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MANYABE CONSULTANCY

INTEGRATED WATER AND WASTE MANAGEMENT PLAN - 2024 ANNUAL UPDATE: REPORT NO: IWWMP- 01/2025

DWS LICENCE NUMBER: 03/A21K/ABCGIJ/1468
MANYABE CONSULTANCY (PTY) LTD PROJECT CODE: 202465

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DOCUMENT HISTORY – MANYABE CONSULTANCY

Revision	Date	Compiled By	Reviewed By	Comments
01	10 March 2025	Didimalang Masoabi	Mpho Manyabe	Initial draft for commenting by the client
02	19 March 2025	Didimalang Masoabi	Mpho Manyabe	Final report for submission to DWS

APPROVAL FOR RELEASE

Name	Title	Signed
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EXECUTIVE SUMMARY

PROJECT INTRODUCTION AND BACKGROUND

Tharisa Minerals (Pty) Ltd (Tharisa) operates an opencast mining operation that produces chrome and platinum group metals (PGM) concentrate.

Tharisa holds existing environmental authorisations (EAs) and licenses under the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA), the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended (NEMA), the National Environmental Management: Waste Act, 2008 (Act. 59 of 2008) (NEMWA) and the National Water Act, 1998 (Act. No 36 of 1998) (NWA) for the mining of the East, West and Far West open pits.

Tharisa Mine has been in operation since November 2009 having an initial Mining Right 49/2009 (MR) effective 19 September 2008, issued on 13 August 2009 by the then the Department of Minerals and Energy (DME). Tharisa subsequently applied for an amendment of the MR with the Reference Number: NW/30/5/1/2/2/358 MR, stamped 28 July 2011. This MR was however only registered in 2016.

Tharisa was issued with an Integrated Water Use Licence (IWUL) on 17 September 2024 (Licence Number: 03/A21K/ABCGIJ/1468, File Number: 27/2/2/A1021/37/1), which will operate over Farm K/Kraal 342 JQ and Farm Elandsdrift 467 JQ, which is approximately 95 kilometres (km) north-west of Johannesburg and 35 km east of Rustenburg, within Tharisa Mining Right Area (MRA). The 2024 IWUL supersedes the IWUL that was issued on 12 November 2020 and all the other amendments.

Condition 6.1, Appendix VI of the IWUL 2024, requires that the "*The Integrated Water and Waste Management Plan (IWWMP) and Rehabilitation Strategy and Implementation Plan (RSIP) must be updated annually and submitted to the Provincial Head/Chief Executive Officer (CEO) for approval*".

Manyabe Consultancy (Pty) Ltd (hereunder referred to as MC) in collaboration with Tlhagontle Consulting Services (Pty) Ltd (hereunder referred to as Tlhagontle) has been appointed by Tharisa to undertake the annual update of the IWWMP for the 2024 operational year.

PROJECT LOCATION

Tharisa Mine is located approximately 95km north-west of Johannesburg and 25 km from Rustenburg in the Bushveld Complex of the North-West Province, South Africa. The mine is accessible via R104 Regional Road just off the N4 toll road. Tharisa has been granted a MR on farms K/Kraal 324 JQ, Rooikoppies 297 JQ and Elandsdrift 467 JQ, in the Rustenburg Local Municipality, within the Bojanala Platinum District Municipality (BDM).

OVERVIEW OF THE EXISTING OPERATIONS AND INFRASTRUCTURE

Tharisa operates an opencast mining operation that produces chrome and platinum group metals (PGM) concentrate. Currently, three pits namely, Far West Pit, West Pit and East Pit are being mined via conventional open pit truck and shovel methods up to a defined economic limit. The ore is mined from the Middle Group (MG) reefs No.1 to 4A (i.e., MG1, MG2, MG3, MG4, MG4A) and is enriched through a concentration process to produce the ore concentrates that are sold ex-mine to different customers.

The two mining sections (East and West) are separated by a tributary of the Sterkstroom River and the D1325 (Marikana Road). Waste rock from the open pit areas is stockpiled in various Waste Rock Dumps (WRDs) while tailings from the processing plants are disposed of on Tailing Storage Facilities (TSFs). The processing methods from Genesis, Voyager and Vulcan (Scavenger) Processing Plants used are a comminution of crushing, milling, screening, gravity/density classification (spirals, shaking tables), flotation, magnetic separation, and thickening.

The existing mining infrastructure includes the following:

- West WRD (64.89 ha);
- Far-West WRD (32.90 ha);
- Far-West Pit (48.03 ha);
- West Pit (39.47 ha);
- Central WRD /Eastern WRD 1 (76.3 ha);
- Eastern WRD (63.23 ha);
- East Pit (211.43 ha);
- Run of Mine (RoM) pad (15.84 ha);
- Concentrator plant (Genesis and Voyager) (28.43 ha);
- Vulcan plant (3.29 ha);
- TSF1 Phase 1 & 2 (115.99 ha); and
- TSF 2 Phase 1 & 2 (101.91 ha).
- Haul roads;
- Various product stockpiles;
- Topsoil stockpiles;
- Stormwater Dam;
- Pollution Control Dam (PCD);
- Hernic quarry (Stormwater Dam);
- Sewage Treatment Plant (STP); and
- Supporting Infrastructure such as:
  - Offices;
  - Workshops;
  - Change houses; and
  - Access control facilities.

A network of roads exists within the mine. A 275 kV powerline and associated Eskom servitude cross through the eastern part of the mining area in a north-south direction. Smaller rural power and telephone lines currently service the residential areas within the western and eastern sections of the project area. Infrastructure (pipes and canals) associated with the Buffelspoort Irrigation Board traverses various sections of the project area in a south-north direction.

WATER USES

Tharisa currently operates under a WUL (Licence No: 03/A21K/ABCGIJ/1468) that was issued to Tharisa on 17 September 2024. The Section 21 authorised water uses acquired by Tharisa are presented in the table below.

Section 21 Water Uses	Water Uses
21 (a)	• Taking water from East Pit through dewatering • Taking water from West Pit through dewatering • Taking water from various boreholes surrounding the East Pit • Taking water from Boreholes (Direct Boreholes)
21 (b)	• Storage of water on a Raw Water Dam • Storage of water on an SLP dam • Storage of water on a Zink dam from boreholes
21 (c) & (i)	• Diverting stream around TSF complex • Altering the headwater of the non-perennial tributary of Sterkspruit by means of TSF • River crossing (culvert) over a tributary of Sterkstroom River • Altering the banks of the eastern tributary of the Sterkstroom • Altering the headwaters of non- perennial tributary of Sterkspruit • Altering the banks of the western tributary of the Sterkstroom

Section 21 Water Uses	Water Uses
	• Altering the headwaters of the western stream 2
Section 21(f)	• Discharge of wastewater from Hernic Quarry
21 (g)	• Sewage drying beds • Storing of water on a Stormwater Dam • Disposing waste: Northeastern WRD • Disposing wastewater on a process water dam • Disposing water on an MCC dam • Disposing of tailings on a TSF (TSF2) • Depositing tailings on a TSF 1 • Depositing tailings on a TSF 2 • Overburden WRD (West) • Overburden WRD (East) • Backfilling with WRD (east pit) • Backfilling with WRD (west pit) • Disposal of sewage sludge • Disposing water containing waste on a Hernic quarry • Disposing water for dust suppression • Disposing wastewater for dust suppression • New TSF3 • Buffer Dam (Rail Loop) • WRD expansion near TSF 2 • East Above Ground (OG) WRD • West Above Ground (OG) WRD (FWWRD)
21 (j)	• East pit dewatering • West pit dewatering

IMPACTS AND MANAGEMENT OF WATER USES

Potential impacts and mitigation measures have been identified, management objective, strategy and operational action plan have been developed based on the Best Practice Guidelines (BPGs) for mining, applicable Environmental Management Programme Report (EMPr) commitments, WUL findings and specialists' reports recommendations. The operational action plans have been aligned with the WUL. Eleven (11) actions including ongoing actions have been identified to be addressed.

ACTION PLAN

The action plan which is based on recommendations from specialists' studies undertaken and audit findings, focuses on the measures that will be implemented during the next annual period of the operational phase. The key action plans for 2025 to be implemented, excluding the ongoing actions are listed below:

- Updating of the Stormwater Management Plan (SWMP) to include all infrastructure within the mine site;
- Addition of extra flow meters at the start of all activities;
- Complying with the conditions of the WUL in terms of water abstraction and pit dewatering;
- Maintaining required freeboard on all the dams;
- Drilling, pump testing and implementation of phase 2 deep dewatering boreholes; and
- Water quality monitoring, especially within Elandsdriftspruit mining area.

CONCLUSION

This IWWMP serves as the first annual update after the approval and issuance of the amended WUL (Licence Number:03/A21K/ABCGIJ/1468, File Number: 27/2/2/A1021/37/1), signed on 17 September 2024. The 2024 IWUL supersedes the IWUL that was issued on 12 November 2020 and all the other amendments.

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LIST OF ABBREVIATIONS

Aquatico	Aquatico Scientific (Pty) Ltd
ARD	Acid Rock Drainage
BAR	Basic Assessment Report
BDM	Bojanala Platinum District Municipality
BIC	Bushveld Igneous Complex
BPGs	Best Practice Guidelines
CD: RDM	Chief Directorate: Resource Directed Measures
CEO	Chief Executive Officer
Clean Stream	Clean Stream Biological Services (Pty) Ltd
CMA	Catchment Management Agency
DACE	North West Department of Agriculture, Conservation and Environment
DEA	Department of Environmental Affairs
DFFE	Department of Forestry, Fisheries and the Environment
DME	Department of Minerals and Energy

DMRE	Department of Mineral Resources and Energy
DO	Dissolved Oxygen
DWA	Department of Water Affairs
DWAF	Department of Water Affairs and Fisheries
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EC	Electrical Conductivity
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
ELU	Existing Lawful Use
EMP	Environmental Management Plan
EMPr	Environmental Management Programme Report
EMS	Environmental Management System
EWR	Ecological Water Requirement
GA	General Authorisation
GISTM	Global Industry Standard on Tailings Management
GLCs	Ground Level Concentration
GN	General Notice
GNR	Government Notice Regulation
ISO	International Organisation for Standardisation
IUA	Integrated Units of Analysis
I&APs	Interested and Affected Parties
IWUL	Integrated Water Use Licence
IWWMP	Integrated Water and Waste Management Plan
km	kilometres
LCT	Leachable concentrations thresholds
LG	Lower Group
LoM	Life of Mine
Ltd	Limited
mamsl	meters above mean sea level
MAP	Mean Annual Precipitation
MAR	Mean annual runoff
MC	Manyabe Consultancy (Pty) Ltd
MG	Middle Group
MPRDA	Mineral and Petroleum Resources Development Act, 2002 (Act No. 22 of 2002)
MR	Mining Right
MRA	Mining Right Area
mS/m	milli-Siemens per meter
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended
NEMWA	National Environmental Management Waste Act, 2008 (Act No. 59 of 2008)
NEMWAA	NEMWA Amendment Act
NWA	National Water Act, 1998 (Act No. 36 of 1998)
NWRS	National Water Resource Strategy
PCD	Pollution Control Dam
PES	Present ecological state
PGE	Platinum Group Elements
PGM	Platinum group metals
PPP	Public Participation Process
REC	Recommended ecological category
RoD	Record of Decision
RoM	Run of Mine
RQO	Resource Quality Objectives
RSIP	Rehabilitation Strategy Implementation Programme
SANS	South African National Standards
SHE	Safety, Health and Environmental
SPLP	Synthetic Precipitation Leaching Procedure
STP	Sewage Treatment Plant
SWMP	Stormwater Management Plan
Tharisa	Tharisa Minerals (Pty) Ltd
Tlhagontle	Tlhagontle Consulting Services (Pty) Ltd

TSFs	Tailing Storage Facilities
UN	United Nations
WMA	Water Management Area
WML	Waste Management License
WRC	Water Research Commission
WRCS	Water Resource Classification System
WRD	Waste Rock Dumps
WUL	Water Use Licence
WULA	Water Use Licence Application
WWTW	Wastewater Treatment Works

SECTION 1: PROJECT INTRODUCTION AND BACKGROUND

Tharisa Minerals (Pty) Ltd (Tharisa) operates an opencast mining operation that produces chrome and platinum group metals (PGM) concentrate. The mine is located on Farms K/Kraal 342 JQ, Rooikoppies 297 JQ and Elandsdrift 467 JQ, south of Marikana in the North West Province (refer to Figure 1).

Tharisa holds existing environmental authorisations (EAs) and licenses under the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA), the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended (NEMA), the National Environmental Management: Waste Act, 2008 (Act. 59 of 2008) (NEMWA) and the National Water Act, 1998 (Act. No 36 of 1998) (NWA) for the mining of the East, West and Far West open pits.

Tharisa Mine has been in operation since November 2009 having an initial Mining Right 49/2009 (MR) effective 19 September 2008, issued on 13 August 2009 by the then the Department of Minerals and Energy (DME). Tharisa subsequently applied for an amendment of the MR with the Reference Number: NW/30/5/1/2/2/358 MR, stamped 28 July 2011. This MR was however only registered in 2016.

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Condition 6.1, Appendix VI of the IWUL 2024, requires that the "*The Integrated Water and Waste Management Plan (IWWMP) and Rehabilitation Strategy and Implementation Plan (RSIP) must be updated annually and submitted to the Provincial Head/Chief Executive Officer (CEO) for approval*".

Manyabe Consultancy (Pty) Ltd (hereunder referred to as MC) in collaboration with Tlhagontle Consulting Services (Pty) Ltd (hereunder referred to as Tlhagontle) has been appointed by Tharisa to undertake the annual update of the IWWMP for the 2024 operational year.

This report serves as the 2024 IWWMP update for the existing Tharisa operations required as per the licence conditions. This IWWMP update has been compiled as per the 2024 IWUL conditions of Licence No. 03/A21K/ABCGIJ/1468.

1-1 CONTACT DETAILS OF THE APPOINTED ENVIRONMENTAL SPECIALIST

Contact Details of the Environmental Specialist – Environmental Assessment Practitioner (EAP)	
Name of the Company	Manyabe Consultancy (Pty) Ltd
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Email Address	mpho@manyabeconsultancy.com
Contact Details of the Environmental Specialist – Water Specialist	
Name of the Company	Tlhagontle Consulting Services (Pty) Ltd
Contact Person	Didimalang Masoabi
Physical Address	120 Chelsea Mews Complex, Ferdinand Street, Suideroord, 2091
Email Address	didi@tlhagontle.co.za

1-2 THARISA DETAILS

The person who is responsible for the implementation of the conditions of the WUL and this IWWMP are presented in the table below.

Contact Details of the Applicant	
Name of the Company	Tharisa Minerals (Pty) Ltd

Contact Details of the Applicant	
Name of the Mine	Tharisa Mine
Contact Person	Mr. Patrick Sibuyi
Physical Address	Portion 84, Farm 342-JQ, Marikana, 0284, South Africa
Postal Address	Postnet Suite 473, Private bag X51 Bryanston, 2021
Telephone Number	014 572 0876
Fax Number	014 572 0700
Email Address	psibuyi@tharisa.com

1-3 REGIONAL SETTING AND LOCATION OF ACTIVITY

Tharisa Mine is located approximately 95km north-west of Johannesburg and 25 km from Rustenburg in the Bushveld Complex of the North-West Province, South Africa. The mine is accessible via R104 Regional Road just off the N4 toll road. Tharisa has been granted a MR on farms K/Kraal 324 JQ, Rooikoppies 297 JQ and Elandsdrift 467 JQ, in the Rustenburg Local Municipality, within the Bojanala Platinum District Municipality (BDM) (Figure 1).

The surrounding land uses are residential, business, mining and farming and the surrounding communities consist of various formal and informal community groupings including landowners, land occupiers, informal and formal settlements. The communities and villages closest to Tharisa are Buffelspoort; Marikana; Mmaditlhokwa; Lapologang; Mamba and Mooinooi.

1-4 PROPERTY DESCRIPTION

Tharisa is the holder of the MR for the properties within the Tharisa Mine boundary area, which are presented in Figure 2 below and on the Master Plan map appended to this report as Appendix B.

1-5 PURPOSE OF THE IWWMP

From a legal perspective, this IWWMP provides a plan for the implementation of the WUL and integrated mine water management best practices as per the Department of Water and Sanitation (DWS) Best Practice Guidelines (BPGs).

This IWWMP contains information on the mining and related activities that are undertaken at Tharisa, with emphasis on current and proposed management measures for water and waste. The IWWMP has been updated in collaboration with the relevant mine personnel and can be considered a living document that will continue to be revised and updated annually in terms of the WUL requirements throughout the life of the Tharisa operations, to accommodate additional information and improved technology to ensure that water and waste management is continually optimised and adapted to the changing needs of the water management area thereby reducing the risks of the operation to the environment and humans.

This update of the IWWMP demonstrates the mine’s commitment to continual improvement of the water and waste management system in order to comply with changes in legislative requirements and to keep up to date with new technological advances. The IWWMP is in the format provided in the Operational Guideline: IWWMP [Department of Water Affairs (DWA), First Edition, February 2010). The applicable BPGs have been used as input to the IWWMP and information on the operations has been sourced from the relevant and most current specialists’ documents.

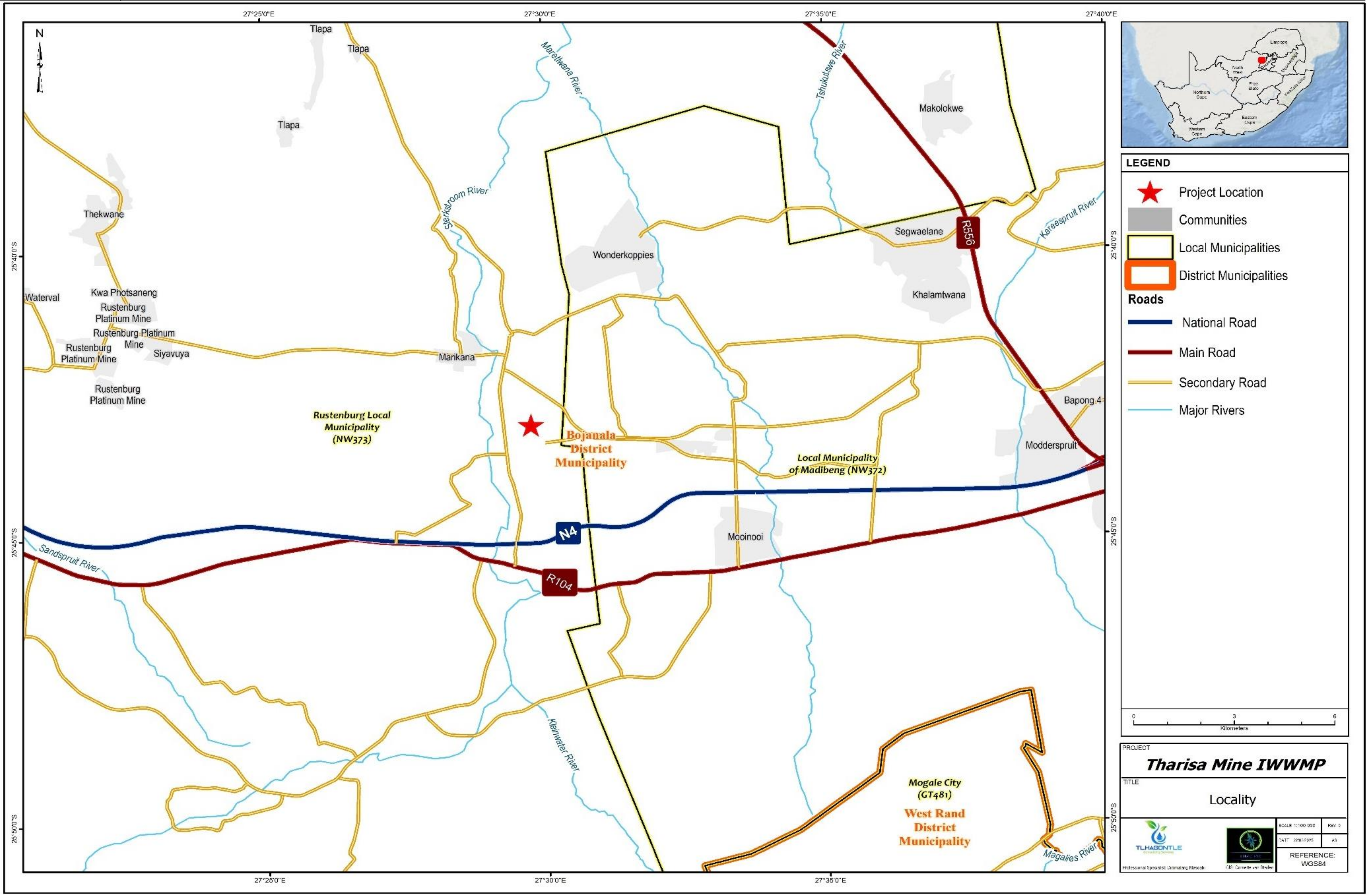


Figure 1: Project Locality Map

Figure 2: Tharisa Property Map

SECTION 2: OVERVIEW OF THARISA OPERATIONS

Tharisa Mine has been in operation since November 2009 having an initial Mining Right 49/2009 (MR) effective 19 September 2008, issued on 13 August 2009 by the then the DME. Tharisa subsequently applied for an amendment of the MR with the Reference Number: NW/30/5/1/2/2/358 MR, stamped 28 July 2011. This MR was however only registered in 2016.

Tharisa operates an opencast mining operation that produces chrome and platinum group metals (PGM) concentrate. Currently, three pits namely, Far West Pit, West Pit and East Pit are being mined via conventional open pit truck and shovel methods up to a defined economic limit. The ore is mined from the Middle Group (MG) reefs No.1 to 4A (i.e., MG1, MG2, MG3, MG4, MG4A) and is enriched through a concentration process to produce the ore concentrates that are sold ex-mine to different customers.

2-1 EXISTING PROJECT INFRASTRUCTURE

Mining at Tharisa Mine is undertaken using conventional open pit truck and shovel methods. The two (2) mining sections (East and West) are separated by a tributary of the Sterkstroom River and the D1325 (Marikana Road). The waste rock from the open pit areas is stockpiled at various Waste Rock Dumps (WRDs) and Tailing Storage facilities (TSFs). Some in-pit dumping of waste rock has taken place at East Mine.

The existing mining infrastructure includes the following (refer to Figure 3 depicting some of the infrastructure):

- West WRD (64.89 ha);
- Far-West WRD (32.90 ha);
- Far-West Pit (48.03 ha);
- West Pit (39.47 ha);
- Central WRD /Eastern WRD 1 (76.3 ha);
- Eastern WRD (63.23 ha);
- East Pit (211.43 ha);
- Run of Mine (RoM) pad (15.84 ha);
- Concentrator plant (Genesis and Voyager) (28.43 ha);
- Vulcan plant (3.29 ha);
- TSF1 Phase 1 & 2 (115.99 ha); and
- TSF 2 Phase 1 & 2 (101.91 ha).
- Haul roads;
- Various product stockpiles;
- Topsoil stockpiles;
- Stormwater Dam;
- Pollution Control Dam (PCD);
- Hernic quarry (Stormwater Dam);
- Sewage Treatment Plant (STP); and
- Supporting Infrastructure such as:
  - Offices;
  - Workshops;
  - Change houses; and
  - Access control facilities.

A network of roads exists within the mine. A 275 kV powerline and associated Eskom servitude cross through the eastern part of the mining area in a north-south direction. Smaller rural power and telephone lines currently service the residential areas within the western and eastern sections of the project area. Infrastructure (pipes and canals) associated with the Buffelspoort Irrigation Board traverses various sections of the project area in a south-north direction.

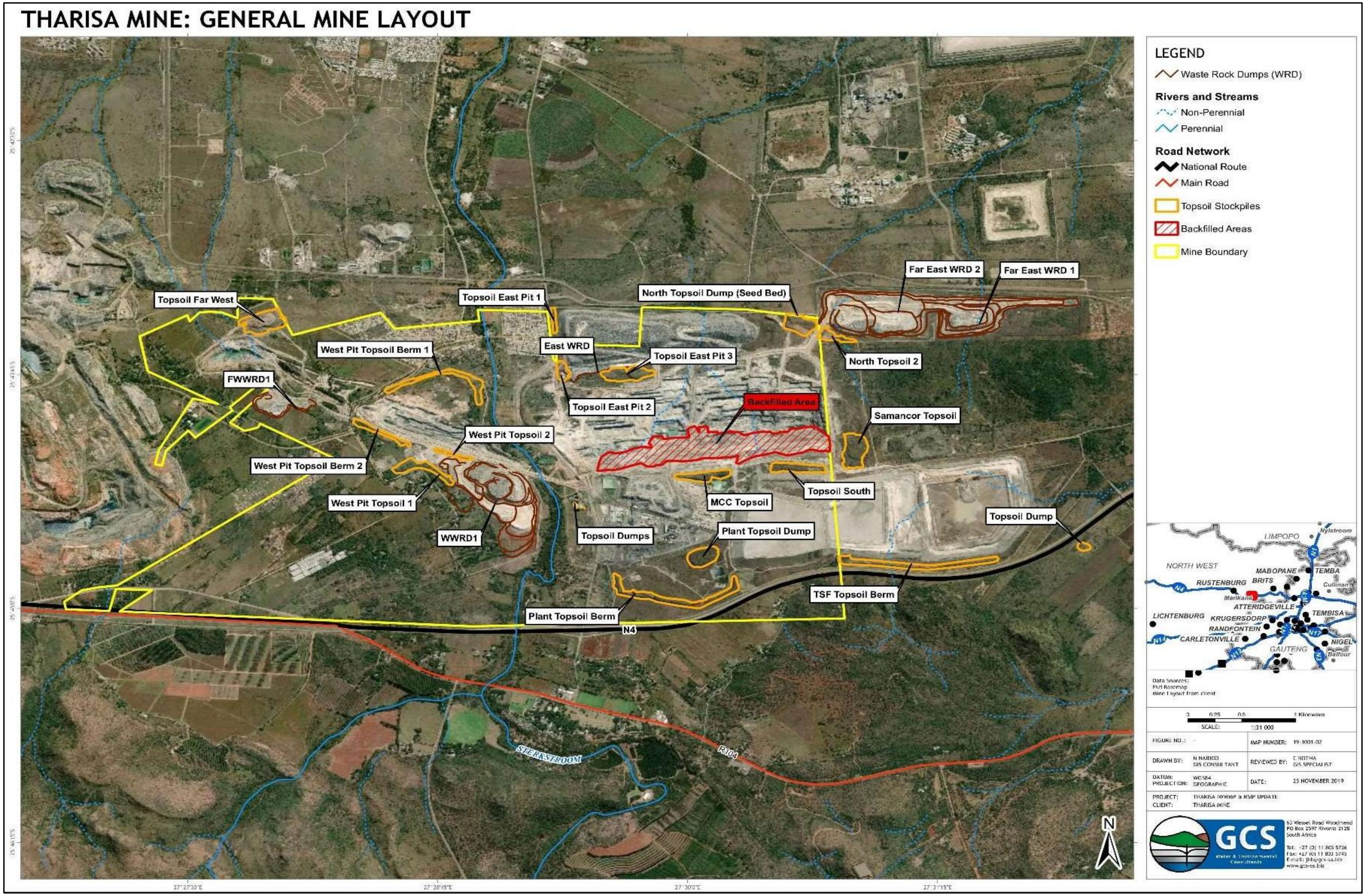


Figure 3: Tharisa infrastructure layout (GCS, 2023 IWWMP)

2-2 KEY ACTIVITY RELATED PROCESSES AND PRODUCTS

2-2.1 Mining method

The ore body at Tharisa Mine is made up of MG1, MG2, MG3, MG4 and MG4a. Currently, the West and East pits are being mined via conventional open pit truck and shovel methods up to a defined economic limit. Mining at Tharisa's western section is undertaken by a mining contractor, whereas the eastern is mined by Tharisa and a contractor (Trollope). The general mining direction is from south to north.

Key activities associated with the mining method are described below:

2-2.1.1 Removal of Topsoil

- All topsoil is dozed into stockpiles along the low wall (outcrop) sides of the open pits. The removal of topsoil is done in accordance with a Topsoil and Subsoil Stripping Procedure (Reference Number: TM-MIN- PRO-31).

2-2.1.2 Drilling and Blasting

- Once the topsoil is removed, the area is drilled as per the approved drill design. Charges are designed to prevent excessive ground vibration, air blast and fly rock. The remaining overburden and the ore are then drilled and blasted together. The blast design is modified from time to time in order to optimise grade and minimise dilution.

2-2.1.3 Removal of Waste Rock/Overburden

- The removal of waste rock/overburden above the ore body is done as a bulk operation by load and haul with large equipment. The material is placed on the pit extremities for the rehabilitation of the final voids.

2-2.1.4 Removal of Ore

- Prior to the removal, the top of the reef horizon is cleaned using machinery. The footwall is then swept to ensure that all the fines are recovered.

2-2.1.5 Rehabilitation:

- Rehabilitation is concurrent with mining. Waste rock/overburden will be used to backfill voids where required. Overburden material will be used to cater for any settlement that occurs with time and to ensure correct drainage. Once the backfill material has been settled, topsoil will be replaced on top of the overburden and vegetation will be re-established.
- With respect to final voids and residual WRDs, mine planning has changed and as such, it is anticipated that there will be residual WRDs and a final void at each pit at closure. Any voids and WRDs that do remain at closure will be made safe in line with the requirements of the Department of Mineral Resources and Energy (DMRE). No surface subsidence is expected as measures will be implemented to prevent and rectify this. Any residual WRDs will be rehabilitated according to the mine's conceptual closure plan.

2-2.2 Processing of Minerals

The mineral processing operation comprises of a concentrator complex. The concentrator complex caters for two streams, namely PGM and chrome, in order to accommodate the different characteristics of the MG ore seams that are mined. The PGM plant processes ROM from the MG2, 3 and 4 seams and produces PGM concentrate. The chrome plant processes ROM from the MG1 and MG4A seams and produces chrome concentrate. The target production figures for the plants are approximately 40 000 tonnes of PGM concentrate and approximately 1.5 million tonnes of chrome concentrate per annum (Green Gold, 2017).

The processing methods from Genesis, Voyager and Vulcan (Scavenger) Processing Plants used are a comminution of crushing, milling, screening, gravity/density classification (spirals, shaking tables), flotation, magnetic separation, and thickening.

The PGM concentrate is taken by trucks to the surrounding smelters in the region. The chrome concentrate is taken by trucks to the Marikana Railway Siding where it is transported by rail to Richards Bay, KwaZulu-Natal. Waste streams from both production streams are deposited in the TSFs.

2-3 ACTIVITY LIFE DESCRIPTION

Tharisa has been in operation since November 2009. The approved mine changes will result in the mining of additional ore reserves, an increased mine footprint, and an increased Life of Mine (LoM) for the open pit mining from the initial 12 years to 17 years. This excludes the planned future underground mining which may increase the LoM to approximately 40 years.

2-4 KEY WATER USES AND WASTE STREAMS

Refer to Section 3 for the key water uses at Tharisa. An overview of waste streams has been summarised in Table 1 below.

Table 1: Tharisa waste streams

Aspect	Description
Tharisa Water and Waste Management Systems	
Identified waste streams	Mine waste, waste rock, concentrator tailings, general domestic waste, general industrial waste, medical waste (from in-house emergency room – Paramedic services), laboratory chemical waste; scrap metal, process and hazardous chemical containers and chemical.
Waste disposal (domestic, industrial and hazardous waste)	There are no on-site waste disposal facilities, and none are planned. Domestic waste from the site is collected, compressed and then transported to a municipal waste disposal facility at Rustenburg or Mooinooi. Hazardous waste is collected and transported back to suppliers for recycling or by a waste disposal company to the Holfontein waste site in Springs, Gauteng. Domestic and industrial waste is removed from site on a monthly basis as a minimum.
STP	The STP is a modular system which makes it highly flexible in its design capabilities. It is currently designed for an anticipated peak of 1500 personnel thus capable of handling sewage and wastewater from the plant change house, offices, ablutions. mining change houses and office areas. The design capacity is in the order of 300m^3/day with a design peak flow of 25m^3/h. Authorisation to upgrade the current STP has been granted by DMRE on 14 August 2020 and it is now operational.
Mine residue characterisation	The 2008 geochemical assessment classified the waste streams (waste rock and tailings) according to the Minimum Requirements for Waste Disposal by Landfill [2nd Edition, 1998; Department of Water Affairs and Forestry (DWAF)]. Based on the assessment, waste rock and tailings material were given a hazard rating of HR2 (in terms of the minimum requirements). In turn, this determined the landfill class that would accept that waste and the minimum design requirements to which it needed to be constructed. According to the minimum requirements, materials classified as HR2 were to be disposed of to a landfill constructed with a H:H liner system. Changes in mine water legislation resulted in all residue deposits and stockpiles from mining activities being regarded as waste and fell under the ambit of the NEMWA. A waste type assessment was undertaken for five existing waste facilities at Tharisa in terms of Regulation 8 of Government Notice Regulation (GNR.) 634 of 2013 in January 2016. The tailings facility and the three WRDs namely Eastern WRD, West WRD and Far West WRD were classified as a Type 3 waste, which requires disposal in a Class C landfill. A Geochemistry study and Waste Assessment was again undertaken in 2023. 3 waste rock composite and 2 tailings samples from the mine were subjected to comprehensive geochemical investigation and waste assessment to predict the leachate quality from the waste storage facilities on site and if they pose any risk to surface or groundwater resources. The laboratory results [Leachable concentrations thresholds (LCT) and Synthetic Precipitation Leaching Procedure (SPLP)] are based on first flush static tests that often give

	conservative (elevated) concentrations whereas the modelled source terms are calibrated to long term water quality monitoring data that is subject to field scale conditions and are regarded as more accurate indicators of site leachate quality. According to NEMWA GNR. 635 and 636 guidelines, all the waste rock and tailings samples were classified as equivalent to Type 3 waste and are required to be incorporated into a storage facility with a Class C barrier.
WRDs/Stockpiles	Waste rock from the open pit mining operations has been used in the construction of the TSFs containment walls, mine haul roads and as general backfill for various platforms. These uses would continue where required. Waste rock will also be used in the backfilling of the open pits on an advancing front basis once the pits have been developed sufficiently. Excess waste rock is stored in WRDs. The approved Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) report (Metago, 2008) made provision for four WRDs. The project components make provisions for changes to these as well as the addition of a WRD. The WRDs have been classified in terms of the requirements of the South African National Standards (SANS) Code of Practice for Mine Residue Deposits and are rated as a medium hazard (central and northeast WRDs) and high hazard (east WRD). The environmental classification is such that there could be potentially significant impacts associated with the facilities, but with mitigation measures put in place, the impacts can be mitigated to an acceptable level.
Tailings Complex	Although waste from the two-production stream in the plant complex are jointly disposed, the following TSFs exist: • TSF1 Phase 1 & 2 (115.99 ha); and • TSF 2 Phase 1 & 2 (101.91 ha). Only TSF 2 Phase 2 is currently operational.

2-5 ORGANISATIONAL STRUCTURE OF ACTIVITY

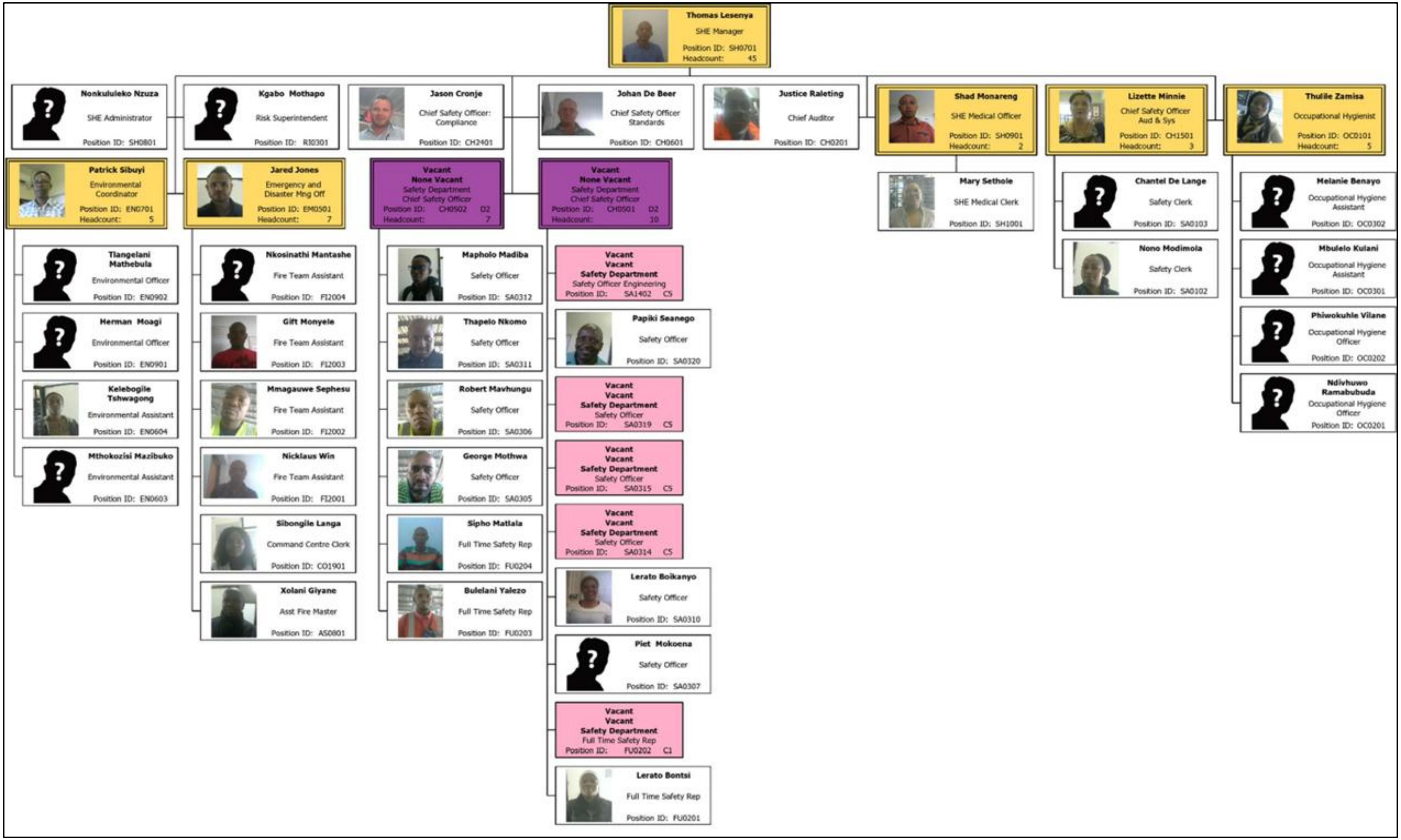


Figure 4: Tharisa Organogram

2-6 BUSINESS AND CORPORATE POLICIES

2-6.1 Safety, Health and Environmental Policy

Tharisa's 'Safety, Health and Environmental (SHE) Policy' was updated and signed on 08 January 2025, and states the following:

- "Tharisa Operation is located on the Western Limb of the Bushveld Complex, approximately 35km east of Rustenburg. The mine lease area covers approximately 5 590ha, with a deposit with an outcrop, strike length of approximately 5km.
- The operation comprises of an opencast mine and processing facilities to produce PGM and chrome contrate.
- Tharisa's significant risks are blasting, noise, dust, operation, storage and handling of hazardous materials, working heights, high walls, fly rocks, chemical fires and explosions, vibrations, pollution (water, land and air), moving equipment, electricity and drowning.
- Tharisa Operation is committed to practices which minimise harm to employees, non- employees as well as prevent damage to the environment. The following principles for SHE resulting from the company's ethical conviction take precedence and apply throughout the operation. Management will take reasonably practicable steps to eliminate or reduce these risks and manage the residual risks. Tharisa will strive for continual improvement.
- By applying comprehensive SHE management systems; SHE related risks are actively managed as an integral part of our business and operational practices. Tharisa will ensure that non- employees will be engaged on a regular basis concerning health and safety matters affecting them, and that any aspect that may impact on their health and safety will be proactively managed.
- We will maintain a safe work environment for our employees and provide appropriate information and training to increase skills and promote SHE awareness. All employees have a fundamental responsibility in terms of addressing SHE risks at work.
- We are committed to continual improvement of our SHE performance and measure progress by specific SHE performance indicators. We are also committed to implementing international best practices and have adopted the Global Industry Standard on Tailings Management (GISTM).
- We periodically audit our operation with regard to SHE performance and compliance.
- New or modified processes and installations are subjected to a systematic risk assessment prior to introduction. All raw materials, intermediates and products are assessed for regulatory compliance.
- All internal and external communication channels in case of an emergency are defined and operable. We openly communicate and provide information on our SHE performance to our employees, customers, shareholders and investors, government authorities and the public at large.
- Tharisa operation ensures that its business practices conform to its ethical conviction and the principles of sustainable development. This policy will be revied annually and will be made available to members of the public on request."

2-6.2 Sustainability

Sustainability starts with a corporate value system that upholds responsibilities to the planet and to people. This corporate value system is based on a principled approach to doing business and is guided by the need to protect the environment, human rights and stakeholders that are affected and effected by the Group's businesses.

Sustainability is a blueprint for the creation of shared value, and it is through sustainability that Tharisa is able to create additional value for its investors and for all of its stakeholders including employees, contractors, suppliers, the communities in which it operates and various levels of government.

As a means of measuring the impact of sustainability efforts, Tharisa is working towards the adoption of international sustainability guidelines such as the Global Reporting Initiatives and International Organisation for

Standardisation (ISO) 26000. On a broader basis, the Group subscribes to the Equator Principles and has embraced the Ten Principles of the United Nations (UN) Global Compact.

Equator Principles is a risk management framework, adopted by financial institutions, for determining, assessing and managing environmental and social risk in projects and is primarily intended to provide a minimum standard for due diligence to support responsible risk decision-making.

The UN Global Compact is the world's largest corporate sustainability initiative. It is a call to companies to align strategies and operations with universal principles on human rights, labour, environment and anti-corruption. The Ten Principles of the UN Global Compact aims to help advance societal goals.

The safety and health of the Group's employees is a priority. Tharisa is proud of its track record in minimising its environmental impact and, while it strives to improve further, it takes similar pride in its mature and mutually beneficial relationships with the communities that border the Tharisa Mine.

Tharisa not only understands its obligations to create social capital as enshrined in the MPRDA but strives to achieve these obligations in ways that create ongoing positive social impacts.

2-6.3 Corporate Governance

The Audit Committee provides the Board with additional assurance regarding the quality and reliability of financial information used by the Board and the financial statements of the Group. The Committee reviews the internal and financial control systems, accounting systems and reporting and internal audit functions. It liaises with the Group's external auditors and monitors compliance with legal requirements.

Furthermore, the Audit Committee assesses the performance of financial management, approves external audit fees and budgets, monitors non-audit services provided by the external auditors against an approved policy and ensures that management addresses any identified internal control weakness. In addition, the Audit Committee oversees the integrated reporting process, risk management systems, information technology risks (as they relate to financial reporting), the Group's whistleblowing arrangements and policies and procedures for preventing corrupt behaviour and detecting fraud and bribery.

SECTION 3: POLICY AND LEGAL CONTEXT

There are a number of legal and regulatory frameworks which regulate mine water management in South Africa. A summary is provided in Table 2 with specific details relating to the NWA and NEMWA provided in the remainder of this section.

Table 2: Water management legal and regulatory framework requirements

Legislation
Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996) The Act describes the Bill of Rights, and it is the cornerstone of democracy in South Africa, enshrining the rights of all people and affirming the democratic values of human dignity, equality and freedom. Section 24 is directly relevant to environmental law. The Bill of Rights states that everyone has the right to an environment that is not harmful to their health or well-being.
National Water Act, 1998 (Act No. 36 of 1998) Provides for the protection of the quality of water and water resources in South Africa, for the establishment of Water Management Areas (WMAs) to be managed by Catchment Management Agency's (CMAs) and describes the actions that can be taken by the CMAs to enforce the requirements of the NWA. Section 19 of the NWA sets out the principles for "an owner of land, a person in control of land or a person who occupies or uses land" to: • Cease, modify or control any act or process causing pollution; • Comply with any prescribed waste standard or management practice; • Contain or prevent the movement of pollutants; • Eliminate any source of pollution; • Remedy the effects of the pollution; and • Remedy the effects of any disturbance to the bed and banks of a watercourse. In terms of Section 21 of the NWA there are eleven (11) water uses that may require authorisation including: (a) taking of water from a water resource; (b) storing of water; (c) impeding or diverting the flow of water in a water course; (d) engaging in a stream flow reduction activity; (e) engaging in a controlled activity, such as irrigation of any land with waste or water containing waste generated through any industrial activity or by a waterworks; (f) discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit; (g) disposing of waste in a manner which may detrimentally impact on a water resource; (h) disposing in any manner of water which contains waste from, or which has been heated in, any industrial process or power generation process; (i) altering the bed, bank, course or characteristics of water courses; (j) removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people; (k) use of water for recreational purposes.
NWA Amendment Act, 2014 (Act No. 27 of 2014) This act makes provision for integration and alignment of the Water Use Licence Application (WULA) process with applications in terms of the NEMA and MPRDA.
NWA Regulations: **Regulation 704 (GNR. 704, Gazette No. 20119, 1999)** Regulations that require separation of clean and dirty water systems, including restrictions on activities within the 1:100 floodline or 100 m from a watercourse or use of waste rock in the construction of the TSF. **Regulations regarding the procedural arrangements for WULAs and appeals (GNR. 267, Gazette No. 40713, 24 March 2017)** Consideration of and decision on WULAs is now time regulated to align with the EIA/EMPr process. The final decision on the WULA is required within 90 calendar days from submission of the application. **General Authorisation (GA) for Section 21(c) and (i) water uses (GN509, Gazette No. 40229, 26 August 2016)** Defines a regulated area of a watercourse as: • the outer edge of the 1 in 100-year flood line and/or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, lake or dam; • in the absence of a determined 1 in 100-year flood line or riparian area the area within 100 m from the edge of a watercourse

Legislation
where the edge of the watercourse is the first identifiable annual bank fill flood bench; or • a 500 m radius from the delineated boundary (extent) of any wetland or pan.
Water Services Act, 1997 (Act No. 108 of 1997) Provides for the regulation of water boards and the setting of national water quality standards.
National Environment Management Act, 1998 (Act No. 107 of 1998) Sections 28(1) and (3) of NEMA set out the duty of care principle, which is applicable to all types of pollution and must be considered in considering any aspects of potential environmental degradation. Every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment.
EIA Regulations of 2014, as amended, GNR. 982, GNR. 983, GNR. 984 and GNR. 985 These regulations were developed for the preparation, evaluation, submission, processing and consideration of, and decision on, applications for EAs.
National Environment Management: Waste Act, 2008 (Act No. 59 of 2008) Follows the principle that waste generation be avoided, or if it cannot be avoided, that it is reduced, reused, recycled or recovered, and as a last resort treated and/or safely disposed of. The objects of this Act are- (a) to protect health, well-being and the environment by providing reasonable measures for- (i) minimising the consumption of natural resources; (ii) avoiding and minimising the generation of waste; (iii) reducing, re-using, recycling and recovering waste; (iv) treating and safely disposing of waste as a last resort; (v) preventing pollution and ecological degradation; (vi) securing ecologically sustainable development while promoting justifiable economic and social development; (vii) promoting and ensuring the effective delivery of waste services; (viii) remediate land where contamination presents, or may present, a significant risk of harm to health or the environment; and (ix) achieving integrated waste management reporting and planning; (b) to ensure that people are aware of the impact of waste on their health, well-being and the environment; (c) to provide for compliance with the measures set out in paragraph (a); and (d) generally, to give effect to Section 24 of the Constitution in order to secure an environment that is not harmful to health and well-being. The National Environmental Management Laws Amendment Bill, 2017, once promulgated, will reverse the inclusion of mine residues under NEMWA and return these to NEMA.
Waste Classification and Management Regulations The Waste Classification and Management Regulations require that all waste generators must ensure that the waste they generate is classified in accordance with SANS 10234 within 180 days of generation and if the waste is to be disposed of to landfill that the waste is assessed in accordance with the Norms and Standards for Assessment of Waste for Landfill Disposal (refer to Section 3-5 for details).
Regulations Regarding the Planning and Management of Residue Stockpiles and Residue Deposits (Government Gazette No. 39020, GNR. 632 of 24 July 2015) The regulations specify the requirements relating to residue stockpiles and residue deposits as follows: • Assessment of impacts and analysis of risks • Characterisation • Classification • Site selection • Design • Impact management • Monitoring and reporting • Dust management and control • Decommissioning, closure and post closure management

Legislation
When the National Environmental Management Laws Amendment Bill is promulgated, these will be deemed to have been promulgated in terms of NEMA.
The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) The Act seeks amongst other things, to manage and conserve biological diversity, to protect certain species and ecosystems, to ensure the sustainable use of biological resources and to promote the fair and equitable sharing of benefits arising from bioprospecting involving those resources. The NEMBA includes a Regulation related to the management of threatened and protected species. A similar Regulation is applied to Threatened Ecosystems. NEM:BA has a set of norms and standards for the development of management plans for both species (e.g. Threatened or Migratory Species) and ecosystems (Endangered or Critically Endangered).
Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) The MPRDA makes provision for equitable access to and sustainable development of South Africa's mineral resources. The MPRDA requires that the environmental management principles set out in NEMA shall apply to all mining operations and serves as a guideline for the interpretation, administration and implementation of the environmental requirements of NEMA.

In addition to the above, DWS has developed the National Water Resource Strategy (NWRS) to give effect to Section 5 of the NWA. The second edition of the NWRS (NWRS2, DWA 2013) is the primary mechanism to manage water across all sectors towards achieving national government's development objectives. The water sector vision for the NWRS2 is "sustainable, equitable and secure water for a better life and environment for all" and is aligned with the vision of South Africa 2030. Towards achieving this vision, the overall goal is: "Water is efficiently and effectively managed for equitable and sustainable growth and development". NWRS2 strives to achieve three main objectives (DWA, 2013):

- Water supports development and the elimination of poverty and inequality;
- Water contributes to the economy and job creation;
- Water is protected, used, developed, conserved, managed and controlled sustainably and equitably.

The core strategies of the NWRS2 (DWA, 2013) include the following:

- Implementation of Equity Policy;
- Putting water at the centre of integrated development planning and decision-making;
- Ensuring water for equitable growth and development;
- Contributing to a just and equitable South Africa;
- Prioritising and ensuring the implementation of water conservation and demand management;
- Optimising and stretching of our available water resources (groundwater, water reuse, desalination (including seawater), water systems optimisation and rainwater harvesting);
- Committing to the protection of our water resources and ecosystems;
- Achieving effective and smarter water governance;
- Embedding sustainable business principles and practices in water resources and systems management;
- Implementing a water sector investment framework for infrastructure, human resource capacity and institutions; and
- Engaging the private and water use sectors.

Strategic actions have been developed per sector for the key priority areas. Measures to give effect on the strategies and priority areas are discussed in SECTION 6: of this IWWMP.

3-1 SUMMARY OF ALL WATER USES

Table 3 highlights a list of IWULs issued to the Tharisa Mine indicating which IWULs are still applicable and enforceable and which have been superseded. This document aims to provide a summary of the water uses currently permitted at the mine.

Table 3: Tharisa Mine IWULs

Licence Number	Licence Description	Approved Date	Status
03/A21K/ABCGIJ/1468 16/2/7/A210/C497	Tharisa Mine WUL	16/07/2012	Superseded by 2020 IWUL – No longer applicable
03/A21K/ABCGIJ/1468 16/2/7/A210/C497	Tharisa Mine WUL Amendment	12/11/2020	Superseded by 2024 IWUL – No longer applicable
03/A21K/ABCGIJ/1468 27/2/2/A1021/37/1	Tharisa Mine WUL Amendment	17/09/2024	Applicable
03/A21K/ABCGIJ/1468 27/2/2/A1021/54/1	Tharisa Mine WUL TSF 3 WRD Extension	12/11/2024	Applicable

Summary of water uses associated with Tharisa are as included in the WUL No: 03/A21K/ABCGIJ/1468 that was issued in September 2024 and presented in Table 4 and on the Master Plan Map.

Table 4: Summary of water uses

Section 21 Water Uses	Water Uses
21 (a)	• Taking water from East Pit through dewatering • Taking water from West Pit through dewatering • Taking water from various boreholes surrounding the East Pit • Taking water from Boreholes (Direct Boreholes)
21 (b)	• Storage of water on a Raw Water Dam • Storage of water on an SLP dam • Storage of water on a Zink dam from boreholes
21 (c) & (i)	• Diverting stream around TSF complex • Altering the headwater of the non-perennial tributary of Sterkspruit by means of TSF • River crossing (culvert) over a tributary of Sterkstroom River • Altering the banks of the eastern tributary of the Sterkstroom • Altering the headwaters of non- perennial tributary of Sterkspruit • Altering the banks of the western tributary of the Sterkstroom • Altering the headwaters of the western stream 2
Section 21(f)	• Discharge of wastewater from Hernic Quarry
21 (g)	• Sewage drying beds • Storing of water on a Stormwater Dam • Disposing waste: Northeastern WRD • Disposing wastewater on a process water dam • Disposing water on an MCC dam • Disposing of tailings on a TSF (TSF2) • Depositing tailings on a TSF 1 • Depositing tailings on a TSF 2 • Overburden WRD (West) • Overburden WRD (East) • Backfilling with WRD (east pit) • Backfilling with WRD (west pit) • Disposal of sewage sludge • Disposing water containing waste on a Hernic quarry • Disposing water for dust suppression • Disposing wastewater for dust suppression • New TSF3 • Buffer Dam (Rail Loop) • WRD expansion near TSF 2 • East Above Ground (OG) WRD • West Above Ground (OG) WRD (FWWRD)
21 (j)	• East pit dewatering • West pit dewatering

3-2 EXISTING LAWFUL WATER USES

In terms of Section 32 of the NWA, an existing lawful water use is defined as follows: "Water use which has taken place at any time during a period of two years immediately before the date of commencement of the Act (01 October 1996 to 30 September 1998) and which was authorised by or under any law which was in force immediately before the date of commencement of this Act, or which has been declared an existing lawful water use in terms of Section 33 of the Act".

3-3 REGULATION GN 704

Regulation 704 (Government Gazette 20118, 04 June 1999), under the NWA stipulates conditions for managing water on a mine and was drawn up to address Section 26 (1) of the NWA in relation to mining activities. Section 26 provides for the development of regulations that:

- Require that the use of incoming and discharging water from a water resource be monitored, measured and recorded.
- Regulate or prohibit any activity in order to protect a water resource or in-stream or riparian habitat.
- Prescribe the outcome or effect that must be achieved through management practices for the treatment of waste, or any class of waste, before it is discharged or deposited into or allowed to enter a water resource.

Sub-section 4 of 26 provides for the Minister to take all relevant considerations into account when making regulations, including the need to:

- Promote the economic and sustainable use of water;
- Conserve and protect water resources or in-stream and riparian habitat;
- Prevent wasteful water use;
- Facilitate the management of water use and waterworks;
- Facilitate the monitoring of water use and water resources; and
- Facilitate the imposition.

Section 3 of GN 704 makes provision for the Minister to authorise, in writing, an exemption from the requirements of regulations 4, 5, 6, 7, 8, 10 or 11 on his or her own initiative or on the application, subject to such conditions as the Minister may determine.

In addition to the water uses that were originally applied for and approved, an application for exemption from certain Government Notice (GN 704) activities was also included. These formed part of the IWULs that were issued to Tharisa. The following activities were included in the exemption:

- West 1 WRD, access road and security fence; and
- Toe of the west pit – topsoil stockpile high wall.

It must be noted that one of the conditions of the issued IWUL states that the mine is prohibited from commencing with the backfilling without an exemption in terms of GN 704 4(C).

3-4 GENERALLY AUTHORISED WATER USES

In terms of Section 22(1) of the NWA, a person may use water without a licence if that water use is permissible in terms of a GA issued under Section 39 of the Act. There are currently no GAs applicable to Tharisa Mine activities and associated infrastructure in terms of the NWA.

3-5 WASTE MANAGEMENT ACTIVITIES (NEMA/NEMWA)

The NEMWA follows the principle that waste generation be avoided, or if it cannot be avoided, that it is reduced, reused, recycled or recovered, and as a last resort treated and/or safely disposed of. NEMWA previously excluded mine residues controlled under the MPRDA, but the NEMWA Amendment Act (NEMWAA) came into effect on 02 June 2014 (Act No 26 of 2014, Government Gazette 37714) and makes provision for inclusion of mine residue deposits and stockpiles under Schedule 3 (defined wastes) of NEMWAA. Although the Minister of the DMRE is the licensing authority for residue stockpiles and residue deposits, their management must be in accordance with the NEMWA Regulations as prescribed by the Minister of the Department of Forestry, Fisheries and the Environment (DFFE).

The lists of Waste Management Activities that may require licensing in terms of NEMWA were revised on 29 November 2013 (GN 921, Gazette No 37083) and on 02 May 2014 (GN 332, Government Gazette No. 37604). Schedule 3 of NEMWA implies that all mining residues are pre-classified as “hazardous” based on the definition unless classification under the Norms and Standards indicates otherwise. A revision was published for comment on the 14 November 2014 [General Notice (GN) 1006, Government Gazette 38210] to allow for the exclusion of some waste streams from the definition of waste. Such exclusions may apply to mine residues if it can be demonstrated to the satisfaction of the authorising authority that any contaminant of concern from waste reaching a receptor will not exceed the acceptable environmental limits for any contaminant of concern for such a receptor.

Draft regulations regarding the planning and management of residue stockpiles and residue deposits from a prospecting, mining, exploration or production operation, were published for comment on 14 November 2014 (GN 1005, Government Gazette 38209). The regulations deal with characterisation and classification of the residue; investigation and the selection of sites; design; assessment/prediction of impacts; analysis of risk relating to the management of residue stockpiles and deposits; duties of permit holders; monitoring and reporting; dust management; and decommissioning, closure and post-closure management.

The National Norms and Standards for waste include those in Government Gazette No. 36784, 23 August 2013, namely National Norms and Standards for Waste Classification and Management (GNR. 364), the National Norms and Standards for the Assessment of Waste for Landfill Disposal (GNR. 365) and the National Norms and Standards for Disposal of Waste to Landfill (GNR. 636) and Government Gazette No 37083, 29 November 2013 for Storage of Waste (GN 926).

The Norms and Standards for waste required wastes to be evaluated within 18 months to three years of the date at which the legislation was promulgated i.e., by August 2016.

Part 8 of Chapter 4 of the NEMWA came into effect on the 02 May 2014 (Government Gazette 37547, Proclamation No. 26). This section of the NEMWA pertains to the land contamination where “contaminated’’, in relation to Part 8 of Chapter 4, means the “presence in or under any land, site, buildings or structures of a substance or micro-organism above the concentration that is normally present in or under that land, which substance or micro-organism directly or indirectly affects or may affect the quality of soil or the environment adversely”. National Norms and Standards for the remediation of contaminated land and soil quality were promulgated on 02 May 2014 (GN331, Government Gazette 37603).

3-5.1 Waste Related Authorisations

As from September 2014, a Waste Management License (WML) is required in terms of the NEMWA for mineralised waste disposal facilities. For all authorised waste management facilities, Integrated Applications for Amendment of EAs and WMLs were submitted to the North West DMRE. It is therefore concluded that the approved waste management facilities have been issued with integrated authorisations.

3-5.2 Other Authorisations

Over the past 16 years since the mine began operating, significant changes, improvements and new facilities have been constructed to support the operation of the mine. Each change or amendment resulted in the need for environmental approval which was issued as a separate licence.

The following EAs/ WULs applicable to the Tharisa Mine are to be consolidated and amended as listed in Table 5 below.

Table 5: EAs and EMPrs Granted to Tharisa Mine

Approval	Reference	Licence Type	Approval Date
EIA and EMPr for a Proposed PGM Mine, Metago Project Number: T014-01, June 2008	DMRE Reference Number: NW30/5/1/2/3/2/1/358EM	MR	19 September 2008
	North West Department of Agriculture, Conservation and Environment (DACE[1]) Reference Number: NWP/EIA/159/2007	EA	23 October 2009
Amendment of the EA, 23 October 2009 to incorporate additional listed activities previously excluded: Transmission and distribution of above ground electricity (120KV or more)	DACE Reference Number: NWP/EIA/159/2007	EA and EMPr Amendment	30 August 2011
EIA and EMPr for changes to the pit, tailings dam and waste rock facilities; a chrome sand drying plant and other operational and surface infrastructure.	DEDECT Reference Number: NWP/EIA/50/2011	EA	29 April 2015
	DMRE Reference Number: NW30/5/1/2/3/2/1/358EM	EA and EMPr Amendment and WML	24 June 2015
EIA Report and EMPr Amendment 3: Inclusion of Portion 113 of the Farm K/Kraal 342 JQ and increase of waste rock quantities.	DMRE Reference Number: NW30/5/1/2/3/2/1/358	EA and EMPr Amendment and WML	01 September 2020
Amendment of an Environmental Authorisation for Increase Storage Capacity of Tailings Facility and WRD and increase the authorised Fuel Storage Capacity in respect of Farm Rooikopies JQ 297, Elandsdrift JQ 467 And K/Kraal JQ 342, within the Magisterial District of Bojanala, North West Province.	DMRE Reference Number: NW30/5/1/2/3/2/1/358EM	EA and EMPr Amendment and WML	03 August 2021
EA for the establishment of a mixed-use township development on portion 149 of the farm Rooikoppies 297.	NWP-EIA-60-2022 EA	EA	25 April 2023
Tharisa Additional Waste Rock Storage EIA and EMPr. • The expansion of the existing and approved Far West WRD 1 by a footprint of 109 ha. The expanded area will be referred to as the West Above Ground (OG) WRD. Portions of the West OG WRD will be located on backfilled areas of the West Pit; and • The establishment of a WRD (referred to as the East OG WRD) on backfilled portions of the East Pit. The proposed East OG WRD will cover an area of approximately 72 ha.	DMRE: NW 30/5/1/2/3/2/1/358EM	EA and EMPr Amendment and WML	31 May 2023
EA for TSF 3 WRD Extension 1.	DMRE: NW 30/5/1/2/3/2/1/358EM	EA and EMPr Amendment and WML	05 December 2024
TSF 3 Construction and Operation	DMRE: NW 30/5/1/2/3/2/1/358EM	EA and EMPr Amendment and WML	Signed 02 February 2025. Received on 04 March 2025.
Supporting Infrastructure			

[1] North West Department of Agriculture, Conservation and Environment (now known as the DEDECT).

Approval	Reference	Licence Type	Approval Date
EA for the diversion of an existing 275kV powerline and associated infrastructure.	Department of Environmental Affairs (DEA) Record of Decision (RoD) Reference Number: 14/12/16/3/3/3/408.	EA	15 November 2012
Amendment of an EA in respect of the upgrade of the existing Waste Water Treatment Plant (WWTP) in respect of the Farm Rooikoppies JQ 297, Elandsdrift JQ 467 and K/kraal JQ 342 JQ.	DMRE RoD Reference Number: NW30/5/1/2/3/2/1/358EM	Amendment of an EA	14 August 2020

Currently, Tharisa has applied to amend their current approved EMPr (DMRE Reference Number: NW30/5/1/2/3/2/1/358) for the Tharisa Mine as the current EMPr makes provision for the backfilling of the final mine voids as a closure option. However, Tharisa would like to amend this closure option in the approved EMPr to make provision to convert the final mine voids (East and West Pit) into pit lakes. To date, no response has been received from the DMRE.

In addition to the above approved licenses, further EA processes are in progress.

Table 6: Projects currently underway which have not yet been issued with approvals.

Approval	Reference	Licence Type	Progress
Raising of the walls of TSF 1 Expansion, TSF 2 and TSF 2 Extension at East Mine. The application process started in November 2023. MC has been appointed to lodge the application.	DMRE: NW 30/5/1/2/3/2/1/358EM	EA, EMPr Amendment, WML and WUL.	Final Basic Assessment Report (BAR) still to be submitted to DMRE for decision making. With respect to the WULA, Phase 1 documentation to be submitted on receipt of acknowledgment of receipt of the application by the DMRE.
Underground Expansion Project. MC has been appointed to lodge the application.	DMRE: NW30/5/1/1/3/2/1/00358 (SEC 00330 MR) EM	EA, EMPr Amendment, WML and WUL.	The Draft EIA and EMPr Report, and IWWMP are being subjected to a PPP. WULA Phase 1 documentation is being submitted.

SECTION 4: SPECIFIC BASELINE ENVIRONMENTAL ATTRIBUTES ASSOCIATED WITH THE SITE

4-1 CLIMATE

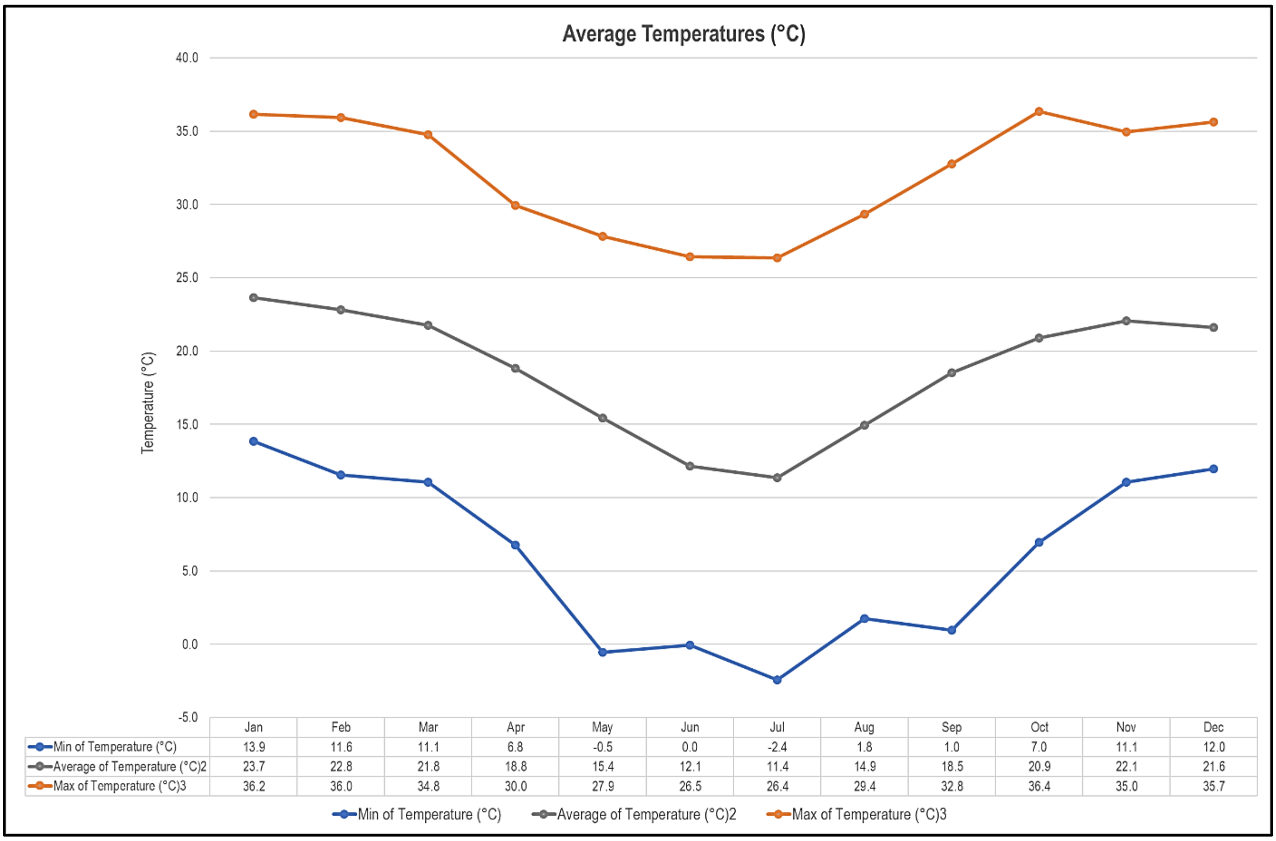
Climate data was assessed from various data sources, a DWS Station for Buffelspoort Dam (A2E005) for the period 31 March 1942 – 01 March 2024 and Water Research Commission (WRC) - WR2012 project data for station 0511855A for the periods 1925-1936 and 1966-2009 (WR2012), (WRC,2024). Tharisa Mine has a weather station on site, used for monitoring. From the data, the mean annual precipitation (MAP) of the study area was calculated in other studies to be 665 mm (ACS, 2024), which is lower than the DWS Station A2E005 MAP of 753mm.

4-1.1 Regional Climate

Tharisa Mine falls within the Highveld Climatic Zone (semi-tropical region), which is characterised by moderately warm temperatures, mild dry winters and hot summers.

4-1.2 Ambient Temperature

The area experiences hot temperatures during summer, with a maximum of 36.4°C for October. Winter temperatures are relatively low especially in May to July, with a minimum of -2.4°C in July. The monthly temperature pattern is provided in Figure 5.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Min of Temperature (°C)	13.9	11.6	11.1	6.8	-0.5	0.0	-2.4	1.8	1.0	7.0	11.1	12.0
Average of Temperature (°C)2	23.7	22.8	21.8	18.8	15.4	12.1	11.4	14.9	18.5	20.9	22.1	21.6
Max of Temperature (°C)3	36.2	36.0	34.8	30.0	27.9	26.5	26.4	29.4	32.8	36.4	35.0	35.7

Figure 5: Minimum, Average and Maximum Temperatures Over the Project Area [Weather Research and Forecasting (WRF) Data; 2019 to 2021]

4-1.3 Rainfall and Evaporation

Tharisa Mine typically receives the highest rainfall during the rainy season in December and January. From the data, the MAP of the study area was calculated in other studies to be 665 mm (ACS, 2024) which is lower than the DWS Station A2E005 MAP of 753mm. The average rainfall is presented in Table 7 below.

Table 7: Average Monthly Rainfall and Evaporation

Month	A2E005 Average Rainfall (mm)	0511855A Average Rainfall (mm)	A2E005 Average S pan Evaporation (mm)
Jan	138.6	136.6	193.8
Feb	108.1	92.8	164.3
March	98.1	90.5	156.5
Apr	56.1	41.5	122.3
May	19	14.1	104.9
Jun	9	4.5	85.7
July	4.8	3.5	95.4
August	5.9	6.1	126
Sept	18.6	17.9	166.5
Oct	63.4	54.4	193.6
Nov	102.2	86.0	189.9
Dec	129.2	105.6	199.6
Total	753.0	653.6	1798.5

Precipitation is important to air pollution studies since it represents an effective removal mechanism for atmospheric pollutants and inhibits dust generation potentials. Monthly rainfall for the project site (based on WRF data for 2019 – 2021) is given in Figure 6. Months wherein the most rain occurred stretched from October to April (Airshed Planning Professionals, 2025).

Relatively high levels of evaporation occur because of the elevated solar radiation levels experienced. The maximum evaporation rate occurs in December, with a mean rate of more than 7mm per day. Evaporation is greater than rainfall for all months of the year resulting in a marked moisture deficit in the region (GCS, 2022).

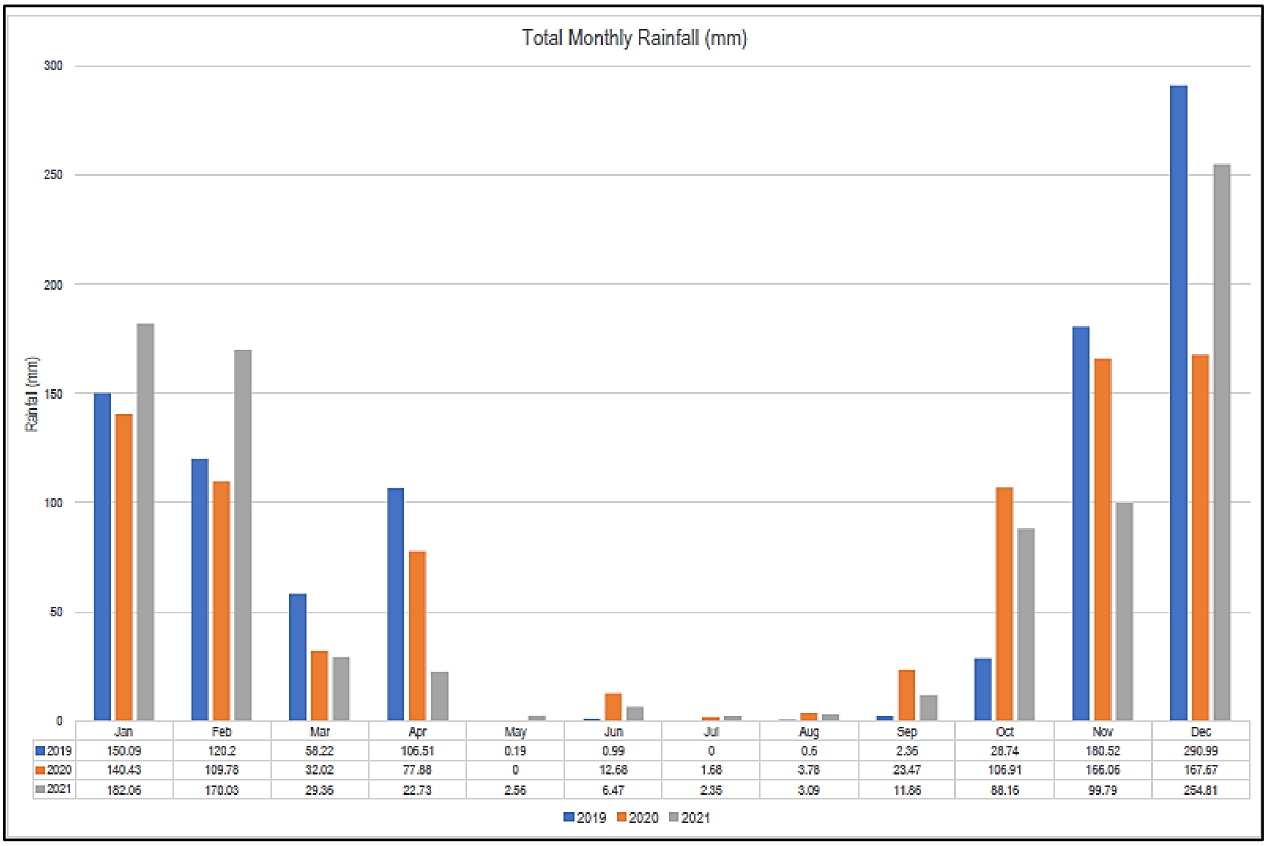


Figure 6: Monthly Precipitation over the Project Area (WRF Data; 2019 to 2021)

4-1.4 Surface Wind Field

The wind field determines both the distance of downward transport and the rate of dilution of pollutants. The generation of mechanical turbulence is a function of the wind speed, in combination with the surface roughness. The wind field for the study area is described with the use of wind roses. Wind roses comprise 16 spokes, which represent the directions from which winds blew during a specific period. The colours used in the wind roses below, reflect the different categories of wind speeds; the yellow area, for example, representing winds in between 4 and 5 m/s. The dotted circles provide information regarding the frequency of occurrence of wind speed and direction categories. Calm conditions are periods when the wind speed was below 1 m/s. These low values can be due to “meteorological” calm conditions when there is no air movement; or, when there may be wind, but it is below the anemometer starting threshold.

The period wind field and diurnal variability in the wind field are shown in Figure 7. The average wind field is mainly from the eastern half of the wind grid with calm conditions 3.17% of the time. The daytime wind field is mainly from the north, ranging between north-west to north-east with 2.47% calm conditions. During the night, the wind field shifts to the south and south-southwest with less frequent winds from the south-westerly to north-westerly sector. The frequency of night-time calm conditions increases to 3.85%.

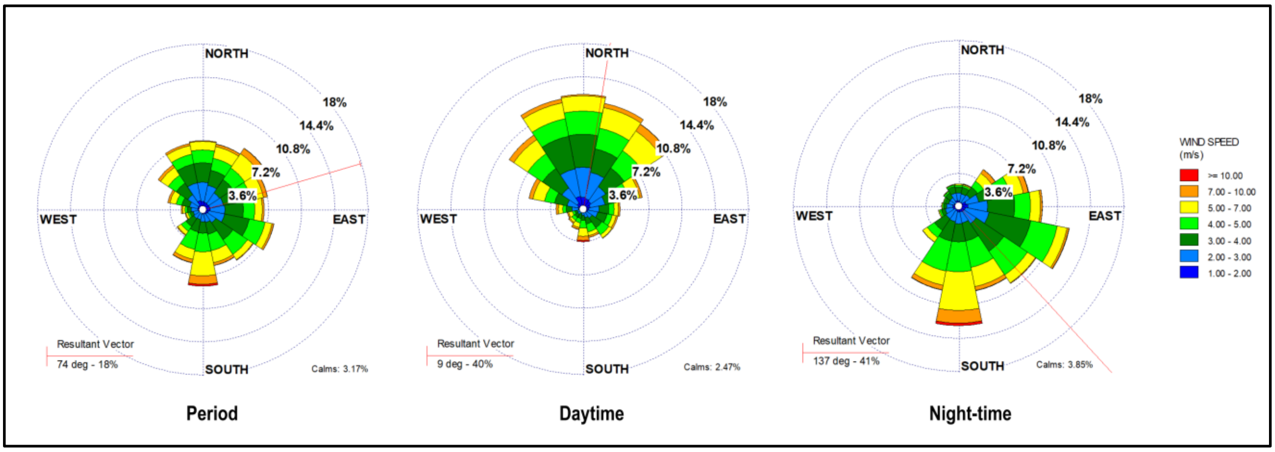


Figure 7: Period, day- and night-time wind roses (WRF data; 2019 to 2021)

A distinct seasonal variation in the wind field in visible from Figure 8. During summer, the wind field is varied between most directions with more frequent winds from the north-eastern sector. The wind field shifts to south during autumn, with more frequent southerly winds during winter. During spring, the northerly winds increase with frequent north to north-east winds.

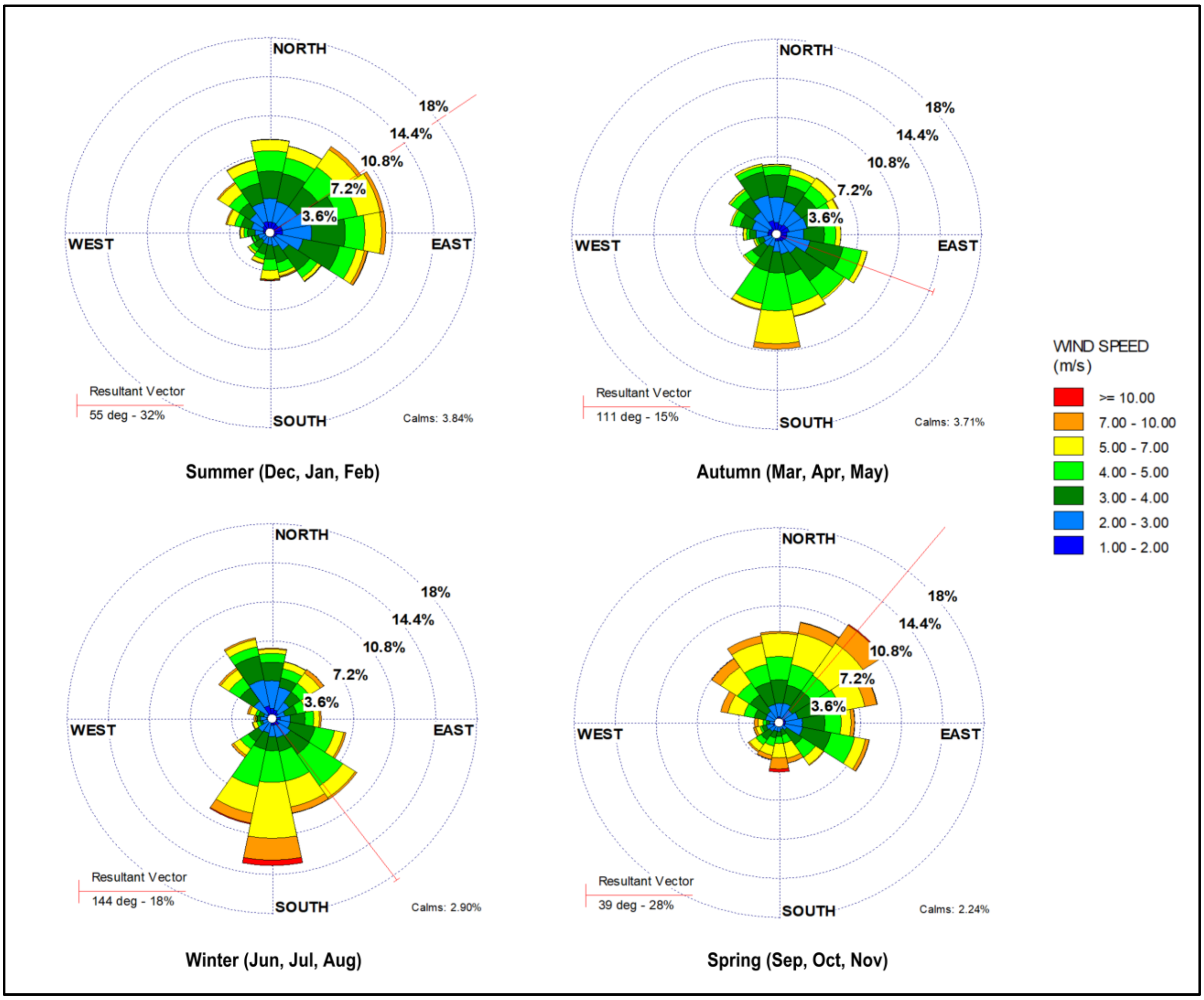


Figure 8: Seasonal wind roses (WRF data; 2019 to 2021)

According to the Beaufort wind force scale (https://www.metoffice.gov.uk/guide/weather/marine/beaufort-scale), wind speeds between 6-8 m/s equates to a moderate breeze, with wind speeds between 14-17 m/s near gale force winds. Based on the three years of WRF data, wind speeds exceeding 7 m/s occurred for only 3.3% of the time, with a maximum wind speed of 16.1 m/s. The average wind speed over the three years is 3.2 m/s with calm conditions (wind speeds < 1 m/s) occurring for 7.6% of the time (Figure 9). According to the US EPA, the likelihood exists for wind erosion to occur from open and exposed surfaces with loose fine material when the wind speed exceeds at least 5.4 m/s (US EPA, 2006). Wind speeds exceeding 5.4 m/s occurred for 8% over the three years (2019 -2021).

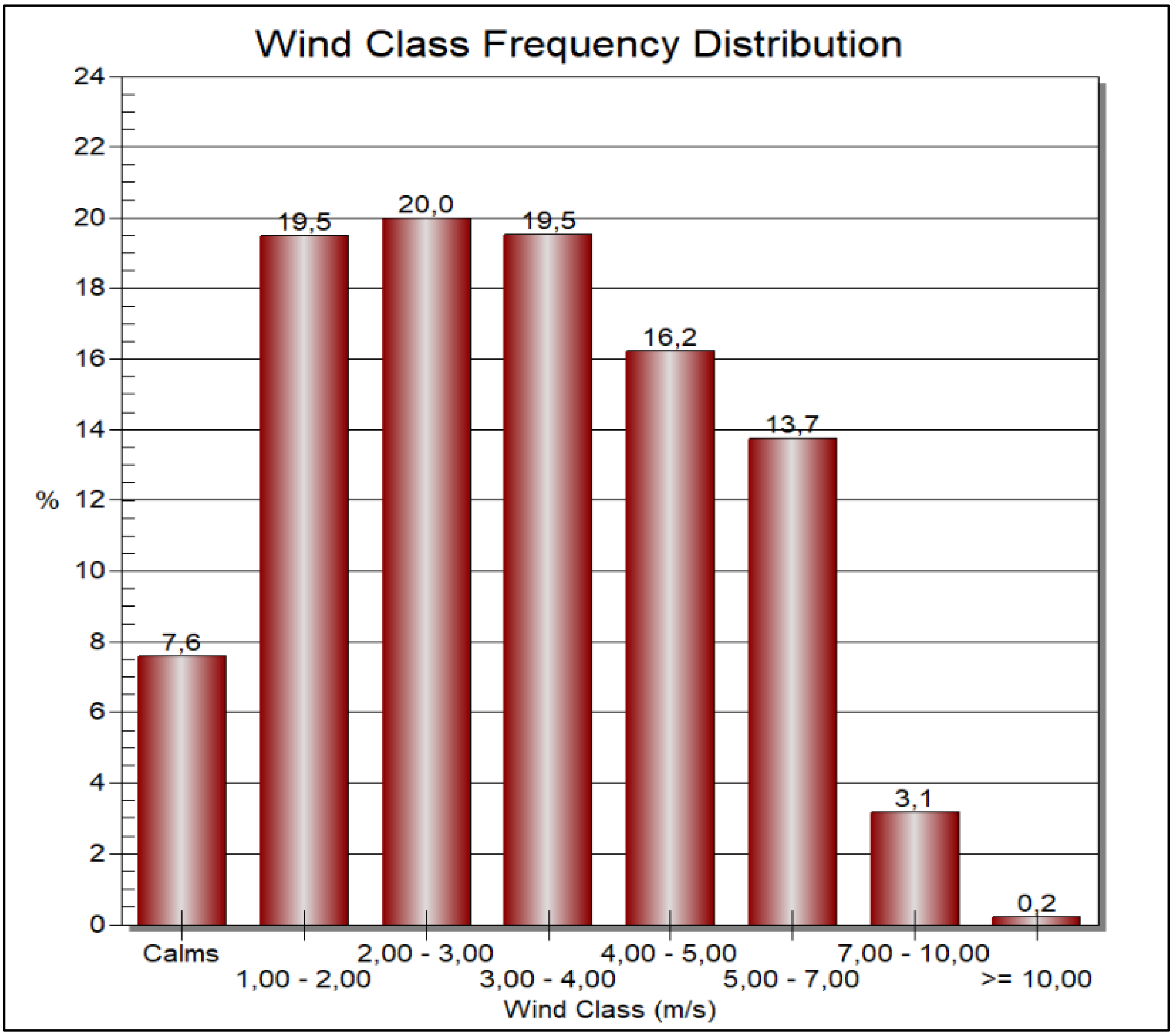


Figure 9: Wind speed categories (WRF data; 2019 to 2021)

4-1.5 Extreme Weather Conditions

Rainfall conditions are highly variable, and droughts and floods do occur.

4-1.6 Atmospheric Stability and Mixing Depth

The atmospheric boundary layer constitutes the first few hundred metres of the atmosphere. This layer is directly affected by the earth's surface, either through the retardation of flow due to the frictional drag of the earth's surface, or as result of the heat and moisture exchanges that take place at the surface. During the daytime, the atmospheric boundary layer is characterised by thermal turbulence due to the heating of the earth's surface and the extension of the mixing layer to the lowest elevated inversion. The radiative flux divergence during the night usually results in the establishment of ground-based inversions and the erosion of the mixing layer. The night times are characterised by weak vertical mixing and the predominance of a stable layer. These conditions are normally associated with low wind speeds, hence less dilution potential.

The mixed layer ranges in depth from a few metres (i.e. stable or neutral layers) during night times, to the base of the lowest-level elevated inversion during unstable, daytime conditions. Elevated inversions may occur for a variety of reasons and on some occasions as many as five may occur in the first 1000 m above the surface.

Atmospheric stability is frequently categorised into one of six stability classes – these are briefly described in Table 8. The most commonly occurring stability class calculated the site is Class C and F, representing Unstable and Very Stable conditions respectively. For elevated releases (e.g. from the plant stack), the highest Ground Level Concentration (GLCs) would occur during unstable, daytime conditions. For low level releases, such as vehicle and materials handling activities, the highest GLCs would occur during weak wind speeds and stable (night-time) atmospheric conditions. Windblown dust is likely to occur under high winds (neutral conditions).

Table 8: Atmospheric stability classes

Designation	Stability Class	Atmospheric Condition
A	Very unstable	calm wind, clear skies, hot daytime conditions
B	Moderately unstable	clear skies, daytime conditions
C	Unstable	moderate wind, slightly overcast daytime conditions
D	Neutral	high winds or cloudy days and nights
E	Stable	moderate wind, slightly overcast night-time conditions

4-2 TOPOGRAPHY, VEGETATION AND LANDUSE

4-2.1 Topography

Tharisa Mine is situated on slightly undulating plains and located to the east and west of the perennial Sterkstroom River. Small sections of original vegetation remain intact on the site, although most of the site represents old, cultivated land. The major land uses of the project area as classified by the Environmental Potential Atlas of South Africa (2000) are mining and vacant/unspecified land (AGES, 2023b).

Approximately 15 km to the south of the project area lies the Magaliesberg Mountain range. Peaks in this part of the Magaliesberg rise to approximately 1 700 meters above mean sea level (mamsl). The area is approximately 1 200 mamsl. However, the natural topography surrounding the project area is modified by the mining activities of Tharisa Mine and other miners through open pits, WRDs and tailings facilities.

4-2.2 Regional Vegetation

Tharisa Mine is situated within the Savanna biome which is the largest biome in Southern Africa. The Savanna Biome is characterised by a grassy ground layer and a distinct upper layer of woody plants (trees and shrubs).

The most recent classification of the area by Mucina and Rutherford (2006) shows that the mine is classified as Marikana Thornveld. The Marikana Thornveld vegetation type is considered Endangered. While the national conservation target for this vegetation type is 19%, less than 1% is statutorily conserved. This vegetation type has been transformed (48%), mainly by cultivation and urban or built-up areas. Most agricultural development of this area is in the western regions towards Rustenburg, while in the east industrial development is a greater threat. Alien invasive plants are localised in high densities, especially along drainage lines, in this vegetation type.

The Marikana Thornveld vegetation type is characterised by open Vachellia karroo woodland, valleys and slightly undulating plains and some lowland hills. Shrubs are denser along drainage lines, on termitaria and rocky outcrops or in other habitats protected from fire.

4-2.3 Land Use

Tharisa's operations, land use in the area was a mixture of farming, residential, mining, small business, and general community activities. Similar land uses still take place adjacent to the mine infrastructure and activity areas (Metago, 2008; SLR, 2014).

Mining activities occur to the North and immediate West and East of Tharisa Mine. Amongst the mining activities is open land mostly owned by mining companies and the community of Marikana (GLYA, 2023). Immediately West of the mining area, in the MR footprint, is the Lapologang community.

The predominant land cover types in the area are listed below:

- Mine: Extraction Pits and Quarries;
- Mine: Surface Infrastructure;
- Mine: Tailings and Resource Dumps; and
- Commercial Annual Crops rainfed/dryland.

As a result of this, the area may be described as significantly transformed by mining.

4-3 GEOLOGY

The Bushveld Igneous Complex (BIC), a massive intrusive body, has undergone erosion and tilting, and now emerges along the apparent boundary of a large basin measuring nearly 350km across. The BIC is comprised of eastern and western lobes, with a northern and far western extension. Additionally, a buried limb, known as the Bethal Limb, exists based on borehole intersections. All five limbs were formed approximately 2,000 million years ago. The eastern and western limbs exhibit striking similarities. This extensive complex originated when vast amounts of molten rock (magma) from the Earth's mantle ascended to the surface through vertical cracks and conduits in the crust. Upon reaching the surface, it differentiated, cooled, and solidified, resulting in a vast layered igneous body with a predominance of Chromite, thus forming the rare rock type known as Chromitite.

Chromite deposits in the BIC are found as stratified layers of massive chromitite. These significant chromitite layers are located in the lower section of the BIC known as the Critical Zone. They are categorised into three groups based on their proximity to each other (Figure 10). The Lower Group (LG) consists of seven chromitite layers, the MG has four main chromitite layers, and the UG contains two chromitite layers (some sources also mention a third layer - UG3). The naming convention assigns ascending numbers to the layers within each group, starting from the bottom layer (e.g., LG1, LG2, and so on, up to UG2 at the top). This naming convention reflects the concept that the lowermost layers are considered the oldest.

The Merensky Reef, situated at some distance above the UG2 chromitite layer, is the uppermost layer of economic interest in the Critical Zone. However, the Merensky Reef is mainly composed of Pyroxenite with only a few thin chromite stringers near its base.

The individual chromitite layers can vary in width from a few centimeters to over 2 meters in localised areas, but they generally range around 1 meter in thickness, seldom exceeding 2 meters. As a general trend, the average chrome content and Cr/Fe ratio of the layers decrease as the sequence progresses upward, while the PGMs content increases. The chromitite layers in the MG exhibit intermediate concentrations of both chrome and Platinum Group Elements (PGE) mineralisation, but there is a general decrease in grain size from the lowermost to the uppermost layers.

Traditionally, chrome production primarily focused on exploiting the layers of the Lower Group, while PGE production typically targeted the uppermost Merensky Reef and the underlying UG2 Chromitite layer from the Upper Group. From an economic perspective, the chrome and PGE concentrations in the MG Chromitite layers are considered marginal on an individual basis.

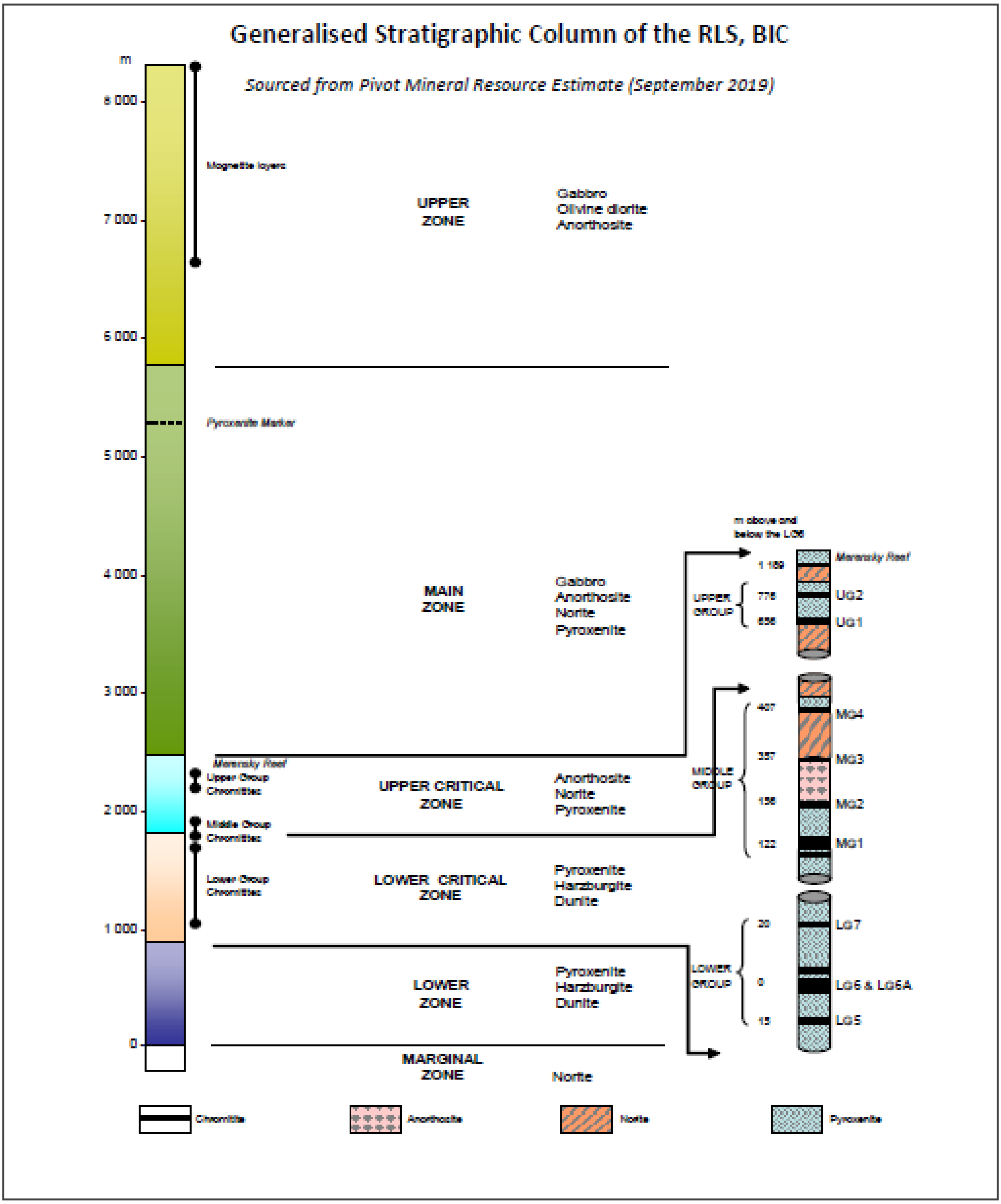


Figure 10: Stratigraphy of the Regional Geology

4-3.1 Local Geology

The open cast operations of Tharisa are located on Farm K/Kraal 342JQ where chromitite layers of the MG and UG1 (for which Tharisa holds the MRs) is outcropping on the property. The MR for these layers extends northward underground onto Rooikoppies 297JQ. Both properties are situated in the Marikana Section of the southwestern limb of the Bushveld Complex. The Marikana Section is separated from the Brits Section by Wolhuterskop in the east, and from the Rustenburg Section by the Spruitfontein “upfold” in the west. Tharisa Mine property is positioned on the western side of the Marikana Section, with its westernmost area falling within the Rustenburg Section.

The MG package has four main groups of chromitite layers hosted in anorthosite, norite and feldspathic pyroxenite. These chromitite layers are important as they contain significant concentrations of chromite and PGMs. Of the four main chromite layers (seams), the MG1 has the highest chrome content. It is common for the MG1 to be divided into more than one band. Shearing in the MG1 is also common but the location varies.

The MG2s have three subdivisions, with the MG2A, MG2B and MG2C identifiable from the base upwards. MG2A and MG2B usually occur as one layer but are distinguishable by their definite analytical signature. Of the three subdivisions, MG2C contains the highest content of PGMs followed slightly by MG2A. MG2B has a much lower content in comparison. The MG2s are hosted in a felspathic pyroxenite but directly underlay the anorthositic marker. The anorthositic marker is a prominent anorthosite and often a norite separating the MG2s and the overlying MG3.

Chrome stringers are sometimes present within the marker and can be high in PGM content. The MG3 appears as a banded layer of chrome stringers and bands within norite and anorthosite. The MG4s are subdivided into the MG4(0) at the base, MG4 and MG4A at the top (refer to Figure 11).

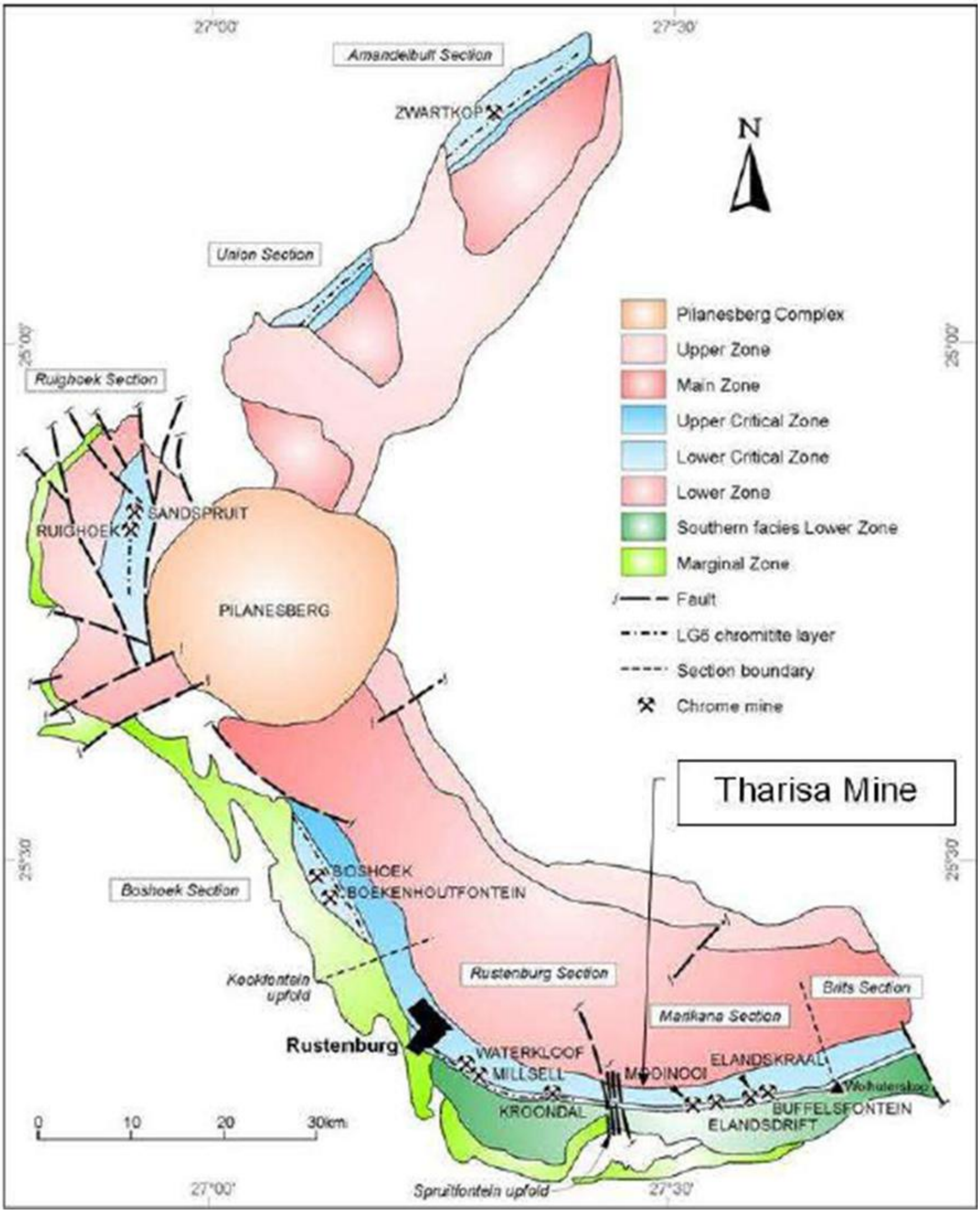


Figure 11: Map of the western BIC showing the location of the Tharisa Mine

4-4 SURFACE WATER

4-4.1 Water Management Area

Tharisa is located near Marikana in the Quaternary sub-catchment A21K. The mine falls within the Lower Crocodile Secondary and Crocodile River catchment and within Limpopo Water Management Area which was formerly the Crocodile West Marico WMA3 (Figure 12). The Crocodile River is a major tributary of the

Limpopo River (Drainage Region A) which discharges into the Indian Ocean (Mozambique). The Pienaars, Apies, Moretele, Jukskie, Hennops, Magalies and Elands rivers are all major tributaries of the Crocodile River which make up the A20 tertiary hydrological catchment with its 39 quaternary catchments.

4-4.2 Surface Water Hydrology

The information below was extracted from a recent Hydrological Assessment Study for Tharisa that was undertaken by CM Eclectic (Pty) Ltd (2025). The study was undertaken as part of the WULA for the proposed Underground expansion project at East and West mines.

The following watercourses are located within the vicinity of the mine:

- Sterkstroom River – Sterkstroom River – a perennial watercourse which flows from the Buffelspoort Dam, south of the N4, in a northerly direction through the centre of the project area. Flows within the Sterkstroom River are dependent on releases from the Buffelspoort Dam. This river originates in the headwaters of the A21K quaternary catchment, within the Magaliesberg Mountain range, and then flows through the Buffelspoort Dam (approximately 5.8 km upstream) and then traverses the mine between East and West mining pits.
- On the eastern section of the Mine, are the unnamed tributaries of the Maretlwane – two non-perennial watercourses which originate in the vicinity of the eastern pit, and flow to the north then north-east to a confluence with the Maretlwane;
- On the western side of the Mine property are, Unnamed tributaries of the Brakspruit – two non-perennial watercourses which originate in the north-west of the mine, and flow to the north to separate confluences with the Brakspruit;
- Eastern unnamed tributaries of the Maretlwane – two non-perennial watercourses which originate to the north of TSF 2, and flow to the north then north-east to a confluence with the Maretlwane tributaries; and
- Several non-perennial tributaries which originate just south of the mine and flow north, have been interrupted by the mine and have been authorised for diversion of these headwaters, to the tributaries of the Brakspruit on the west of Sterkstroom River, and to the Elandsdrifspruit on the east of Sterkstroom River through the far eastern part of the mine.

Figure 12: Water Management Area of Tharisa

4-5 WETLANDS

Wetland delineations were determined using a combination of accepted methodologies from the DWS ‘A practical field procedure for identification and delineation of wetlands and riparian areas’ (DWAF, 2005) and the “Updated manual for identification and delineation of wetlands and riparian areas” (DWAF, 2008). The wetland delineations approach also includes consideration of the Corps of Engineers Wetlands Delineation Manual (U.S. Army Corps of Engineers, 2010).

Based on the NFEPA database the following information with regards to the Tharisa mining area is noted (as cited in SAS, 2013):

- The Upper Crocodile Sub-Management Area is not regarded as important in terms of:
  - Fish sanctuaries, rehabilitation or corridors; and
  - Translocation and relocation zones for fish.
- The Sterkstroom River is the major drainage line in the mining area and is a Class C (moderately modified) system; and
- No NFEPA-defined wetlands in the mining area are considered to be important in terms of biodiversity conservation.

SAS identified wetlands within the project area during the 2013 and 2014 studies. These have been grouped as follows (SAS, 2013):

- North-western wetlands (Wetlands 1 and 2);
- North-eastern wetlands (Wetlands 3 to 5);
- South-eastern wetlands (Wetlands 6 and 7);
- South-western wetland (Wetland 10) and artificial wetland (Wetland 9); and
- Sterkstroom River (Wetland 8).

The artificial wetland in the south-west is believed to have been formed due to earthworks and increased runoff from the tarred roads to the south, which led to localised changes in hydrology such as ponding, which supports wetland vegetation (SAS, 2013).

During the 2013 SAS survey, it was noted that the valley seep wetland (Wetland 3) just north of the west open Pit has been impacted by waste rock disposal. The wetland features are described in Table 9.

Table 9: Wetland Features Identified in the Project Area (Manyabe, 2024)

<table>
<tr><th colspan="5">North West Group</th></tr>
<tr><td>Wetland 1 (West Open Pit Area)</td><td>Unchannelled Valley Bottom</td><td rowspan="2">1.1 (moderately low)</td><td>Category C</td><td rowspan="2">Category C (Ecologically important and sensitive on provincial or local scale)</td></tr>
<tr><td>Wetland 2 (West Open Pit Area)</td><td>Channelled Valley Bottom</td><td>Category C/D</td></tr>
<tr><th colspan="5">North East Group</th></tr>
<tr><td>Wetland 3 (East WRD Area)</td><td colspan="4">This wetland has been affected by waste rock disposal.</td></tr>
<tr><td>Wetland 4 (Northeast WRD Area)</td><td>Unchannelled Valley Bottom</td><td>1.2 (moderately low)</td><td>Category C</td><td rowspan="2">Category C (Ecologically important and sensitive on provincial or local scale)</td></tr>
<tr><td>Wetland 5 (Northeast WRD Area)</td><td>Channelled Valley Bottom</td><td>1.1 (moderately low)</td><td>Category B</td></tr>
<tr><th colspan="5">South Eastern Group</th></tr>
<tr><td>Wetland 6 (TSF2 Area)</td><td rowspan="2">Channelled Valley Bottom</td><td rowspan="2">1.1 (moderately low)</td><td rowspan="2">Category C</td><td rowspan="2">Category C (Ecologically important and sensitive on provincial or local scale)</td></tr>
<tr><td>Wetland 7 (TSF2 Area)</td></tr>
<tr><th colspan="5">Sterkstroom River Wetland</th></tr>
</table>

North West Group				
Wetland (Sterkstroom 8 River)	Channel (River)	2.0 (moderately high)	Category C	Category C (Ecologically important and sensitive on provincial or local scale)
South Western Wetland Group				
Wetland 9 (Artificial Wetland)	Unchannelled Valley Bottom	Not Determined	Not Determined	Category C (Ecologically important and sensitive on provincial or local scale)
Wetland 10	Channelled Valley Bottom	Not Determined	Category C (based on vegetation assessment)	

**Category B – Largely unmodified.*
**Category C – Moderately modified.*
**Category D – Largely modified.*
**Ecoservices and function ranking ranges from 0.5 (low) to 3 (high)*

4-6 SURFACE WATER QUALITY

Surface water quality monitoring is conducted monthly in accordance with the amended IWUL:2024 requirements as indicated in the water quality monitoring reports submitted to DWS. Aquatico Scientific (Pty) Ltd (Aquatico) has been appointed to undertake monthly surface water motoring within the project area.

The existing water quality monitoring locations are provided in Table 10 and Figure 13. A comprehensive report discussing surface quality is compiled biannually. The data is compared to the applicable water quality limits presented in Table 11, which includes the quality limits and monitoring frequency as included in Table 6 of IWUL 2024.

Table 10: Surface water quality monitoring points

Sample point	Description	Coordinates	
		Latitude	Longitude
Sterkstroom Localities			
TM SW01	Upstream on the Sterkstroom	S25.75711	E27.48329
TM SW02	Downstream on the Sterkstroom	S25.72562	E27.48292
TM SW03	Middle Stream	S25.73562	E27.48600
TM SW16	Elandsdrift Upsteam	S25.73722	E27.54661
Elandsdrift Monitoring Localities			
TM SW17	Elandsdrift Downstream	S25.73069	E27.54706
TM SW07	Old Hernic Quarry	S25.73660	E27.48786
Process			
TM SW08	STP	S25.73878	E27.49435
TM SW10	MCC Dam	S25.73950	E27.50306
TM SW11	TSF Dissipator	S25.73963	E27.50480
TM SW12	Raw Water	S25.74643	E27.50217
TM SW13	Storm Water Dam	S25.73836	E27.49333
TM SW14	Process Water Dam	S25.74096	E27.49308
TM SW15	SLP Dam	S25.74722	E27.50250

Table 11: Water Quality Limits (IWUL:2024)

Constituents	Water quality limits	Units	Monitoring frequency
pH	6.5-8.5	pH units	Monthly
Electrical conductivity	70-150	mS/m	Monthly
Dissolved oxygen	5	mg/l	Monthly
Na	70	mg/l	Monthly
Ca	20	mg/l	Monthly
Mg	15	mg/l	Monthly
Cl	57	mg/l	Monthly
SO_4	70	mg/l	Monthly

Constituents	Water quality limits	Units	Monitoring frequency
F	0.75	mg/l	Monthly
NO_3	15	mg/l	Monthly
Al	5	ug/l	Monthly

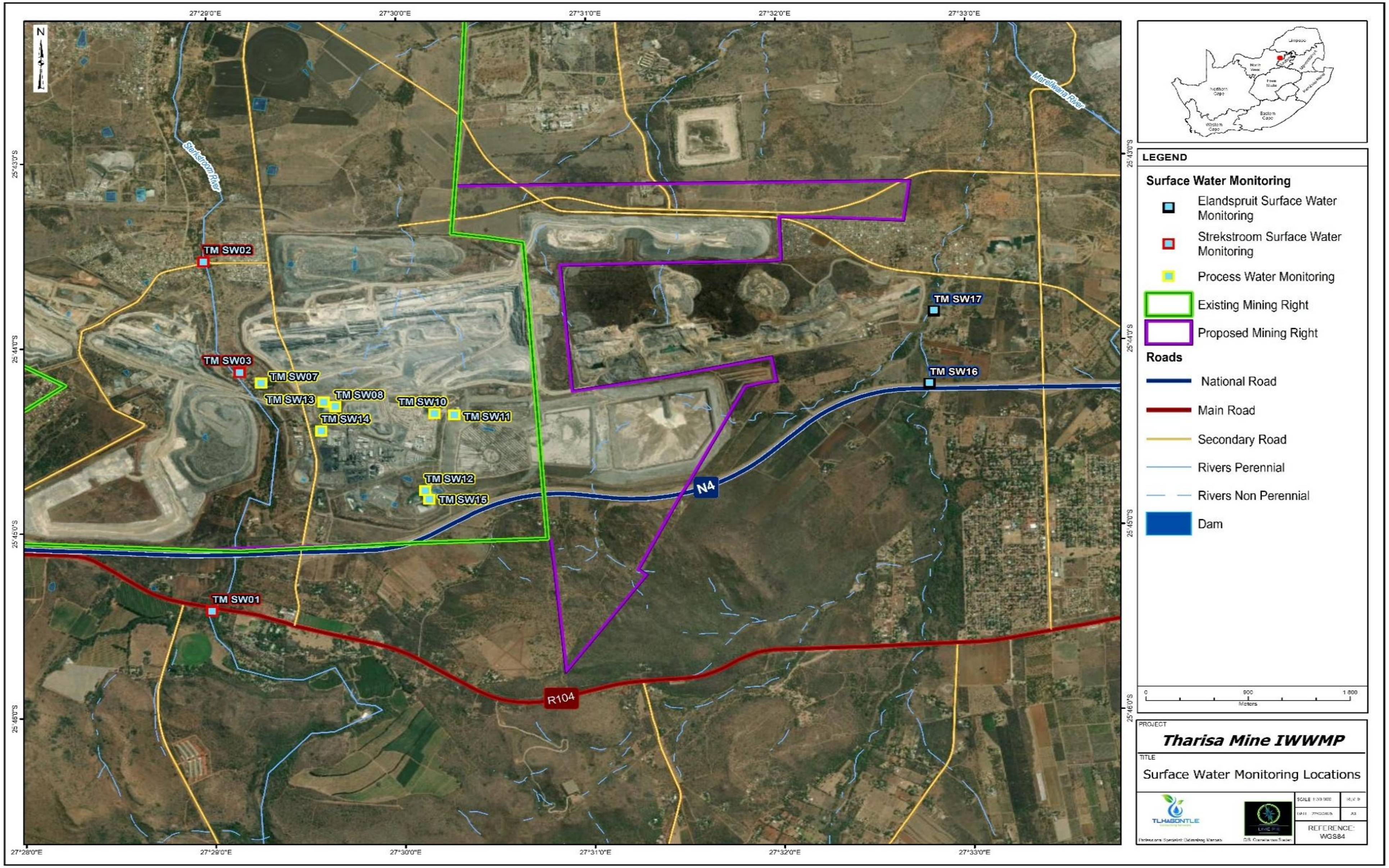


Figure 13: Surface water monitoring points

Information below is extracted from the "Biannual Surface Water Quality Assessment Report" for January to June 2024 and July to December 2024 respectively. Both reports were compiled by Aquatico.

- For the biannual period January 2024 to June 2024:
  - The water quality of the analysed samples was compared to the amended IWUL 2020 and the General Limit Guideline. The amended IWUL 2020 limits were exceeded in terms of the EC, Ca, Mg, Na, Cl, NO_3, SO_4 and Al.
  - The Dissolved Oxygen (DO) recorded in the water localities is considered to be low. Unpolluted surface water measures DO concentration within the range of 9 – 12 mg/l. There are a couple of factors that can cause a reduction of DO in water which include river floods and dredging activities, the presence of oxidisable organic matter (either from natural origin or from waste discharge) and the amount of suspended material in the water (DWAF, 1996 Vol. 7). Low DO can harm aquatic life and affect water quality.
  - The average concentration of Atrazine fully complied with the IWUL 2020 limits at all the sampled localities.
  - The majority (except at localities TM SW01 and TM SW017) of the surface water localities show nitrate concentrations exceeding the IWUL 2020 Limit. High nitrate levels are regularly associated with mining operations as nitrate is a major component of most explosives used in the mining sector and remnants of the nitrate find their way into process water sources and natural resources such as groundwater.
  - The water quality was compared to the GA Limit (2013) which was exceeded in terms of the Electrical Conductivity (EC) (TM SW10 and TM SW14) and NO_3 at some of the surface water localities (TM SW07, TM SW08, TM SW10, TM SW11, TM SW12, TM SW13 and TM SW14). Hence water from these localities is not permitted to be discharged into the environment.
- For the biannual period from July 2024 to December 2024:
  - The water quality of the analysed samples was compared to the amended IWUL 2024 and the General Limit Guideline. The amended IWUL 2024 limits were exceeded in terms of the EC, Ca, Mg, Na, Cl, K, NO_3, SO_4 and Al.
  - The DO recorded in the water localities is considered to be low. Unpolluted surface water measures DO concentration within the range of 9 – 12 mg/l. There are a couple of factors that can cause a reduction of DO in water which include river floods and dredging activities, the presence of oxidisable organic matter (either from natural origin or from waste discharge) and the amount of suspended material in the water (DWAF, 1996 Vol. 7). Low DO can harm aquatic life and affect water quality.
  - The average concentration of Atrazine fully complied with the IWUL 2024 limits at all the sampled localities.
  - The majority (except at localities TM SW01, TM SW02, TM SW03 and TM SW015) of the surface water localities show nitrate concentrations exceeding the IWUL 2024 Limit. High nitrate levels are regularly associated with mining operations as nitrate is a major component of most explosives used in the mining sector and remnants of the nitrate find their way into process water sources and natural resources such as groundwater.
  - The water quality was compared to the GA Limit (2013) which was exceeded in terms of the NO_3 at some of the surface water localities (except for TM SW15). Hence water from these localities is not permitted to be discharged into the environment.

4-7 MEAN ANNUAL RUNOFF

According to WR2012, the quaternary catchment A21K has a catchment area of 865 km^2 and an estimated mean annual runoff (MAR) of 23.73 Mm^3/year. Figure 14 shows the seasonal distribution of the runoff in quaternary catchment A21K.

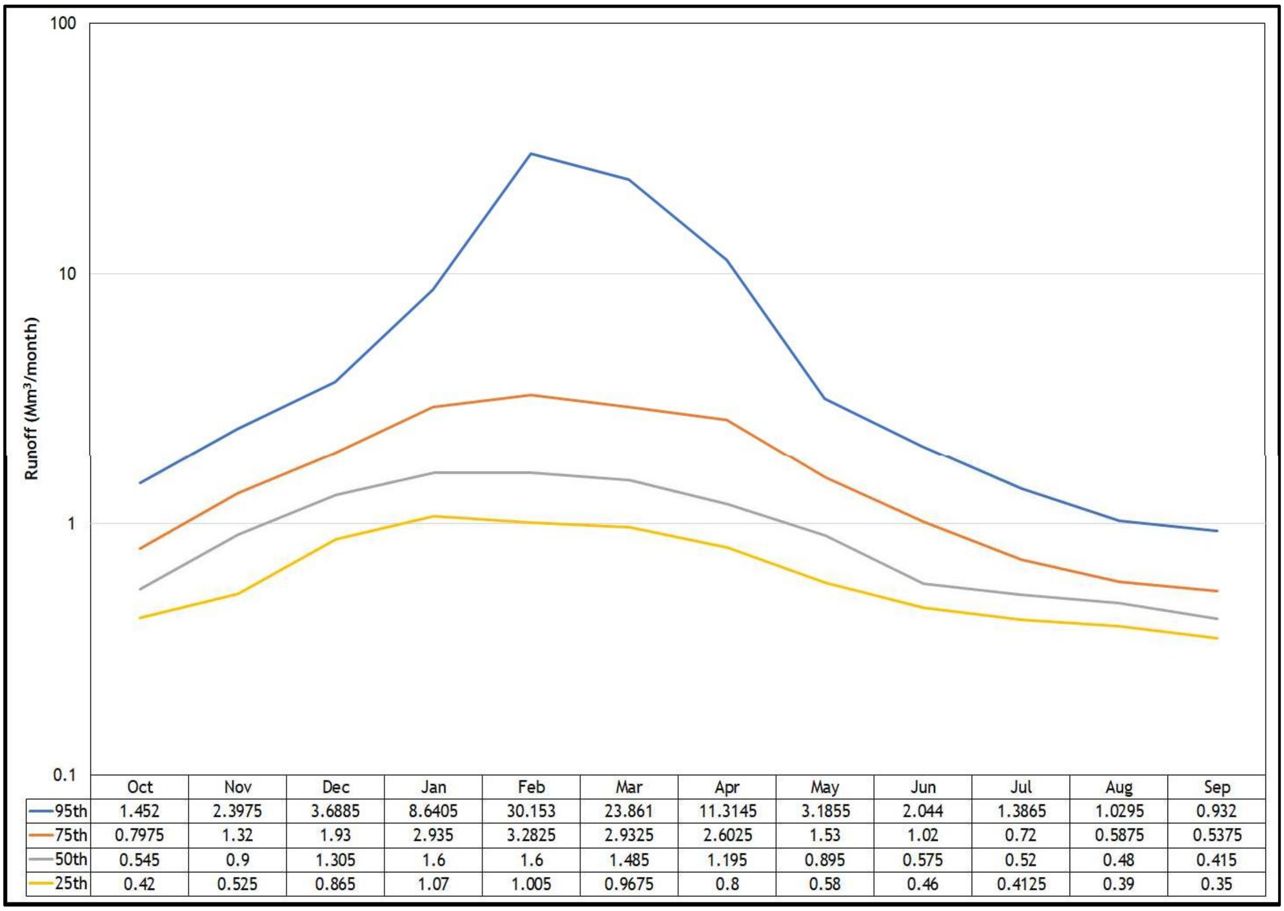


Figure 14: Seasonal distribution of the mean monthly runoff for quaternary A21K

4-8 RESOURCE CLASS AND RIVER HEALTH RECEIVING WATER QUALITY OBJECTIVES AND RESERVE

The Chief Directorate: Resource Directed Measures (CD: RDM) of DWS has identified the need to undertake the classification of significant water resources (rivers, wetlands, groundwater and lakes) in accordance with the Water Resource Classification System (WRCS) (DWA, 2012).

The management classes and the ecological categories are defined below (DWA, 2013):

- Class I (Minimally used): Water resource is one which is minimally used, and the overall ecological condition of that water resource is minimally altered from its predevelopment condition (the ecological category is a Class A/B);
- Class II (Moderately used): Water resource is one which is moderately used, and the overall ecological condition of that water resource is moderately altered from its predevelopment condition (the ecological category is a Class C); and
- Class III (Heavily used): Water resource is one which is heavily used, and the overall ecological condition of that water resource is significantly altered from its predevelopment condition (the ecological category is Class D).

In terms of Government Gazette No 42775 of 22 February 2019, the DWS has published the classes of water resources and resource quality objectives (RQOs) – flow and quality - for the Mokolo, Matlabas, Crocodile (West) and Marico catchments for the delineated Integrated Units of Analysis (IUA). The RQOs and resource classes for the quaternary catchment where Tharisa is located are presented in Table 12. The classification and RQOs include the ecological water requirements (EWR), present ecological state (PES), ecological importance and sensitivity (EIS), recommended ecological category (REC) and quality limits for certain parameters (nitrate, sulphate and phosphate).

Table 12: Proposed management classes for the Sterkstroom area (A21K)

Catchment/water resource	RQO		
Flow	Natural MAR x 10^6 m^3	EWR as % N MAR	Monthly maintenance flow range over dry and wet season
A21K: Crocodile River	14.0	28.21	184.5x106m^3
Classification	**EIS**	**PES**	**REC**
A21K: Crocodile River	Moderate to High	C	C
Quality	**PO_4 mg/l as P**	**NO_3 mg/l as N**	**SO_4 mg/l as S**
A21K: Crocodile River	≤ 0.010mg/l	≤0.5mg/l	≤70mg/l

4-9 BIOMONITORING AND TOXICITY TESTING

4-9.1 Biomonitoring

Biomonitoring was undertaken by Clean Stream Biological Services (Pty) Ltd (Clean Stream). The biomonitoring survey was undertaken twice during the 2024 operational year. The first survey was undertaken in April 2024 (wet season survey) and the second survey was undertaken in October 2024 (dry season survey). Location of the sampling sites are presented in Table 13 and Figure 15. Tharisa has diligently maintained a biannual biomonitoring program since its design and inception during August 2013.

Table 13: Biomonitoring testing points

Sample point	Description	South	East
		Latitude	Longitude
TM-SW01	Upstream on the Sterkstroom	25.7566	27.4834
TM-SW03	Middle Stream	25.7370	27.4871
TM-SW02	Downstream on the Sterkstroom	25.7257	27.4830
TM-SW16	Elandsdrift Upsteam	25.73722	27.5466
TM-SW17	Elandsdrift Downstream	25.7307	27.5471

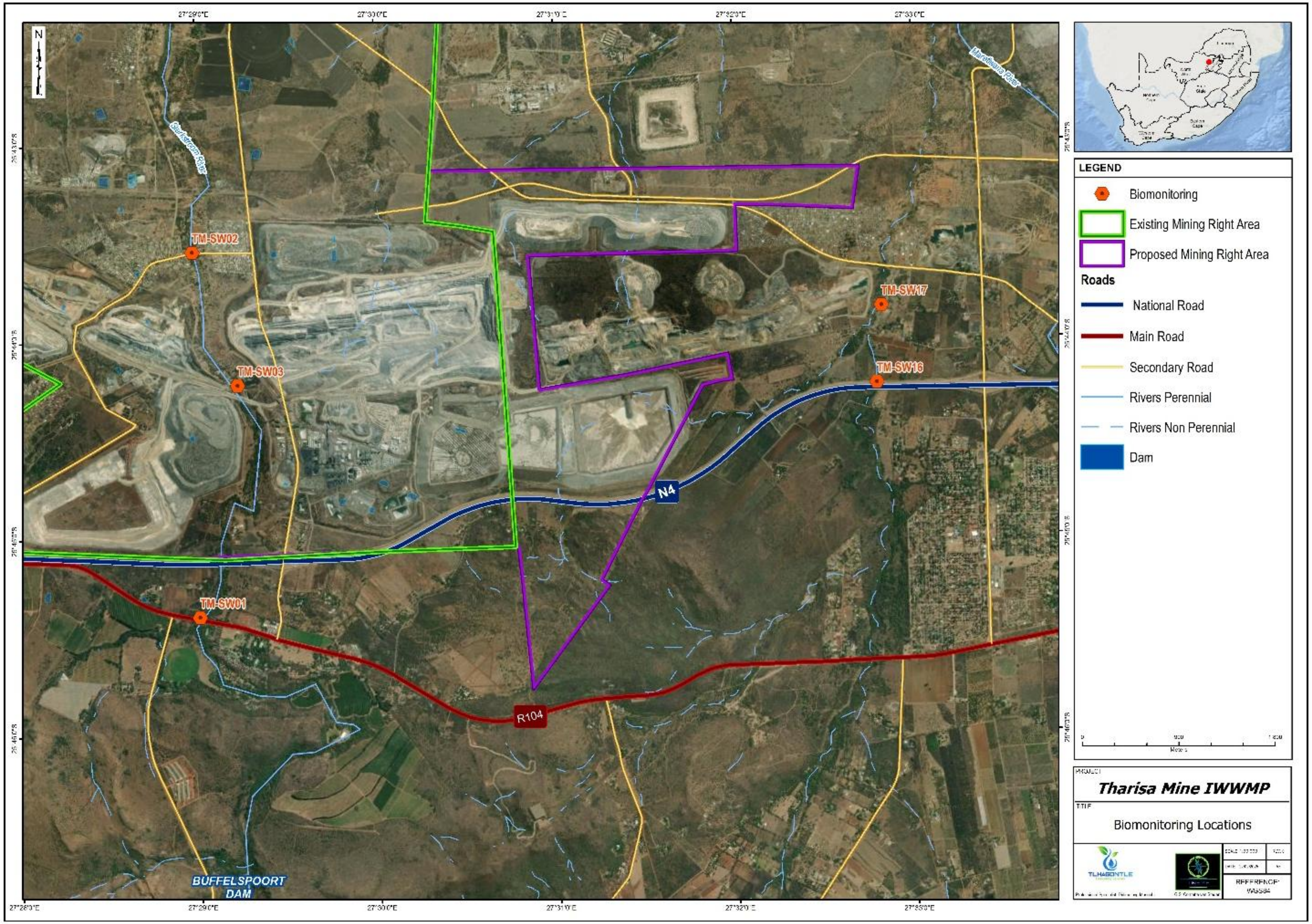


Figure 15: Biomonitoring testing points

The following is the summary of the findings from the March 2024 survey:

a) In situ water quality measurements (2024)

- Sterkstroom:

The April 2024 survey saw a pronounced increase in EC from the upstream site, TM-SW01 (8.3 mS/m), to the downstream site, TM-SW02 (44.1 mS/m), in the Sterkstroom indicating water quality deterioration. Temporal data confirm that most previous surveys have similarly shown a spatial increase in salinity. Additionally, the EC measured at site TM-SW02 in April 2024 was the highest EC recorded at this site since September 2017. Temporal data show a decreasing (improving) trend in EC for site TM-SW01, while a slightly increasing (deteriorating) trend is displayed for site TM-SW02. Temporal data also show that salinity (EC) almost always increases towards site TM-SW02. These findings suggest that impacts along this reach (from mining and/or other activities) are impacting on the salinity of the Sterkstroom and that a pathway for water pollution has been established. Tharisa' environmental staff are urged to take steps to ensure that Tharisa mining activities are not contributing to the scenario and to implement remedial action if needed.

The DO level measured above the lower guideline level (>5mg/l) at site TMSW01 and TM-SW02 in April 2024 and was not limited to aquatic biota. The pH measured within the target range for fish health (6.5-9.0) at site TM-SW01 and TM-SW-02 and was not limited to aquatic biota.

- Elandsdriftspruit:

Sites TM-SW16 and TM-SW17, respectively located in the Elandsdriftspruit upstream and downstream of potential impacts from the Tharisa Mine mining area, are included in the biomonitoring surveys as of April 2023 to assess potential impacts from Tharisa Mine on this stream.

Site TM-SW17 is presently severely impacted by deep excavation (of unknown reason) and was unsuitable for sampling in April 2024, thus precluding assessment of potential impacts from Tharisa Mine. Furthermore, in November 2023, dry conditions precluded sampling of the Elandsdriftspruit sites. Brief reference is again made to the findings of the April 2023 survey (report TM-A-23).

Salinity measured 49.7 mS/m at site TM-SW16 in April 2024, reflecting a notable increase in salinity at this site compared to April 2023 (17.6 mS/m), however this deterioration is unrelated to Tharisa Mine, given the site's upstream location. The DO level measured above the median guideline and the pH fell within the target range at site TM-SW16 in April 2024, as in April 2023.

Based on the April 2023 survey (report TM-A-23): In April 2023, the salinity remained fairly stable from site TM-SW16 (17.6 mS/m) to site TM-SW17 (18.5 mS/m), the pH values (although somewhat high) measured within the target range for fish health at both sites, and the DO level measured above the minimum guideline level. These findings suggest no deterioration in the water quality of the Elandsdriftspruit after flowing past the Tharisa Mine mining area.

b) SASS5 protocol (macroinvertebrates):

- Sterkstroom:

The total South African Scoring System (SASS) 5 score and, to a lesser extent, Average Score Per Taxon (ASPT) decreased from site TM-SW01 (77 and 4.5) to site TM-SW02 (51 and 4.3) based on the April 2024 findings. Habitat (total biotope availability and suitability) was similar at these sites, suggesting that water quality deterioration played a role in the deterioration in biotic integrity. In-situ water quality measurements supported the SASS5 findings, showing a notable increase in salinity (EC) from site TM-SW01 to TM-SW02. Only site TM-SW01 was included for testing during the latest toxicity testing survey, precluding spatial comparisons. The April 2024 findings therefore showed that biotic integrity decreased from site TM-SW01 to

TM-SW02, with water quality possibly underlying this decrease, and activities along this reach (Tharisa Mine and/or others) thus appeared to be impacting on the Sterkstroom. Environmental staff should take steps to rule out or identify and remedy any possible contributions from mining activities.

In contrast to the findings of the present survey, biotic integrity remained fairly stable in November 2023, however the SASS5 findings of April 2023, August 2022, and several previous surveys have also shown a downstream deterioration in macroinvertebrate-based biotic integrity. Surface flow often ceases at the downstream site, while higher water levels and better surface flow are usually observed for the upstream site. This observed flow effect probably played a role in the low scores achieved at the downstream site during some surveys. Nonetheless, possible impacts of Tharisa Mine on this reach of the Sterkstroom cannot be disregarded. The limitations of applying SASS in seasonal streams must also be considered when interpreting these findings. Reference should be made to the water quality monitoring programme to identify and mitigate potential water quality variables of concern originating from Tharisa Mine. Toxicity testing should also be maintained at all possible source waters at Tharisa Mine (Pollution Control Facilities, effluents etc.).

The temporal database remains limited at this stage and trends will become increasingly accurate with continued monitoring. Early indications tend to suggest generally lower biotic conditions at the downstream site, which is likely related to the low to zero-flow scenario often observed at this site. Biotic conditions at the upstream site (TM-SW01) followed an overall slight but steady improving trend for most of the study period to date, however lower ASPT values were obtained during the two latest surveys and further monitoring is required to verify if this is the start of a changing trend. Conditions at the downstream site reflected a decreasing (deteriorating) trend from 2013 to 2019, thereafter, an increasing (improving) trend became apparent, pointing to recent temporal improvement in biotic integrity. However, the lower ASPT value recorded for this site in April 2024 indicates that close monitoring remains warranted.

- Elandsdriftspruit:

As explained before, only TM-SW16 (upstream site) could be sampled in April 2024 as deep excavation at site TM-SW17 (downstream site) rendered this site unsuitable for sampling. Assessment of potential impacts from Tharisa Mine on the Elandsdriftspruit was therefore not possible. Dry conditions prevented sampling of both Elandsdriftspruit sites in November 2023. Brief reference is again made to the April 2023 survey (report TM-A-23), when sampling was indeed possible.

The total SASS5 score and ASPT at site TM-SW16 were lower in April 2024 (49 and 3.8) than in April 2023 (67 and 4.8), pointing to a temporal decrease in biotic integrity at the upstream Elandsdriftspruit site. In-situ water quality supported this finding, reflecting a notable increase in salinity over this period. Toxicity testing of March 2024 and March 2023 samples from this site reflected no toxicity hazard (Class I), however these results provide only snapshots of the conditions prevailing at the time of sampling and does not allude to hazards before or after sampling.

Brief reference is again made to the April 2023 survey: The total SASS5 score reflected stability, while the ASPT pointed to slight improvement in biotic integrity from site TM-SW16 (67 & 4.8) to site TM-SW17 (70 & 5.8), based on the April 2023 survey. Water quality improvement may be underlying the slight improvement in ASPT, however toxicity testing placed both sites in Class I (no hazard) and in-situ water quality measurements did not reveal notable differences. The SASS5 findings, therefore, did not reflect impacts on the macroinvertebrate-based biotic integrity of this reach of the Elandsdriftspruit related to Tharisa Mine or other users.

The Elandsdriftspruit sites, TM-SW16 and TM-SW17, have only been included in the biomonitoring programme since March 2023, and inclusion of temporal trend analysis is not yet possible for these sites.

c) FAII (fish):

Fish sampling is only performed in the Sterkstroom and is not considered suitable for application in the Elandsdriftspruit.

Fish sampling is conducted once per annum and was performed during the survey. Fish-based biotic integrity (April 2023/April 2024 surveys) showed downstream improvement in the Sterkstroom, in contrast to the spatial deterioration noted for macroinvertebrates. The previous fish assessment (based on the April2022/April 2023) survey also showed downstream improvement. However, the low fish diversity generally present in this reach renders the fishbased index (FAII) of lowered confidence. The presence of exotic predator species (recorded during previous surveys) and low-flow conditions are considered to be limiting factors.

Temporal trends in FAII scores are included as of April 2024. It must be noted that trends are still of limited confidence and continued population of the temporal database is required. Additionally, the flow limitations in this reach lowers confidence in FAII findings, as does the generally low diversity of indigenous fish species recorded during surveys.

Early indications are that the FAII score generally improved from the upstream site (TM-SW01) to the downstream site (TM-SW02) in the Sterkstroom. A slight improving trend in FAII score is displayed for site TM-SW02 while a stable to marginally declining trend is displayed for site TMSW01. These early findings suggest that activities between these sites (Tharisa Mine and/or others) have not impacted on the fish assemblages of the Sterkstroom. The FAII trends are in contrast to the trends of the SASS5 protocol, which generally reflects downstream deterioration.

The following is the summary of the findings from the October 2024 survey:

a) In-situ water quality measurements:

- <u>Sterkstroom:</u>

As of November 2023, temporal trends in the salinity (EC) of the Sterkstroom sites are included. Linear trends were fitted to data collected between September 2017 and October 2024 to better examine changes in the salinity of the Sterkstroom over time.

Site TM-SW02 (downstream site) was dry during the October 2024 survey, precluding sampling and spatial comparisons with the upstream site (TM-SW01). Brief reference is therefore also made to the April 2024 survey when spatial comparisons were possible.

The October 2024 survey recorded an EC of 21.2 mS/m for site TM-SW01, reflecting an increase in EC since the April 2024 survey when the EC measured 8.3 mS/m at this site, and constituting water quality deterioration. Low water levels associated with the dry season likely contributed to the increase.

In April 2024, the EC increased notably from site TM-SW01 (8.3 mS/m) to TM-SW02 (44.1 mS/m), reflecting water quality deterioration. Additionally, the EC measured at site TM-SW02 in April 2024 was the highest EC recorded at this site since September 2017. Temporal data show a decreasing (improving) trend in EC for site TM-SW01, while a slightly increasing (deteriorating) trend is displayed for site TM-SW02. Temporal data also show that salinity (EC) almost always increases towards site TM-SW02. These findings indicate that impacts along this reach (from mining and/or other activities) are impacting on the salinity of the Sterkstroom and that a pathway for water pollution has been established. Tharisa environmental staff are urged to take steps to ensure that Tharisa mining activities are not contributing to the scenario and to implement remedial action if needed.

The DO level measured marginally below the lower guideline level (>5mg/l) at site TM-SW01 in October 2024 (4.9 mg/l) but is likely attributable to decreased physical aeration associated with low surface flow. The DO level measured above the guideline level at both site TM-SW01 and TM-SW02 in April 2024 and was not limited to aquatic biota. The pH measured within the target range for fish health (6.5-9.0) at site TM-SW01 in October 2023 and at both sites in April 2024 and was not limited to aquatic biota.

- Elandsdriftspruit:

Sites TM-SW16 and TM-SW17, respectively located in the Elandsdriftspruit upstream and downstream of potential impacts from the Tharisa Mine mining area, are included in the biomonitoring surveys as of April 2023 to assess potential impacts from Tharisa Mine on this stream.

Dry conditions precluded sampling of site TM-SW16 in October 2024, but the site was sampled in April 2024. Site TM-SW17 is severely impacted by deep excavation (suspected illegal mining) and dumping and was unsuitable for sampling in April 2024 and October 2024, thus precluding assessment of potential impacts from Tharisa Mine. Furthermore, in November 2023, dry conditions precluded sampling of the Elandsdriftspruit sites. Brief reference is again made to the findings of the April 2023 survey (report TM-A-23). Although unrelated to Tharisa Mine, the suspected illegal mining as well as dumping of animal carcasses should be reported to the relevant authorities.

Salinity measured 49.7 mS/m at site TM-SW16 in April 2024, reflecting a notable increase in salinity at this site compared to April 2023 (17.6 mS/m), however this deterioration is unrelated to Tharisa Mine, given the site's upstream location. The DO level measured above the median guideline and the pH fell within the target range at site TM-SW16 in April 2024, as in April 2023.

Based on the April 2023 survey (report TM-A-23): In April 2023, the salinity remained fairly stable from site TM-SW16 (17.6 mS/m) to site TM-SW17 (18.5 mS/m), the pH values (although somewhat high) measured within the target range for fish health at both sites, and the DO level measured above the minimum guideline level. These findings suggest no deterioration in the water quality of the Elandsdriftspruit after flowing past the Tharisa Mine mining area.

b) SASS5 protocol (macroinvertebrates)

- Sterkstroom:

At the time of the October 2024 survey, site TM-SW02 was dry and therefore sampling and spatial comparison with the upstream site was not possible for this survey. Brief reference is therefore also made to the previous survey (April 2024), when spatial comparisons were indeed possible.

In contrast to what is expected based on seasonal differences, the total SASS5 score was higher and the ASPT similar (to marginally lower) at site TM-SW01 in October 2024 (103 and 4.4) than in April 2024 (77 and 4.5). Changes in the biotic integrity of site TM-SW01 are, however, unrelated to Tharisa Mine activities, given the upstream location of this site.

In April 2024, the total SASS5 score and, to a lesser extent, ASPT decreased from site TMSW01 (77 and 4.5) to site TM-SW02 (51 and 4.3). Habitat (total biotope availability and suitability) was similar at these sites, suggesting that water quality deterioration played a role in the deterioration in biotic integrity. In-situ water quality measurements supported the SASS5 findings, showing a notable increase in salinity (EC) from site TM-SW01 to TM-SW02. Only site TM-SW01 was included for testing, precluding spatial comparisons.

The April 2024 findings therefore showed that biotic integrity decreased from site TM-SW01 to TM-SW02, with water quality possibly underlying this decrease, and activities along this reach (Tharisa Mine and/or others) thus appeared to be impacting on the Sterkstroom. Environmental staff should take steps to rule out or identify and remedy any possible contributions from mining activities.

Several previous surveys have also shown a downstream deterioration in macroinvertebrate based biotic integrity. Surface flow often ceases at the downstream site, while higher water levels and better surface flow are usually observed for the upstream site. This observed flow effect probably played a role in the low scores achieved at the downstream site during some surveys. Nonetheless, possible impacts of Tharisa Mine on this reach of the Sterkstroom cannot be disregarded. The limitations of applying SASS in seasonal streams must also be considered when interpreting these findings. Reference should be made to the water quality monitoring programme to identify and mitigate potential water quality variables of concern originating from Tharisa Mine. Toxicity testing should also be maintained at all possible source waters at Tharisa Mine (Pollution Control Facilities, effluents etc.).

The temporal database remains limited at this stage and trends will become increasingly accurate with continued monitoring. Early indications tend to suggest generally lower biotic conditions at the downstream site, which is likely related to the low to zero-flow scenario often observed at this site. Biotic conditions at the upstream site (TM-SW01) followed an overall slight but steady improving trend for most of the study period to date, however lower ASPT values were obtained during the recent surveys, and further monitoring is required to verify if this is the start of a changing trend. Conditions at the downstream site reflected a decreasing (deteriorating) trend from 2013 to 2019, thereafter, an increasing (improving) trend became apparent, pointing to recent temporal improvement in biotic integrity. However, the lower ASPT value recorded for this site in April 2024 indicates that close monitoring remains warranted.

- Elandsdriftspruit:

For reasons stipulated above (dry conditions and excavation), sampling has been limited in the Elandsdriftspruit to date and neither site could be sampled in October 2024 (site TM-SW16 sampled in April 2024). Spatial comparisons were last possible in April 2023, and brief reference is therefore also made to that survey.

The total SASS5 score and ASPT at site TM-SW16 were lower in April 2024 (49 and 3.8) than in April 2023 (67 and 4.8), pointing to a temporal decrease in biotic integrity at the upstream Elandsdriftspruit site. In-situ water quality supported this finding, reflecting a notable increase in salinity over this period. Toxicity testing of March 2024 and March 2023 samples from this site reflected no toxicity hazard (Class I), however these results provide only snapshots of the conditions prevailing at the time of sampling and does not allude to hazards before or after sampling.

Brief reference is again made to the April 2023 survey: The total SASS5 score reflected stability, while the ASPT pointed to slight improvement in biotic integrity from site TM-SW16 (67 & 4.8) to site TM-SW17 (70 & 5.8), based on the April 2023 survey. Water quality improvement may be underlying the slight improvement in ASPT, however toxicity testing placed both sites in Class I (no hazard) and in-situ water quality measurements did not reveal notable differences. The SASS5 findings, therefore, did not reflect impacts on the macroinvertebrate-based biotic integrity of this reach of the Elandsdriftspruit related to Tharisa Mine or other users. o Water toxicity testing and SASS5 sampling are likely to continue to be limited by dry conditions (non-perennial stream) which are further exacerbated by excavation in the Elandsdriftspruit, and addition of sediment toxicity testing is strongly recommended for all stream sites.

The Elandsdriftspruit sites, TM-SW16 and TM-SW17, have only been included in the biomonitoring programme since March 2023, and inclusion of temporal trend analysis is not yet possible for these sites.

c) FAII (fish):

Fish sampling is only performed in the Sterkstroom and is not considered suitable for application in the Elandsdriftspruit.

Fish sampling is conducted once per annum and was performed during the previous survey with the findings represented here being an excerpt from that report (TM-A-24). Fish-based biotic integrity (April 2023/April 2024 surveys) showed downstream improvement in the Sterkstroom, in contrast to the spatial deterioration noted for macroinvertebrates. The previous fish assessment (based on the April2022/April 2023) survey also showed downstream improvement. However, the low fish diversity generally present in this reach renders the fish-based index (FAII) of lowered confidence. The presence of exotic predator species (recorded during previous surveys) and low-flow conditions are considered to be limiting factors.

Temporal trends in FAII scores are included as of April 2024. It must be noted that trends are still of limited confidence and continued population of the temporal database is required. Additionally, the flow limitations in this reach lowers confidence in FAII findings, as does the generally low diversity of indigenous fish species recorded during surveys.

Early indications are that the FAII score generally improved from the upstream site (TM-SW01) to the downstream site (TM-SW02) in the Sterkstroom. A slight improving trend in FAII score is displayed for site TM-SW02 while a stable to marginally declining trend is displayed for site TMSW01. These early findings suggest that activities between these sites (Tharisa Mine and/or others) have not impacted on the fish assemblages of the Sterkstroom. The FAII trends contrast with the trends of the SASS5 protocol, which generally reflects downstream deterioration.

4-9.2 Toxicity testing

Toxicity testing was undertaken by BioTox Lab on behalf of Aquatico. Samples were analysed as received from Aquatico. The toxicity testing survey was undertaken twice during the 2024 operational year. The first survey was undertaken in March 2024 and the second survey was undertaken in September 2024.

Location of the toxicity sampling sites are presented in Table 14 and Figure 16. This section is updated with information obtained from the March and September 2024 surveys.

Table 14: Toxicity testing points

Sample point	Description	Coordinates	
		Latitude	Longitude
TM SW01	Upstream on the Sterkstroom	S25.7566	E27.4834
TM SW07	STP	S25.73660	E27.48786
TM SW08	MCC Dam	S25.73878	E27.49435
TM SW10	TSF Dissipator	S25.73950	E27.50306
TM SW11	Raw Water	S25.73963	E27.50480
TM SW12	Storm Water Dam	S25.74643	E27.50217
TM SW13	Process Water Dam	S25.73836	E27.49333
TM SW14	SLP Dam	S25.74096	E27.49308
TM SW15	STP	S25.74722	E27.50250
TM SW16	MCC Dam	S25.7307	E27.5471

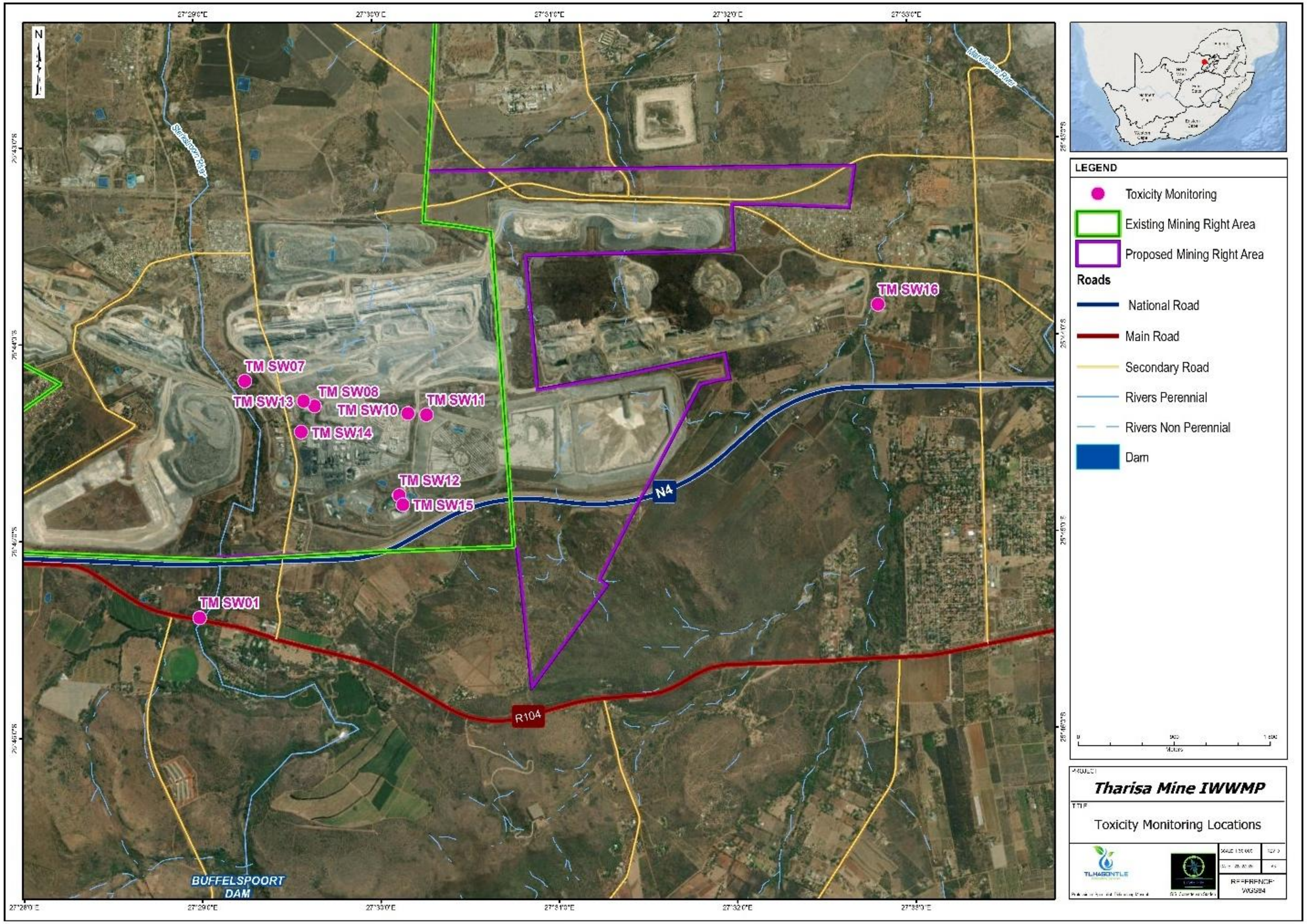


Figure 16: Toxicity testing points

The following is the summary of the findings from the March 2024 survey:

a) Sterkstroom:

Only the upstream Sterkstroom site, TM-SW01, was included for toxicity testing in March 2024. The March 2024 sample from the upstream Sterkstroom site, TM-SW01, reflected no lethal/sublethal environmental toxicity hazard (Class I). Sites TM-SW02 (downstream site) and TMSW03 (situated between sites TM-SW01 and TM-SW03) were not included for toxicity testing in March 2024.

- Elandsdriftspruit:

In March 2024, no lethal/sub-lethal environmental toxicity hazard (Class I) was detected for the sample from the upstream Elandsdriftspruit site, TM-SW16. Deep excavation at the downstream site, TM-SW17, rendered this site unsuitable for sampling in March 2024.

- Temporal trends (stream sites):

Long-term trend assessment of the stream sites is included (2017 to 2024), however it must be noted that further population of the temporal database is required to improve the accuracy of trends.

Temporal data show that all three (3) Sterkstroom sites reflected no toxicity hazard (Class I) for the majority of surveys conducted to date. However, Class II and Class III hazards have been detected at all three (3) sites on a few occasions. Temporal trends have generally been fairly similar at sites TM-SW01 and TM-SW03, with a spatial increase in toxicity hazard noted towards site TM-SW03 during three (3) surveys. A stable to marginally decreasing trend is displayed for site TM-SW01 over recent surveys, while a stable to marginally increasing trend is displayed for site TM-SW03. The toxicity hazard has generally remained similar or decreased towards the most downstream site (TM-SW02), and a trend of decreasing toxicity hazard is displayed for this site. Close monitoring remains essential. It is again noted that the database is still sparse at this time and the continued population of the dataset will be essential to improve the accuracy of trends.

The Elandsdriftspruit sites, TM-SW16 and TM-SW17, have only been included in the biomonitoring programme since March 2023, and inclusion of temporal trend analysis is not yet possible for these sites.

- Source water toxicity testing sites:

The March 2024 sample from the STP (TM-SW08), tested as posing a slight sub-lethal environmental toxicity hazard (Class II). The STP is tested on a definitive level; however, no minimum acceptable effect level (safe dilution factor) could be established for the March 2024 sample. Water from this source should therefore not be allowed to reach the natural environment. Toxicity hazards (Class II to Class IV) for the water sampled from the sewage plant have been observed during several previous surveys and it is of utmost importance to monitor this source frequently for focused mitigation.

Based on the March 2024 samples, no lethal/sub-lethal environmental toxicity hazard (Class I) was recorded for the pollution control facilities, TM-SW07 (Old Hernic Quarry), TM-SW11 (TFS Dissipator), TM-SW12 (Raw Water), TM-SW13 (Storm Water Dam), and TM-SW14 (Process Water Dam).

The pollution control facilities represented by samples TM-SW10 (MCC Dam) and sample TMSW15 (SLP Dam) are tested on a definitive level. The March 2024 sample from TM-SW10 showed a slight lethal/sub-lethal environmental toxicity hazard (Class II) and the sample from TM-SW15 was assigned a slight sub-lethal environmental toxicity hazard (Class II). No minimum acceptable effect level (safe dilution factor) could be established for either sample and water from these sources (TM-SW10 and TM-SW15) should not be allowed to reach the natural environment.

- Temporal trends (source water toxicity testing sites):

Five samples (TM-SW-07, TM-SW08, TM-SW10, TM-SW11, and TM-SW14) have reflected a higher than Class II toxicity hazard, during a few occasions since March 2017. The trend in most of the facilities has generally been within the lowest (best) class (Class I). Recent surveys have resulted in a slight increasing trend in toxicity hazard being reflected for sites TM-SW10, TM-SW11, and TM-SW14, however, although an increasing trend is still displayed for site TMSW10, the trend at sites TM-SW11 and TM-SW14 now appears to be stabilising. Sites TMSW07, TM-SW12, and TM-SW13 are reflecting stable to decreasing trends in toxicity hazard over recent surveys. Site TM-SW08 (STP) has generally displayed the highest toxicity hazard of all the samples. Site TM-SW08 also previously reflected a trend of increasing toxicity hazard, however, following inclusion of recent results the trend appears to be stabilising.

The increasing toxicity trend noted for site TM-SW10 (MCC Dam) and the regular toxicity hazard recorded at site TM-SW08 is an early indication that, should these trends continue, extreme care should be taken not to release (controlled or uncontrolled) these pollutions sources to the receiving environment. Definitive toxicity testing should be considered for pollution control facilities that regularly pose toxicity risks so that safe dilution factors can be established. Sites TM-SW08, TM-SW10, and TM-SW15 are currently tested on a definitive level.

The following is the summary of the findings from the September 2024 survey:

- Sterkstroom:

The October 2024 water sample from site TM-SW01 showed no lethal/sub-lethal environmental toxicity hazard (Class I). Similarly, no toxicity hazard (Class I) was recorded for the sample from site TM-SW03 (situated between sites TM-SW01 and TM-SW02). Site TM-SW02 was dry, precluding sampling in October 2024.

- Elandsdriftspruit:

Site TM-SW16 was dry at the time of sampling in October 2024 and dry conditions as well as deep excavation also precluded sampling of site TM-SW17.

- Temporal trends (stream sites):

Long-term trend assessment of the stream sites is included (2017 to 2024), however it must be noted that further population of the temporal database is required to improve the accuracy of trends.

Temporal data show that all three Sterkstroom sites fluctuated between no toxicity hazard (Class I) and a slight toxicity hazard (Class II) for the majority of surveys conducted to date. However, Class II and Class III hazards have been detected at all three sites on a few occasions. Temporal trends have generally been fairly similar at sites TM-SW01 and TM-SW03, with a spatial increase in toxicity hazard noted towards site TM-SW03 during three surveys. A stable to marginally decreasing trend is displayed for site TM-SW01 and TM-SW03 over recent surveys. The toxicity hazard has generally remained similar or decreased towards the most downstream site (TM-SW02), and a trend of decreasing toxicity hazard is displayed for this site. Close monitoring remains essential. It is again noted that the database is still sparse at this time and the continued population of the dataset will be essential to improve the accuracy of trends.

The Elandsdriftspruit sites, TM-SW16 and TM-SW17, have only been included in the biomonitoring programme since March 2023, and inclusion of temporal trend analysis is not yet possible for these sites.

- <u>Source water toxicity testing sites:</u>

A high lethal/sub-lethal environmental toxicity hazard (Class IV) was assigned to the October 2024 sample from the STP (TM-SW08). The STP is tested on a definitive level, however no minimum acceptable effect level (safe dilution factor) could be calculated for the sample and water from this source should therefore not be allowed to reach the natural environment. Toxicity hazards (Class II to Class IV) for the water sampled from the sewage plant have been observed during several previous surveys and it is of utmost importance to monitor this source frequently for focused mitigation.

The October 2024 sample from site TM-SW13 (Storm Water Dam) reflected no lethal/sub-lethal environmental toxicity hazard (Class I). A slight sub-lethal environmental toxicity hazard (Class II) was recorded for the samples from sites TM-SW11 (TFS Dissipator) and TM-SW12 (Raw Water). A lethal environmental toxicity hazard (Class III) was assigned to the sample from site TM-SW07 (Old Hernic Quarry).

The pollution control facilities represented by samples TM-SW10 (MCC Dam) and sample TMSW15 (SLP Dam) are tested on a definitive level. The October 2024 samples from TM-SW10 and TM-SW15 reflected a slight sub-lethal environmental toxicity hazard (Class II). A safe dilution factor of 9% was calculated for sample TM SW15 (SLP Dam) (i.e. 9 parts TM SW15 water diluted with 91 parts 'clean' water). However, no minimum acceptable effect level (safe dilution factor) could be established for the sample from TM-SW10 and water from this source (MCC Dam) should not be allowed to reach the natural environment.

- <u>Temporal trends (source water toxicity testing sites):</u>

Five (5) samples (TM-SW-07, TM-SW08, TM-SW10, TM-SW11, and TM-SW14) have reflected a higher than Class II toxicity hazard, during a few occasions since March 2017. The trend at most of the facilities has generally fluctuated between no toxicity hazard (Class I) and a slight hazard (Class II). A very slight increasing trend in toxicity hazard is now displayed for sites TMSW10, TM-SW11, and TM-SW12, although the trend at the latter two sites appears to be stabilising. Site TM-SW07 also shows an overall slight increasing trend and although it appears to be stabilising towards the latter part of the period, the Class III hazard detected for this site in October 2024 might be the start of an increasing trend and warrants close monitoring. Sites TM-13 and TM-SW14 are reflecting a trend of decreasing toxicity hazard over recent surveys.

Site TM-SW08 (STP) has generally displayed the highest toxicity hazard of all the samples. Following the high toxicity hazard (Class IV) recorded for site TM-SW08 in October 2024, a trend of increasing toxicity hazard is again displayed for this site.

The increasing toxicity trend noted for site TM-SW10 (MCC Dam) and the regular toxicity hazard and increasing trend recorded at site TM-SW08 is an early indication that extreme care should be taken not to release (controlled or uncontrolled) these pollutions sources to the receiving environment. Definitive toxicity testing should be considered for pollution control facilities that regularly pose toxicity risks so that safe dilution factors can be established. Sites TM-SW08, TM-SW10, and TM-SW15 are currently tested on a definitive level.

4-9.3 Recommendations from the Toxicity Report

- Reference should be made to the water quality monitoring programme (refer to Aquatico water quality monitoring programme) to identify potential water quality hazards that may originate from Tharisa Mine.
- Biomonitoring protocols, as applied in this study, should be continued in future to verify and identify any biotic responses that may arise from activities at the mine. This would serve as an early warning system when potential biotic problems arise and allow for further investigation to identify and mitigate

problematic water quality variables. Such a biomonitoring programme should be performed at least twice per annum, once during the dry season and once during the wet season.

- It is recommended that the bio-toxicity analyses be maintained as a key component of the biomonitoring programme (as adopted during the 2016/2017 monitoring period).
- It is recommended to perform toxicity testing twice per annum and to also upgrade the level of testing from screening to definitive testing, with sources that are frequently of toxicity Class II or higher. Definitive testing will allow for more accurate classification and assist in the determination of safe dilution factors, in order to negate the hazard, prior to release if it becomes an option.
- Given the often-regular dry conditions at the Sterkstroom and especially the Elandsdriftspruit sites, it is strongly recommended to include sediment toxicity testing in addition to the other biomonitoring tools. Sediment toxicity testing will allow monitoring of sites even when devoid of water and will help to timeously detect potential impacts and so inform appropriate management decisions.
- It should be considered to move site TM-SW17 slightly further downstream to ensure all potential impacts from the Tharisa Mine mining area on the Elandsdriftspruit are taken into consideration.

4-10 SURFACE WATER USER SURVEY

Water from the Sterkstroom is used for domestic purposes, mining and agriculture. Potential uses of surface water by surrounding communities and the environment are as follows:

- Domestic use is mainly limited to informal communities (washing and bathing), as farmers and other parties rely on groundwater for domestic purposes.
- Livestock drink water from the streams; and
- Irrigation during rainy seasons for agriculture.

4-11 GROUNDWATER

Tharisa Mine is underlain by a shallow upper-weathered aquifer and a deeper fractured aquifer. The weathered overburden is highly variable in thickness from 3m to more than 30m based on existing borehole logs and evidence of borehole depths. The deeper fractured bedrock aquifer is characterised by very low matrix permeability, poorly connected joints/fractures and dolerite/diabase dykes (that may act as barriers to groundwater flow).

In the vicinity of the water courses, alluvium either fully or partially replaces the weathered overburden and the water courses do lose and gain water to the alluvium aquifer. Recharge of the alluvial aquifers is also through lateral groundwater flow from the shallow weathered aquifer and by rainfall events. The thickness of the alluvial sediments has been estimated at 3 to 5 m with its lateral distribution restricted to the immediate banks of the current active channel.

The interface between the overlying weathered or alluvial aquifer and the deeper fractured aquifer features is relatively impermeable. Its effective permeability is determined by interconnected and open fracture systems. These fracture systems can potentially allow for rapid vertical groundwater flow from the weathered overburden as well as surface water bodies to greater depths. Whilst in general the weathered aquifer and lower fractured aquifer are poorly connected; this is not always the case. On the mine site, localised groundwater flows are expected to be influenced by pit dewatering.

Regional groundwater flow is from south to north. Groundwater flow is expected to also be controlled by the presence of open structures that act as conduits for rapid groundwater flow. Locally groundwater flow may also be diverted to drainage points such as abstraction boreholes and deep excavations (open pits and Samancor workings).

SLR (2014) reported recharge figures of 8.4% of the mean annual rainfall for the Tharisa Mine area. Based on the rainfall data collected from October 2014 to January 2022, this equates to a maximum of 64.57 mm and a minimum of 23.56 mm recharge per year.

4-12 AQUIFER CLASSIFICATION AND VULNERABILITY

Artesium Consulting Services (Pty) Ltd (ACS, 2023), undertook a Hydrogeological Baseline Impact Assessment for the TSFs and WRDs within Tharisa. Based on the locality and aquifer characteristics, it is inferred that the site is situated on a minor and special aquifer region, characterised by poor to minor groundwater quality. The main water source in the region is surface water. Considering the Aquifer Vulnerability of South Africa Map (2013), the aquifer region is rated as least vulnerable.

Aquifer mass susceptibility can be determined by the product of the classification and vulnerability of an aquifer. The matrix included in Table 5 of ACS 2023 report shows the different classes in aquifer susceptibility. The localised aquifer at Tharisa Mine has low susceptibility to mass transport.

4-13 AQUIFER CHARACTERISATION

Tharisa is underlain by shallow upper-weathered aquifer and a deeper fractured aquifer. The interface between these features is relatively impermeable. Near the water courses, alluvium replaces the weathered overburden, and the water courses do lose and gain water to the alluvium aquifer.

The mine is underlain by a minor aquifer region with potential for higher yielding zones [defined by the ground water specialist in accordance with Parsons (1995)]. Pump tests of a range of boreholes indicate that the average upper aquifer yield is between 1 and 2.5l/s. Two higher yielding boreholes (WGC15 and WGC19) were investigated as higher yielding boreholes. These boreholes are associated with isolated structures within the bigger project area.

4-14 GROUNDWATER QUALITY

Groundwater quality monitoring is conducted quarterly in accordance with the amended IWUL:2024 requirements as indicated in the water quality monitoring reports submitted to DWS. Sampling is conducted by Sedibelo and Aquatico is responsible for the analysis and reporting on the water quality. Ground water levels are also undertaken and included in the report.

Groundwater monitoring was conducted at 17 monitoring boreholes during the quarterly period and their positions are presented in Table 15 and Figure 17. A comprehensive report discussing groundwater quality is compiled quarterly by Aquatico. The data are compared to the applicable water quality limits presented in Table 16. Table 16 includes the quality limits and monitoring frequency as included in Table 13 of IWUL 2024.

Table 15 :Groundwater monitoring points

Sample point	Description	Coordinates	
		Latitude	Longitude
TM GW COMM 01	South of Plant-Mrs Potgieter	25°44´59.74"S	27°29´35.02"E
TM GW COMM 02	South of TSF Complex adjacent to N4 - Clenn Ross	25°44´55.88"S	27°30´56.25"E
TM GW COMM 05	In line with west mine activities - Retief School	25°44´20.12"S	27°28´33.33"E
TM GW COMM 06	In line with west mine activities - Harbours	25°44´34.84"S	27°28´44.52"E
TM GW Dissipator 1	Dissipator Borehole	25o44'22.44"S	25o30'15.80"E
TM GW Dissipator 2	In line with east mine activities - Near the Dissipator	25o44'20.99"S	27o30'15.21"E
TM GW HP5	Hardpark 5	25°44´31.78"S	27°30´04.85"E
TM GW MCC	Groundwater monitoring Hardpark	25°44´34.78"S	27°30´08.78"E
*TM GW MEW	Marikana Engineering Workshop	S0	E0
TM GW New Well		25°44'53.05"S	27°29'58.60"E

Sample point	Description	Coordinates	
		Latitude	Longitude
*TM GW PR	Borehole at Mr Pretorius Residence	S0	E0
TM GW RPM	Near RPM Workshop	25°44´22.41"S	27°30´11.05"E
TM GW SBH	Samancor Borehole	25°43´35.65"S	27°30´42.93"E
Proposed Additional Monitoring Localities			
TM GW Sec	Groundwater feeding tap at Security	25o44'23.58"S	27o29'25.97"E
TM GW TSF 01	West of TSF Complex	25°44´48.29"S	27°29´57.51"E
TM GW WM 03	In line with west mine activities - Braam Janse Van Rensburg	25o44'31.53"S	27o29'18.91"E
TM GW EM01	North of TSF	25°44'11.62"S	27°30'53.17"E
TM GW EM02	North of east mine pit and east mine WRD	25°43'26.88"S	27°30'20.69"E
TM GW WM01	North of west mine pit and west mine WRD	25°43'45.17"S	27°28'40.61"E
TM GW FW01	North of far West pit and far-west WRD	25°43'25.87"S	27°27'47.13"E

**No coordinates are recorded in the WUL*

Table 16: Groundwater monitoring variables and limits

Parameter (mg/l unless otherwise stated)	Groundwater base line limits	Frequency
	Groundwater quality reserve	
EC (mS/m)	70	Quarterly
Sodium	20	Quarterly
Magnesium	50	Quarterly
Chloride	30	Quarterly
Calcium	32	Quarterly
Sulphates	70	Quarterly
Nitrates	6	Quarterly
Fluorides	0.5	Quarterly
Cr	0.05	Quarterly
pH (pH units)	6.0-9.0	Quarterly

Information below is extracted from the "Groundwater Quality Assessment Report" for the four quarters in 2024. All reports were compiled by Compiled by Aquatico.

Seventeen (17) boreholes make up the monitoring localities for groundwater. Four out of the 17 boreholes are community (user) boreholes, and all four boreholes could be sampled during the recent quarterly period. The rest of the boreholes are the mine boreholes. Three additional boreholes are yet to be drilled.

The following is the summary of the findings for the quarterly period from January 2024 to March 2024:

Majority of boreholes were sampled over this reporting period, except for TM GW HP5 and TM GW WM 03. A sampling and analysis efficiency of 88% was achieved for this quarter.

a) Community boreholes:

- The physical parameters for water quality could be described as neutral (pH: 6.0 – 8.5) and non-saline (EC:<70). Exceeding variables were evident at locality TM GW COMM 01 in terms of the recorded Mg, SO_4 and NO_3, when compared to the IWUL (Table 6). Other exceedances were noted for TM GW COMM 02 in terms of Ca, while locality TM GW COMM 05 exceeded the stipulated limits in terms of the recorded Ca and Mg. Locality TM GW COMM 06 fully complied with the stipulated limits. Although the Ca, Mg and EC concentrations at localities TM GW COMM 01, TM GW COMM 02 and TM GW COMM 06 exceeded the IWUL 2020 guidelines for groundwater, the water quality at these localities is still within suitable drinking water conditions. Exceeding NO_3 was recorded at TM GW COMM 06, thus care should be taken when water is being consumed. According to the colour-coded classification system of the WRC (1998) "Quality of Domestic Water Supplies", the water quality based on the measured variables can be classified as 'Ideal' at TM GW COMM 02 and TM GW COMM 05 while TM GW COMM 01 can be classified as 'Good'. TM GW COMM 06 was classified as "Marginal" due to the raised NO_3.

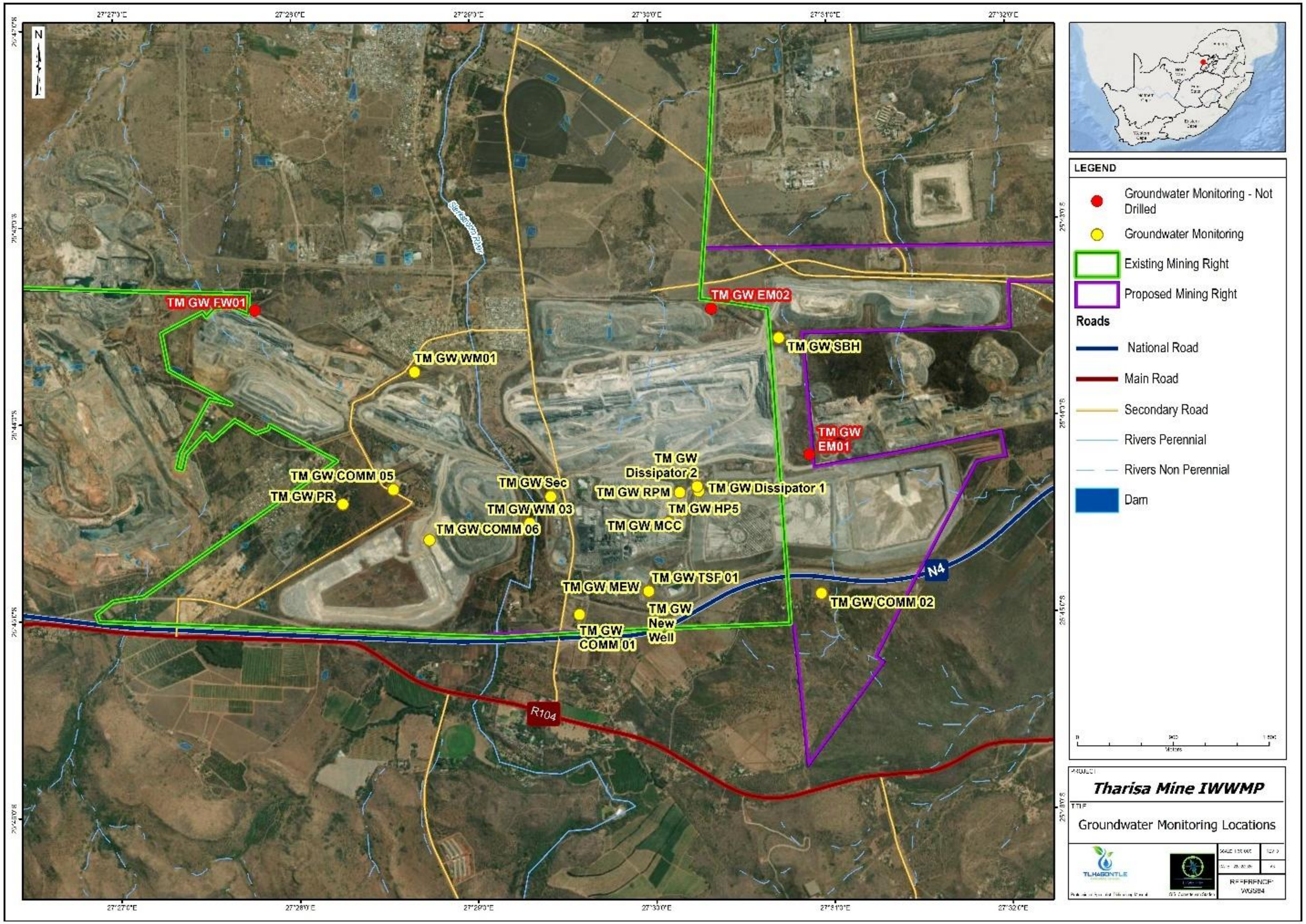


Figure 17: Groundwater monitoring points

- It should be noted that even though the community boreholes exceeded the IWUL guidelines by the aforementioned variables, the water quality from some of these boreholes are within ideal to good drinking water conditions. Therefore, it is the opinion of Aquatico that the limits set out in the IWUL are unrealistically low and not representative of the ambient/unaffected groundwater quality conditions of the mining area and its immediate surroundings.

b) Mine boreholes:

- The physical parameters for the water quality could be described as neutral (pH: 6.0 – 8.5) to alkaline (pH: > 8.5; TM GW MEW), non-saline (EC: <70) (TM GW MEW, TM GW New Well, TM GW PR and TM GW TSF 01), saline (EC: 70 – 150) (TM GW Dissipator 1, TM GW Dissipator 2, TM GW MCC, TM GW RPM and TM GW Sec) and very saline (EC: 150 – 370) (TM GW SBH). According to the colour-coded classification system of the WRC (1998) "Quality of Domestic Water Supplies", the water quality based on the measured variables can be classified as:
    - 'Ideal' at TM GW New Well, TM GW TSF 01 and TM GW MEW;
    - 'Good' at TM GW Dissipator 2;
    - 'Marginal' at TM GW MCC, TM GW PR and TM GW WM01;
    - 'Poor' at TM GW Dissipator 1 and TM GW Sec due to very high NO_3 concentrations and;
    - 'Unacceptable' at TM GW RPM and TM GW SBH due to extremely high NO_3 concentrations.

The following is the summary of the findings for the quarterly period from April 2024 to June 2024:

Majority of the boreholes were sampled over this reporting period, except for TM GW Dissipator 1 and TM GW HP5. A sampling and analysis efficiency of 88% was achieved for this quarter.

a) Community borehole:

- The physical groundwater quality during the quarterly period can be described as neutral (pH: 6.0 – 8.0) and non-saline (EC: <70). According to the colour-coded classification system of the WRC (1998) "Quality of Domestic Water Supplies", the water quality based on the measured variables can be classified as:
    - 'Ideal' at TM GW COMM 02 and TM GW COMM 05;
    - 'Good' at TM GW COMM 01;
    - 'Marginal' at TM GW COMM 06 due to the raised NO3.

It should be noted that even though the community boreholes exceeded the IWUL guidelines by the aforementioned variables, the water quality from some of these boreholes is within ideal to good drinking water conditions. Therefore, it is the opinion of Aquatico that the limits set out in the IWUL are unrealistically low and not representative of the ambient/unaffected groundwater quality conditions of the mining area and its immediate surroundings.

b) Mine boreholes:

- The groundwater quality was assessed by the IWUL 2020 guideline values for compliance and with three other assessment sets for comparison. The physical parameters for the water quality could be described as neutral (pH: 6.0 – 8.0), nonsaline (EC:<70) (TM GW MEW, TM GW New Well, TM GW PRM and TM GW TSF 01), saline (EC: 70 – 150) (TM GW Dissipator 2, TM GW MCC, TM GW Sec, TM GW WM01) and very saline (EC: 150 – 370) (TM GW SBH). According to the colour-coded classification system of the WRC (1998) "Quality of Domestic Water Supplies", the water quality based on the measured variables can be classified as:
    - 'Ideal' at TM GW MEW, TM GW New Well, TM GW RPM, and TM GW TSF 01;
    - 'Good' at none of the localities;
    - 'Marginal' at TM GW MCC and TM GW WM01;

- ‘Poor’ at TM GW Dissipator 2 and TM GW Sec due to very high NO3 concentrations and;
- ‘Unacceptable’ at TM GW SBH due to extremely high NO3 concentrations

The following is the summary of the findings for the quarterly period from July 2024 to September 2024:

The majority were sampled, except for TM GW HP5 and TM GW WM 03. A sampling and analysis efficiency of 88% was achieved for this quarter.

a) Community borehole:

- The physical parameters for water quality could be described as neutral (pH: 6.0 – 8.0) and non-saline (EC:<70). According to the colour-coded classification system of the WRC (1998) “Quality of Domestic Water Supplies”, the water quality based on the measured variables can be classified as:
  - ‘Ideal’ at TM GW COMM 02;
  - ‘Good’ at TM GW COMM 01 and TM GW COMM 05 can be classified as ‘Good’; and
  - “Marginal” at TM GW COMM 06 due to the raised NO3.

It should be noted that even though the community boreholes exceeded the IWUL guidelines by the aforementioned variables, the water quality from some of these boreholes is within ideal to good drinking water conditions. Therefore, it is the opinion of Aquatico that the limits set out in the IWUL are unrealistically low and not representative of the ambient/unaffected groundwater quality conditions of the mining area and its immediate surroundings.

b) Mine borehole:

- The physical parameters for the water quality could be described as neutral (pH: 6.0 – 8.0), non-saline (EC:<70) (TM GW FWM, TM GW MEW, TM GW New Well, TM GW RPM and TM GW TSF 01), saline (EC: 70 – 150) (TM GW Dissipator 1, TM GW Dissipator 2, TM GW MCC, TM GW Sec and TM GW WM01) and very saline (EC: 150 – 370) (TM GW SBH). According to the colour-coded classification system of the WRC (1998) “Quality of Domestic Water Supplies”, the water quality based on the measured variables can be classified as

  - ‘Ideal’ at TM GW FWM, TM GW MEW, TM GW New Well, TM GW RPM and TM GW TSF 01;
  - ‘Good’ TM GW Dissipator 2;
  - ‘Marginal’ at TM GW Dissipator 1, TM GW MCC, TM GW Sec and TM GW WM01;
  - ‘Unacceptable’ at TM GW SBH due to extremely high NO3 concentrations.

The following is the summary of the findings for the quarterly period from October 2024 to December 2024:

The groundwater quality was assessed by the IWUL 2024 guideline values for compliance and with three other assessment sets for comparison.

a) Community boreholes:

- The physical parameters for water quality could be described as neutral (pH: 6.0 – 8.0) and non-saline (EC:<70). Exceeding variables were evident at the localities: TM GW COMM 01: Ca and Mg; TM GW COMM 02: Ca; TM GW COMM 05: Ca and Mg; TM GW COMM 06: Fully compliant with IWUL 2024. Although the Ca and Mg concentrations exceeded the IWUL 2024 guidelines for groundwater at some localities, the water quality at these localities is still within suitable drinking water conditions. Raised NO_3 was recorded at TM GW COMM 06, thus care should be taken when water is being consumed, and treatment is recommended. According to the colour-coded classification system of the WRC (1998) “Quality of Domestic Water Supplies” (Table 2), the water quality based on the measured variables can be classified as

- 'Ideal' at TM GW COMM 02, TM GW COMM 05 and TM GW COMM 06; and
- 'Good' at TM GW COMM 01.

It should be noted that even though the community boreholes exceeded the IWUL guidelines by the aforementioned variables, the water quality from some of these boreholes is within ideal to good drinking water conditions. Therefore, it is the opinion of Aquatico that the limits set out in the IWUL are unrealistically low and not representative of the ambient/unaffected groundwater quality conditions of the mining area and its immediate surroundings.

b) Mine borehole:

- The physical parameters for the water quality could be described as neutral (pH: 6.0 – 8.0), non-saline (EC:<70) (TM GW Dissipator 2, TM GW FWM, TM GW MEW, TM GW New Well, TM GW RPM and TM GW TSF 01), saline (EC: 70 – 150) (TM GW Dissipator 1, TM GW MCC, TM GW Sec and TM GW WM01) and very saline (EC: 150 – 370) (TM GW SBH). According to the colour-coded classification system of the WRC (1998) "Quality of Domestic Water Supplies", the water quality based on the measured variables can be classified as:

  - 'Ideal' at TM GW Dissipator 2, TM GW FWM, TM GW MEW, TM GW RPM and TM GW TSF 01;
  - 'Good' TM GW MCC and TM GW New Well;
  - 'Marginal' at TM GW Sec and TM GW WM01; and
  - 'Unacceptable' at TM GW SBH due to extremely high NO_3 concentrations.

4-14.1 Groundwater levels

Groundwater levels are measured on a monthly basis as reported by Aquatico. **For the quarterly period January 2024 to March 2024**, Figure 18 presents the bar graph of groundwater levels showing the variance in water levels of the groundwater localities during the quarterly period.

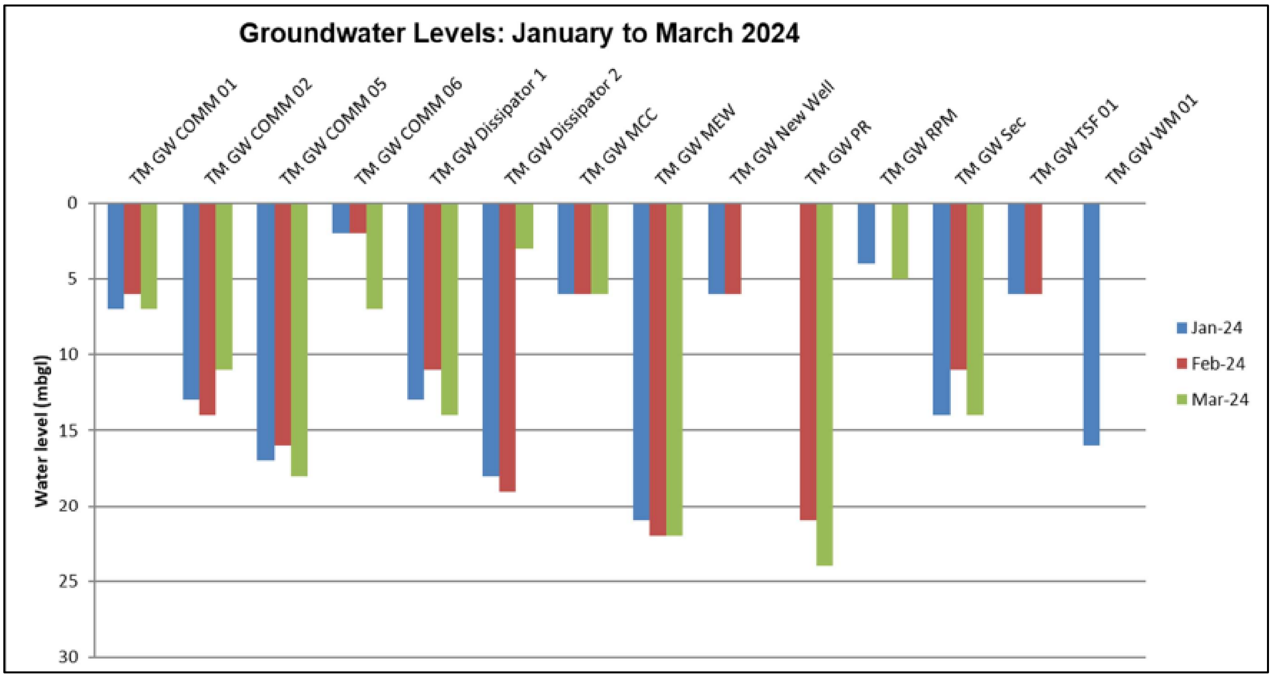


Figure 18: Water levels for period January 2024 to March 2024 (Aquatico, 2024)

On average, the highest/deepest water levels were recorded at TM GW RPM, TM GW COMM 06 and TM GW MCC which implies that the water levels were closer to the ground surface while the lowest groundwater level was measured at TM GW PR and TM GW MEW (further away from the ground surface). Fairly constant water levels were measured at the majority of the localities while fluctuating water levels are observed at TM GW Dissipator 2 and TM GW Sec.

For the quarterly period April 2024 to June2024, Figure 19 presents the bar graph of groundwater levels showing the variance in water levels of the groundwater localities during the quarterly period.

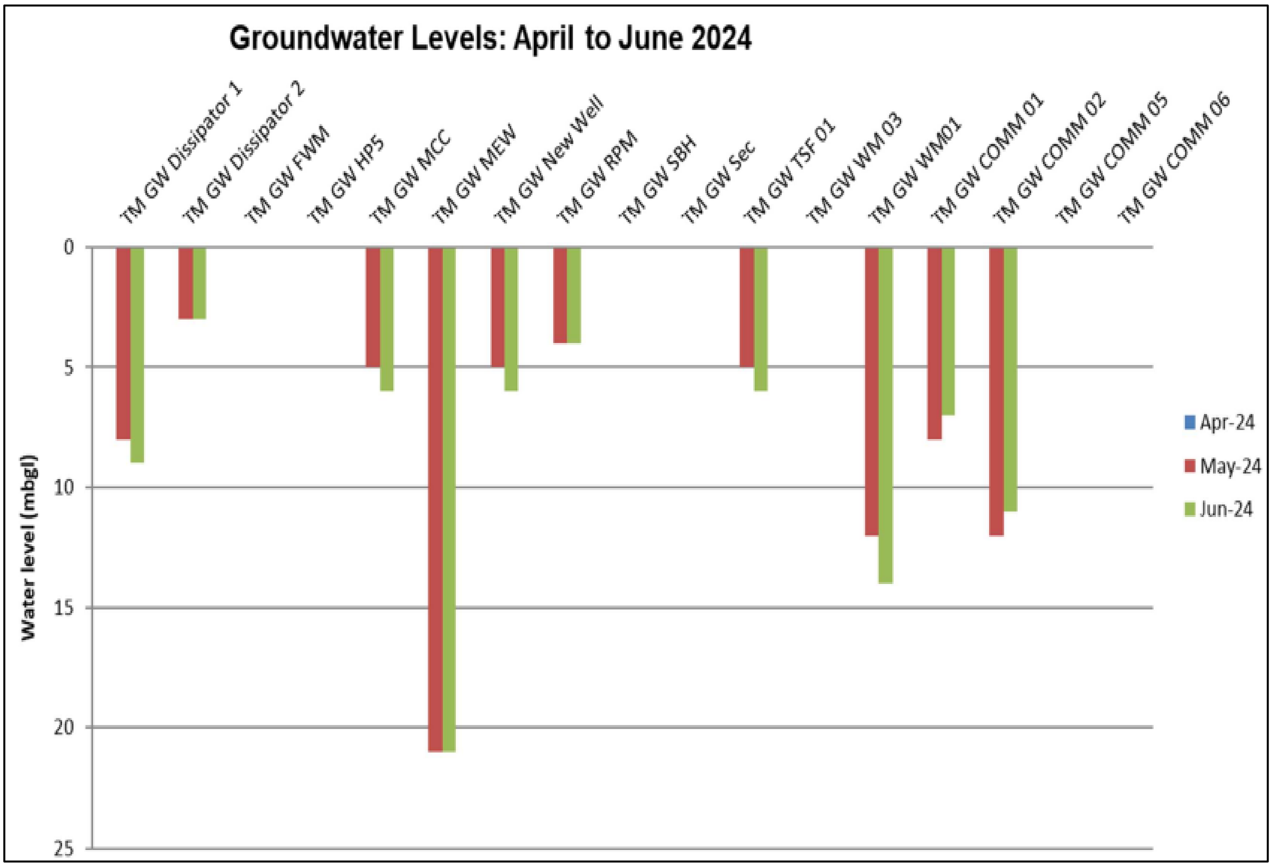


Figure 19: Water levels for period April 2024 to June2024 (Aquatico, 2024)

The highest/deepest water level was recorded at TM GW TSF 01 which implies that the water level was closer to the ground surface while the lowest groundwater level was measured at TM GW New Well (further away from the ground surface).

For the quarterly period July 2024 to September 2024, Figure 20 presents the bar graph of groundwater levels showing the variance in water levels of the groundwater localities during the quarterly period. The highest/deepest water levels were recorded at TM GW RPM and TM GW Dissipator 2 which implies that the water level was closer to the ground surface while the lowest groundwater level was measured at TM GW MEW (further away from the ground surface). Fairly constant water levels were measured at the majority of the localities.

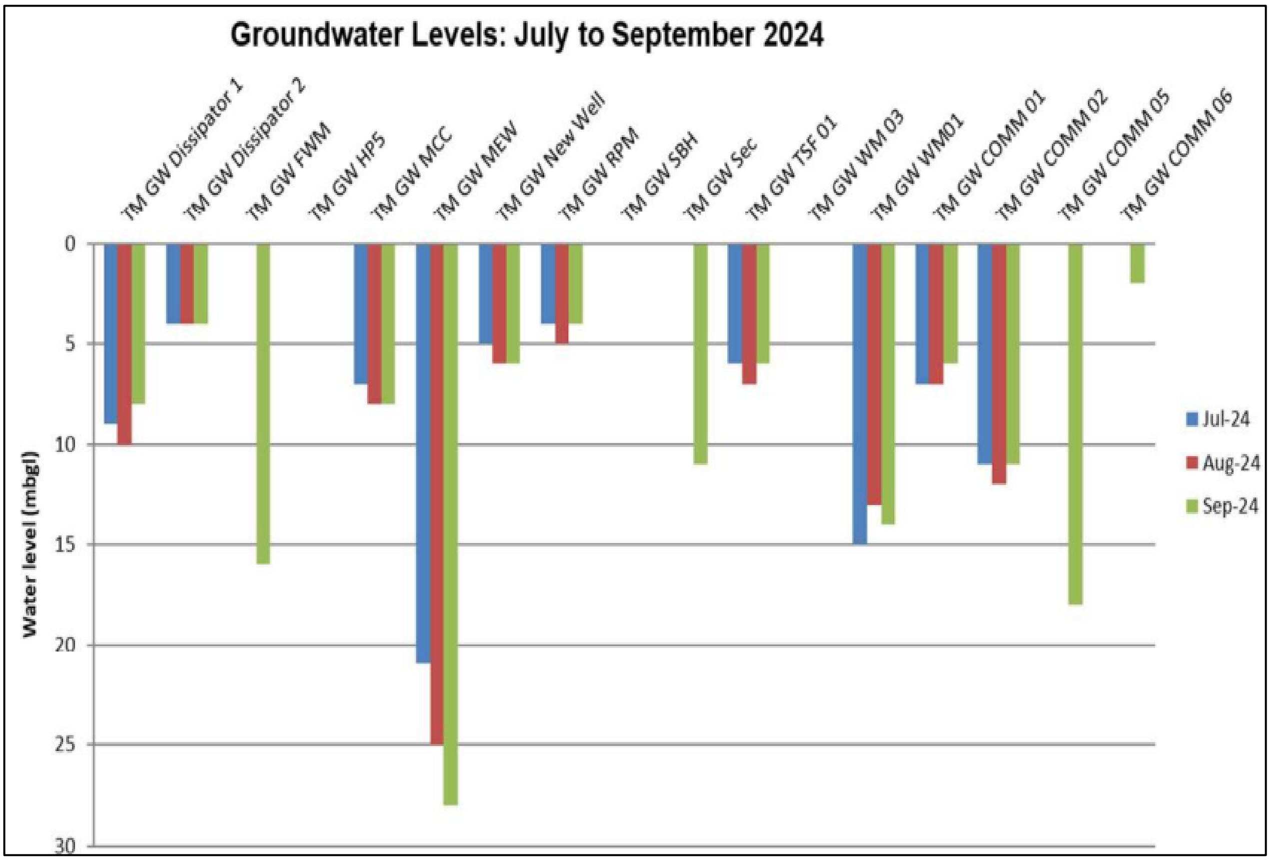


Figure 20: Water levels for period July 2024 to September 2024 (Aquatico, 2024)

For the quarterly period October 2024 to December 2024, Figure 21 presents the bar graph of groundwater levels showing the variance in water levels of the groundwater localities during the quarterly period.

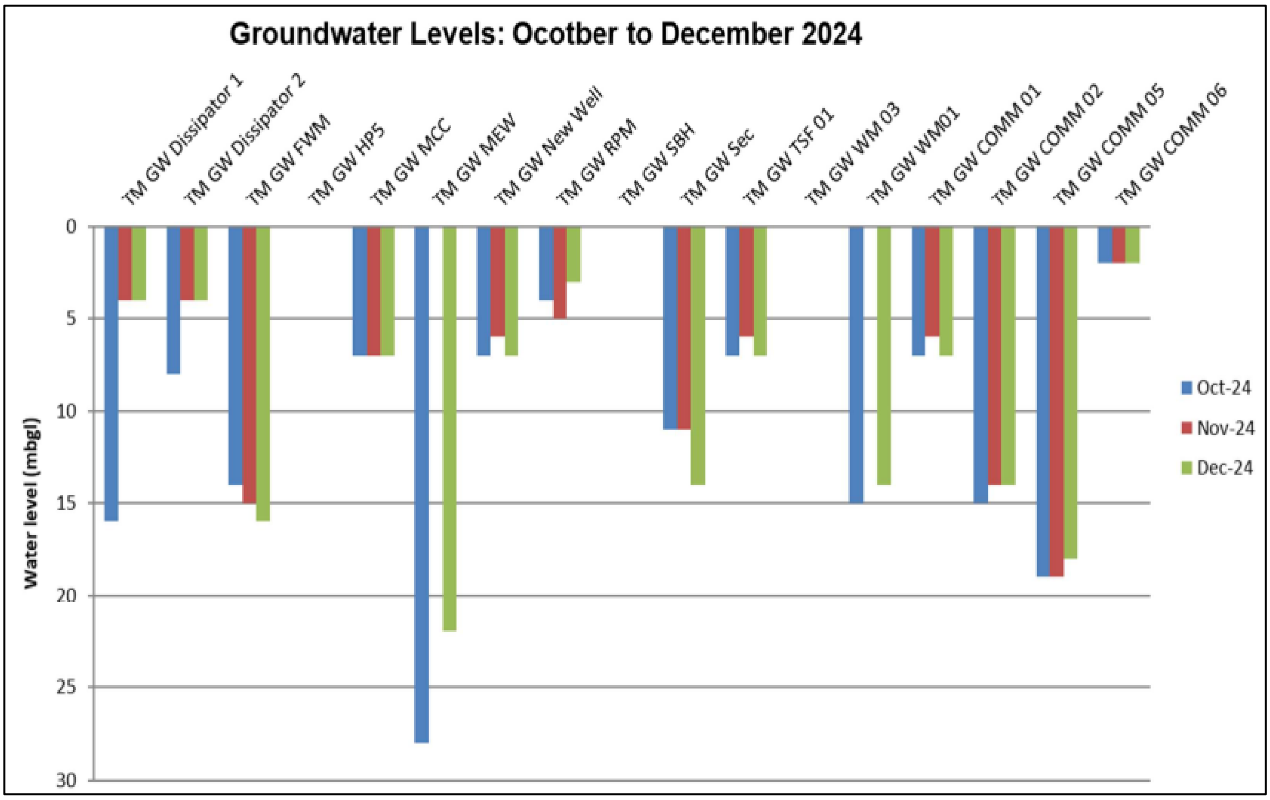


Figure 21: Water levels for the period October 2024 to December 2024 (Aquatico, 2024)

The highest/deepest water levels were recorded at TM GW RPM, TM GW COMM 06 and TM GW Dissipator 2 which implies that the water level was closer to the ground surface while the lowest groundwater level was measured at TM GW MEW (further away from the ground surface). Fairly constant water levels were measured at the majority of the localities.

4-15 HYDRO-CENSUS

A hydrocensus of surrounding water resources was undertaken by SLR in 2014 and one spring was identified. The location of boreholes identified as part of the hydro census and monitoring locations are shown in Figure 22. Most of these boreholes are used for domestic and agricultural (livestock and irrigation) purposes.

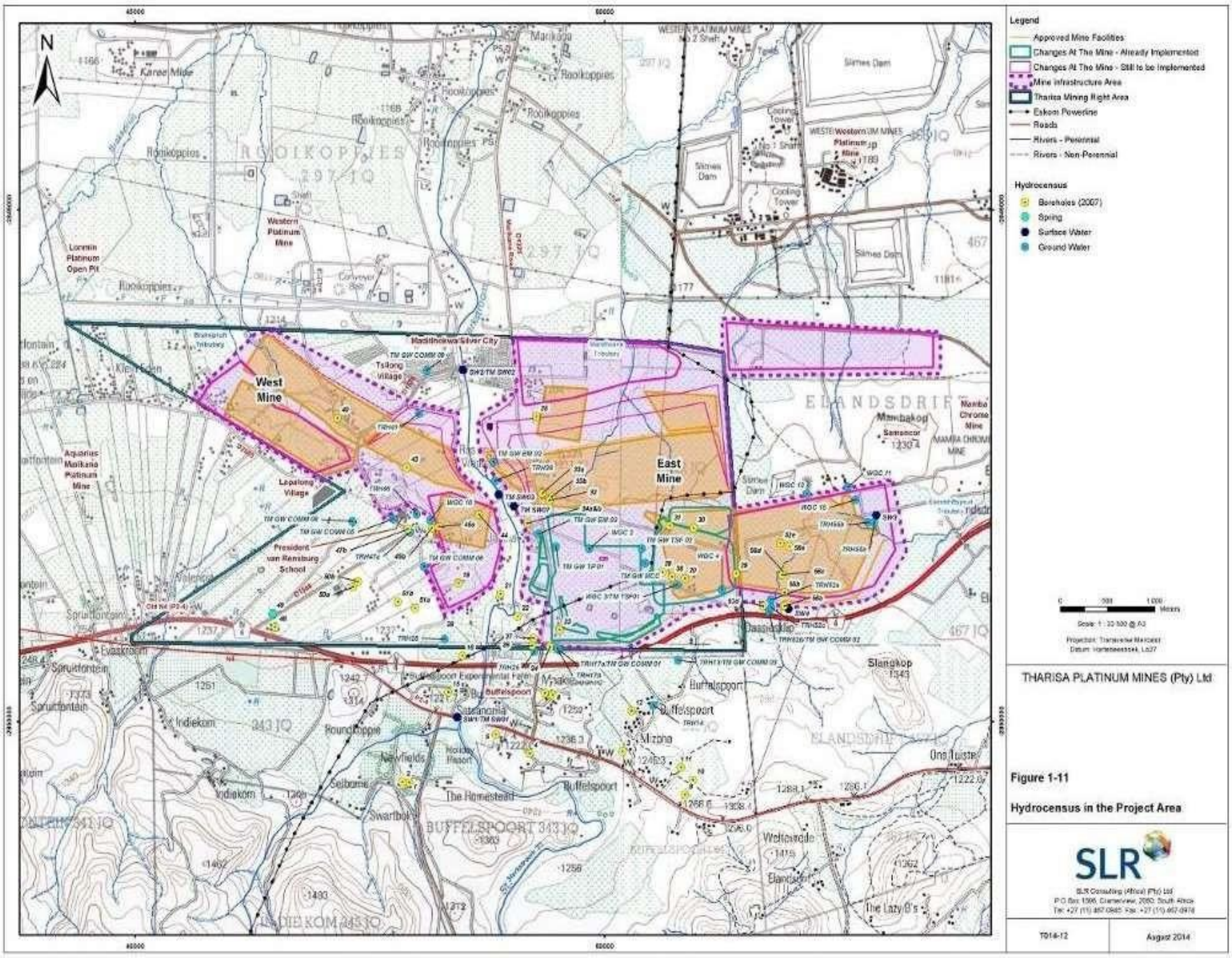


Figure 22: Hydrocensus (SLR, 2014)

4-16 POTENTIAL POLLUTION SOURCE IDENTIFICATION

The biggest impactors on water quality in the area are the large-scale water and land users. Surface water resources downstream of the project infrastructure and activities could be polluted if there are discharges of contaminated substances into these resources. Pollution of water resources can have negative health impacts on both people and animals, and it can negatively impact on the water course related biodiversity. In the unmanaged scenario, potential pollution sources include:

- Sedimentation from erosion;
- Spillage of chemicals, solvents, paint, fuel, oil, cement;
- Sewage; and

- Contaminated discharges from the dirty water systems including: the pits, plant, TSFs, return water dam, rock dumps, dirty water and waste pipelines, sewage plants, machinery maintenance workshops and wash bays.

4-17 GROUNDWATER MODEL

The 2014 Tharisa groundwater numerical model was updated in September 2016 by SLR (2016) to include the new pumping which was to be implemented at Tharisa. The update was constructed using FEFLOW finite element code. Annual mining plans and sequential mining and backfilling of open pits derived from the annual plans, were included in the groundwater model update. WRDs and TSFs source term was used to estimate the migration of sulphate contaminant plume at Tharisa. The groundwater numerical model constructed contains 15 vertical layers, 120 720 elements, and 65 392 nodes.

The groundwater model was calibrated at a reasonable value of 9.73% (ASTM Guidelines) using the groundwater measurements from the monitoring boreholes at Tharisa. Refer to Figure 23 for the Tharisa model domain, together with the main hydraulic stress elements incorporated into the groundwater model. The predictive simulations were run for a period of 100 years, from 2016 to 2116.

The SLR (2016) groundwater model was further updated in a study undertaken by Artesium Consulting Services (ACS, 2023) and is included in the report "Hydrogeological Baseline and Impact Assessment – TSF 2 WRD Extension 2, FW WRD 1 Extension 1, TSF 3 WRD Extension 1 and TSF 3 WRD Extension 2". The study was undertaken mainly to evaluate the risk of the proposed TSF 3 mine residue facility to receptors via the surface water and groundwater pathways, which is used to plan and design management and mitigation measures.

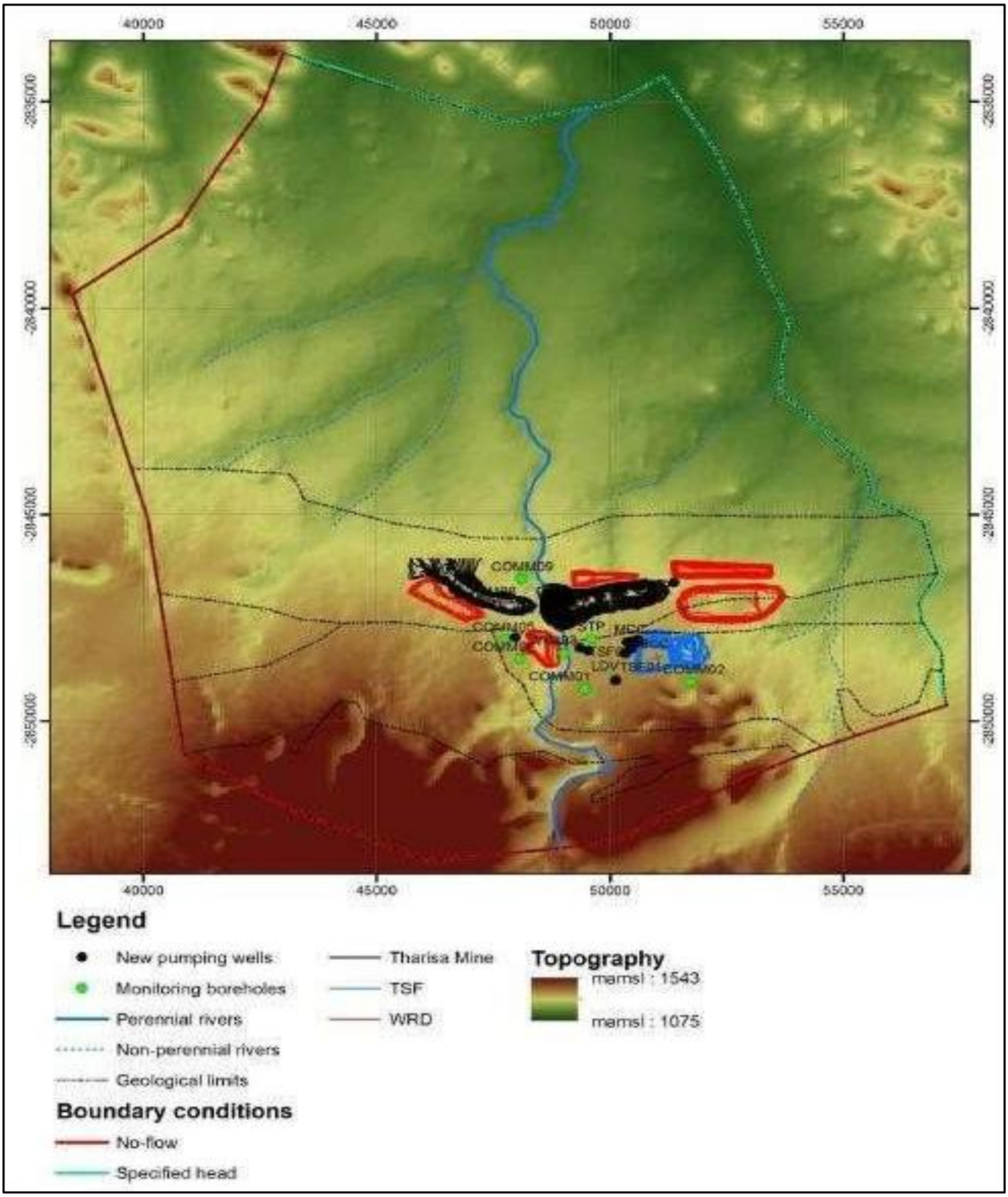


Figure 23: Tharisa Groundwater Model Domain (SLR, 2016)

4-18 SOCIO-ECONOMIC ENVIRONMENT

The Mine is located within the jurisdictional area of the Rustenburg Local Municipality, within the jurisdiction of Bojanala Platinum District Municipality and near the town of Marikana in the North-West province. Information in this section was abstracted from the 2022-2027 Final Integrated Development Plan for Rustenburg Local Municipality.

4-18.1 Demographics

When compared to other regions, the Rustenburg Local Municipality accounts for a total population of 719,000, or 38.2% of the total population in the BDM, which is the most populous region in the BDM for 2020. The ranking in terms of the size of Rustenburg compared to the other regions remained the same between 2010 and 2020. In terms of its share, the Rustenburg Local Municipality was significantly larger in 2020 (38.2%) compared to what it was in 2010 (36.0%). When looking at the average annual growth rate, it is noted that Rustenburg ranked highest (relative to its peers in terms of growth) with an average annual growth rate of 3.0% between 2010 and 2020.

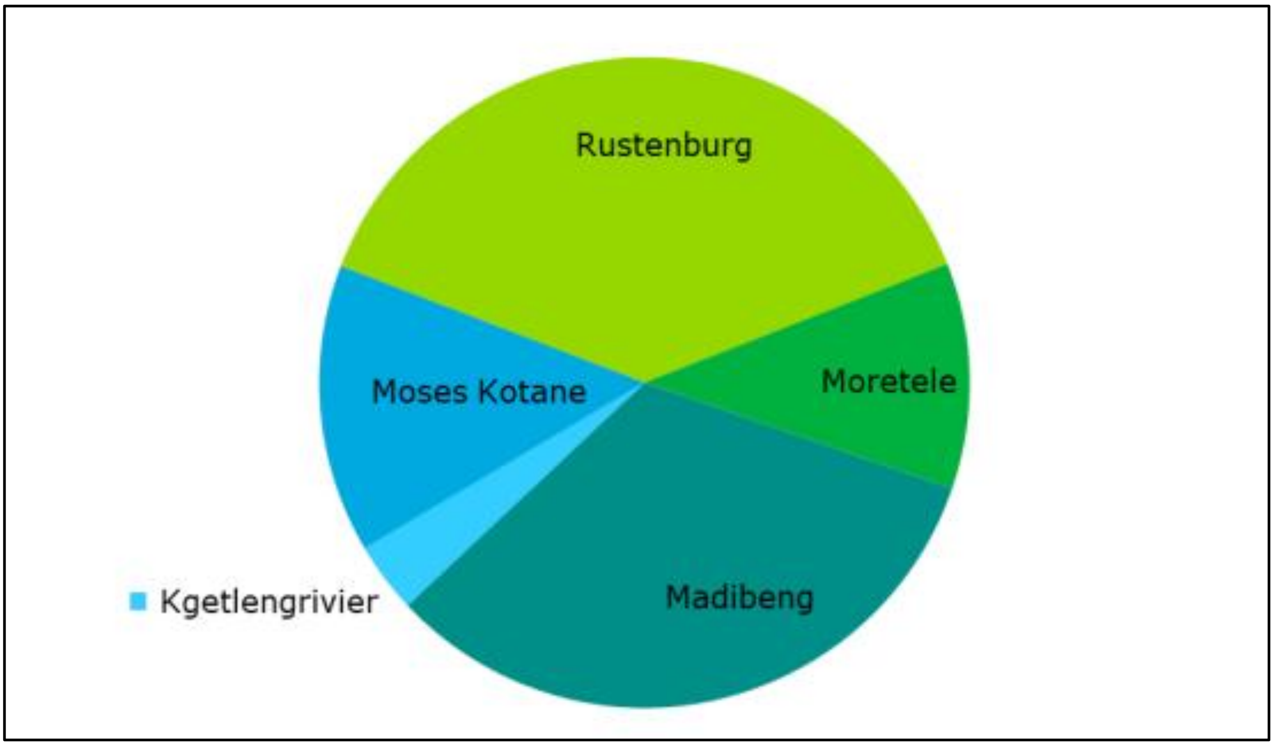


Figure 24: Total population within the Bojanala Platinum District Municipality

4-18.2 Population distribution

Based on the present age-gender structure and the present fertility, mortality and migration rates, Rustenburg's population is projected to grow at an average annual rate of 1.7% from 719 000 in 2020 to 782 000 in 2025.

The population projection of Rustenburg Local Municipality shows an estimated average annual growth rate of 1.7% between 2020 and 2025. The average annual growth rate in the population over the projection period for BDM, North-West Province and South Africa is 1.6%, 1.5% and 1.3% respectively and is lower than that the average annual growth in the Rustenburg Local Municipality.

Rustenburg Local Municipality's male/female split in population was 120.9 males per 100 females in 2020. The Rustenburg Local Municipality has significantly more males (54.73%) relative to South Africa (48.97%), and what is typically seen in a stable population. This is usually because of physical labor-intensive industries such as mining. In total there were 326 000 (45.27%) females and 394 000 (54.73%) males. This distribution holds for BDM as a whole where the female population counted 888 000 which constitutes 47.22% of the total population of 1.88 million.

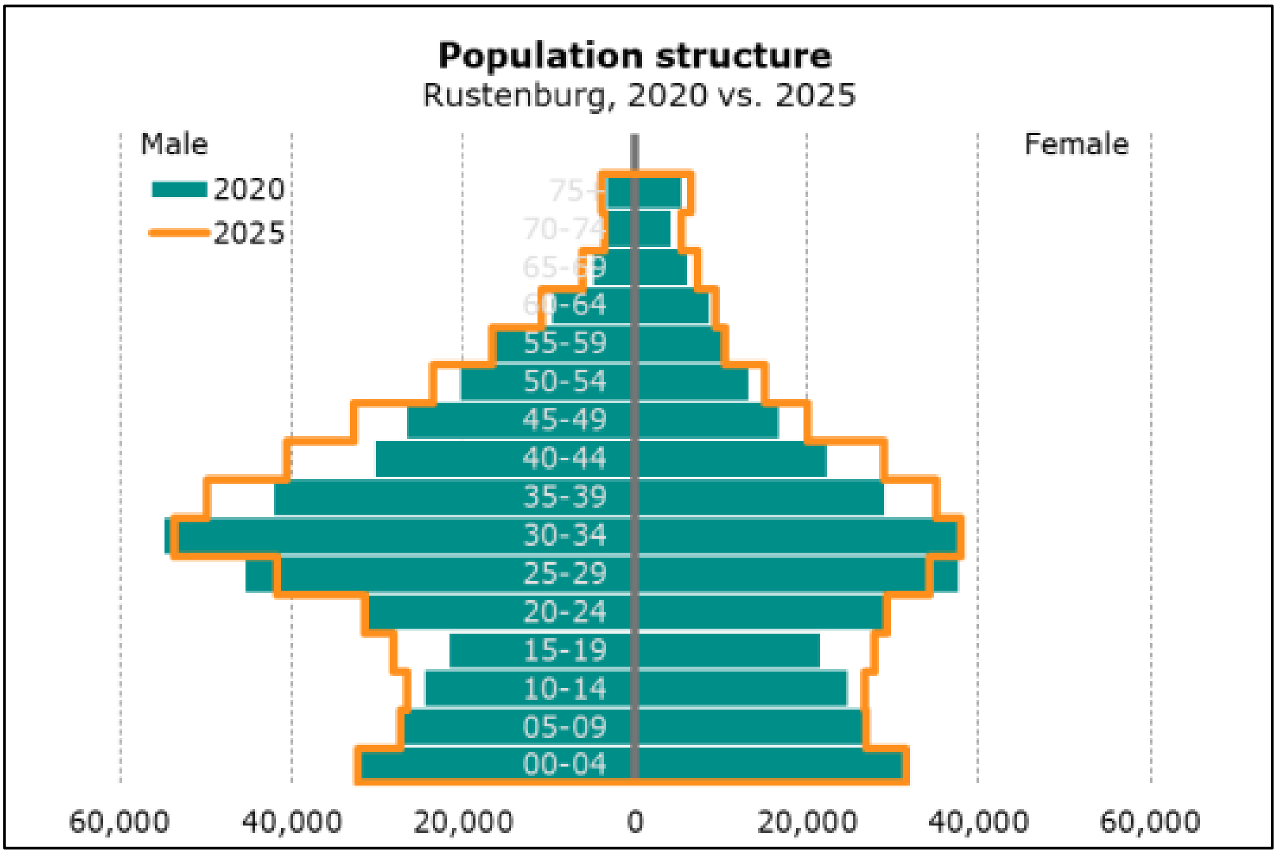


Figure 25: Population pyramid for Rustenburg Local Municipality, 2020 vs2025

4-18.3 Households

The composition of the households by population group consists of 90.5% which is ascribed to the African population group with the largest number of households by population group. The White population group had a total composition of 8.0% (ranking second). The Asian population group had a total composition of 0.8% of the total households. The smallest population group by households is the Coloured population group with only 0.7% in 2020.

The growth in the number of African headed households was on average 3.28% per annum between 2010 and 2020, which translates in the number of households increasing by 59 600 in the period. Although the Coloured population group is not the biggest in size, it was however the fastest growing population group between 2010 and 2020 at 5.06%. The average annual growth rate in the number of households for all the other population groups has increased with 3.11%.

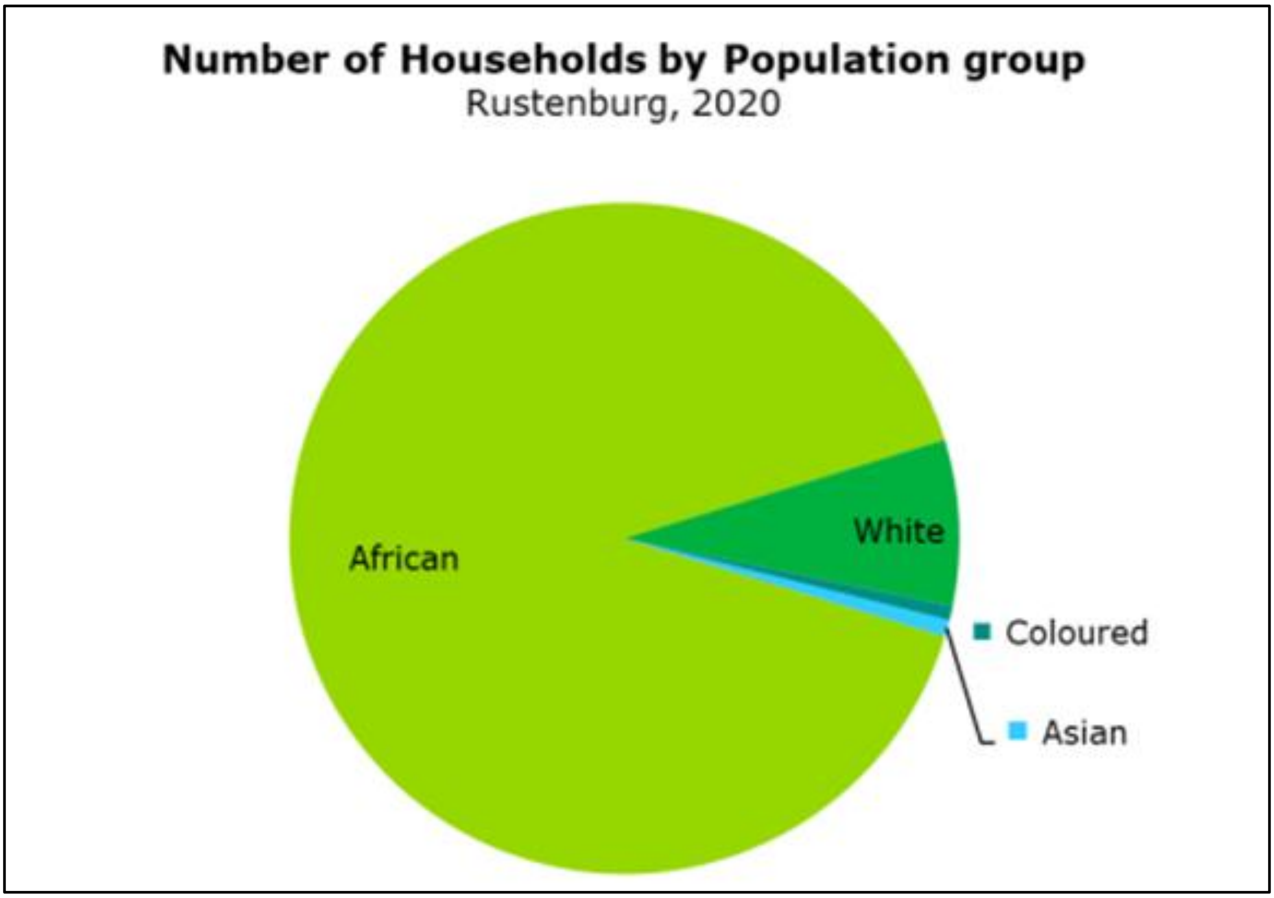


Figure 26: Number of households

4-18.4 Gross Domestic Product (GDP)

The Rustenburg Local Municipality had a total GDP of R 72.9 billion and in terms of total contribution towards BDM, the Rustenburg Local Municipality ranked highest relative to all the regional economies to total BDM GDP. This ranking in terms of size compared to other regions of Rustenburg has remained the same since 2010. In terms of its share, it was in 2020 (47.0%) significantly larger compared to what it was in 2010 (43.7%). For the period 2010 to 2020, the average annual growth rate of -0.7% of Rustenburg was the highest relative to its peers in terms of growth in constant 2010 prices.

It is expected that Rustenburg Local Municipality will grow at an average annual rate of 7.51% from 2020 to 2025. The average annual growth rate in the GDP of BDM and Northwest Province is expected to be 5.76% and 3.06% respectively.

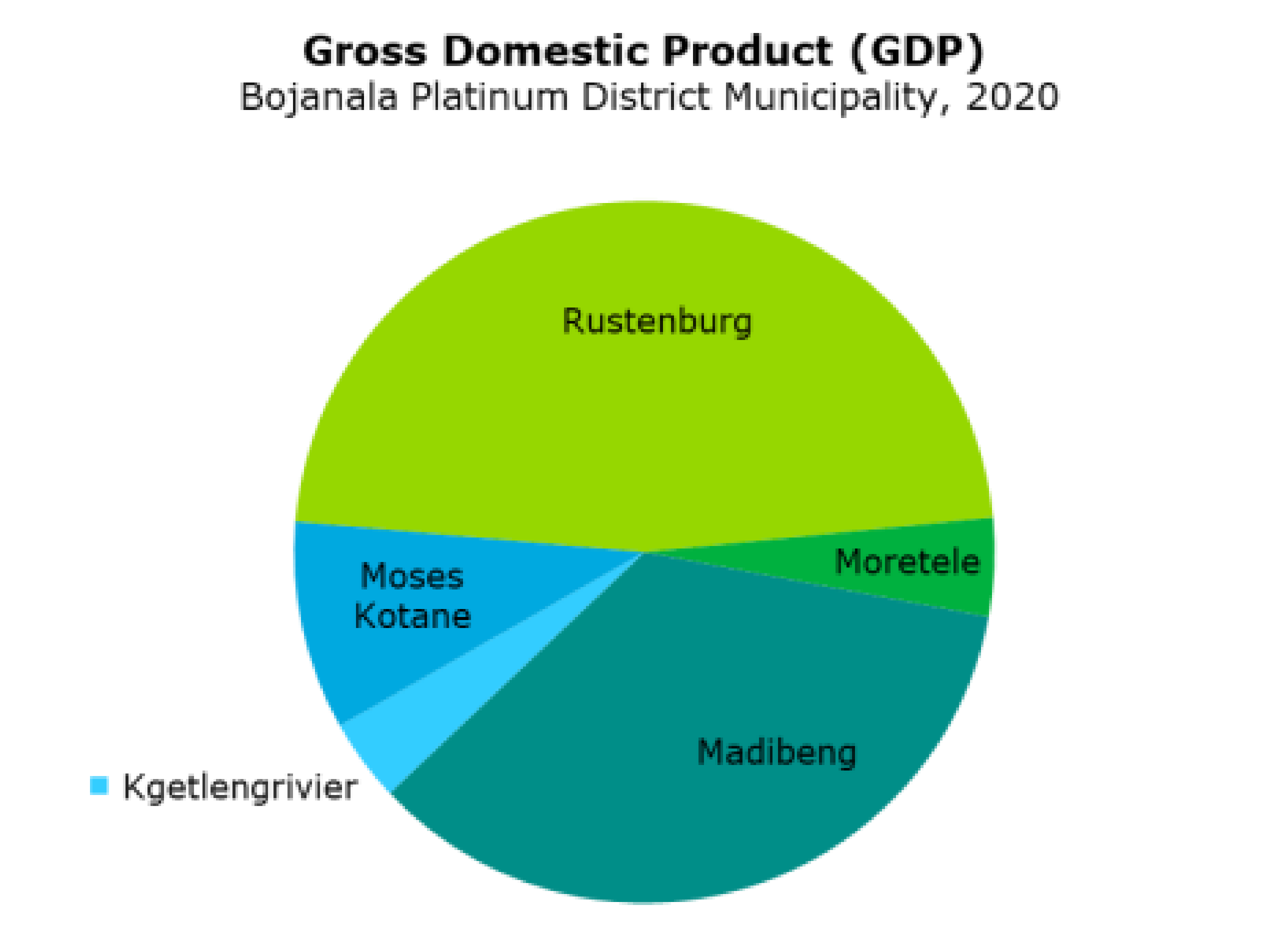


Figure 27: Rustenburg Local Municipality GDP

4-18.5 Annual income

The total personal income of Rustenburg Local Municipality amounted to approximately R 56.2 billion in 2020. The African population group earned R 43.5 billion, or 77.51% of total personal income, while the White population group earned R 11.5 billion, or 20.49% of the total personal income. The Asian and the Coloured population groups only had a share of 1.23% and 0.78% of total personal income respectively.

When looking at the annual total personal income for the regions within BDM it can be seen that the Rustenburg Local Municipality had the highest total personal income with R 56.2 billion which increased from R 22.5 billion recorded in 2010. It can be seen that the Kgetlengrivier Local Municipality had the lowest total personal income of R 3.97 billion in 2020, this increased from R 1.56 billion in 2010.

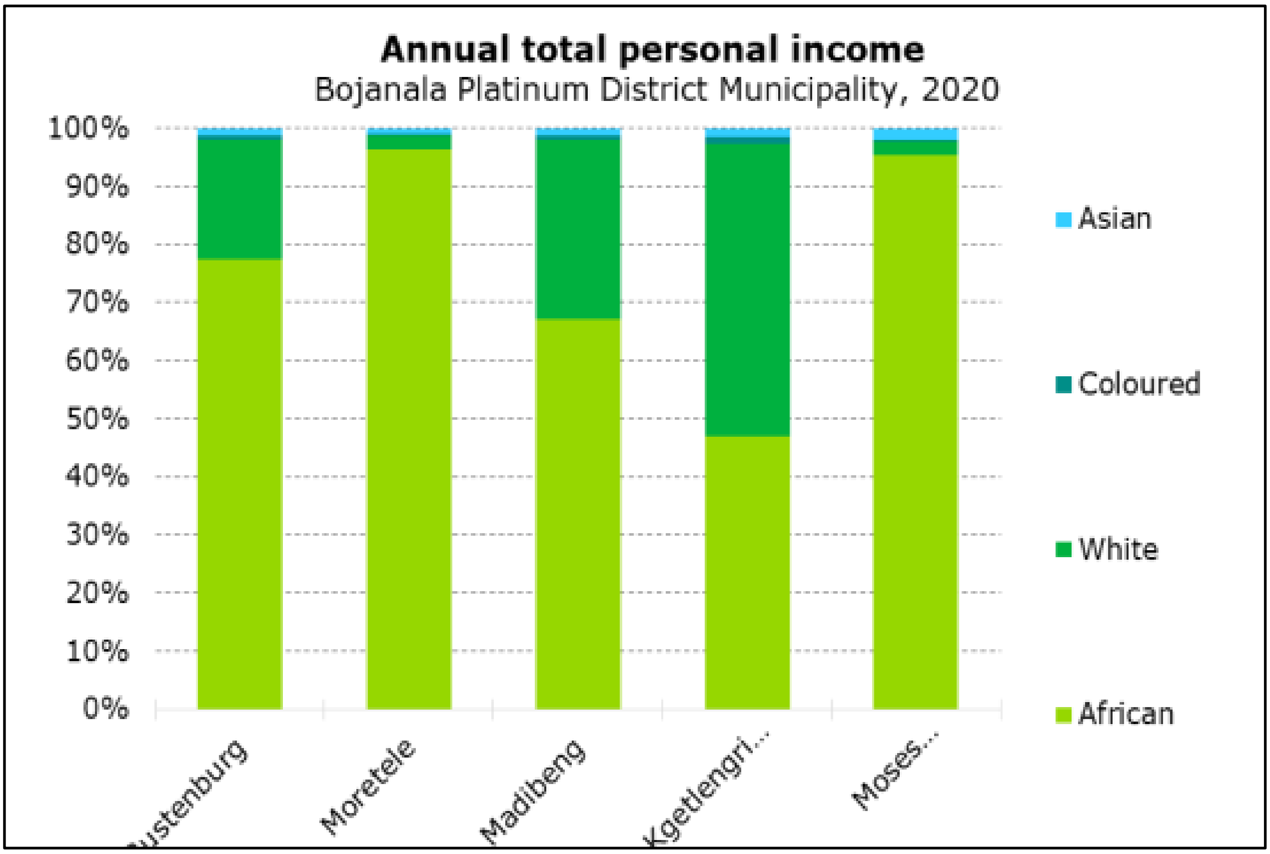


Figure 28: Annual total personal income

SECTION 5: ANALYSES AND CHARACTERISATION OF ACTIVITY

5-1 SITE DELINEATION FOR CHARACTERIZATION

All mining and related activities that take place at Tharisa occur within the mine boundary area. The existing open pits, the proposed underground mine and associated infrastructure will also be located within the mine boundary.

5-2 WATER AND WASTE MANAGEMENT

5-2.1 Potable water

Potable water is obtained from the well field, TP4 and rand water supply through a Samancor pipeline. The abstracted groundwater is treated to make it suitable for potable supply. Tharisa also supplies the local community with potable water via boreholes that are located within the community.

5-2.2 Process water

Water at the mine is sourced from both the local ground water aquifers via abstraction from boreholes developed by the mine and from the western irrigation canal of the Buffelspoort dam irrigation system. Tharisa has also secured an additional water allocation from Rand Water through an agreement with Samancor. In terms of the agreement, the total maximum quota to be supplied to Tharisa is 2 666 000 kilolitres per month.

It is worth noting that the operations process water supply includes the following key infrastructure, which are sampled once a month:

- Process Water Dam (15 000m^3);
- Raw water Dam (45 000m^3);
- Stormwater Dam (30 000m^3);
- Hernic Quarry (200 000m^3);
- Zinc Dam (12 000m^3); and
- MCC Dam (50 000m^3).

5-2.3 Waste

The waste management systems at Tharisa are described in this section. Tharisa has established a waste management procedure (TM-ALL-SHE-PRO-004). Tharisa adheres to the waste hierarchy of control as far as reasonably possible: Reduce, Reuse, Recycle, Recover, Disposal.

5-2.3.1 General/ Domestic Waste

Tharisa has the following types of general/domestic waste:

- Plastics;
- Glass;
- Cardboard;
- Discarded Personal Protective Equipment (PPE);
- Kitchen Waste;
- Old Food;
- Polystyrene;
- Garden Waste;
- Old Clothing; and

- Small Strips of Plastics.

Handling and Storage of General /Domestic Waste

- The containers (wheelie bins) for the abovementioned waste types should be painted green and be marked as “Domestic Waste” and must be identified with an appropriate “Domestic Waste” sign or sticker.
- An area should be demarcated for the containers and signs erected stating the above waste types to be disposed of in this container. No other waste types are allowed into these green containers. When full, the green marked wheelie bins should be emptied into a domestic waste skip.

Disposal of General /Domestic Waste

- There are no on-site waste disposal facilities, and none are planned. Domestic waste from the mine is collected and then transported to a licensed municipal waste dumping site in Rustenburg or Mooinooi.

Recycling of General/ Domestic Waste

- The appropriate management and storage of waste prevents on-site and off-site pollution and enhances opportunities for reuse. Waste will be sent for disposal to landfill only once other options have been exhausted;
- Blue waste containers have been placed outside each area for recycling paper and boxes;
- Paper recycling bins are placed in the offices and plant for recycling and are emptied on a regular basis. The waste contractor will collect the paper waste to be recycled from these blue paper waste recycling containers;
- The appointed Waste Contractor is responsible for the collection and transportation of paper from the blue recycling containers to a suitable wastepaper recycler;
- Glass, plastic, tins, and food residue will be placed in the green general/domestic waste containers; and
- All volumes of recycled domestic waste will be collected by the waste contractor and recorded in a book kept by the waste contractor’s driver. A carbon copy will be provided to the Environmental Department for record keeping.

5-2.3.2 Industrial Waste

Tharisa has the following types of industrial waste:

- Salvageable (Scrap) materials:
  - Discarded water pipes;
  - All steel and metals;
  - Scraper rope;
  - Electrical cables;
  - Electrical switchgear boxes; and
  - Timber/pallets.
- Non-salvageable materials:
  - Gumboots;
  - Waste tyres;
  - Conveyor belting; and
  - Building rubble.

Handling and Storage of Industrial Waste

- All industrial waste should be sorted into salvageable and non-salvageable waste. Both salvageable and non-salvageable waste should be disposed of into yellow containers.
- These containers should be placed at the different production areas and workshops.
- The yellow wheelie bins should be properly demarcated, and signs put in place in terms of which waste should go into each container.
- In confined areas or in workshops, yellow 210L drums/wheelie bins can be used for industrial waste storage.
- As far as possible, sorting of this waste should be done at source, i.e. at each production area and process plants. The waste contractor will transport the salvageable and non-salvageable material to where it will be sorted further into usable material and recyclable material.

Disposal of Industrial Waste

- Concrete and bricks (building rubble) should be collected and then transported to a licensed municipal waste dumping site in Rustenburg or Mooinooi; or it could be crushed in order to be reused for various other applications.

Recycling of Waste

- The appropriate management and storage of waste prevents on-site and off-site pollution and enhances opportunities for reuse. Waste will be sent for disposal to landfill only once other options have been exhausted;
- All the salvageable and non-salvageable materials will be sent for refurbishments or reused in the operation.
- Material which cannot be refurbished due to high cost or any other reason or cannot be reused within the operation will be sold.
- All volumes of recycled material bought by outside contractors /waste contractors will be recorded in a register. Carbon copies should be provided to the Environmental Department.
- Gumboots and hardhats will be sold to contractors for recycling.

5-2.3.3 Hazardous Waste

The following hazardous waste streams are found at Tharisa:

- Lead;
- Pesticides /herbicides;
- Different types of chemicals (reagents);
- Oil, oil drums and oil filters;
- Grease and grease rags;
- Old batteries;
- Petrol;
- Diesel;
- Degreasers, degreaser tins;
- Paint;
- Contaminated/polluted soil;
- Fluorescent tubes;
- Equipment such as steel, hoses, etc. contaminated with grease and oil; and
- Medical and sanitary waste.

Handling and Storage of Hazardous Waste

- Where possible hazardous waste facilities should be bunded, concreted and properly demarcated;
- Where possible, hazardous waste should be stored under shelter in order to keep rain water out;
- Chemical and hydrocarbon waste should be stored together with their Material Safety Data Sheets (MSDSs). Before any hazardous chemical and hydrocarbon waste is sent for disposal, the Environmental Department should be informed, and a hazardous waste disposal manifest should be provided by the waste contractor;
- Reagents and flux containers will be disposed of in the hazardous waste containers at the plant;
- Each production area will be responsible for ensuring sumps filled with contaminated water are emptied on a regular basis. The contaminated water will be pumped into tanks and discharged in sumps where the oil can be separated from the water. The water will then be discharged into the system to be re-used, and the separated oil will be sold to an authorised and registered used oil recycler;
- The waste contractor will provide the mine with fluorescent tube boxes and will also be responsible for transporting full fluorescent tube boxes to a registered hazardous waste disposal site; and
- If a problem does arise with the disposal of hazardous waste, the Environmental Department should be contacted without delay.

Disposal of Hazardous Waste

- Hazardous waste should be placed in the black wheelie bins or green telicon bins (skips);
- The Waste Contractor will be responsible for the collection and transportation of hazardous waste from the mine to registered hazardous legal waste disposal sites; and
- Certificates of safe disposal from the hazardous legal waste disposal site must be provided by the Waste Contractor to the Environmental Department for record purposes.

5-3 STORMWATER

Tharisa implements the Stormwater Management Plan (SWMP), and the plan is updated in phases throughout the mine site. Several SWMP updates were undertaken as follows:

5-3.1 SLR Consulting, 2014

The stormwater management required at the proposed Central WRD extension area, to ensure that clean and dirty water is adequately separated, as required by GN 704 Regulations. See Figure 29 below.

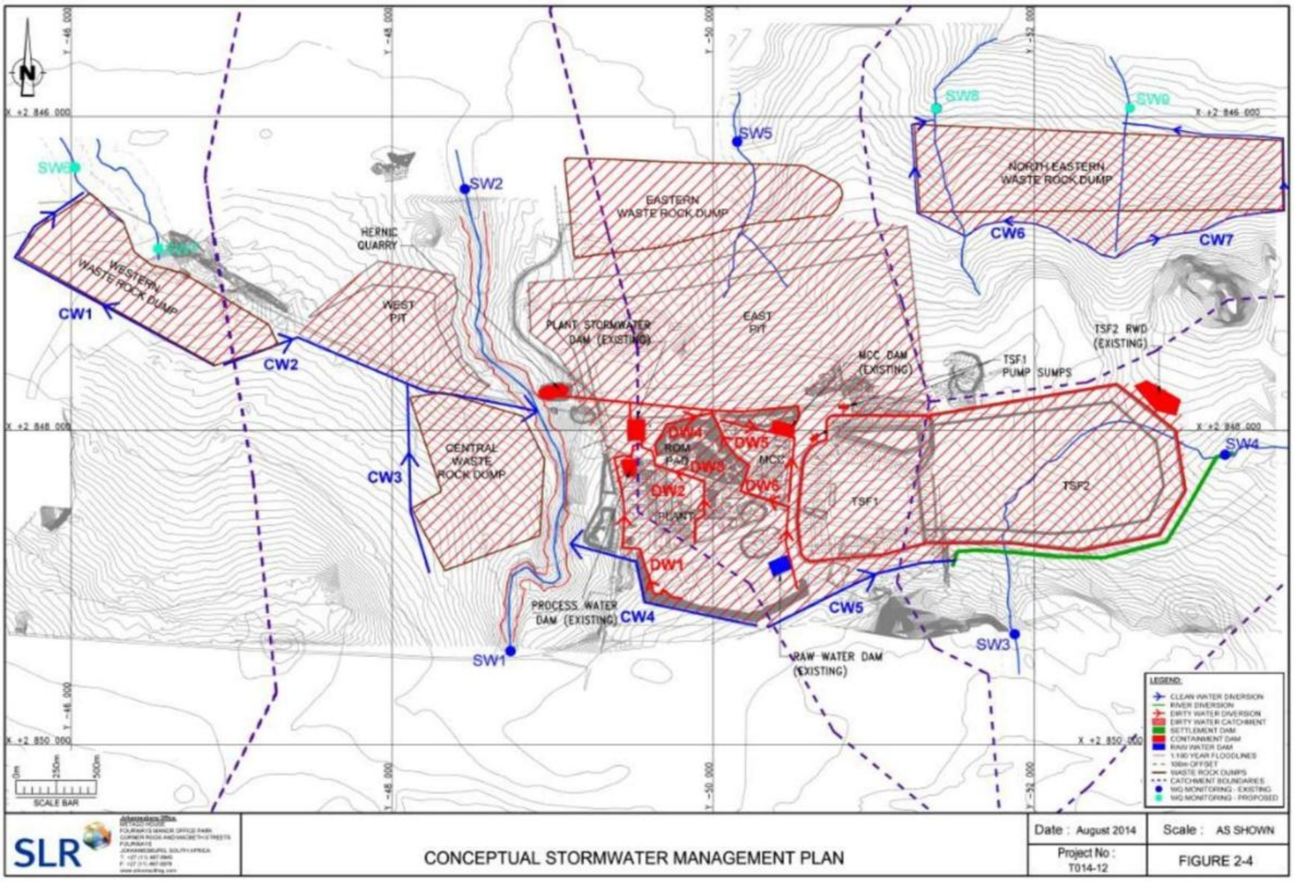


Figure 29: SWMP for Tharisa (SLR, 2014)

5-3.2 Design Point Consulting Engineers, 2016

A SWMP gap analysis and SWMP site report was prepared, as the 2015 Environmental and Social Status Quo Report highlighted a number of shortfalls in terms of stormwater management at the mine. Recommended stormwater measures in the report, including the installation of silt traps near the Stormwater Dam, additional Stormwater Dam storage capacity, lining of dirty water channels, upgrading of culverts and roofing over hazardous storage areas, amongst others.

Due to the footprint areas of the other WRDs and TSFs remaining the same, the previous proposed stormwater measures by SLR Consulting and Design Point Consulting Engineers remain, and therefore no additional stormwater measures are proposed at those facilities.

5-3.3 Design Point Consulting Engineers, 2017

Tharisa requested Design Point Consulting (Pty) Ltd (2017) (Design Point), to undertake Conceptual SWMP for the mine. The study was developed based on South African best practice guidelines and conceptualised through mapping and indicative design drawings.

Clean and dirty areas on the mine were separated in accordance with the principles presented in GN 704. Dirty areas on site are comprised of a variety of works and infrastructure as illustrated in Figure 30. The dirty areas require diversions and associated containment facilities to manage dirty stormwater generated, in accordance with the principles presented in GN 704. Furthermore, the storage/handling of fuel, lubricants and chemicals will require special attention due to their hazardous nature. These areas are required to be managed on impermeable floors with appropriate bunding and sumps.

The clean water areas on site are positioned upslope of the aforementioned dirty areas. These clean water areas require clean water diversions to prevent runoff from clean water areas mixing with runoff from dirty water areas.

5-3.4 HydroSpatial, 2018

The SWMP was updated in December 2018. Hydrospatial (Pty) Ltd was appointed by the Green Gold to conduct a hydrological assessment for a WML application and EMPr amendment for Tharisa. The SWMP was designed as a closed system (i.e., no discharge of dirty water for the environment). Stormwater measures proposed to separate clean and dirty water areas included a culvert, berms and clean and dirty water channels. See Figure 31 below.

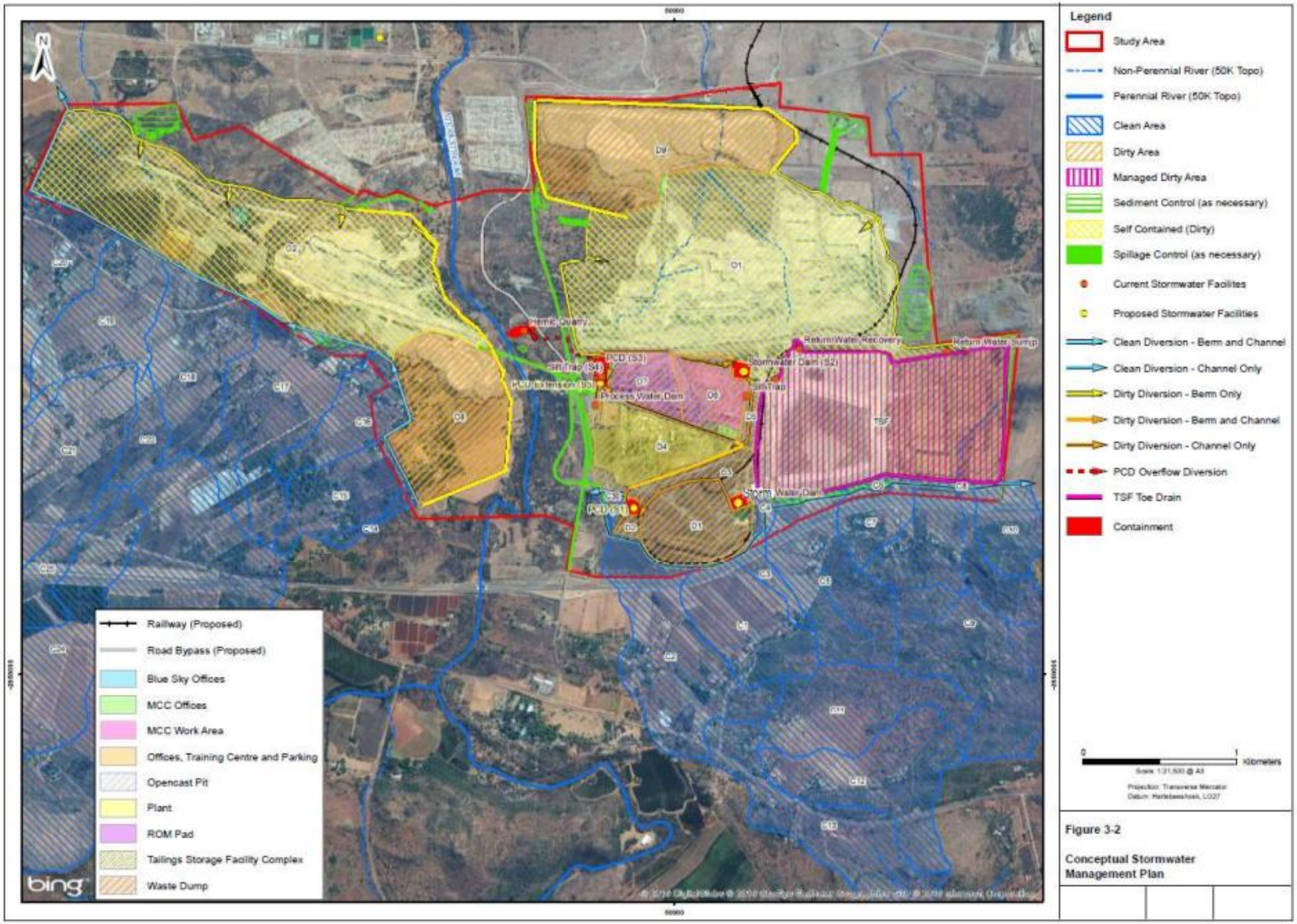


Figure 30: Conceptual Storm Water Management Plan (Design Point, 2017)

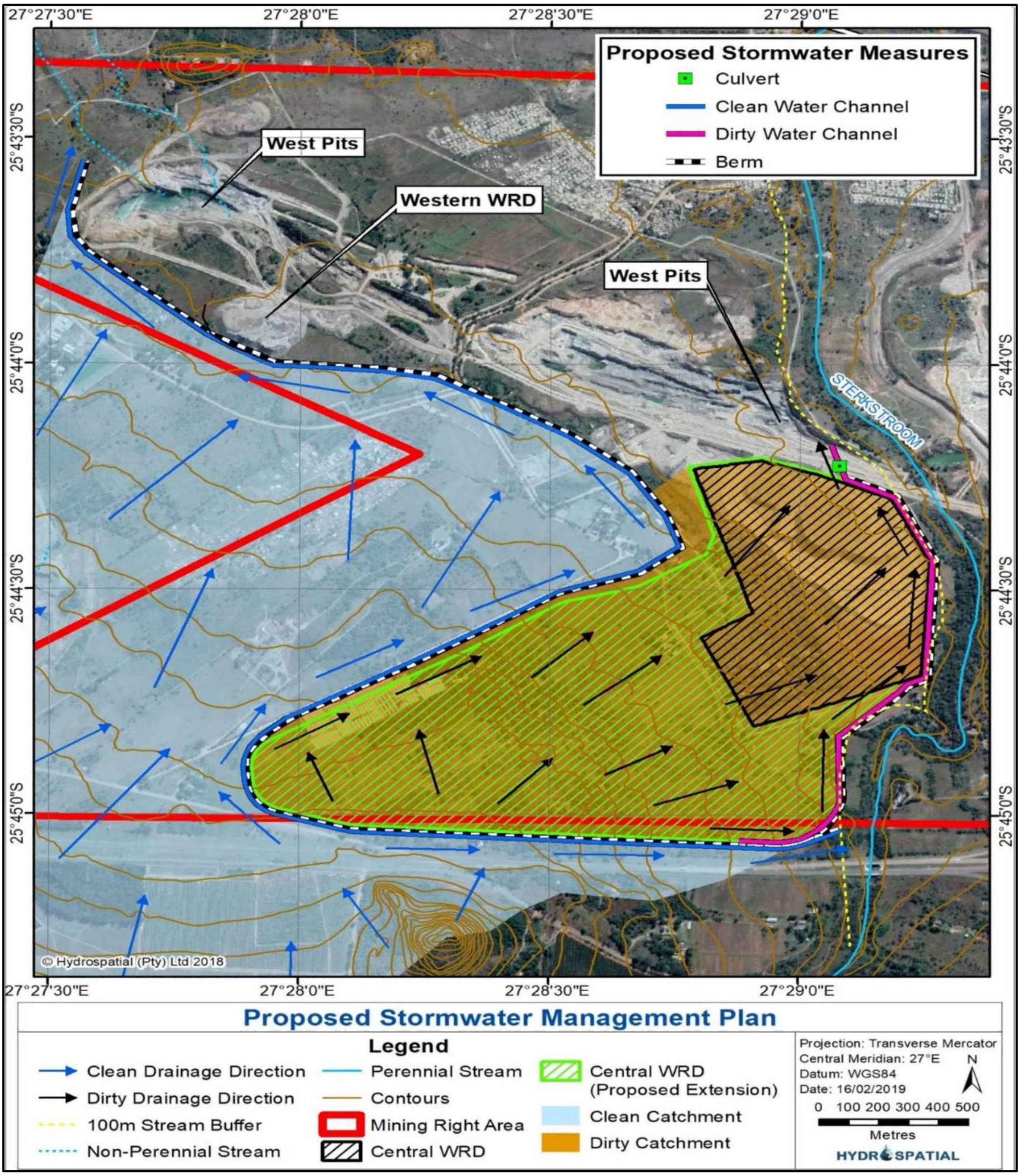


Figure 31: Proposed SWMP and Clean and Dirty Areas (Hydro Spatial, 2018)

In addition, in 2023, Tharisa requested SRK Consulting (South Africa) (Pty) Ltd (SRK) to carry out the design of a SWMP, detailing the conceptual stormwater control measures for the mine with focus on the proposed stormwater controls for the Eastern and Western pits and including the plant areas.

The objective of this study was to:

- Carry out a Regulation GN 704 audit on the site to determine what stormwater and/or process water measures will be required to make the mine GN 704 compliant; not limited to but should include:
  - Gap analyses on current design;
  - Integrate the proposed design; and

    - Catchment and runoff calculations for various risks.
- Prepare conceptual designs for the stormwater measures, including but not limited to cut-off channels, bunds and stormwater containment facilities;
- Prepare implementation plan;
- Prepare a high-level estimate for the implementation of the measures; and
- Prepare the scope of work, produce the bill of quantities and the detailed drawings required to implement the recommended designs for each phase of the project.

Figure 32, Figure 33 and Figure 34 below presents the SWMP for the plant area and the western side of the mine respectively.

Figure 32: Proposed Stormwater Control

Figure 33: Proposed Stormwater Control

Figure 34: Stormwater Control for Western side

A summary of the findings for the project includes the following:

- The SWMP was compiled in compliance to the DWS Guidelines;
- The stormwater management control measures in and around the plant area are designed to handle the 1:50-year flood event;
- Road flows for 1:50-year increase from 0.7 m^3/s at the top of the haul road and increase to 1.6 m^3/s at the bottom of the pit;
- The SWMP should be followed to ensure clean and dirty water separation, thereby mitigating the impact of pollution of the downstream clean environment.

The following is recommended:

- Upgrade the existing channels, mainly the Voyager Crusher area; and
- Construct a 1m diameter pipe through haul road near the Stormwater Dam and discharge into the Stormwater Dam.

5-4 DEWATERING

Tharisa appointed KLM Consulting Services (Pty) Ltd (2023), to undertake the review and update of the hydrogeological model in order to improve the pit dewatering and pit water management strategies for LoM. This strategy takes into consideration the expected pit bottom elevations and the transition to underground mining. The numerical groundwater flow model was updated based on the conceptual understanding of the site through the additional drilling of dewatering boreholes and measured inflows. It was also developed as a tool to aid in evaluating the impacts of the proposed mine during the operational phases by adding proposed additional dewatering boreholes.

Scenarios were developed as follows:

5-4.1 Scenario 0 Future Mining for Open Pit LOM- Base Case

There are no dewatering plans in place in this scenario.

5-4.2 Scenario 1 Future Mining for Open Pit LOM with 12 Dewatering Boreholes

Twelve (12) additional boreholes were drilled and added in 2024 in this scenario (Figure 35). The effect of the dewatering boreholes is seen with approximately 3500 m^3/d being abstracted. The effect of the Samancor flooded workings adds the potential for an inrush of water and flooding the pit. This area needs to be continually dewatered over the next two years and heads needs to be monitored. The passive inflows decrease from around 8000 m^3/d in 2024 to 5000 m^3/d in 2026. This includes the dewatering from the 12 dewatering boreholes (3500 m^3/d) and abstraction from the Samancor workings (2800 m^3/d) starting in July 2021. At current dewatering rates in Samancor working the head will reach 1000 mamsl in the year 2042.

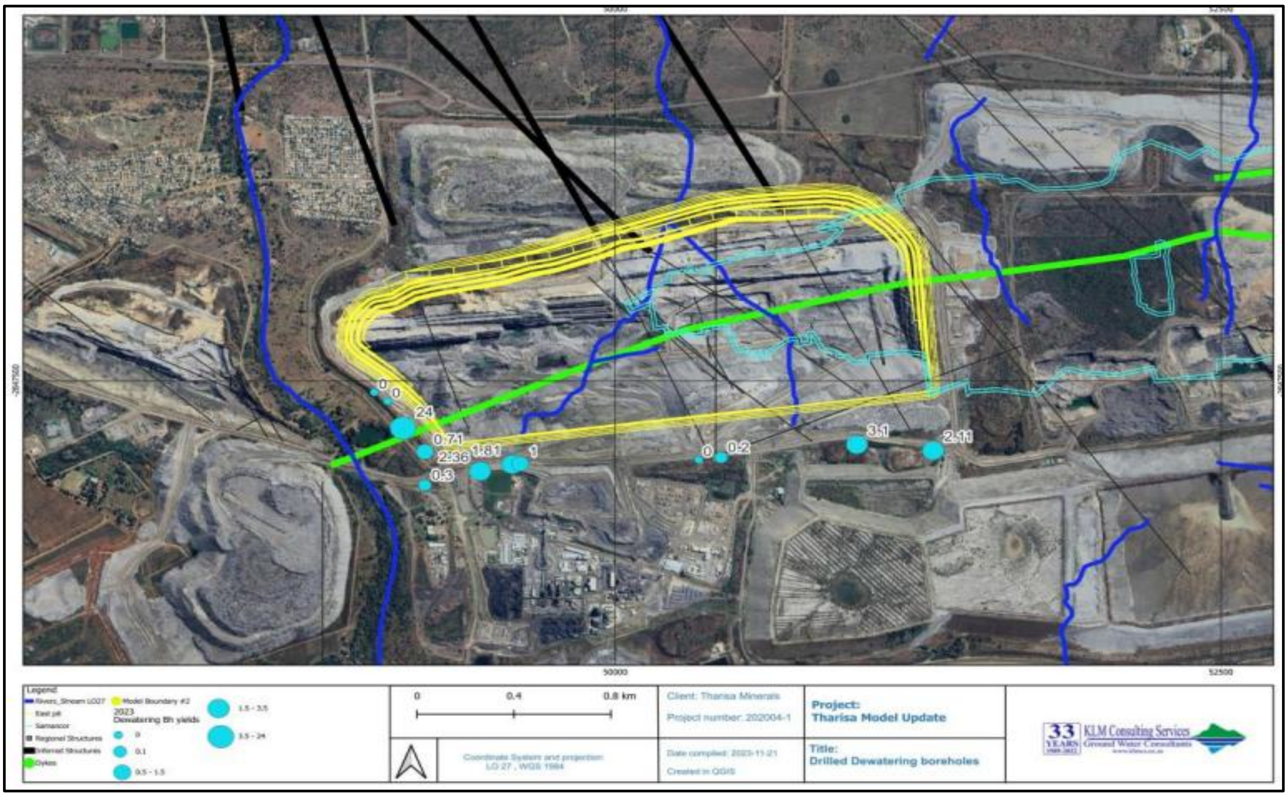


Figure 35: Twelve (12) Drilled Dewatering boreholes with yields

5-4.3 Scenario 2 Future Mining for Open Pit LOM with 12 Drilled Dewatering Boreholes and Additional 5 Dewatering Boreholes

This scenario simulated the effect of adding 5 additional dewatering boreholes North of East Pit and in the contact zone of the East West dyke. The Samancor working abstraction is doubled. Decrease of about and additional 1000 m^3/d in simulated passive inflows are observed in East Pit when the additional five dewatering boreholes are implemented. The Samancor workings is dewatered to 950 mamsl in 2029 (Figure 36).

The study included recommendations for dewatering as follows:

- It is recommended that groundwater monitoring must be continued and expanded where possible. It is recommended that weekly water levels must be taken in boreholes around the open pits.
- Drilling, pump testing and implementation of phase 2 deep dewatering boreholes is recommended. Once the drilling of phase 2 is completed, this report will be updated with the drilling results.
- The model results show that there will not be an increase in dewatering rates required as pit deepens, but that the drilled dewatering boreholes would assist in lowering heads and ingress into the East pit by about 3000 m^3/d. The additional 5 boreholes would assist with a further 1000 m^3/d.
- The Samancor flooded workings need to be dewatered in the next 2 years and heads need to be monitored to measure success. Total volumes of water are estimated to be around 1,500,000 m^3.

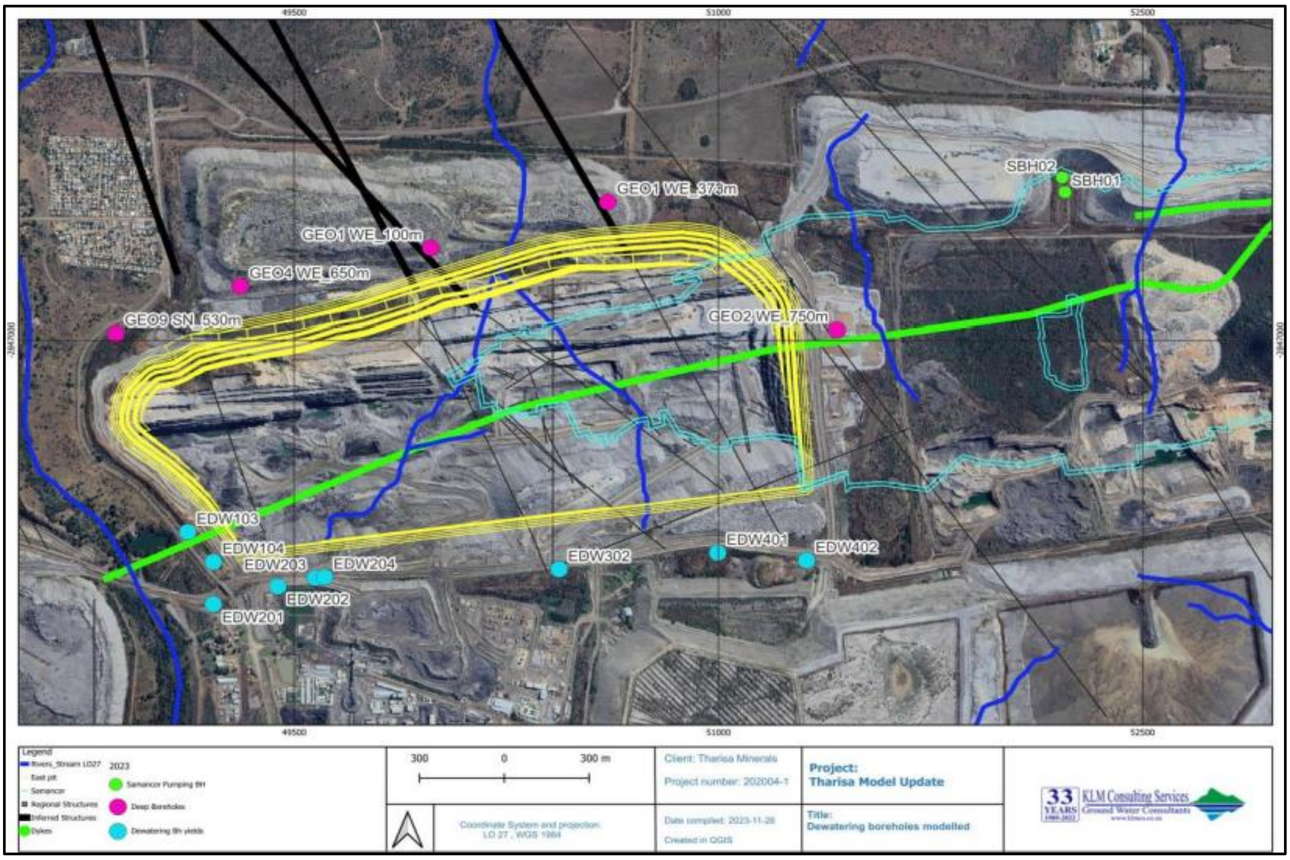


Figure 36: Drilled and proposed additional dewatering boreholes

5-5 WATER AND SALT BALANCE

This section is updated with information obtained from a "Water and Salt Balance Assessment Report (2024)" prepared by Bilavel Projects and Consulting (Pty) Ltd.

The conceptualised water balance was developed using available data, serving as the basis for estimating the salt balance distribution within the system. These values represent an annual period. Water balance is presented in cubic meters per annum (m³/annum), whereas the annual salt balance was converted to an average of kilograms per day (kg/day). The current water and salt balance represent a simplified model due to limited input data. However, the information provided in this report offers the most current and comprehensive understanding of the expected water usage at the operations. Table 17 below presents the water and salt balance accuracy based on the information provided to the consultant (Bilavel Projects and Consulting).

Table 17: Water Balance Accuracy

Process Unit	Inflow	Outflow	Imbalance
Rand Water Feed	400 660,00	400 660,00	0,0%
East Pit	2 304 987,62	2 304 987,62	0,0%
West Pit & Far West Pit	1 293 556,86	1 293 556,86	0,0%
Hernic Quarry	4 096 509,81	4 096 509,81	0,0%
Storm Water Dam	640 240,22	640 240,22	0,0%
Process Dam	1 795 045,07	1 795 045,07	0,0%
MCC Dam	120 677,19	31 285,00	285,7%
Zinc Dam	529 195,00	529 195,00	0,0%
SLP Dam	71 942,90	71 942,90	0,0%
Raw Water Dam	3 345 678,05	1 378 595,00	142,7%
Rail Loop Buffer Dam	-	-	-
Wastewater Treatment Works (WWTW)	327 813,43	327 813,43	0,0%
Plant Operations	3 676 272,00	3 676 272,00	0,0%

Process Unit	Inflow	Outflow	Imbalance
TSF	6 364 558,50	4 044 890,41	57,3%
Domestic Water	109 273,70	109 273,70	0,0%
Offices & Change Houses	21 291,00	21 291,00	0,0%
Total (Sourcing and Losses)	**8 367 246,53**	**9 955 795,98**	**15,956027%**

Table 17 above indicates that the majority of the facilities /units demonstrated equilibrium or minor variation, while the MCC Dam and TSF presents a net water surplus. The water surplus is attributed to the potential absence of unknown output streams or potential underestimation/inaccurate measurements of the volumes. Tharisa's annual mine water balance and annual salt water balance are presented in Figure 37 and Figure 38 respectively for continuity with the WUL. The Water and Salt Balance Report is included in Appendix C of this report.

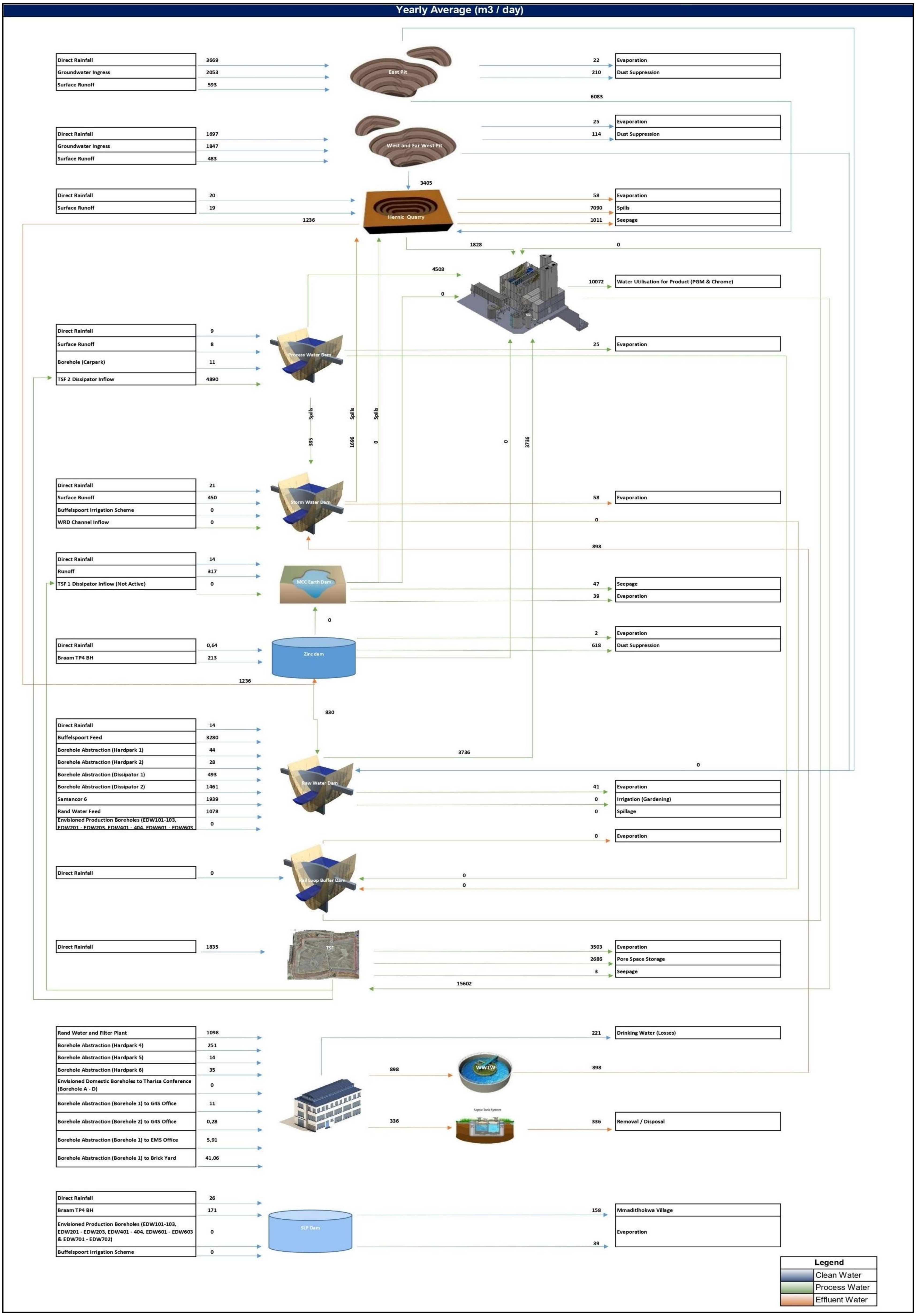


Figure 37: Tharisa Annual Water Balance

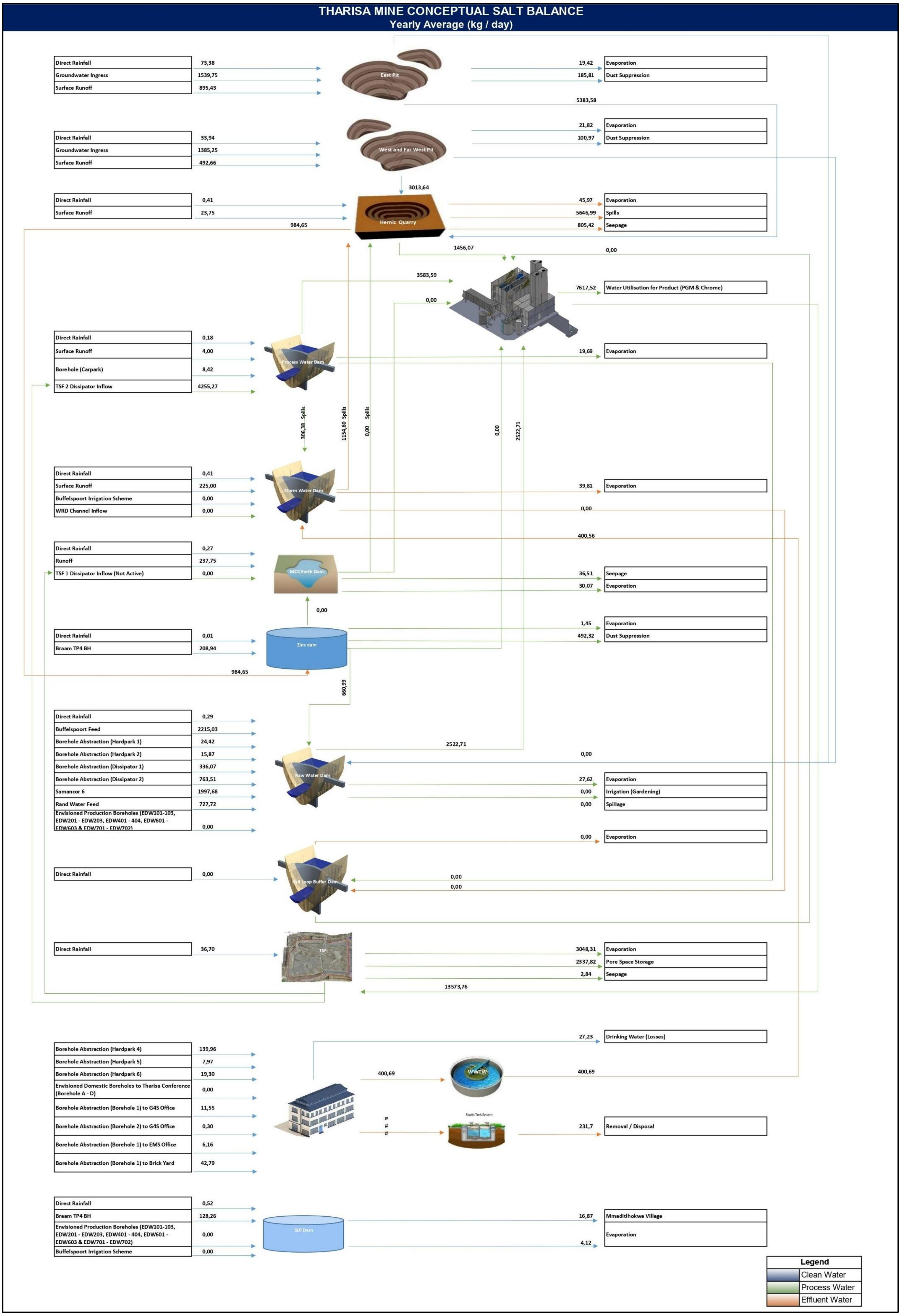


Figure 38: Tharisa Annual Salt Balance

5-5.1 Key conclusions drawn from the balances include:

- Interactive:
  - The balances were developed in an interactive format, allowing for updates as additional monitoring or process information becomes available. The salt balance accommodates various calculations automatically, enabling seamless data transfer and updates as needed.
- Water Balance Insights:
  - The envisioned Rail Loop Buffer Dam and envisioned abstraction boreholes were added to the water balance for a holistic conceptualisation of the process; however, water volumes are not included due to the sectors being in-active.
  - Evaporation estimates restrict abstraction from the pits.
  - Certain process units in terms of the provided volumes by Tharisa presented significant imbalances which were recalculated in terms of assumed distribution to account for missing data. The assumption of spillage for unaccounted water volumes were implemented.
- Salt Balance Insights:
  - Considering the average salt balance, the salinity concentrations are directly dependent on water volumes.

5-5.2 Recommendations

It is advisable that Tharisa initiate a water circuit monitoring program at the site, incorporating additional flow meters and water quality data collection, concurrent with the commencement of all activities and constructed facilities. This proactive measure is essential to accurately calculate the distribution of water and salt loads. Furthermore, the monitoring program should be systematically assessed based on the initial balances. This evaluation will enable the identification of potential gaps and discrepancies, allowing for the implementation of supplementary monitoring requirements. Such enhancements are pivotal for improving the accuracy and overall conceptualisation of the system, ensuring a robust and efficient operational framework.

5-6 ORGANISATIONAL STRUCTURE

The organisational structure that will implement the IWWMP in accordance with the management plan set out in Section 2-5 and presented in Figure 4. The implementation of the IWWMP will require the continued involvement of several key managers as well as requiring the co-operation of all mine employees and contractors.

5-7 RESOURCES AND COMPETENCE

Tharisa currently comprises mining, engineering, process, technical, administration and the surface infrastructure-related operations that are undertaken during the operational phase. The management, operational and monitoring procedures have been compiled to manage the significant aspects and impacts of the activities, products, and services of Tharisa. All environmental aspects are handled by the Environmental Department.

5-8 EDUCATION AND TRAINING

Environmental education and training at Tharisa are guided by mine’s Environmental Awareness Plan Procedure - TM-ALL-SHE-PRO-025. The aim of the Environmental Awareness Plan is to ensure that all personnel and management understand the general environmental requirements of the site. In addition, greater environmental awareness must be communicated to personnel involved in specific activities which can have a significant impact on the environment and ensure that they are competent to carry out their tasks on the basis of appropriate education, training and/or experience.

Training and development are utilised as a tool to ensure that there is constant availability of skills to sustain its activities and to equip employees with the necessary knowledge, skills and experience required to perform their jobs and to develop further in their careers.

All employees and contractors undergo induction which includes environmental management training. Each department arranges extra training according to the level of possible environmental hazards they are exposed to in their specific working conditions. Competency of staff and the effectiveness of training and development initiatives are determined through the following methods:

- Trend analysis of incidents reported;
- Analysis of work areas during visits and audits; and
- Trend analysis of monthly zero tolerance data as recorded per business area.

5-9 INTERNAL AND EXTERNAL COMMUNICATION

Internal and external communication at Tharisa is guided by the mine's Communication Policy and Procedure - TM-ALL-HRS-PRO-037.

Stakeholders are broadly defined as people or entities that have an interest in or that are affected by the operation. Structures are in place to meet with the representatives of the surrounding communities and other key stakeholders on a monthly and quarterly basis.

Internal communication is done through meetings, bulletin boards, e-mail, memorandums, intranet, screen display and reports.

External communication is done through forum development and involvement, stakeholder liaison, regulatory authorities' meetings, and public participation with the community via newsletters, telephone calls, SMSs, e-mails and periodic meetings.

5-10 AWARENESS RAISING

Part of Tharisa's approach to environmental management is the development of an Environmental Awareness Plan that aims to raise awareness of environmental issues amongst all staff. Methods of awareness include monthly environmental articles/topics, quarterly community meetings, induction, monthly bulletin, environmental campaign, environmental policy as well as environmental calendar days such as arbour week, earth day, world environmental day, water saving week etc.

In addition, all employees, contractors and directors are made aware of company policies and standards as well as environmental obligations directly related to their job. It is every employee's and contractor's responsibility to comply with the policies and standards relating to their work and to seek assistance from a manager or supervisor, or other source of advice listed if they do not fully understand their legal or company obligations or the application thereof.

5-11 MONITORING AND CONTROL

The key to the success of environmental management lies in the effective implementation of the proposed mitigation and management measures. Monitoring provides qualitative and quantitative information pertaining to the possible impacts of the development on the environment and enables the measurement of the effectiveness of environmental management measures. The current water and biomonitoring programme at Tharisa is executed by Aquatico and Clean Stream. The monitoring programme allows the mine to monitor its compliance in terms of the NWA for its entire mining operations.

5-12 SURFACE WATER MONITORING

A surface water monitoring programme is important for environmental protection, as well as managing waterways and their catchments. Monitoring consists of making observations and taking measurements that are analysed and reported to provide information on water quality and quantity. Monitoring provides the information that permits rational management decisions to be made on the following:

- Describing water resources and identifying actual and emerging problems of water pollution;

- Formulating plans and setting priorities for water quality management;
- Developing and implementing water quality management programmes; and
- Evaluating the effectiveness of management actions.

Currently, surface water monitoring is undertaken on a monthly basis at 13 locations within the Tharisa mining area. Locations and co-ordinates of the monitoring points are listed in Table 10 and plotted in Figure 13 in Section 4-6 above.

5-13 GROUNDWATER MONITORING

The purpose of the groundwater monitoring programme is to understand the current baseline conditions prior to rehabilitation and to identify potential future impacts from mining operations on the groundwater systems. It is required for rehabilitation to determine the occurrence, source and extent of contamination such as Acid Rock Drainage (ARD) to verify decant predictions from underground modelling and to determine whether water treatment will be required as part of rehabilitation.

Currently, groundwater monitoring is undertaken on a quarterly basis at 17 locations within Tharisa mining area. Locations and co-ordinates of the monitoring points are listed in Table 15 and plotted in Figure 17 in Section 4-14above.

5-14 BIOMONITORING

The biomonitoring programme is in place and monitoring is conducted bi-annually, once during the wet season and once during the dry season. Locations of biomonitoring are presented in Table 13 and Figure 15 in Section 4-9 above.

5-15 RISK ASSESSMENT/BEST PRACTICE ASSESSMENT

The BPGs that apply to the operations and where the requirements are addressed in this IWWMP are presented in Table 18.

Table 18: BPGs applicable to this IWWMP

BPG	Section reference in this IWWMP
All applicable BPGs	Section 5
A2: Water Management for Mine Residue Deposits	Sections 5-2, 5-3 and 5-4
A4: Pollution control dams	Sections 5-2.2
A5: Water Management for Surface Mines	SECTION 5: and SECTION 6:
G1: Stormwater Management	Section 5-3
G2: Water and Salt Balances	Section 5-5
G3: Water Monitoring Systems	Sections 4-6, 4-9, 4-12, 4-17, 5-11, 5-12, 5-13, 5-14
G4: Impact Prediction	Sections 4-6, 4-9, 4-12, 4-17, 5-11, 5-12, 5-13, 5-14
G5: Water Management Aspects for Mine Closure	Sections 6-5
H1: Integrated Mine Water Management	This IWWMP
H2: Pollution Prevention and Minimisation of Impacts	SECTION 6:
H3: Water Reuse and Reclamation	SECTION 6:

The impacts of the mining and related activities on the surrounding environment were assessed in Tharisa's approved EMPr (DMRE Ref NW30/5/1/2/3/2/1/358EM), and subsequent approved EMPr Amendments. The extent to which the identified potential impacts on the water resources at Tharisa have or may still occur is assessed in the environmental monitoring reports and other specialist studies undertaken as appropriate, taking into consideration the requirements of BPG G4: Impact Prediction. The assessed impacts are reviewed in this section.

In assessing the risks posed by Tharisa, it is important to consider that the mine has been operational since 2009 and as the regulatory requirements have developed, Tharisa has implemented appropriate management measures. Many of the current and potential impacts can be, and in some cases have been, successfully mitigated and risks reduced through the implementation of these measures. These management measures are described in this IWWMP under the relevant sections and additional measures that may be required are presented in SECTION 6:.

5-16 ISSUES AND RESPONSES FROM PUBLIC CONSULTATION PROCESSES

Public consultation was undertaken as part of the WUL application and was outlined in the previous applications and associated reports. During the Public Participation Process (PPP), comments and issues from Interested and Affected Parties (I&APs) for the proposed project were recorded and presented in order to be addressed. However, this is an IWWMP update, and no PPP is required.

5-17 MATTERS REQUIRING ATTENTION/PROBLEM STATEMENT

Updating and completion of the SWMP throughout the mine site and rehabilitation of river diversions and crossings.

5-18 ASSESSMENT OF LEVEL OF INFORMATION AND CONFIDENCE OF INFORMATION

The information is considered to be at a medium level of confidence. With the development of water quality monitoring, which includes specialist recommendations, the level of confidence should increase to medium-high over the medium term.

SECTION 6: WATER AND WASTE MANAGEMENT

6-1 STRATEGIES

6-1.1 Surface water

The strategies for water management at Tharisa are to minimise impacts on the surface water resources within the mine area as follows:

- Ensure that stormwater management is undertaken in such a manner as to minimise the mine's impacts on the surrounding water environment;
- Maximise the reuse, reclamation and conservation of water;
- Minimise or even eliminate, discharge of contaminated water;
- Manage domestic wastewater in such a manner as to minimise the risks of contamination of the surrounding environment;
- Implement management measures to minimise the mine's impacts on and risks to the groundwater, particularly regarding groundwater contamination from the onsite stockpiles and long- term management thereof;
- Continue to develop and refine the water balance using the latest available water monitoring data to inform the decisions to be taken in becoming water secure;
- Undertake surface rehabilitation in such a manner as to reduce the mine's effect on the receiving water environment, most notably stormwater runoff; and
- Develop a long-term water management strategy during the Operational Phase to ensure the long-term sustainability of future land use(s) and water management during the Post-Closure Phase.

6-1.2 Groundwater

The strategies for water management at Tharisa are to minimise impacts on groundwater resource:

- Identify and map seepages underground;
- Assess all known or identified potential source areas and determine whether everything practicable is done to contain all sources – wet and dry – of groundwater pollution;
- Continue to monitor groundwater levels;
- Use numerical model as a management tool for future scenarios including the following:
  - Potential mine closure scenarios; and
  - Potential sources of contamination.
- Assess the water balance process to ensure that recycling and reuse is maximised while clean water abstraction from boreholes is minimised; and
- Avoid any form of polluted discharge as far as practicable.

6-1.3 Waste

According to NEMWA, waste should be separated at its source and contained in appropriately labelled containers specifying the type of waste and its specific handling requirements. General waste will be collected in waste skips and should be removed by an appointed contractor and disposed of at an authorised local municipal waste site.

Hazardous waste, such as hydrocarbons and hydrocarbon contaminated material, should be stored in separate bins/drums or waste skips in bunded areas and will be removed and disposed of by reputable contractors. Where possible, the recycling of glass, paper, cans, oil and scrap waste will be implemented through collaboration with recycling companies.

The mine's waste management is undertaken according to the following strategy:

- Minimise the generation of waste as far as practicable;

- Separate waste at source;
- Recycle and reuse waste as far as practicable; and
- Dispose of waste to licensed offsite facilities only as a last resort.

The provision of adequate and appropriate equipment such as labelled waste containers; designated waste collection points; dedicated waste separation area; disposal of materials at appropriately licensed waste disposal facilities; and appointment of suitably qualified waste management and transport contractors effectively minimises the impacts of the mine on the receiving environment due to the generation of waste.

Tharisa will implement these strategies to avoid and/or reduce the impact on water resources.

6-1.4 Rehabilitation

The principles outlined in the BPG5: Water Management Aspects for Mine Closure that are appropriate and could be used to formulate the rehabilitation strategy for Tharisa are:

- Concurrent rehabilitation must be undertaken in a manner that supports the final closure landform to ensure that rehabilitation does not need to be redone at a later stage;
- Management measures at closure should primarily be of a passive nature with minimal long-term maintenance and operating costs;
- The final landform must be sustainable, free draining, must minimise erosion and avoid ponding; and
- Land use plan which is directly interlinked with water management issues insofar as water is required to support the intended land use and the land use itself may have an impact on the water resource.

Short to medium term rehabilitation measures/interventions should be outlined in the RSIP, which is to be updated on an annual basis. Tharisa should also develop a Rehabilitation, Decommissioning and Mine Closure Plan and continue to update the plan in accordance with national legislation. This plan should be included in the annual IWWMP update reports.

6-2 PERFORMANCE OBJECTIVES/GOALS

The following objectives and strategies are followed in order to achieve the SHE and Community Policy:

- Compliance:
  - Identify all applicable legislation and other applicable requirements to the identified environmental aspects and ensure that the operations remain in compliance with such legislation and requirements.
- Pollution Prevention:
  - Identify the impacts that all operations, processes and products have on the environment and will ensure that pollution on the environment is prevented or minimised.
- Improvement:
  - Set objectives and targets to improve environmental performance and the Environmental Management System (EMS) and will continually strive to find even better sustainable solutions to problems.
- Competence:
  - Ensure that all people who perform work for or on behalf of Tharisa are competent and understand the impact of their activities on the environment, and their role in the prevention of pollution and the maintenance of the EMS.
- Communication:
  - Actively communicate this policy to persons working for and on behalf of Tharisa to ensure that they understand the content intent and will make it available to the public.
- Review:
  - Review the continued sustainability and adequacy of this policy at least annually to ensure it remains valid at all times.

6-3 MEASURES TO ACHIEVE AND SUSTAIN PERFORMANCE OBJECTIVES

The IWWMP must clearly demonstrate that it has incorporated all of the above objectives/principles or, alternatively, must clearly motivate why any of the above principles are not relevant. Water resources can be protected in the following ways by applying water conservation, pollution prevention and minimisation of impacts principles:

- Reduction in the level of contamination of water through implementation of pollution prevention strategies thereby increasing the economic reuse of the water without treatment; and
- Minimisation of impacts through capture, containment, reuse and reclamation of contaminated water, thereby preventing discharges/releases.

6-4 IWWMP ACTION PLAN

This part of the IWWMP details the actions that will be taken to give effect to the water management strategy. The action plan focuses on the measures that should be implemented during the current annual period of the Operational Phase.

The compilation of an IWWMP is a long-term commitment in terms of resources requirements including technical investigations that are conducted. These also require disbursing financial resources to implement management measures which can in most cases take months. With this in mind, this IWWMP has been developed for short to medium term (i.e., first 1 - 5 years of operation of the mine). This Action Plan should be reviewed and updated every year. It is the intention of the mine to have yearly interaction with DWS and update the Action Plan accordingly.

Table 19: IWWMP Action Plan

ID	Aspect	Issue	Target/Action Plan	Timeline	Source
1	Stormwater Management	Stormwater Management update	Construct a paddock around the WRD in order to prevent dirty stormwater generated from the WRD entering the river.	Medium term 2026/2027	Tharisa Stormwater Design (SRK) 2023
2	Water Balance	Addition of extra flow meters at the start of all activities.	Initiate a water circuit monitoring program at the site, incorporating additional flow meters and water quality data collection, concurrent with the commencement of all activities and constructed facilities.	Medium term 2025/2026	Tharisa Water and Salt Balance Report (2024), Bilavel Projects and Consulting (Pty) Ltd
3	Water abstraction from boreholes Section 21 (a)	It was observed during the 2023 WUL audit that most localities as per Table 1 in Appendix II of the WUL have exceeded the WUL abstraction limits.	The licensee must comply with the requirement of this condition as outlined in Table 1 in Appendix II of the WUL.	Ongoing	2023 WUL Audit Report Blacc Engineering Services (2024)
4	Metering	It was observed during the 2023 WUL audit that only water entering the dams is measured, however the water leaving the dams from overflow points is not being measured.	Tharisa to measure water discharged from the Hernic Quarry dam into the stream.	Ongoing	2023 WUL Audit Report Blacc Engineering Services (2024)
5		It was observed during the 2023 WUL audit that the East and West pit dewatering volumes for the year 2023, recorded in January 2024, exceeded the WUL limits. East Pit Dewatering for 2023 = 4 888 778 m^3 (limit:1 354 034) West Pit Dewatering for 2023 =2 228 856 m^3 (limit: 207 199)	Tharisa to ensure that water removed from the pits areas be kept within the authorised limits all the time.	Ongoing	2023 WUL Audit Report Blacc Engineering Services (2024)
6	Dirty water dams/Containment facilities	It was observed during the 2023 WUL audit that Stormwater Dam, process water dam and return water dam did not have the minimum freeboard of 0.8m as required.	Tharisa to ensure that the required freeboard of 0.8m is maintained for all dams by desilting the dams when necessary.	Ongoing	2023 WUL Audit Report Blacc Engineering Services (2024)
7	Water quality monitoring	Toxicity monitoring.	Tharisa to consider moving the site TM-SW17 slightly further downstream to ensure all potential impacts from the Tharisa Mine mining area on the Elandsdriftspruit are taken into consideration.	Medium term 2025/2026	Toxicity Testing Report BioTox Lab, March 2024 Survey, Report reference: AQL-THA-A-24_TOX.

ID	Aspect	Issue	Target/Action Plan	Timeline	Source
8	Dewatering	The dewatering study indicated that 5 additional dewatering boreholes at the North of East Pit and in the contact zone of the East West dyke be drilled in order to double the Samancor working abstraction.	Drilling, pump testing and implementation of phase 2 deep dewatering boreholes must be undertaken.	Medium term 2025/2026	KLM Consulting Services (Pty) Ltd (2023)

6-5 CONTROL AND MONITORING

6-5.1 Operational phase

Monitoring as described in Section 5-11 to 5-14 should continue. Data from water quality monitoring should continue to be assessed against the WUL compliance limits.

6-5.2 Post-closure

The anticipated monitoring post closure will include:

- Surface Water Quality Monitoring against parameters as required by the WUL. Sampled monthly for a five-year post-closure period;
- Groundwater Quality Monitoring of both the shallow and deep aquifers against the parameters required by the WUL. Monitoring of the boreholes against the parameters as required by the WUL. Sampled quarterly for a five-year post-closure period;
- Erosion Monitoring: This will take the form of developing a representative reference site on the disturbed footprints and undertaking visual and topographic assessments to determine erosion rate, using standard erosion monitoring techniques. This will be undertaken once a year at the end of the wet season for a five-year post-closure period;
- Soils: The rehabilitated area must be assessed for compaction and fertility during dry season. A compacted soil has a reduced rate of both water infiltration and drainage. As a result, there will be less erosion happening. Soil fertility should be assessed (during the dry season so that recommendations can be implemented before the start of the wet season) so as to correct any nutrient deficiencies;
- Vegetation establishment: Vegetation condition will be monitored using standard field techniques to determine whether the vegetation has been established with a species composition and density similar to that of a reference analogue site established in a similar ecotype, conducted annually for a five-year post-closure period;
- Biomonitoring: Should be undertaken upstream and downstream of the mining activities. A long-term operational bio-monitoring programme will be implemented to monitor physico-chemical and biological components of the aquatic ecosystems within the mining area, which will be extended into the closure period. An appropriate biological index will be included in order to quantify and classify the longer-term changes in biotic integrity, with monitoring being undertaken annually; and
- Rehabilitation Performance Monitoring: Rehabilitation Performance Monitoring will be undertaken using standardised approaches. This will consist of comparing the reclaimed areas to sites of pre-mining vegetation where vegetation, soil chemical and physical properties are measured.

Photographic records should be maintained together with findings. Annual reports will be prepared to document the results of the monitoring during the closure and post-closure phases.

6-6 MONITORING OF CHANGE IN BASELINE INFORMATION

Monitoring provides information pertaining to the changes in baseline conditions and the impacts of the mine on the environment and enables the effectiveness of the environmental management implemented on site to be measured both qualitatively and quantitatively.

At Tharisa Mine, surface water monitoring, groundwater monitoring and biomonitoring are conducted by suitably qualified persons, and interpretation of monitoring results is done by appropriately qualified and experienced scientists. Information from the assessment of the data and reporting will be used towards continual improvement at the mine and will inform the annual updates of the IWWMP.

6-7 AUDIT REPORT ON PERFORMANCE MEASURES

Originally, Tharisa Mine was issues with a WUL in 2012. There have been several amendments to the WUL. The applicable WUL for the mine was issued in 2024, which supersedes the 2020 and all the other amendments. Since the issuance of the original WUL, internal and external WUL audits are conducted annually. The latest internal and external WUL audits were undertaken in December and February 2024 respectively.

Concerns and non-compliances that were identified during the audits are included in the action plan for implementation and tracking progress.

6-8 AUDIT AND REPORT ON RELEVANCE OF IWWMP ACTION PLAN

Tharisa should conduct audits as follows:

- External environmental compliance audits against the EMPr and amendments will be conducted biannually for submission to the DMRE. The continued appropriateness and adequacy of the EMPr is evaluated during the audits;
- IS0 14001 audits will be conducted annually;
- Internal and external audits against the WUL will be conducted annually for submission to DWS. Actions identified to rectify non-compliances are incorporated into the Action Plans of this IWWMP, and
- DWS conducts scheduled site visits and compliance audits to assess compliance to the NWA and WUL.

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SECTION 7: CONCLUSION

This IWWMP serves as the first annual update after the approval and issuance of the amended WUL Number No:03/A21K/ABCGIJ/1468, File Number: 27/2/2/A1021/37/1, signed on 17 September 2024. This WUL supersedes the WULs issued in 2020 and all the other amendments.

This IWWMP contains information on the mining and related activities that are undertaken at Tharisa, with emphasis on water and waste management. Information provided includes the current environmental situation, the activities taking place at the mine with the associated, authorised Section 21 Water Uses of the NWA, the current and potential impacts and risks posed by the operation to the receiving environment and other water users, and mitigation measures to address the identified impacts and risks.

Since Tharisa is an existing mine, the IWWMP will continue to be implemented in a phased approach. An action plan for the current and next operational period (midterm actions) has been developed. This updated IWWMP also demonstrates the mine's commitment to continual improvement to the water and waste management system in order to comply with the WUL and other changes in legislative requirements, and to keep up to date with new technological advances pertaining to water management in the mining industry.

SECTION 8: REFERENCES

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