy system			
21	**Depositing slurry into basin**	• Burst pipes below slime level • No access to the delivery point • Blockages or pipe chokes • Valve Leaks • Possible HCN gas at tipping point • Employee getting stuck in mud. • Employee falling into wet tailings.	• Sub-standard pipes • Wear and tear • Weather conditions • Lack of planning • Inconsistent pumping • Improper operation of valves • Defective valves • Poor maintenance • Vandalism • Sudden spike in the plant processes of WAD above 50ppm • Employees taking short cut.	• Injuries/ Fatalities • Legal consequences • Damage to property • Spillages • Damage to day walls • No/incorrect PPE	S, H BI E	4 4 4			• SHE Monthly inspections • Communication between Intasol and client • Plant continuously monitor WAD levels pumped from the plant • Supervision • No unnecessary traveling or walking in basin area.			
22	**Operating a high-pressure valve**	• Improper opening and closing • No valve spanner • Untrained employees • Ergonomics	• Lack of knowledge or skill • Lack of planning • No equipment for the specific job	• Injuries • Damage to property	S MD	4 3			• Valve spanners available on site • Site specific induction • Proper management in place			

23	**Manual packing of dam walls**	• Faulty tools • Not packing straight or high enough • Slipping and falling • Wet areas • Poor quality walls • Back injury to employees	• No proper inspection • Poor supervision • Site conditions • No drying time allowed • Continuous rain • Lack of knowledge or skill • No/incorrect PPE	• Injuries / fatalities • Damage to property • Production loss • Injuries • Dam wall failure	S, H BI E	4 3 3			• Monthly tools inspection • Supervision • Site specific induction • SHE Monthly inspections • COP			
24	**Mechanical packing of dam walls**	•No proper access to the area •Unlicensed operator •No proper demarcation •Wet conditions •Poor quality walls •Exposure to revolving parts •Sub-standard machinery	•No proper planning •No daily inspections •No proper control system •Poor supervision •No drying time allowed •Continuous rain •Inadequate guarding •Machinery not checked prior to use	•Injuries •Production loss •Damage to wall / equipment •Poor packing of wall •Dam wall failure •No / little freeboard •Legal consequences	S BI E	4 3 3			• COP • SHE Monthly inspection • Proper control system in place • Driver assessments in place • Proper supervision in place • Site specific induction • Hazard Awareness training			
25	**Reading of piezometers**	•Slipping and falling •Wet conditions •Substandard reading material	•Equipment not inspected prior to use •Lack of knowledge / skill •No drying time allowed •Not using proper travelling ways	•Injuries / fatalities •Incorrect Readings •Failure of dam structure	S, H	4			•Site specific induction, •Hazard Awareness training			
26	**Install / extent datum poles**	•Slipping and falling •Not using proper tools / equipment •Damaged tools / equipment	•Site conditions •Lack of knowledge / skill •No drying time allowed	•Injuries / fatalities •Incorrect readings	S, H	4			•Site specific induction •Monthly hand tools inspection			

			• Not using proper travelling ways • Wet conditions • Tools and equipment not inspected prior to use • Continuous rain						• Hazard Awareness training			
27	**Decant pool water**	• Slipping and falling • Wet conditions • Not using proper tools / equipment • **Inhalation/Contact with HCN gasses**	• No access to penstock rings • Catwalk damaged • Lack of knowledge / skill • No drying time allowed • Not using proper travelling ways • No/incorrect PPE • Continuous rain • Damaged tools / equipment • Plant processes	• Injuries/Fatalities • Production loss • Dam wall failure • No / little freeboard • Damage to dam walls	S, H BI E	4 3 3			• COP • SHE Monthly inspection • Proper supervision in place • Site specific induction • Hazard Awareness training • Plant continuously monitor WAD levels pumped from the plant			
28	**Abnormal conditions (rain, lightning. Strong winds, Thermal and Heat stress).**	• Struck by lightning. • Foreign objects into eyes. • Environmental pollution • Unsafe/unstable working surfaces. • Slipping and falling • Extreme High/Low temperatures. • Excessive dust exposure	• Excessive rain. • Thunder/lightning. • Strong winds. • Poor planning and lay out. • Wet, slippery conditions • No/incorrect PPE • Accumulation of water on TSF • Return water dam over flowing	• Personal injuries. • Lost time injuries. • Possible fatalities. • Production loss. • Property damaged. • Environmental pollution. • Dam failure • Damage and injuries due to high faces collapsing	S L&R	5 3		22E X	• Lightning detector and procedure in place. • Weather/ lightning shelters in place. • Correct PPE available. • Barricade and report unsafe areas. • All operations will stop if weather conditions are poor.			

									• Storm water control measures in place. • Availability of drinking water. • Green area talks. • Site Induction. • Job Specific Training. • Freezer suits to be provided. • Mandatory Signage • WIGHT monitor in place			
29	**Security (crime, theft).**	• Assault on employees. • Theft on tools and equipment. • Vandalizing of pipes, valves and safety signs	• Employees not aware of dangers in the working area. • Easy access to working areas. • Tools and equipment not maintained and locked up.	• Personal injuries. • Lost time injuries. • Possible fatalities. • Production loss. • Property damaged. • Financial loss	S MD	3 2			• Mine security does frequent patrol of the area. • Proper training to make employees aware. • Tools and equipment maintained and locked up. • Eye contact of vehicles at all time. • Site Induction. • Job Specific Training. • 2 Way radio's			
30	**Wild life**	• Snake bites • Insects bites / sting • Spiders	• Natural movement of wild life	• Personal injuries / fatalities • Loss of limbs	S	4			• Hazard awareness training			

					H	4						
31	**Environmental**	• Surface pollution. • Ground Water pollution. • Air Pollution. • Veldt fires.	• Poor housekeeping and waste disposal methods. • Slurry spills into surface water. • Dust & vehicle emission fumes. • Fires lit by employees or vagrants. • Lightning igniting the veldt.	• Pollution of the natural environment. • Wild animals ingest waste and die. • Veldt can burn down and bordering farms.	S E	4 4			• Daily visual housekeeping inspections. • Waste disposal plan. • Deposition plan. • No fires around TSF complex. • Radio link to Plant to report veldt fires. • Communication document • Fire breaks around TSF			
32	**Fatigue Management**	• Poor planning • Little supervision • No regard for employee well-being	• Not following fatigue management • Disregard Misacts • Poor control over working hours	• Absenteeism • Personal injuries. • Lost time injuries. • Possible fatalities. • Production loss. • Property damaged. • Financial loss • Individual health consequences	S MD	3 2			• Employees to clock or fill in clock card daily. • Overtime request to be completed for employees that need to work overtime. • MH&S Act • OHS Act • Client control system in place • Contractor control system in place			
33	**Thermal/Heat stress**	• About heat, "significant" constitutes conditions where the wet-bulb temperature exceeds 27.5°C (>27.5°) or the dry-bulb or radiant	• When exposure levels change due to controls being initiated and likewise when controls deteriorate;	• Absenteeism • Personal injuries. • Lost time injuries. • Possible fatalities. • Production loss.	S MD	3 2			• Heat stress monitoring • WIGHT monitoring station			

		temperature exceeds 37.0°C (>37.0°) or in terms of cold stress, where the temperature is less than 10°C (<10) or equivalent chill temperature.	• Employee complaints are received; • Processes are changed • Occupational illness occurs; • A change in exposure category occurs	• Property damaged. • Financial loss • Individual health consequences								
34	**Unauthorized personnel**	• Assault on employees. • Theft on tools and equipment. • Vandalizing of pipes, valves and safety signs	• Employees not aware of dangers in the working area. • Easy access to working areas. • Tools and equipment not maintained and locked up	• Personal injuries. • Lost time injuries. • Possible fatalities. • Production loss. • Property damaged. • Financial loss	S MD	3 2		12H 10H	• Mine security does frequent patrol of the area. • Proper training to make employees aware. • Tools and equipment maintained and locked up. • Eye contact of vehicles at all time. • Site Induction. • Job Specific Training. • 2 Way radio's			11H
35	**Drowning**	• Tower fails or blocked • Persons falling into inlet • No cages/ incorrect placement of cage • Leaning cage tower • Pool wall inaccessible/ poor packing standards • No/poor condition wings	• Lack of inspections • No safety cages • Unauthorized persons • Lack of knowledge • Incorrect operating procedures • Lack of training	• Water accumulates on dam • Possible loss of dam wall • Legal consequences • Possible penstock failure • Fatality / Injury • Penstock Operation Impaired • Damaged rings	S, H MD BI	4 3 3		16H 13H 13H	• Client's emergency procedures. • Monitor tower integrity • Use only good quality rings • If fails: Emergency procedures as determined by Operations Manager			14H

				• Tower integrity impaired					• Platform constructed to Standard • Safety Cages Installed • Signs • Safety Belts • Life Buoy • Safe Operating Procedures • Training & Supervision • Daily inspections			
36	**Dust suppression**	• Other TMM's • Runaway vehicle • Slip and fall • Exposure to dust • Exposure to noise • Poor visibility • Lightning / Rain • Incompetent Operator	• Poor road conditions. • Incompetence of other road users. • Unsafe access routes. • Operator intoxicated (alcohol/drugs). • Not familiar with the surroundings. • Not adhering to road traffic rules. • Operators fail to use safety devices (seat belts). • No Pre-use inspections conducted.	• Injuries • Damage to property • Occupational illness	S MD	4 3			• No unauthorized vehicles / only water car crew must be involved • Adhere to lockout procedure at all times/stop blocks • Wear the correct PPE for the job • Dust suppression to be done • Only competent authorized operators / drivers are permitted to operate / drive vehicles			

									• No work permitted during thunder / lightning storms • No work permitted when visibility is poor due to mist/dust/rain			
37	**Pipe ruptures**	• Improper opening and closing • No valve spanner • Untrained employees • Ergonomics	• Lack of knowledge or skill • Lack of planning • No equipment for the specific job	• Injuries • Damage to property	S MD	4 3			• Valve spanners available on site • Site specific induction • Proper management in place • Task procedure			
38	**Portable electrical equipment**	• Broken or Damaged Tools. • Broken or Damaged Equipment. • Homemade Tools. • Theft/loss. • Poor Quality.	• Employees not trained. • No pre-use inspections. • Lack of maintenance. • Lack of storage space. • Abuse of tools. • Tools not issued. • No stock available or stock control. • Inadequate/Sub-standard Tools. • Theft of the tools.	• Personal injuries. • Production and Financial loss. • Damage to Property.	S MD	3 2			• Good housekeeping practices. • Maintenance and inspections on tools and equipment. • Adequate training provided. • Adequate supervision. • Awareness training. • Disciplinary actions against abusers. • Quality Control • Training			

									• Pre-use checklist done			

Standard Risk Matrix	**Hazard Effect / Consequence (where an event has more than one "Loss Type" choose the "Consequence" with the highest rating)**				
Loss Type (additional "Loss Type" may exist for an event: identify and rate accordingly)	**1 Insignificant**	**2 Minor**	**3 Moderate**	**4 Major**	**5 Catastrophic**
(S/H) Harm to People (Safety / Health)	First aid case / Exposure to minor health risk	Medical treatment / Exposure to major health risk	Loss time injury / Reversible impact on health	Single fatality or loss of quality of life / irreversible impact on health	Multiple fatalities / impact on health ultimately fatal
(EI) Environmental Impact	Minimal environmental harm – L1 incident	Material environmental harm – L2 incident remediable short term	Serious environmental harm L@ incident remediable within LOM	Major environmental harm – L2 incident remediable post LOM	Extreme environmental harm – L3 incident irreversible
(BI/MD) Business Disruption / Material Damage and Other Consequential Losses	No disruption to operation / up to R10 000.00	Brief disruption to operation / R10 000 to R100 000	Partial shutdown / R100 000 to R500 000	Partial loss of operation / R500 000 to R1 000 000	Substantial or total loss of > R1 000 000
(L & R) Legal and Regulatory	Low level legal issue	Minor legal issue; non-	Serious breach of law;	Major breach of the law;	Very considerable

		compliance and breaches of the law	investigation, report to authority, prosecution and / or moderate penalty possible	considerable prosecution and penalties	penalties and prosecutions. Multiple law suits and jail terms
(R/S/C) **Impact of reputation / Social / Community**	Slight impact – public awareness may exist but no public concern	Limited Impact – local public concern	Considerable impact – Regional public concern	National impact – national public concern	International impact – international public attention

Likelihood	**Examples (Consider near hits as well as actual events)**	**Risk Rating**				
5 Almost Certain	The unwanted event has occurred frequently; Occurs in order of one or more times per year and is likely to reoccur within 1 year	**11(M)**	**16 (H)**	**20 (H)**	**23 (EX)**	**25 (EX)**
4 Likely	The unwanted event has occurred infrequently; occurs in order of less than once per year and is likely to reoccur within 5 years	**7 (M)**	**12 (M)**	**17 (H)**	**21 (EX)**	**24 (EX)**
3 Possible	The unwanted event could well have occurred in the business at some point within 10 years	**4 (L)**	**8 (M)**	**13 (H)**	**18 (H)**	**22 (EX)**
2 Unlikely	The unwanted event has happened in business at	**2 (L)**	**5 (L)**	**9 (M)**	**14 (H)**	**19 (H)**

	some time or could happen within 20 years					
1 Rare	The unwanted event has never been known to occur in the business or is highly unlikely that it could ever occur beyond 20 years	**1 (L)**	**3 (L)**	**6 (M)**	**10 (M)**	**15 (H)**

Interpretation of Risk Level

Risk Rating	Risk Level	Guidelines for Risk Matrix
21 to 25	(EX) Extreme	Eliminate, avoid, implement specific action plans / procedures to manage and monitor
13 to 20	(H) High	Proactively manage
6 to 12	(M) Medium	Actively manage
1 to 5	(L) Low	Monitor and manage as appropriate

ANNEXURE 7: SAFETY CLASSIFICATION

A7 SAFETY CLASSIFICATION

Each **Deposit** must be classified into one of three safety categories in accordance with **SABS** 0286 [Ref 4 – See Annex **Error! Reference source not found.**, pg. **Error! Bookmark not defined.**.] All **Deposits** will therefore be classified according to Table A7-1 into one of the three categories of:

- Low hazard
- Medium hazard
- High hazard

Table A7-1: Safety Classification

1	2	3	4	5
No of residents in zone of influence	**No of workers in zone of influence[1]**	**Value of third party property in zone of influence[2]**	**Depth to underground mined workings[3]**	**Classification**
0	<10	0-R2 m	>200 m	Low hazard
1-10	11-100	R2 m-R20 m	50 m-200 m	Medium hazard
>10	>100	>R20 m	<50 m	High hazard

1) Not including workers employed solely for the purposes of operating the **Deposit**
2) The value of third party property should be the replacement value in 1996 terms
3) The potential for collapse of the **Deposit** into the underground workings effectively extends the zone of influence to below ground level.

In order to be able to classify the **Deposits** in terms of Table A7-1 the zone of influence of each **Deposit** must first be determined.

A7.1 Zones of Influence

A7.1.1 Active Tailings Dams

The tailings dams are hydraulic **Deposits** and hence the zone of influence is to be determined based on the criteria in Table A7-2 which is taken from the **SABS** 0286 document [Ref 4 – See Annex **Error! Reference source not found.**, pg. **Error! Bookmark not defined.**.]

In Table A7-2, H is taken to be the maximum height of the **Deposit** above the natural ground. For the upstream flank, the zone of influence is taken to extend to the lesser of either 5 times H or where the increase in the ground elevation exceeds H/2 over that at the toe.

Table A7-2: Zone of Influence Determination

Upstream flank	5H
Flank parallel to ground slope	10H

Downstream flank	100H

The zones of influence of all active tailings dams have been determined and are presented graphically in [Annex 0, pg. 59] of this **COP**.

A7.1.2 Decommissioned and/or Dormant Tailings Dams

In case of all residue **Deposits** that have been decommissioned for more than five years and all other residue **Deposits** (i.e. these not placed by hydraulic methods), the boundary of zone of influence should be determined as follows: As per **SABS** 0286 document [Ref 4 – See Annex 1]

- Twice the maximum design height or actual height, or
- The distance to the point where the ground level exceed *h/2* above the elevation of the toe, whichever is the lesser.
- Alternatively, a site specific zone of influence for hydraulically placed residue **Deposits** that either are operational or have been decommissioned for a period of less than five years, may be determined by a **Professional Engineer**, based on the assumption that the tailings will flow and taking the topography and physical constrains into consideration.

The zones of influence of all **Decommissioned and/or Dormant Tailings Dams Tailings Dams** have been determined and are presented graphically in [Annex 0 pg.59 .] of this **COP**

A7.2 Environmental Classification

Each **Deposit** shall have an environmental classification. The **SABS** 0286 (4) classification system shall be used to categorise the **Deposits** into one or other of the following two categories:

- **Deposits** that pose a significant threat to the environment
- **Deposits** that do not pose a significant threat to the environment.

If a **Deposit** is classified as "possibly significant" by virtue of it falling into the central column, then the **Deposit** must be classified as having a "significant" environmental **Risk** unless additional investigations are conducted to demonstrate that it can be classified as "not significant".

Table A7-3: Environmental Classification Determination

	Aspect under consideration	Environmental classification		
		Significant	**Possibly significant**	**Not significant**
1	Surface and groundwater	**Deposit** has potential to contaminate water that may be consumed by humans.*	**Deposit** has potential to contaminate water that may be consumed by flora or fauna.	No contamination of water supply likely.
2	Land	**Deposit** has potential to permanently render surrounding land unsuitable for its pre-existing potential.	Release of residue from **Deposit** could have a long-term detrimental effect on land.	Release of residue from **Deposit** can be completely remediate.
3	Air	**Deposit** has potential to degrade air quality to a level that is detrimental to human health.*	**Deposit** has potential to elevate dust nuisance (only) to an unacceptable level.	**Deposit** has negligible potential to adversely affect air quality.
4	Physical security	Residue has potential to cause injury on release as a result of structural failure[1]	Residue has potential to cause injury as a result of structural failure[2]	Residue has negligible potential to cause harm through structural failure.
5	Business environment	Failure of **Deposit** has potential to result in business failure of operation	Failure of **Deposit** has potential to result in significant economic loss	Low potential for failure of **Deposit** to result in economic loss
6	Social environment	Failure of **Deposit** could lead to severe adverse publicity, resulting in business failure and impairment of credibility	Failure of **Deposit** could lead to adverse publicity, leading to regulatory intervention and/or financial loss	Failure of **Deposit** is unlikely to lead to adverse publicity or indirect losses

* Chronic or acute

[1] Usually where there is a potential to liquefy

[2] Usually where structural failure can occur but where there is limited potential to liquefy

A7.2.1 Deposit Classification

The classification of the Tailings dams is summarised in Table A7-4.

Table A7-4: Deposit Classification – Tailings Dams

Section	Deposit	Safety Classification	Environmental Classification
Noligwa Plant	Mispah 1 TSF	High	Significant
Mispah Plant	Mispah 2 TSF	High	Significant

A7.2.2 Implications of Classification

The level of management input, level of detail required for the **Risk** assessment and the minimum requirements appropriate to each **Deposit** are determined according to the safety and environmental classification.

According to the **SABS** Code [Ref 4 – See Annex 1] **Deposits** classified as low or medium hazard require a qualitative **Risk** assessment whereas high hazard **Deposits** require a quantitative **Risk** assessment.

Table A7-5: Requirements for Hazard Classification

Active	Hazard Classification			Reference
	High	**Medium**	**Low**	
Code of Practice	Yes	Yes	Yes	1 (Sect. 3.1)
Risk assessment Qualitative safety assessment Quantitative analysis	Yes Yes Yes	Yes - -	Yes - -	1 (11) 2 (7.4.6) 2 (7.4.6)
Geotechnical Investigation	Yes	Yes	No	2 (Fig. 3)
Characterisation	Lab Analysis	Lab Analysis	Past Experience	2 (Fig. 3)
Design & Report	**Professional Engineer**	**Professional Engineer**	**Suitable Qualified Person.**	2 (Fig. 3)
Operating Manual	**Professional Engineer**	**Professional Engineer**	Yes	2 (10.4.5)
Construction Supervision	**Professional Engineer**	**Suitable Qualified Person.**	**Suitable Qualified Person.**	2 (Fig. 3)
Reduce Hazard Classification	Yes	Yes	-	1 (11.2.4)
Monitoring	**Professional Engineer**	**Professional Engineer**	**Suitable Qualified Person.**	2 (Fig. 3)
Surveillance Plan	Yes	Yes	-	2 (10.4.5.5)
Audit	**Professional Engineer** every 12 Month	**Professional Engineer** every 24 Month	**Suitable Qualified Person.** every 36 Month	2 (Fig. 3)

Inspection per shift, daily, monthly	Competent Person	Competent Person	Mine to Specify	1 (12.10.1)
Recommissioning Autorisation	**Professional Engineer** after 6 Month inactive	**Professional Engineer** after 6 Month inactive	-	1 (12.13.1)
Closure Plan	Yes	Yes	Yes	2 (12.4.3)

Deposits that classify as High or Medium hazard and those with a significant environmental **Risk** will require a management system to be developed in accordance with the **EMPR**.

The **Professional Engineer** must re-assess and revise the classification on an annual basis.

Minimum requirements for the hazard categories are summarised in Table A7-6.

Table A7-6: Requirements for Hazard Classification

Reference 1: Guideline for the compilation of a Mandatory Code of practice on Mine Residue Deposit (Ref. No DME 16/3/2/5-A1. November 2000

Reference 2: SABS 0286: Code of Practice – Mine Residue November 1998

ANNEXURE 8: ZONE OF INFLUENCES

A8.1 Active TSFs

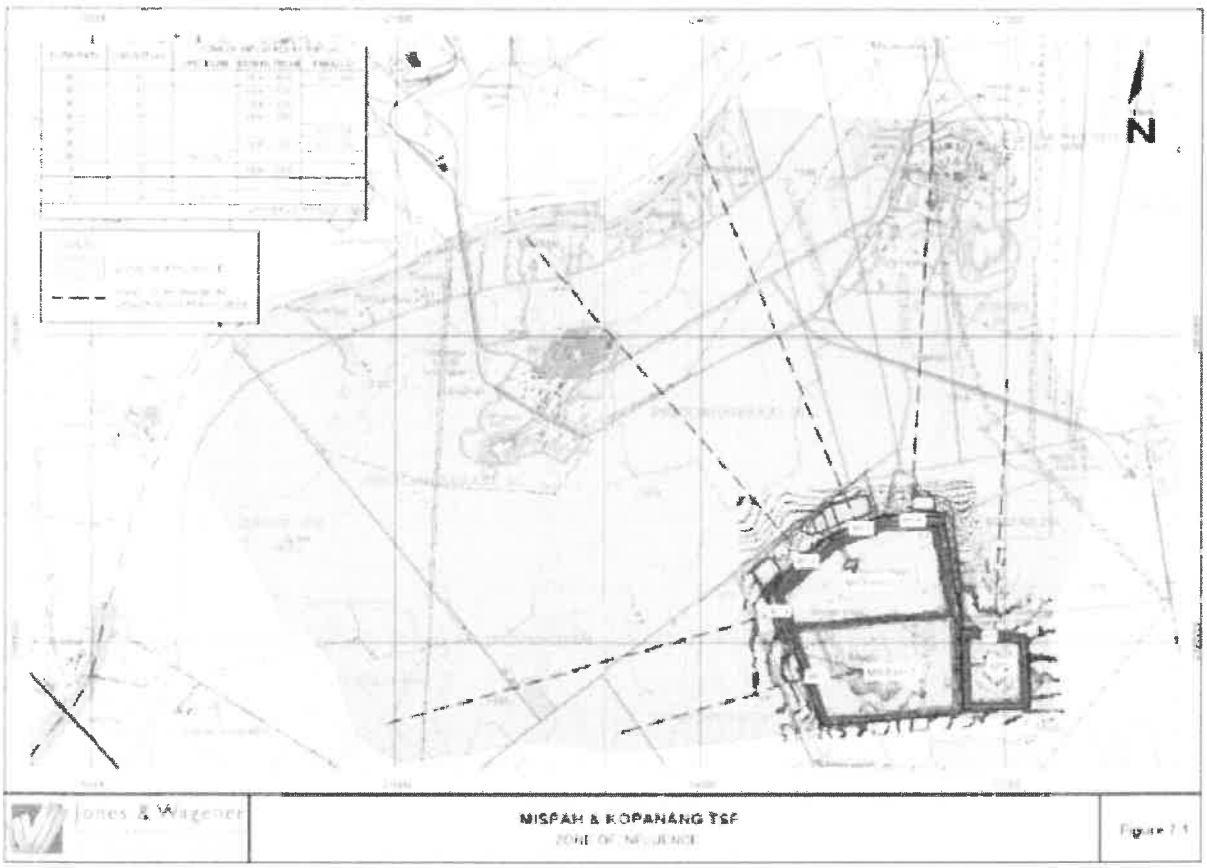


Figure A8.1.1 Zone of Influence – Noligwa TSF

ANNEXURE 9: MANAGEMENT OF SIGNIFICANT RISKS RELATING TO MRDS

This section includes a description of the management plan for managing the significant **Risk**s relating to the MRDs identified in the **Risk** assessment process (point 12 of the "Guideline for the Compilation of a Mandatory Code of Practice on **Mine Residue Deposits**").

A9.1 Reference Material

The following reference material is relevant to the compilation of the **COP** for the **MRDs**:

- The Chamber of Mines Guidelines Volume 1;
- The Chamber of Mines Guidelines Volume 2;
- SABS 0286 Code of Practice for Mine Residue **Deposits**;
- Environmental Management Programme (EMP);

A9.2 Active Tailings Dams

A9.2.1 Technical Reports

The following comprehensive technical reports must be compiled:

1. A detailed investigation into the characteristics of the mine residue in which consideration is given to features that may impact upon the design of the proposed MRD.
2. The rationale of the site selection process or a site selection report.
3. The final design of the MRD including the design rationale. See Section 0 "Design".
4. The work procedures to be followed in the construction and operation of the MRD. See Section 0 "Construction and Operation".

For MRDs classified as high or medium **Risk**, the reports referred to in abovementioned points 2, 3 and 4 must be reviewed and certified by a **Professional Engineer**, if the **Professional Engineer** is satisfied that the selected site is optimal and suitable, the design is acceptable for the intended purpose, and the report on construction and operation covers those topics adequately.

For MRDs classified as low **Risk**, the reports referred to in abovementioned points 2, 3 and 4 must be reviewed by a **Suitable Qualified Person..**.

All reports are to be kept in a safe place by the Mine until the closure certificate has been issued for the respective MRDs, and must be made available upon request for scrutiny by the Mine health and safety committee and other persons.

The following reports are to be compiled:

A9.2.1.1 Monthly Report

The Operating Contractor must compile a monthly report. The report is to be forwarded to the Plant Manager and **Professional Engineer** for review.

The following aspects, where applicable, shall be included in the monthly report:

- Piezometer readings, compared to critical levels;
- Under drain flow readings;
- **Freeboard** measurements at and between each delivery station;
- Deposition rates;
- Slurry densities;
- Underflow (coarse material) and overflow (fine material) split percentages from hydro cyclones;
- Particle size distribution of coarse underflow from hydro cyclones; and
- Significant happenings during the month.

A9.2.1.2 Quarterly Report

The **Professional Engineer** must compile a quarterly report based on the monthly reports. The report is to be forwarded to the Plant Manager and Operating Contractor for review.

The following aspects shall be included:

- Piezometer readings trend analysis;
- Deposition rates compared to maximum and target rates;
- **Freeboard** readings; and
- Any additional comments based on significant happenings.

A9.2.1.3 Annual Report

The **Professional Engineer** must compile an annual report.

The following aspects should be included:

- Significant happenings during year under review;
- Stability analysis;
- Piezometer reading trend analysis;
- Update of critical piezometer levels;
- Review of safety classification;
- **Freeboard** analysis;
- Life assessment.

The report shall be backed up by a recent topographical survey of the **Deposits**.

A9.3 Characteristics of the Deposits(Active)

The following characteristics must be analysed for a typical residue sample in order to identify any potential significant health and safety hazard as well as for use in stability analyses. The characteristics must be re-analysed should there be any cause for change. The characteristics will be used to determine the operational requirements for both existing and new **Deposits**.

A9.3.1 Geotechnical Characteristics (Medium and High Hazard)

The following shall be determined for the residue:

- Grading, including hydrometer analysis
- Shear strength;
- Permeability;
- Specific Gravity
- In-situ dry density

A9.3.2 Chemical Characteristics

The following shall be determined for the residue:

- Toxicity
- Leachate quality – pH and chemical composition

A9.3.3 Transport characteristics

- Dust
- Groundwater

A9.3.4 Radiological Characteristics

- The residue shall be tested to determine the degree of radioactivity.

A9.4 Site Selection

Candidate sites for any new **Deposit** or a planned extension to an existing **Deposit** must be investigated in order to select the optimal site. The site selection process must include:

- Identification of a sufficient number of candidate sites to ensure an adequate consideration of possible alternatives;
- Qualitative evaluation and ranking of all the candidate sites;
- More detailed qualitative investigation of the top ranking sites to review the ranking;
- A feasibility study, involving a preliminary safety classification, environmental and social impact assessments and geotechnical and geohydrological investigations, carried out on the highest ranking site(s) with the view of assessing all **Risks** relating to health or safety;
- Obtaining input and acceptance from interested and affected parties and communities; and
- Conducting a detailed site investigation on the selected site.

A detailed environmental impact assessment must be undertaken to ensure its adequacy in terms of the health and safety of mining and non-mining personnel in the vicinity and the impact on the surrounding environment. The investigation shall comprise the following aspects as a minimum:

- Land use
- Topography and surface drainage
- Infrastructure and man-made features
- Climate
- Flora and fauna
- Geology, including faults, joints and fractures
- Soils
- Ground water morphology, flow, quality and usage
- Surface water

A9.5 Design

A9.5.1 Design Requirements

The design of all new **Deposits** and the extension of existing **Deposits** must:

- Be undertaken by an approved **Professional Engineer**;
- Be based on the specified design criteria; and
- Consider and incorporate all factors having a bearing on potential health and safety issues associated with the proposed **Deposit**.

The design must take into account all phases of the life cycle from construction through to **Closure** and must include:

- Characteristics of the residue;
- Characteristics of the site determined during the detailed site investigations;
- The general layout of the **Deposit**, including the planned incremental growth;
- The deposition system to be used;
- The rate of rise/advance of the **Deposit**;
- Control of storm water on and around the **Deposit** taking the requirements of the relevant legislation into account;
- The design of the storm and polluted water infrastructure
- The design of the foundation, including liner if deemed necessary
- The design of the outer wall profile.

A9.5.2 Design Criteria

The following criteria shall be used in the design of all new **Deposits** and extensions to the existing **Deposits**. The criteria must be updated as necessary with any revision of applicable legislation.

Table A9-1: Design Criteria

Criteria	Description	Value
Design Storm: Residue **Deposit**	Maximum precipitation to be expected over a 24 hour period with a frequency of once in 50 years.	113mm
Design Storm: Return Water Dams and storm water infrastructure	Maximum precipitation to be expected over a 24 hour period with a frequency of once in 50 years.	113mm
Decant Period	Period required to decant the design storm and process water pumped to the dam during the decant period.	72hours
Freeboard	A minimum height above the maximum expected water level resulting from the design storm and operating pool level.	800mm
Return Water Dam Capacity	All return water dams shall have a minimum capacity to cater for storing the design storm decanted off the **Deposits** plus one week's process water under normal operating conditions. The dam and the pumping system shall be designed such that the dam has less than 2% probability of overtopping in one year. The Return Water Dam **Freeboard** shall be at least 800mm measured to the invert of the Spillway.	

A9.5.3 Modifications to Existing Deposits

Any modifications carried out to existing **Deposits** shall be in accordance with the requirements for a new **Deposit**.

A9.5.4 Design and Continuation Reports

The following design and investigation reports are available on record:

- AA8/92/4353 - Geotechnical Investigation for Slimes Dam M – Vaal Reefs – November 1992
- AA10/92/4353 – Vaal reefs Slime Dam M, Summary Design Report – November 1992
- AA4/96/4934 – Risk Assessment of Mispah Slimes Dam – January 1996
- FW03/05/108 – Geotechnical Report for Extension to Mispah Tailings Dam, Vaal River Operations – July 2005
- FWA01/06/115 – Mispah extension Tailings dam, Design Report, Vaal river Operations – January 2006

A9.6 Construction and Operation

Measures must be instituted to ensure that MRDs are constructed and operated in accordance with the approved design and standards prescribed in this COP. The appropriate systems should be established to monitor adherence to the design and operating standards. Such measures should be formulated by competent persons, who must familiarise themselves with the reports referred to in Section 0.

The requirements are addressed in the following sub-headings to this COP:

- Section 0 – Organisational Structure and Responsibilities
- Section 0 – Operations Manual
- Section 0 – Conformance Measurements

A9.7 Decommissioned and / or Dormant Tailings Dams

A9.7.1 Technical Reports

The following reports are to be compiled:

A9.7.1.1 Monthly Report

The Operating Contractor must compile a monthly report. The report is to be forwarded to the Manager.
The following aspects, where applicable, shall be included in the monthly report, See Fig 9-2.

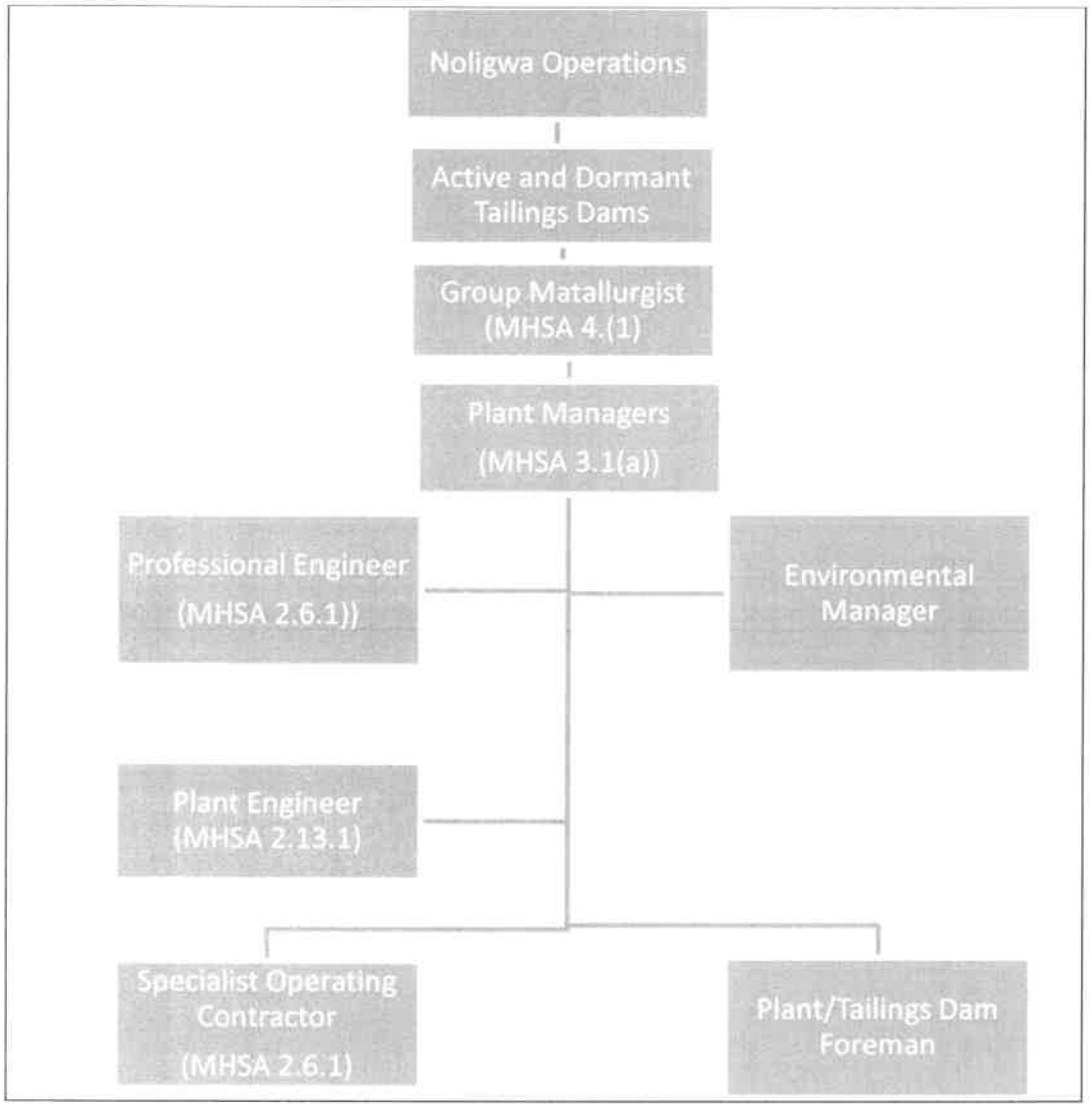
A9.7.1.2 Annual Report

The **Professional Engineer** must compile a technical note within the annual report. The frequency of the technical note for the respective Decommissioned and/or Dormant facility will be determined as per **Table A9-2: Safety Classifications 1**

A9.7.2 Organisational Structure and Responsibilities

The structure with respect to the **Deposits** is detailed in Figure A9-1.

Figure A9-1: Overall Organisational Structure



The responsibilities apply to the management and operation of the **Deposits**:

A9.7.2.1 Plant Manager (3.1 Appointment)

- To make sure that resources are adequate in terms of personnel, training, planning and budgets.
- To implement an appropriate management structure and procedures including the production and implementation of appropriate codes of practice, procedures and specification for the operation of the residue deposit.
- To ensure the implementation of appropriate operating procedures.
- To ensure that regular inspections and audits of the system by appropriately qualified personnel take place.
- To ensure that a contingency plan is in place for emergencies.
- To ensure that environmental planning and co-ordination take place and that conformance to the prescribed procedure and the EMP, including rehabilitation and closure of the deposit, is reviewed on a regular basis.
- Make the requisite appointments, and
- Ensure that there is legal compliance.

A9.7.2.2Plant Engineer (2.13.1 Appointment)

- To be familiar with the **Deposits** under their control and associated infrastructure including procedures, philosophies and life of mine plans.

A9.7.2.3 Plant/Tailings Dam Foreman

- To be familiar with the **Deposits** under their control and associated infrastructure including procedures, philosophies and life of mine plans.
- To ensure the operation of the tailings dams are in accordance with the operating procedures.
- To co-ordinate and liaise between the plant and operations contractor/personnel in terms of pumping of residue and return water.
- Inspections as required under Section 01.
- To sign off Daily Diary.

A9.7.2.4 Environmental Manager

- To be familiar with the **Deposits** and associated infrastructure including procedures, philosophies and life of mine plans;
- To ensure compliance with the **EMS**;
- To monitor environmental impact of **Deposit**; and
- To liaise with the relevant managers and report non-compliance.

A9.7.2.5 Professional Engineer *(2.6.1 Technical Appointment)*

Professional Engineer are appointed in terms of the Minerals Act regulation 2.6.1 as a sub - ordinate manager. The **Professional Engineer** must have the appropriate qualification and experience to fulfil the responsibility of the appointment.

The **Professional Engineer** should be independent of the tailings dam operator. The responsibilities of the **Professional Engineer** include all of the following. The **Professional Engineer** shall advise on any aspects of the deposit or operations or management thereof that, in his professional opinion, failure to do would adversely affect the integrity of the deposit and operations.

The following responsibilities shall apply:

- In your capacity as a remotely based Consulting Engineer, your responsibility is to assist and advise the Plant Manager who is appointed in terms of section 3.(1)(a) and 7(2)of the Mine Health and Safety Act No 29 of 1996, and the Plant Engineer appointed in terms of 2.13.1 of the same act on the following aspects of the residue disposal facility.
- To attend the quarterly TSF site inspections and meetings at the mine (or nominate an appropriately qualified person in your place in the event of you being unable to attend)..
- To write and issue the minutes from the quarterly meeting with action dates and responsibilities, and issue within 2 weeks following the meeting.
- To update monthly monitoring records received from the mine and/or the contractor that is responsible for the maintenance on the tailings dam(s) and provide monthly surveillance feedback, highlighting deviations from the agreed performance targets such as freeboard, tonnages, slurry density, rates of rise and water recover

- To review quarterly stage capacity curves and actual deposition tonnages received from the mine, to assess the development of the facility in line with the design, and provide recommendations as required where operations have deviated from the plan.
- To analyse annually the stability of the TSF, compile a report, and make recommendations as required to deal with current or future instability.
- To annually audit the TSF in terms of legal compliance, management, operation, planning, incidents and stability, and compile an audit report for the Manager including recommendations on remedial measures as required.
- Assisting the mine in updating the operating manual in line with the necessary Code of Practice and/or mine procedures.
- Assisting the mine in long term residue disposal planning.
- Advising the mine on technical and environmental issues, standards, legal requirements and contractual matters relating to the tailings facility.
- Advising the mine on rehabilitation and closure of the tailings facility.

A9.7.2.6 Tailings Dam Operator (2.6.1 Appointment)

The Tailings Dam Operator appointed under 2.6.1 has a responsibility to operate the residue deposit and ensure that performance measurements are made. The following duties will apply:

- Ensure that the facility is operated according to the design and lifecycle plan as specified in the operating procedures.
- Ensure that there are adequate trained competent persons to fulfil the functions and tasks necessary to comply with the operating procedures.
- Ensure that the requisite material and equipment are timeously available to comply with the operating procedures.
- Ensure that safety procedures are in place and adhered to.
- To liaise with the Plant Manager if operating inconsistencies occur e.g. low-density slurry and conformance variations.

Figure A9-2 Monthly Dormant Dam Inspection Report

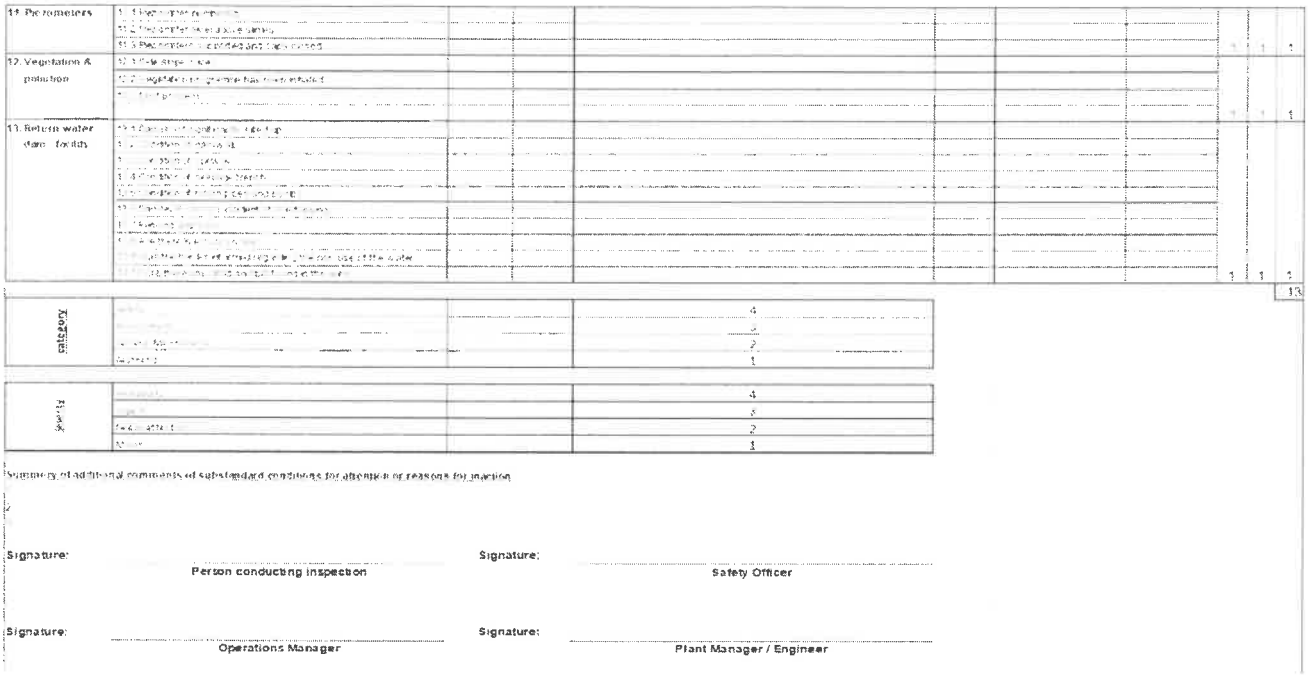
HARMONY

Monthly Dormant Dam Inspection Report

INTASOL

Location:
Inspection date:
Inspected by:

Category	Item	Evaluation Satisfactory Yes	Evaluation Satisfactory No	Comments	By Whom	Date Commitment	Date Completed	Category	Severity	Rating
1. Lekongi Gates & Barrier walls										
								1	1	1
2. Access roads										
								1	1	1
3. Effluent trenches & Bridges										
								1	1	1
4. Underdrains										
								1	1	1
5. Catchment paddocks										
								1	1	1
6. Dam slopes										
								1	1	1
7. Benches										
								1	1	1
8. Day walls, Pool walls, Batters, Dam basin, Freeboard										
								1	1	1
9. Catwalk, Platform & Penstock(s)										
								1	1	1
10. Tailings Delivery System										
								1	1	1



Signature: Person conducting inspection

Signature: Safety Officer

Signature: Operations Manager

Signature: Plant Manager / Engineer

A9.7.3Operations Manual

A9.7.3.1 Active and Dormant Tailings Dams

The operations manual included in this code as Annexure 10. The operations manual shall specify standards in sufficient detail to render acceptable safety and **Risk** levels.

A9.8 Conformance measurements

The objective of conformance monitoring is to provide management with information to assess whether the facility is being managed in accordance with the prescribed objectives. Conformance monitoring involves gathering relevant information, recording and presenting the information in a format that facilitates easy assessment and interpretation. The information needs to be processed in a systematic manner that ensures that the responsible persons review the information, that their assessment is placed on record and that follow-up action is initiated accordingly.

A9.8.1 Inspection (Active TSFs)

A9.8.1.1 Daily

Operating personnel i.e. the Site Manager and/or Operational Supervisor or his team leader, should conduct daily visual inspections of the facility, and record the status of the designated components in a daily logbook. If the facility is operated in more than one shift, the team leader of each shift should accept the logbook from the leader of the previous shift and note any items of concern for attention. The Site Manager and/or Operational Supervisor should carry out the daily inspection with the daytime team leader.

Obvious non-conformance must be noted during the inspections. The more serious deviations or those beyond the understanding and resolution of the operating personnel must be reported to the Plant Manager

The components that must be inspected include the following:

- The slurry delivery pipeline and valves (on the tailings dam);
- The side slopes, toe and the perimeter infrastructure of the facility;

- The decant access and intake;
- The solution trench and drain outlets;
- The areas where deposition is taking place and where areas are being prepared for deposition;
- The clarity of the decant water at the penstock, outfall and return water dam. If necessary, then samples should be taken for testing.

The following information must be recorded in the daily diary:

- Location and period of deposition;
- Period of water decant;
- Slurry density;
- Visitors;
- Weather conditions (including rainfall over the last 24 hours);
- Incidents.

A9.8.1.2 Weekly

The Tailings Dam Operator and his team, must conduct a weekly visual inspection using a standard checklist and review the reporting in the daily diary. See Annex 10. The diary must be used to record the findings of the inspection and must be signed by the inspecting parties.

A9.8.1.3 Monthly

The Plant Manager and his team, Tailings Dam Operator and his team must conduct a formal monthly inspection of the facility using a standard checklist. The inspection checklist must be completed, dated and signed by all the inspecting parties.

Inspection team conducting monthly inspections must, as part of the inspection, determine remedial actions for non-conformances and initiate action. Non-critical items can be held over to the quarterly meetings. Serious deviations and those beyond the understanding and resolution of the inspection team must be reported to the **Professional Engineer**.

A9.8.1.4 Quarterly

These inspections must precede the quarterly meetings and must be attended by the Plant Manager, Plant Engineer, **Professional Engineer**, the Environmental Officer, Health and Safety Officer, the (Operator's team) Tailing Operations Manager and his team. The inspection must cover in particular problem areas, identified during the weekly, monthly and daily inspections.

These inspections and meetings are the main mechanism for controlling the level of **Risk** on the residue deposit. As a minimum a "satisfactory condition" must be reported for each item if no action is prescribed. Non-conformances and follow up must be decided and recorded with responsibilities and time frames stipulated. Progress on implementation of prior actions must be assessed and recorded.

A9.8.1.5 Annual

The **Professional Engineer** must conduct an annual report. The Plant Manager shall provide a survey of the dam in a digital format consisting of the dam plan layout and the piezometer locations, prior to the preparation of the annual report. The survey accuracy should be specified by the **Professional Engineer**.

A9.8.1.6 Independent Audit

If required, an independent suitably qualified person (as defined in SABS 0286) may be appointed to undertake an audit of the facility using a standard checklist. This audit is optional and dependent on the findings of the annual audit.

A9.8.1.7 Review

The review process is implemented to examine the whole operation and construction of the residue deposit and to introduce improvements to the operation particularly with regard to new technologies and changes in the legal regulations. All procedures needs to be reviewed on a regular base.

A9.8.1.8 Survey

A topographical survey must be undertaken regularly for each **Deposit**.

A9.9 Maintenance and Repair

All matters identified as the result of the regular inspections and a review of the monthly data, which require to be rectified, must be reported on the required checklists. The Plant Manager must follow through with the process of:

- Requisition
- Order
- Construction

To ensure that the rectification is carried out efficiently and without delay.

Where there is any contravention of the conditions of this code of practice or any unsafe activities such must be reported according to the Emergency Detection and Levels of Emergency in Table A9.5. A responsible person should be appointed to rectify the matter and target dates should be set and monitored.

Any other problems including:

- Sloughing
- Seepage
- Movement
- Cracking

Are to be reported immediately to the **Professional Engineer** who shall determine the required remedial measures in consultation with the relevant mine and contractor personnel.

A9.10Modifications to Existing Deposits

Any modifications to an existing **Deposit** including modifications to the geometry, installation of alternative infrastructure such as penstocks, deposition rates and characteristics of residue **Deposits** shall be according to Section 0.

A9.11 Re- and Decommissioning

Should a Deposit be re-commissioned after being laid Dormant or being decommissioned, the requirements in Section 0 shall be followed prior to deposition.

When deposition on a **Deposit** is stopped either temporarily during the operating phase or permanently at the end of the life of the **Deposit**, the **Deposit** must be adequately decommissioned such that it does not present an unacceptable health or safety hazard for the foreseeable future.

All decommissioning plans must be designed / approved by the **Professional Engineer**.

The **Professional Engineer** will prepare a **Closure** Report detailing the **Closure** design.

A9.12 Inspections

A9.12.1 Operational Tailings Dams

- **Daily/Weekly inspections (Operational contractor and Plant Manager and Engineer)** – Obvious non-conformance must be noted during the inspections. The more serious deviations or those beyond the understanding and resolution of the operating personnel must be reported to the Plant Manager

- **Monthly inspections (Plant management and Operational contractor)** – Inspection team conducting monthly inspections must, as part of the inspection, determine remedial actions for non-conformances and initiate action. Non-critical items can be held over to the quarterly meetings. Serious deviations and those beyond the understanding and resolution of the inspection team must be reported to the **Professional Engineer**.

- **Quarterly inspection/meetings (Plant management, Operational contractor and Professional Engineer)** – These inspections and meetings are the main mechanism for controlling the level of **Risk** on the residue deposit. As a minimum a "satisfactory condition" must be reported for each item if no action is prescribed. Non-conformances and follow up must be decided and recorded with responsibilities and time frames stipulated. Progress on implementation of prior actions must be assessed and recorded.

A9.12.2 Inspections (Dormant and De-commissioned Tailings Dams)

The monitoring program for Dormant and/or De-commissioned Tailings dams is summarised in Operational Manual. **Professional Engineer** inspections are scheduled as per Hazard Classification.

A9.13 Audit Inspections Frequence by Professional Engineer

A9.13.1 Audit

Audit inspections by a **Professional Engineer** of MRDs classified as high or medium **Risk** and reporting thereon is required as per **Table A9-2: Safety Classifications 1**.

Table A9-2: Safety Classifications 1

1	2	3	4
Safety classification	**Operational deposit**	**Decommissioned and/or Dormant TSFs**	**Qualification of auditor**
High hazard	Annually	Annually	**Professional Engineer**
Medium hazard	Every two years	Every two years	**Professional Engineer**
Low hazard	Every three years	Every five years	Suitably qualified person

A9.13.2 Structural Stability and Life Assessment

The stability of all operational TSFs are to be reviewed annually by a **Professional Engineer** as part of an Annual report. In addition, a Life Assessment is also conducted in order to determine the remaining life of the facilities and verify the correct operations.

A9.14 Emergency Preparedness and Recovery Plan

Emergency preparedness and disaster recovery plans must be compiled for the TSFs. In the event of a major accident or other emergency situations, the Emergency Preparedness Plan (EPP) are put into action. The EPP includes arrangements to evacuate inhabited areas at short notice and the provision of medical assistance and emergency services.

The **EPP** must:

- Define emergency situations;
- Detail actions required for the various emergency situations and the responsibility for the actions;
- List emergency contacts including emergency centre, ambulance and hospital service and fire service; and
- List all responsible and affected parties giving contact details.

A9.14.1 Emergency Situations

The following points outline emergency situations and procedures, which must be followed in the event of an emergency situation.

The emergency procedures become effective when an emergency situation arises. One or more of the following actions must be taken depending on the gravity of the situation.

Situation A: Evacuation: the warning system to evacuate the downstream area is set into operation.

Situation B: Readiness/Preparedness: persons affected are alerted and preparations for possible evacuation are made

Situation C: Uncertainty/Request Advice: The 2.6.1 Appointee notifies the **Professional Engineer** to obtain advice if there is any uncertainty regarding the gravity of the situation. The Plant Manager will be advised of the situation as part of the monthly review report or quarterly inspection report.

Situation D: Operational Non-compliance: The **Professional Engineer** detects during the monthly data review, something that is omitted or inconsistent and the Operating Contractor is requested to supply data or re-measure inconsistent data.

A9.14.2 Emergency Actions and Plan

The emergency actions and responsibilities are defined in Table 9-3.

Table 9-3: Emergency Detection and Levels of Emergency

Emergency Level	Situation	Action	Responsibility
A: Evacuation	1. Tailings dam wall has failed and slurry is flowing downstream 2. There is a large rainfall event and/or the dam is being overtopped 3. There has been a seismic event and the outer wall is sufficiently damaged 4. The outer walls have cracks that are widening by more than 10 mm per day. 5. The outer slopes show signs of serious sloughing or movement exceeding 150 mm.	Implement warning system - to evacuate Issue of press statements	3.(1)(a) Appointee to communicate Group Media Liaison Officer
B: Readiness/ Preparedness	1. There has been a large storm event and the pool is lapping at the outer wall (vertical **Freeboard** = 0). 2. The outer slopes show signs of serious cracking or sloughing 3. Seepage water containing considerable solids appears on the outer wall within a short period of time, and increases rapidly.	Implement warning system - to be prepared, and implement controls and remedial measures (pumping contractor) Stop plant	3.(1)(a) Appointee to communicate
C: Uncertainty – Request Advice	1. The pool is lapping at the outer wall (beach **Freeboard** = 0)	Call for PE, build night walls and/or spigot to increase beach **Freeboard**, increase RD	2.6.1 Appointee
	2. Unusual increase in leakage of seepage water without their having been a large storm event	Call for PE, increase monitoring	2.6.1 Appointee
	3. Sinkholes develop in the basin or on daywall	Call PE, introduce filter and repair	2.6.1 Appointee

Emergency Level	Situation	Action	Responsibility
	4. The outer slopes develop wet patches	Call for PE, increase monitoring	2.6.1 Appointee
	5. The outer slopes are deeply eroded	Repair immediately, preferably with wet material	
	6. Penstock is blocked or decanting very slowly	Mobilise emergency pumping contractor	2.6.1 Appointee
	7. The person in charge is unsure of the gravity of the situation	Call for PE	2.6.1 Appointee
	8. Delivery pipes leak on the outer slopes, causing erosion		
	9. Sloughing is evident on the outer wall and/or toe	Repair immediately, preferably with wet material	2.6.1 Appointee
	10. Cracks appear on the outer wall.	Call for PE, increase monitoring	2.6.1 Appointee
D: Operational Non-Compliance	1. Piezometer levels at or higher than critical	Notify PE, increase monitoring	2.6.1 Appointee
	2. Rainfall event results in the pool level increasing by more than 500 mm in 24 hours	Notify Environmental Operations Manager and decant until the water is removed	2.6.1 Appointee
	3. Daywall eroded back to outer face at delivery stations	Use alternative deliveries and repair	2.6.1 Appointee
	4. Bench penstocks get clogged up during the rainy season	De-silt immediately	2.6.1 Appointee
	5. Penstock takes longer than three days to decant a large storm	Notify PE, review design	2.6.1 Appointee
	6. Under drains get blocked	Jet-rod all drains	2.6.1 Appointee
	7. **Freeboard** below legal limit	Revise deposition cycle, increase by mechanical means	2.61 Appointee
	8. Return water dams full	Return more water to the process, discharge if permitting allows	2.6.1 Appointee

A9.14.3 Extraordinary events

A9.14.3.1 High Rainfall Events

The following is included in Section 0 to monitor and mitigate any adverse conditions due to high rainfall events:

- If a storm of more than 30 mm occurs in a 24-hour period then the Slimes Dam responsible person should be informed and a situation C would arise.
- If the **Freeboard** is greater than the specified minimum total **Freeboard** then a situation D arises. (Then situation C is no longer applicable.)
- If the wall is about to be overtopped during a heavy rainstorm then a situation B arises.
- If the wall is overtopped then a situation A arises.

A9.14.3.2 Weeping, Piping, Sloughing or Cracking

As part of the regular conformance monitoring the daily and weekly inspections allow for checking of signs of instability. This includes for the recording and reporting of seepage, cracking and erosion. The Plant Manager must then follow the requirements of Section 0 and situation C would arise. Depending on further developments, situations B or A could develop. It is imperative that the Plant Manager be notified immediately and the incident be reported verbally, the inspection should not wait for the next weekly or monthly inspection.

A9.14.4 Disaster Recovery Plan (DRP)

The objective behind the **DRP** is to:

- Formulate and detail strategies to locate temporary deposition areas to reduce down time; and
  Identify measures to rehabilitate disaster area and provide for long-term deposition

ANNEXURE 10: COTACT INFORMATION

VITAL INFORMATION FOR EMERGENCY PREPAREDNESS

1.	**Name of dam:**	**Mispah 1&2 TSFs**
2.	**Departmental Ref. No:**	
3.	**Revision date:**	**May 2020**

4. List of responsible persons or authorities (where applicable) who should issue warnings and take certain actions in the event of an emergency situation

Plant Manager Noligwa Plant	Name:	Colin du Plessis	Address:	66 Scott Avenue
	Tel No:	018 478 7201		Orkney
	Cell No:	083 704 9213		2619
Plant Engineer Noligwa Plant	Name:	Thinus Coetzee		27 Theo street
	Tel No:	018 478 8631		Klerksdorp
	Cell No:	083 284 0158		2571
Water and Slimes Dam Metallurgical Foreman	Name:	Thinus Nel	Address:	8ste Laan 33
	Tel No:	018 478 4019		Vaal River Town
	Cell No:	071 643 7953		2621
Intasol Tailings	Name	Lorenzo van Vuuren	Address:	Sagewood House, Eastwood Office Park, Lynwood Service Rd. Lynwood Ridge, Pretoria South Africa, 0081
	Tel No:	012 747 3800		
	Cell No:	071 283 3420		
	Name	Tewie Wessels	Address:	Sagewood House, Eastwood Office Park, Lynwood Service Rd.
	Tel No:	012 747 3800		

	Cell No:	082 491 4395		Lynwood Ridge, Pretoria South Africa, 0081
SAPS	Name:	SAPS	Address:	
	Tel No:	018 464 5080		Klerksdorp
		018 473 2111		Orkney
		018 473 1777		Orkney
		018 441 0009		Vierfontein
Chief of Fire Dept/ Emergency Services (if applicable)	Name:	Leon Hoenderdos	Address:	Day time – nr. 9 Second street Avenue – Vaal Reefs After hours – 5 Uys Krige Street Stilfontein
	Tel No:	018 478 4808		
	Cell No:	074 190 4979		
Relevant Road Authority/Transnet **(if applicable)**	Name:		Address:	
	Tel No:			
	Cell No:			
Other	Name:	Emergency Ambulance – ER24	Address:	
	Tel No:	937-#5963 (Emergency)		
	Cell No:			

5. Other persons/authorities to be informed of the emergency situation

Professional Engineer	Name:	Rynier Shields	Address:	59 Bevan Road
	Tel No:	011 519 0200		P.O.Box 1434
	Cell No:	083 383 3697		Rivonia 2128
The **Professional Engineer**, who is currently appointed for surveillance, should be consulted to determine the gravity of the situation.				
Regional Director of the Department of Water Affairs and Forestry (DWAF)			Tel No:	012 336 7500
Director-General DWAF (Dam Safety Office) An emergency should be reported to the Director-General (for attention of the Dam Safety Office) as soon as possible (within 24 hours after an incident)			Tel No:	(012) 336 7500 (general) (012) 336 8707/336 8010/ 336 8511

6. Persons/authorities threatened by a dam break or flood and who should be evacuated or alerted

A **Medical Station**	Name:		Address:	
	Tel No:	018 4784199/4357		
	Cell No:			
B **Plant Control Room**	Name:	B Motaung	Address:	
	Tel No:	018 478 8667		
	Cell No:	082 214 2262		
C	Name:		Address:	
	Tel No:			
	Cell No:			

ANNEXURE 11: OPERATIONAL MANUAL

Please note:

The actual Operations Manuals documents is a separate document which is kept with this document at all times. The reason that it was not incorporated with this Code of Practice is that the document (i.e. the Operations Manuals documents) is updated on a continuous basis as any changes occur such as a change in personnel, and the COP is only updated every two years. The following pages show a typical layout of how the information is recorded in the Operations Manuals documents

LAYOUT OF THE OPERATIONS MANUAL

1.1.	Scope
1.2.	Operating Limits
1.3.	Purpose and/or Objective
1.4.	Responsibility/Authority Levels
1.5.	References
1.6.	Abbreviations
1.7.	Objectives of the Ops Manual

ANNEXURE 12: CONTROLS AND MEASURES TO PREVENT COVID-19 INFECTIONS

The annexure forms part of this COP and must be complied with and gives more detail regarding to specific controls and measures to mitigate and manage COVID-19.

1. General controls to mitigate and manage COVID-19 infections:

   1.1 Wear a mask at all times when at the Mine

   1.2 Where queuing takes place maintain social distancing at all times 1-2 m.

   1.3 When coughing or sneezing do so in your elbow and if using a tissue dispose thereof in a bin and immediately wash your hands.

   1.4 Wash your hands frequently with soap and water for at least 20 seconds or sanitise.

   1.5 All areas, equipment, desktops, instruments etc. where frequently touched must be wiped down with a cloth disinfected with a chemical suitable to mitigate the virus and used only for that purpose to prevent cross contamination.

   1.6 Immediately report when you feel ill with any of the symptoms as described in the training material and posters observed at the mine.

   1.7 Employees not to share bottles, food or food containers.

2. Specific controls related to this COP implemented to contain and prevent the spread of the virus:

   2.1 When repairs are made to the MRD equipment used must be disinfected with a fog sprayer and where practical wiped down with a disinfected cloth used for that purpose only to prevent cross contamination with a chemical that can eliminate the spread of the virus as supplied by the manager.

   2.2 Machines and related equipment, switches and valves used to place slimes on the MRD must be disinfected with a fog sprayer and where practical wiped down with a disinfected cloth used for that purpose only to prevent cross contamination with a chemical that can eliminate the spread of the virus as supplied by the manager.

ANNEXURE 13: CONSULTATION WITH THE UNIONS BRIEF

HARMONY

HARMONY GOLD MINING COMPANY LIMITED
Randfontein Office Park
Cnr Main Reef Road and Ward
Avenue, Randfontein 1759

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Johannesburg, South Africa

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W www.harmony.co.za

NYSE trading symbol HMY
JSE trading symbol HAR

November 2021

From: Colin du Plessis
Plant Manager – Noligwa Gold Plant

To: Noligwa Gold Plant Health and Safety Committee

Subject: CONSULTATION WITH THE HEALTH &SAFETY COMMITTEE

In order to comply with Section 9(4) of the MHSA, I hereby requesting your assistance for the preparation, implementation and revision of COP 002

Hope you will find this in order

Yours faithfully

C du Plessis
Plant Manager
Noligwa Gold Plant

NUM Representative

Solidarity Representative

UASA Representative

ANNEXURE 14: APPOINTMENT OF REVIEW / DRAFTING COMMITTEE

HARMONY

HARMONY GOLD MINING COMPANY LIMITED
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NYSE trading symbol HMY
JSE trading symbol HAR

November 2021

Code Of Practice 002 – Mine Residue Deposits

To whom it may concern:

The following people were appointed by the Group Metallurgical Manager for the **preparation, implementation, drafting and revision** of the above mentioned COP for NOLIGWA PLANT.

FULL NAME	OCCUPATION	SIGNATURE
Colin du Plessis	Plant Manager	
Thinus Coetzee	Plant Engineer	
Isak Lelimo	Chief Safety Officer	
Pule Hans Mahalaae	Safety Officer	
Lourens Myburgh	Occupational Hygienist	
Johan Steyn	CES Metallurgical Operations	
Carlo Geel	Environmental Manager	
Petrus Bester	UASA H&S Structure	
Marius Botes	Solidarity H&S Structure	
Teboho Khumalo	NUM H&S Structure	
Lorenzo van Vuuren	Operations Manager (Intasol Tailings Pty Ltd)	
Tewie Wessels	Site Manager	
Ljiljana Nedeljkovic	Civil Engineer (Jones & Wagener)	

REL Pobe
Group Metallurgical Manager
SA Operations – North Plants