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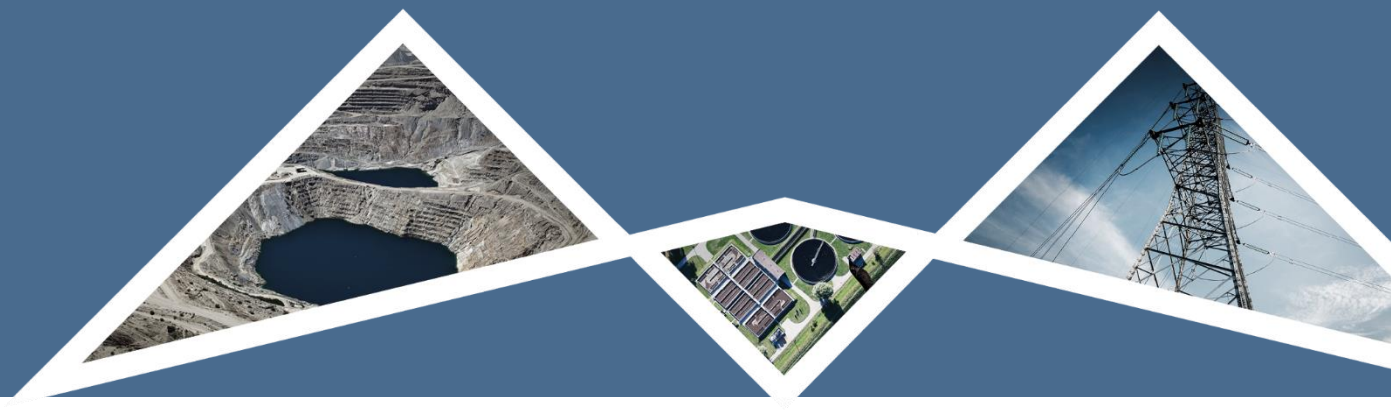
T 011 789 7170 E info@eims.co.za W www.eims.co.za

INTEGRATED WATER AND WASTE MANAGEMENT PLAN

TAU LEKOA GOLD MINE



DOCUMENT DETAILS

EIMS REFERENCE: 1206

DOCUMENT TITLE: Integrated Water and Waste Management Plan Tau Lekoa Gold Mine

DOCUMENT CONTROL

	NAME	SIGNATURE	DATE
COMPILED:	Sonja van de Giessen		2017/12/08
CHECKED:	Brian Whitfield		2017/12/11
AUTHORIZED:	Liam Whitlow		2017/12/11

REVISION AND AMENDMENTS

REVISION DATE:	REV #	DESCRIPTION
2017/12/11	ORIGINAL DOCUMENT	IWWMP

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Abbreviations

ABET	Adults Basic Education Training
BOD	Biological Oxygen Demand
CMA	Catchment Management Area
CMS	Catchment Management Strategy
COD	Chemical Oxygen Demand
DEA	Department of Environmental Affairs
DME	Department of Mineral and Energy
DMR	Department of Mineral Resources
DWA	Department of Water Affairs (formerly DWAF)
DWAF	Department of Water Affairs and Forestry
DWS	Department of Water and Sanitation (formerly DWA)
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EI	Ecological Importance
EIA	Environmental Impact Assessment
EIMS	Environmental Impact Management Services (Pty) Ltd.
EIS	Ecological Importance and Sensitivity
EMP	Environmental Management Plan
EMPR	Environmental Management Program
EMS	Environmental Management System
EO	Environmental Officer
ES	Ecological Sensitivity
ESMS	Environmental and Social Management System
GDP	Gross Domestic Product
HGM	Hydro-geomorphic
I&AP	Interested and Affected Party
IDP	Integrated Development Plan
IEMPR	Integrated Environmental Management Programme
ISO	International Organisation for Standardisation
IUA	Unit of Analysis
IWWMP	Integrated Water and Waste Management Plan
LED	Local Economic Development
LOM	Life of Mine
MAE	Mean Annual Evaporation
MAP	Mean Annual Precipitation

MAR	Mean Annual Runoff
MSDS	Material Safety Data Sheets
MPRDA	Mineral and Petroleum Resources Development Act (Act 28 of 2002)
NEMA	National Environmental Management Act, (Act 107 of 1998).
NEMBA	National Environmental Management: Biodiversity Act (Act 10 of 2004)
NEMWA	National Environmental Management: Waste Act (Act 59 of 2008)
NFEPA	National Freshwater Ecosystem Priority Areas
NWA	National Water Act, Act 36 of 1998
NWRS	National Water Resource Strategy
PCD	Pollution Control Dam
PES	Present Ecological Status
PPP	Public Participation Process
PPR	Public Participation Report
PTN	Portion
RE	Remaining Extent
RMF	Regional Maximum Flood
RQO	Resource Quality Objectives
SANS	South African National Standards
SASS	South African Scoring System
SAWQG	South African Water Quality Guidelines
SDF	Standard Design Flood
SHE	Safety, Health and Environmental
SHEQ	Safety, Health, Environment and Quality
SLP	Social and Labour Plan
SWMP	Storm Water Management Plan
WARMS	Water Authorisation Registration and Management System
WMA	Water Management Area
WML	Waste Management License
WMS	Waste Management Strategy
WUL	Water Use Licence
WULA	Water Use Licence Application
WRD	Waste Rock Dump

EXECUTIVE SUMMARY

Tau Lekoa Gold Mining Company (Pty) Ltd. is required to submit an Integrated Water and Waste Management (IWWMP), as well as to compile and submit the water use licence (WUL) application in terms of the National Water Act (NWA) (Act 36 of 1998) for the Tau Lekoa Gold Mine. Tau Lekoa Gold Mine is an existing gold mine, operating since 1985. The mine consists of the Tau Lekoa Section, which is located near Orkney in the North West Province and the Weltevreden Section, which is located south of the Vaal River in the Free State Province. Through the acquisition of the mine by the Applicant from the previous owner, Buffelsfontein Gold Mines Limited, the WUL relating to the affected properties was relinquished and as such a new WUL is required.

The operation is in possession of two Mining Rights (reference numbers: FS30/5/1/2/2/03MR and NW30/5/1/2/2/17MR) in terms of the Mineral and Petroleum Resources Development Act (MPRDA) (Act 56 of 2002).

CONTEXTUALISATION OF THE ACTIVITY

The Tau Lekoa Section of the mine is an active mine, while the Weltevreden Section is currently flooded and needs to be dewatered for the mine to be accessed for future planned operations. Mining operations are conducted at depths ranging from 800 metres to 1,743 metres. The operations entail the underground mining of the Ventersdorp Contact Reef. These operations comprise of a twin-shaft system, with seven shaft levels at an average of 70 panels in operation. The mine has existing infrastructure that will be utilised and proposes to establish a new pollution control dam (PCD) at the Weltevreden Section, a product stockpile, and expanding the existing waste rock dump.

The organisation has various corporate and business policies and procedures in place to assist with the management of environmental impacts, including waste procedures and water monitoring procedures.

WATER USES AND WASTE STREAMS

The mine is applying for the following water uses in terms of the National Water Act (NWA) (Act 36 of 1998):

- Tau Lekoa water use activities:
  - S21(g) – Waste rock dump;
  - S21(g) – Sewage plant;
  - S21(e) – Irrigation of manicured lawns with treated sewage water; and
  - S21(c&i) – Powerline crossing the Vaal River (between Weltevreden and Tau Lekoa).
- Weltevreden Section:
  - S21(a) – For the use of the water from the shaft (process water);
  - S21(c&i) – Powerline crossing the Vaal River (between Weltevreden and Tau Lekoa);
  - S21(g) – Earth dam upgrade to store water as part of Storm Water Management Plan (dirty water containment);
  - S21(g) – Concrete dam #1 (reservoir) to store mine water for reuse (process water);
  - S21(g) – Settling dams near shaft entrance (temporary settling before pumped to concrete dam #1);
  - S21(g) – Concrete dam #2 (reservoir) to store excess mine water;
  - S21(g) – Waste rock dump;
  - S21(g) – Product Stockpile;
  - S21(g) – Septic tank (depending on proximity to a water resource);
  - S21(g) – Dust suppression; and
  - S21(j) – Dewatering the shaft (shaft is currently flooded).

The main waste streams include domestic waste, hazardous waste and industrial waste.

PRESENT ENVIRONMENTAL SITUATION

The Tau Lekoa Mine is located near Orkney within the North West Province while the Weltevreden Shaft is located in the Free State Province, separated by the Vaal River. The Tau Lekoa Mine falls on the boundary of the C24J and C24H quaternary catchments and the Weltevreden shafts falls on the boundary of C24J and C24B quaternary catchment both of which fall within the Middle Vaal Water Management Area (WMA). The majority of both sites fall within quaternary catchment C24J. The main river draining C24J is the Vaal River.

The surface water quality is relatively good although ammonia exceeds the SANS:241 Drinking Water Guideline limits in both the Schoonspruit and Jagspruit. However, the high concentrations were recorded upstream from the Tau Lekoa mine and therefore are not attributed to the mine's activities. The 'dams' located on the mine property, i.e. Swanepoel Dam and the sewage dam also show elevated ammonia concentrations, but at lower concentrations than the abovementioned streams. The inorganic water quality in the Vaal River (upstream and downstream) do not exceed the SANS 241 guideline limits and there is no evidence of any mining-related impact when comparing the upstream and downstream concentrations.

The Department of Water and Sanitation (DWS) conducted desktop PES and EIS assessments for South Africa's major rivers, which included the Vaal River (DWS, 2014). The Vaal River sub-quaternary reaches, C24B-01962 and C24J-01967, which separate the mine and the shaft, were assessed as being Largely and Moderately Modified (PES 'D' and 'C' Category) and both having a 'High' Environmental Importance and Environmental Sensitivity rating. The Recommended Ecological Category for both reaches is a 'B' or High.

Two Seep wetlands occur on site. Seep 1 is a system with channelled outflow through concentrated surface flow, into the Schoonspruit River. Seep 2 is a seasonal seep system without channelled outflow. It is isolated from the Vaal River channel by a vegetated stable alluvial ridge associated with fluvial processes.

Two main aquifers occur on site, namely a shallow, weathered aquifer exists in the weathered andesite at an average depth of 10m below ground level, and a fractured aquifer. The results of the groundwater quality assessment indicated that the regional groundwater quality is good and generally within the recommended SANS 241guidelines, however, the nitrate concentrations were high in a number of sampled boreholes. This may be attributed to agricultural activities, however the very high concentrations down-gradient of the mine's waste rock dump (WRD) may indicate a mining-related cause. The sampled borehole located down-gradient of the WRD indicates an impact from the WRD with Electrical Conductivity, Total Dissolved Solids and sulphate concentrations being elevated. The uranium concentrations in all the samples were below detection limits.

INTEGRATED WATER AND WASTE MANAGEMENT PLAN

The development of the IWWMP for this project was done in order to meet the water use authorisation requirements in terms of the NWA. The IWWMP clearly defines the responsibility and accountability for the execution of water and waste management. It also identifies and plans for future water and waste management needs and requirements.

The IWWMP further outlines the management of water and waste on site, and serves to document the methods employed, and the management of water and waste related emergencies that may arise. The IWWMP also details the minimisation of costs related to the management of water and waste by specifying how the efficiency of water and waste management systems are optimised, thereby minimising adverse environmental and social impacts related to water and waste management.

PUBLIC PARTICIPATION PROCESS

Interested and Affected Parties (I&AP's) identified were initially notified of the proposed WULA, and invited to register as an I&AP and submit any comments or concerns they may have. All registered I&AP's, including key stakeholders and landowners, have been notified of the availability of the IWWMP that has been placed out for public review. All issues and responses will be captured in the Public Participation Report and will be submitted to the DWS.

IMPACT ASSESSMENT

The main potential impacts identified include impacts on:

- Surface Water quality may decrease due to contamination or the flow regime may change during operation;
- Wetlands may be impacted on due to increased sedimentation and erosion, and
- Groundwater may be impacted on by seepage from the WRD or the PCD or contamination from hydrocarbons.

The final significance of these impacts is all moderate to low once the mitigation measures are implemented.

WATER AND WASTE MANAGEMENT

Tau Lekoa subscribes to a comprehensive waste management strategy, which essentially classifies waste into two (2) main categories namely non-mining (general) waste, and mining/process related waste. Water supply to the mine is supplied by Midvaal Water and is stored in a potable reservoir for domestic purposes. All process water generated within the mine is reused or sent to the Gold Plant. The Tau Lekoa Section uses and processes an average of 3 million cubic metres of water per year. The Weltevreden Section operations use and processes an average of 900,000 cubic metres of water per year.

The mine has a sewage purification plant located on the Tau Lekoa Section, which treats domestic waste from the mine offices and shaft areas. A conceptual storm water management plan has been developed for the mine to ensure that 'clean' and 'dirty' water generated from the sites is adequately contained and routed in accordance with the requirements of GN704 (1999).

IWWMP ACTION PLAN

An IWWMP action plan in terms of wetlands, surface water, as well as ground water has been developed for the Tau Lekoa mine to ensure that the various water management strategies are implemented. The action plan identifies locations within the mine that need to be monitored, the parameters that should be included, as well as the applicable standard and the comparative target to be reached in terms of the implementation of the action plan. The frequency of monitoring is also included, while responsibility and accountability for the execution of the recommended water management related activities are clearly identified.

CONTROL AND MONITORING

Tau Lekoa has implemented a water monitoring programme and has various strategies in place to ensure that responsible and accountable water management is implemented on site for the Tau Lekoa and Weltevreden Section. Monitoring will be undertaken throughout the life of the mine and any monitoring findings will be reported to Department of Water and Sanitation. Tau Lekoa will use the audit report findings to continually ensure that environmental protection measures are working effectively on site through a system of self-checking. The IWWMP (together with the annual Environmental Management Programme – EMPR) performance assessment) will be subject to regular audits. The IWWMP will be updated as per the results of the said audit.

CONCLUSION

Tau Lekoa is applying for various Section 21 water uses in terms of the NWA. An exemption in terms of the provision of GN704 is required for activities falling within 100 m of a watercourse. Tau Lekoa is committed to assisting the South African workforce and through the Social Labour Plan will ensure that the positive social and economic impacts of the mine are optimised.

Through the implementation of the various strategies, goals and objectives, as well the action plan of this IWWMP, Tau Lekoa will ensure the efficient and beneficial use of the water. The mine has made considerable investments, into the project.

The WUL is required for the duration of the Life of Mine, however, it is proposed that the licence be issued for a period of at least twenty (20) years due to the long-term water management measures that are required to be put in place. Tau Lekoa is committed to implementing and reviewing the IWWMP action plan included in this document (Section 6.6).

1 INTRODUCTION

Environmental Impact Management Services (EIMS) (Pty.) Ltd. was appointed by Tau Lekoa Gold Mining Company (Pty) Ltd. (the Applicant) to submit an Integrated Water and Waste Management (IWWMP), as well as to compile and submit the WUL application in terms of the NWA for the Tau Lekoa Gold Mine. Tau Lekoa Gold Mine is an existing gold mine, operating since 1985. The mine consists of the Tau Lekoa Section, which is located near Orkney in the North West Province and the Weltevreden Section, which is located south of the Vaal River in the Free State Province. Through the acquisition of the mine by the Applicant from the previous owner, Buffelsfontein Gold Mines Limited, the WUL relating to the affected properties was relinquished and as such a new WUL is required.

The Tau Lekoa Section is an active mine, while the Weltevreden Section is currently flooded and needs to be dewatered in order for the mine to be accessed for future operations.

1.1 ACTIVITY BACKGROUND

The major reef mined at Tau Lekoa is the Ventersdorp Contact Reef. Mining operations are conducted at depths ranging from 800 metres to 1,743 metres, making this one of the shallower gold mines in South Africa. The Tau Lekoa operation comprises a twin-shaft system. Ore mined by Tau Lekoa is processed and treated in preparation for gold extraction at the Buffelsfontein South Plant (GCS, 2009). The Life of Mine (LOM) is currently estimated at 10 years (Kock, Personal Communication, 2017)

1.2 CONTACT DETAILS OF THE APPLICANT

The applicant is Tau Lekoa Gold Mine (Pty) Ltd. The relevant contact person for the project is provided in Table 1 below.

Table 1: Applicant Details

Item	Details
Company	Tau Lekoa Gold Mine (Pty) Ltd.
Name	Mr William Owen O'Brien
Designation	CEO
Telephone	0184737063
Postal Address	Private Bag X800, Stilfontein, 2550

1.3 REGIONAL SETTING

Tau Lekoa mine is located 7km west of the town of Orkney and 15km south of Klerksdorp. The Tau Lekoa Section of the mine is located on the northern side of the Vaal River in the North West Province. The Tau Lekoa Section is accessed from the R502, and falls within the magisterial district of Klerksdorp (North West Province). The Weltevreden Section lies on the southern side of the Vaal River in the Free State Province and is accessed from the Stokkiesdraai Road, off the R30 (refer to Figure 1). The Weltevreden Section falls within the Viljoenskroon (Free State Province) magisterial district.

1.4 PROPERTY DESCRIPTION

The water uses for the Tau Lekoa Section are located on Portion 27 and Portion 31 of the farm Goedgenoeg 433 IP. The water uses for the Weltevreden Section are located on the farm Weltevreden 130, as well as Boshoek 466 and Jonkerskraal 475, which are both in the process of being transferred to Tau Lekoa Gold Mining Company. The farm Goedgenoeg 433 IP and the farm Weltevreden 130 are owned by the Applicant.

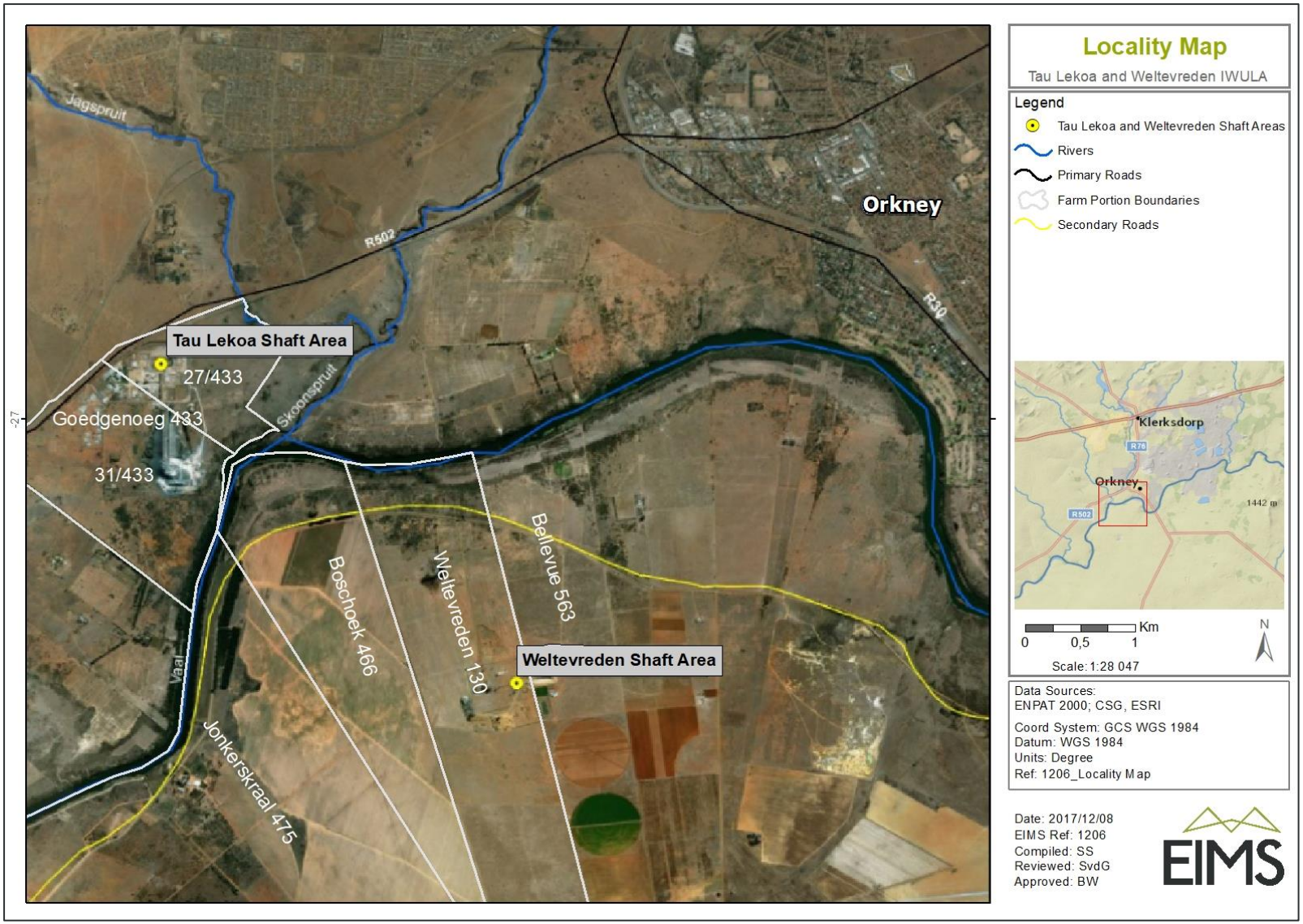

Figure 1: Location of the Tau Lekoa Section and Weltevreden Section

1.5 PURPOSE OF IWWMP

Although the requirement for the compilation of an IWWMP was originally aimed at collating and rationalising the information submitted for Water Use Licence Applications (WULA) to the DWS, it has progressed beyond this purpose to:

- Provide the regulatory authorities with focused and structured information not only to meet their general information needs, but also to articulate the required management measures and actions to achieve the water and waste related performance on an on- going basis; and
- Provide direction and guidance to the water user on water and waste management of any activity.
- The IWWMP should be used in conjunction with other guidelines developed by DWS, such as the External Guideline on the Water Use Authorisation Process and the series of Best Practical Guidelines for water resource protection in the Industries and Mines. The Department and/or relevant Catchment Management Agencies (CMA) implement the integrated water resource management (IWRM) at source by means of an IWWMP.
- The Department requires an IWWMP as a simple feasible, implementable plan for water users based upon site specific programmes, also taking into account the National Water Resource Strategy (NWRS), Catchment Management Strategy (CMS), Resource Quality Objectives (RQO's) and sensitivity of the receiving water resource, upstream and downstream cumulative impacts of water use activities, external water use authorisation guidelines, as well as water use specific supplementary information requirements. The most important component of the IWWMP development process is the formulation of various strategies, goals and objectives for the water use or waste management of an activity, in accordance with the set philosophies and policies. The policies must address the four key areas related to IWWMP development, namely process water, storm water, groundwater and waste. The purpose of an IWWMP is as follows:
- Compilation of a site specific, implementable, management plan addressing all the identified water use and waste management related aspects (e.g. process water balances, storm water management, groundwater management, water re-use and reclamation, water conservation and demand management, waste minimization and recycling) of the specific activity, in order to meet set goals and objectives, in accordance with Integrated Water Resources Management principles;
- Provision of management plan to guide a water user regarding the water and waste related measures which must be implemented on site in a progressive, structured manner in the short, medium and long term;
- Documentation of all the relevant information, as specified in this guideline, to enable the Department to make the decision regarding the authorisation of a water use;
- Clarification of the content of the IWWMP for DWS officials and the water users, as the various regional offices of DWS might have different interpretations regarding the content of an IWWMP;
- Standardisation of the format of the supporting documentation which the Department requires during submission of a WULA;
- Provision of guidance on the content of information required in an IWWMP as part of the water use authorisation process and level of detail that the Department requires to enable them to evaluate the supporting documentation to make a decision on authorisation water use;
- Ensuring that a consistent approach is adopted by the Department and the various Regional Offices and CMA's with regards to IWWMPs; and

It is the responsibility of the water user to demonstrate to the Department that the selected management measures in the IWWMP action plan adhere to the "SMART" concept i.e.:

S	M	A	R	T
•Sustainable	•Measurable	•Achievable	•Resources Allocated	•Timeframe Specific

It is a Departmental requirement that a water user needs to compile an IWWMP for any one of the following purposes:

- As the supporting technical documentation for any IWULA;
- When converting Existing Lawful Use (ELU) to licensed water use; and
- In order to comply with the conditions of an existing water use licence (the main purpose of this document).

In line with the guidelines of the DWS Operational Guideline: Integrated Waste and Water Management Plan (2010), Figure 2 and Table 2 provides a guide to the structure of the IWWMP.

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- As the supporting technical documentation for any IWULA (the main purpose of this document);
- When converting Existing Lawful Use (ELU) to licensed water use; and
- In order to comply with the conditions of an existing water use licence.

The implementation of the IWWMP is an interactive process whereas its performance is monitored on an annual basis. The assessment of the IWWMP document itself, as well as the submission of information relating to monitoring and auditing conducted in terms of it could lead to its shortcomings, which must be addressed in the annual update of the action plan of the IWWMP. This will ensure that the concept of continual improvement is applied throughout the life cycle of the activity (Operational Guideline: IWWMP dated February 2010 and GNR 267, the Water Use Licence Application and Appeals Regulations, dated March 2017).

In line with the guidelines of the DWS Operational Guideline: Integrated Waste and Water Management Plan (2010) and GNR 267, Water Use Licence Application and Appeals Regulations (2017). Table 2 provides a guide to the structure of the IWWMP.

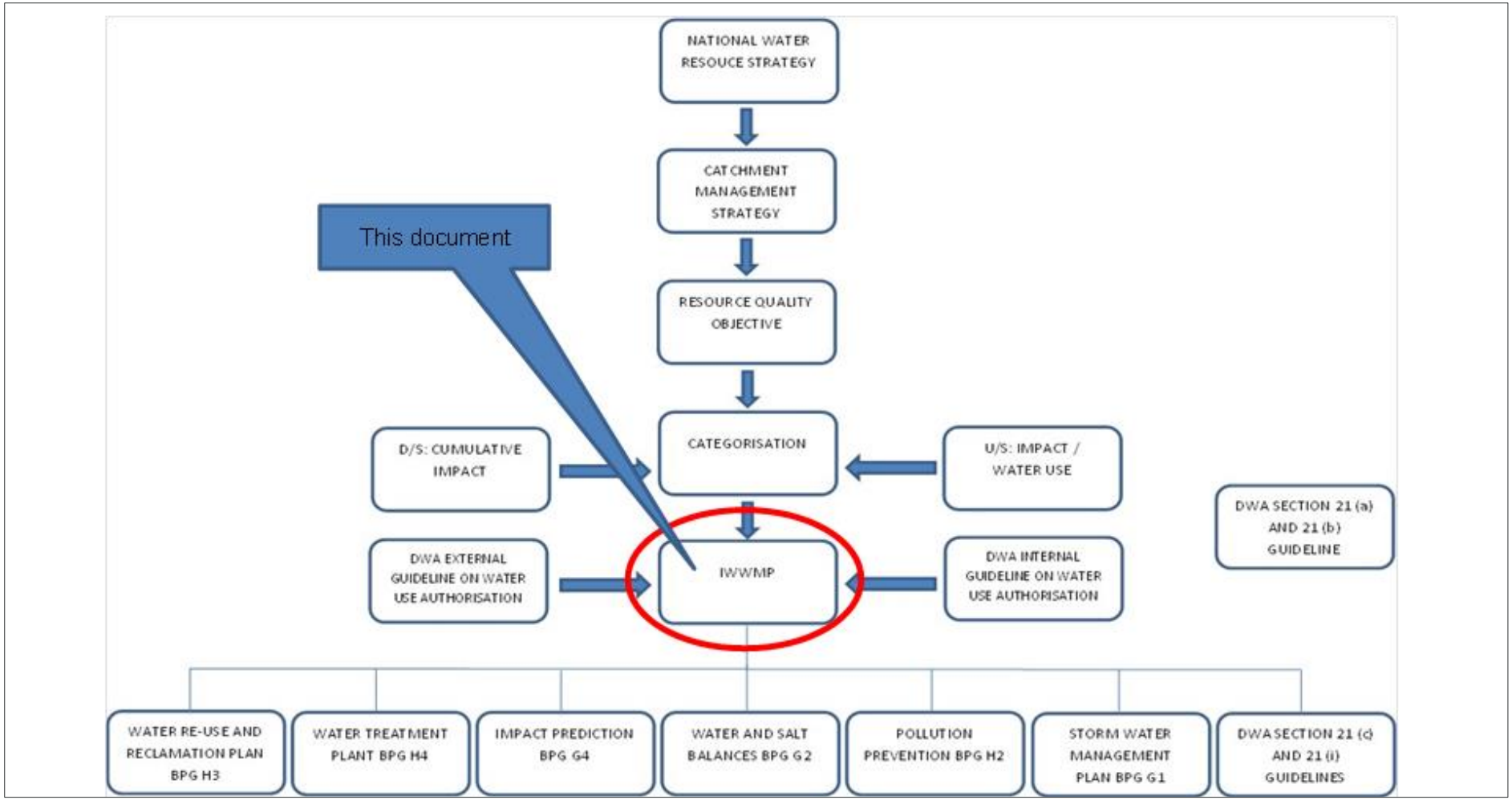


Figure 2: Schematic Layout of the IWWMP Approach

Table 2: Guide to the structure of the IWWMP

Guideline Item	Relevant IWWMP Section
Quantification of the Water Resource Problem	
Quantification of the Water Resource Problem	Section 4.4,
Are the existing water quality data adequate to identify contaminants of concern?	Section 4.2 and Section 4.3
How well have the nature, extent and causes of the water management problems on site been identified?	Section 4.2, Section 4.12 and Section 5.13.
To what extent has the analysis and characterization of the problems considered current thinking on water resource management?	Section 4
Are there any discernible trends?	Section 4 & Section 5
Targets, Indicators and Monitoring	
Does the IWWMP define medium and long-term goals towards sustainable management of water resources?	Section 6.3
Does the IWWMP make provision for the establishment of indicators of progress and set annual and medium term targets?	Section 6.4
Are these indicators and targets appropriate and consistent with the policies and strategies considered for implementation of the IWWMP?	Section 6.6, Section 6.7 and Section 6.9
Are the proposed monitoring, review and evaluation as well as auditing systems adequate and sustainable?	Section 6.7
Priority Actions	
Does the IWWMP describe clear priorities for action, relevant to the goals and targets, feasibility in terms of achieving targets, their estimated costs, available resources, institutional capacities and effectiveness?	Section 6.6, Section 6.7 and Section 6.9
Does the water management strategy have an adequate and credible financial provisioning plan to support the implementation of the IWWMP?	Section 6.6

2 CONTEXTUALISATION OF THE ACTIVITY

The section below provides a detailed project description. The aim of the description is to indicate the activities that are performed at the mine. Furthermore, the detailed project description facilitates the understanding of the activities taking place that will result in impacts on the environment and for which mitigation measures are in place or plans are in place to implement these mitigation measures.

2.1 DESCRIPTION OF ACTIVITY

The Tau Lekoa Section of the mine is an active mine, while the Weltevreden Section is currently flooded and needs to be dewatered for the mine to be accessed for future planned operations. Mining operations are conducted at depths ranging from 800 metres to 1,743 metres. The operations entail the underground mining of the Ventersdorp Contact Reef (VCR). These operations comprise of a twin-shaft system, with seven shaft levels at an average of 70 panels in operation. Due to the geologically complex orebody occurring at Tau Lekoa Mine, a scattered mining method is used with the orebody being accessed via footwall tunnelling while stoping is placed on strike. Underground gold ores are mined by means of drill, blast and water jetting/scraping narrow reef mining systems that innovatively utilize hydropower as a means of drilling and primary ore movement.

Ore mined at Tau Lekoa Mine is processed and treated in preparation for gold extraction at the Nicolor South plant which is located at Stilfontein. To date, Tau Lekoa has mined reserves on farm Goedgenoeg and has proceeded to mine reserves on farm Jonkerskraal. An extension of the underground operations on farm Jonkerskraal and commencement of operations on farm Weltevreden is necessary to extend the life of mine. The extension of the life of mine automatically converts to sustained jobs of the current mine employees and contractors, creation of few new jobs and contracts, and ultimately contributing to the country's Gross Domestic Product (GDP) of South Africa.

2.2 EXTENT OF ACTIVITY

The Tau Lekoa Section is located on the farm Goedgenoeg and has proceeded to mine reserves on farm Jonkerskraal. An extension of the underground operations on farm Jonkerskraal and commencement of operations on farm Weltevreden is necessary to extend the life of mine. The mining lease area (Tau Lekoa and Weltevreden Sections) covers an area of approximately 5854 hectares (refer to Figure 3). The mine surface infrastructure will occupy an area of approximately 120 hectares.

2.3 KEY ACTIVITY RELATED PROCESSES AND PRODUCTS

The operation is aimed at mining gold from a depth of between 800 metres to 1,743 meters which is located in the Ventersdorp Contact Reef. The anticipated Life of Mine (LoM) is 10 years. All material removed from the Tau Lekoa and Weltevreden Sections will be transported to the existing Nicolor South plant, which is located at Stilfontein, for processing. The processing plant is not part of the Tau Lekoa mine and as such is not addressed in this IWWMP.

2.4 PLANNED PRODUCTION RATE

The production rate at Tau Lekoa section is measure in m^2 owing to the narrow, tabular nature of the ore-body. Current production rate range between 20 000 – 23 000 m^2 per month, yielding approximately 130 000 total tonnes, which includes reef and waste. Approximately 700 m of the development is carried out each month, of which approximately 150 m are developed on the reef. The Weltevreden Section will be built up to produce 60 000 tons per month of gold bearing ore.

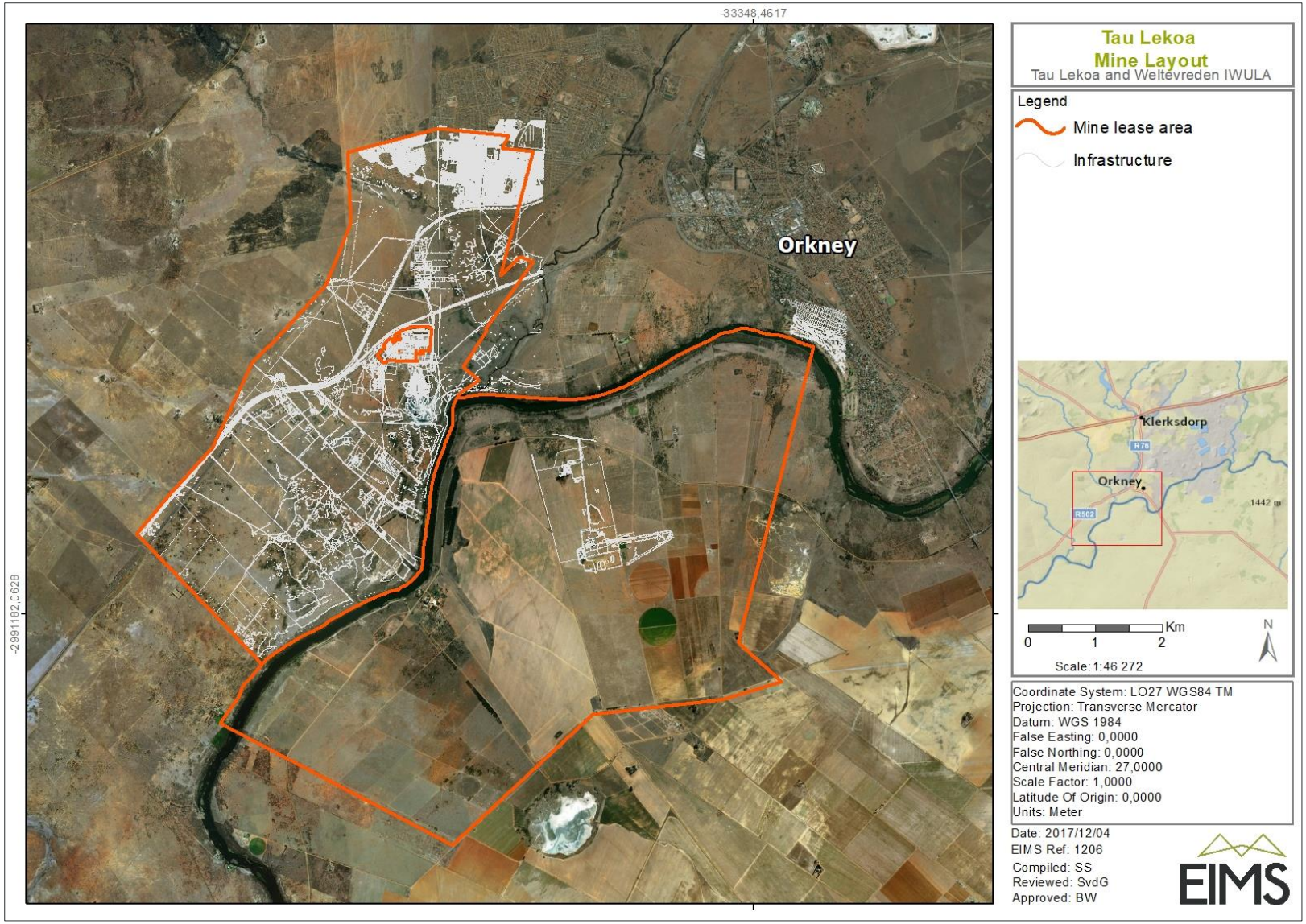


Figure 3: Tau Lekoa gold mine layout plan

2.5 ACTIVITY INFRASTRUCTURE DESCRIPTION

Tau Lekoa is an existing mining operation and, therefore, mining related infrastructure is present and utilised on the Tau Lekoa Section, while the Weltevreden Section also has infrastructure present and new infrastructure that will be built. The following infrastructure (which has been included in the various EIA/EMP reports already submitted and reviewed by the then DME) are present;

- Tau Lekoa shaft related infrastructure;
- Weltevreden shaft related infrastructure;
- Tau Lekoa storage silos;
- Weltevreden silo and structures;
- Access and haul roads;
- Workshop areas;
- Salvage/timber yard;
- Offices;
- Change houses and lamp room;
- Dangerous goods storage (diesel);
- Waste Rock Dump (WRD);
- Vlei dam (Swanepoel dam);
- Borrow Pit 1;
- Borrow Pit 2;
- Hostel complexes; and
- Sewerage works.

As previously indicated, the Weltevreden shaft is flooded and needs to be dewatered in order to commence mining. In order to reinstate the power supply to allow for the dewatering of the shaft, a 22kV power line is proposed. It is proposed that the powerline will run from the current operational Tau Lekoa section to the Weltevreden shaft and will, therefore, be required to cross the Vaal River. A further connection of the powerline to a substation on the farm Jonkershoek is proposed for a ventilation shaft to be commissioned on this farm. A new PCD is proposed to be built at the Weltevreden Section for dirty water management, as well as a product stockpile, while the existing WRD will be expanded. The existing infrastructure on Weltevreden will be utilised as far as possible. Relevant design drawings are included in Appendix J.

2.6 KEY WATER USES AND WASTE STREAMS

In accordance with the requirements of the NWA, the applicant is required to compile and submit for adjudication, an Integrated Water Use License Application (IWULA) for the NWA Section 21 water uses as indicated in Table 3:

Table 3: Water Uses for Tau Lekoa mine

Water Use	Name	Purpose	Capacity / Volume	Co-ordinates		Farm	Portion	Title Deed
				Latitude	Longitude			
Tau Lekoa Section								
Section 21 (e) (Existing Water Use)	Irrigation of lawn	Irrigating of manicured lawns with treated sewage water	657 m^3	Point 1: - 26°59'45.18"S Point 2: - 26°59'48.44"S Point 3: - 26°59'50.73"S Point 4: - 26°59'49.43"S Point 5: - 26°59'45.77"S	Point 1: 26°36'33.46"E Point 2: 26°36'29.82"E Point 3: 26°36'32.39"E Point 4: 26°36'35.99"E Point 5: 26°36'36.16"E	Goedgenoeg 433 IP	27 and 31	T55759/2014 and T55759/2014
Section 21 (c) and (i) (New Water Use)	Powerline Crossing	Powerline crossing the Vaal River and linking Tau Lekoa and Weltevreden Sections	22kVA line	Point 1: - 26°59'54.42"S Point 2: - 26°59'54.90"S Point 3: - 27° 0'18.19"S	Point 1: 26°36'47.76"E Point 2: 26°37'4.79"E Point 3: 26°37'2.61"E	Goedgenoeg 433 IP	31	T55759/2014

Water Use	Name	Purpose	Capacity / Volume	Co-ordinates		Farm	Portion	Title Deed
				Latitude	Longitude			
Section 21 (g) (Existing Water Use)	Waste rock dump	Storing of waste rock	18 ha	Point 1: - 27° 0'0.04"S Point 2: - 27° 0'13.02"S Point 3: - 27° 0'23.49"S Point4: - 27° 0'20.46"S	Point 1: 26°36'47.47"E Point 2: 26°36'42.28"E Point 3: 26°36'41.65"E Point 4: 26°36'58.86"E	Goedgenoeg 433 IP	31	T55759/2014
Section 21 (g) (Existing Water Use)	Sewage Plant	Treatment of effluence	35 625 m^3	Point 1: - 27° 0'23.84"S Point 2: - 27° 0'22.37"S Point 3: - 27° 0'19.12"S Point 4: - 27° 0'17.87"S Point 5: - 27° 0'17.90"S Point 6: - 27° 0'20.78"S	Point 1: 26°36'29.20"E Point 2: 26°36'39.76"E Point 3: 26°36'38.74"E Point 4: 26°36'34.52"E Point5: 26°36'30.62" Point 6: 26°36'28.96"	Goedgenoeg 433 IP	27 and 31	T55759/2014 and T55759/2014

Water Use	Name	Purpose	Capacity / Volume	Co-ordinates		Farm	Portion	Title Deed
				Latitude	Longitude			
Weltevreden Section								
Section 21 (a) (New Water Use)	Removal of underground water from Shaft	For the use of water from the shaft (process water)	36 000 kl/month	- 27° 1'16.60"S	26°38'41.16"E	Weltevreden 130	Whole farm	T5178/2013
Section 21 (c) and (i) (New Water Use)	Powerline Crossing	Powerline crossing the Vaal River and linking Tau Lekoa and Weltevreden Sections	22KVA	Point 1: - 27° 1'21.58"S Point 2: - 27° 1'27.42"S Point 3: - 27° 1'31.04"S Point 4: - 27° 0'31.15"S Point 5: - 27° 0'19.90"S Point 6: - 27° 0'18.53"S Point 7: - 27° 0'18.39"S Point 8: - 27° 0'42.05"S	Point 1: 26°38'36.78"E Point 3: 26°38'38.09"E Point 3: 26°38'5.89"E Point 4: 26°37'46.39"E Point 5: 26°37'42.89"E Point 6: 26°37'11.68"E Point 7: 26°37'7.63"E Point 8: 26°37'10.68"E	Boshoek 466, Weltevreden 130 and Jonkerskraal 475	Whole farms	T3709/1898, T5178/2013 and T37091989

Water Use	Name	Purpose	Capacity / Volume	Co-ordinates		Farm	Portion	Title Deed
				Latitude	Longitude			
				Point 9: - 27° 0'45.85"S Point 10: - 27° 1'21.15"S Point 11: - 27° 1'21.63"S	Point 9: 26°37'12.33"E Point 10: 26°37'4.23"E Point 11: 26°37'9.10"E			
Section 21 (g) (Existing Water Use)	Earth dam	Earth dam upgrade to store dirty water as part of Storm Water Management Plan	29 800m^3	Point 1: - 27° 1'10.66"S Point 2: - 27° 1'10.18"S Point 3: - 27° 1'3.06"S Point 4: - 27° 1'3.25"S	Point 1: 26°38'21.25"E Point 2: 26°38'29.03"E Point 3: 26°38'25.72"E Point 4: 26°38'19.82"E	Weltevreden 130	Whole farm	T5178/2013
Section 21 (g) (Existing Water Use)	Concrete dam #1 (Reservoir)	Store mine water for reuse (process water)	1 000m^3	- 27° 1'19.55"S	26°38'35.14"E	Weltevreden 130	Whole farm	T5178/2013
Section 21 (g) (Existing Water Use)	Concrete dam #2 (Reservoir)	Store excess mine water	6 000m^3	- 27° 1'19.01"S	26°38'22.30"E	Weltevreden 130	Whole farm	T5178/2013

Water Use	Name	Purpose	Capacity / Volume	Co-ordinates		Farm	Portion	Title Deed
				Latitude	Longitude			
Section 21 (g) (Existing Water Use)	Settling dams	Settling dams near shaft entrance for temporary settling water before pumping it to Concrete dam #1	320 m^3 x 2	- 27° 1'20.48"S	26°38'33.82"E	Weltevreden 130	Whole farm	T5178/2013
Section 21 (g) (Existing Water Use)	Waste rock dump	Storing of waste rock	3.62 ha	Point 1: - 27° 1'21.59"S Point 2: - 27° 1'29.90"S Point 3: - 27° 1'22.88"S Point 4: - 27° 1'25.69"S	Point 1: 26°38'13.82"E Point 2: 26°38'15.97"E Point 3: 26°38'21.41"E Point 4: 26°38'22.47"E	Weltevreden 130	Whole farm	T5178/2013
Section 21 (g) (New Water Use)	Product stockpile	Temporary storing of product stockpile	1.14 ha	Point 1: - 27° 1'22.28"S Point 2: - 27° 1'22.35"S Point 3: - 27° 1'14.32"S Point 4:	Point 1: 26°38'25.28"E Point 2: 26°38'20.39"E Point 3: 26°38'18.79"E Point 4:	Weltevreden 130	Whole farm	T5178/2013

Water Use	Name	Purpose	Capacity / Volume	Co-ordinates		Farm	Portion	Title Deed
				Latitude	Longitude			
				- 27° 1'13.97"S	26°38'23.73"E			
Section 21 (g) (New Water Use)	Septic tank	Storing of effluent	8213 m^3/annum	- 27° 1'14.65"S	26°38'24.97"E	Weltevreden 130	Whole farm	T5178/2013
Section 21 (g) (New Water Use)	Dust suppression	Suppression of dust	36 m^3/month	Point 1: - 27° 1'29.77"S Point 2: - 27° 1'33.24"S Point 3: - 27° 1'31.30"S Point 4: - 27° 0'28.66"S Point 5: - 27° 0'28.66"S Point 6: - 27° 0'31.13"S	Point 1: 26°38'38.78"E Point 2: 26°38'24.70"E Point 3: 26°38'6.29"E Point 4: 26°38'6.29"E Point 5: 26°37'45.61"E Point 6: 26°38'24.31"E	Weltevreden 130	Whole farm	T5178/2013
Section 21 (j) (New Water Use)	Dewatering	Dewatering of flooded shaft	432319 m^3/annum	- 27° 1'16.60"S	26°38'41.16"E	Weltevreden 130	Whole farm	T5178/2013

The waste at the mine is classified into two main categories namely non-mining (general) waste, and mining/process related waste:

Non-mining waste refers to, and is classified as:

- Domestic waste: – waste generated from residential, educational, healthcare, sport or recreation purposes;
- Business waste – waste generated by commercial, retail, wholesale, entertainment or government administration purposes;
- Building waste – waste generated from construction, alteration, repair and demolition, including rubble, earth, rock and wood; and
- Garden waste.

Tau Lekoa subscribes to the principles of waste minimization and recycling and waste streams are identifiable and quantifiable (refer to for more details).

- The following mining waste streams are relevant to the Tau Lekoa and Weltevreden Sections:
  - Waste Rock Dump (WRD). Waste rock from the Tau Lekoa mine is disposed at the WRD located to the south of the shaft. The estimated volume of the WRD is 2 million tons and will continue to increase as long as the mine continues to produce. It is expected that the WRD will be completely removed at the time when the mine closes;
  - Swanepoel dam. The Swanepoel dam is a small farm dam located some 800m east of the shaft. Process water is occasionally pumped to this unlined facility and the water quality in this dam is poor;
  - Sewage purification works (SPW): Tau Lekoa has a sewage purification works that treats the domestic waste from the mine offices and the shaft area. The design of the plant is approximately 35 625 m^3/day (GCS, 2009). The waste water is subjected to preliminary, primary and secondary treatment and the final effluent is used in different areas at the mine. Approximately 657 m^3/month is used to irrigate the gardens and the WRD and approximately 14 552 m^3/month is re-used in the mining operations (GCS, 2009); and
  - Shaft area. The potential for groundwater contamination from the shaft area is limited and is predominantly related to spillage from the ore and waste rock loading.

2.7 ORGANISATIONAL STRUCTURE OF ACTIVITY

The organisational structure of Tau Lekoa is indicated in Figure 4 below.

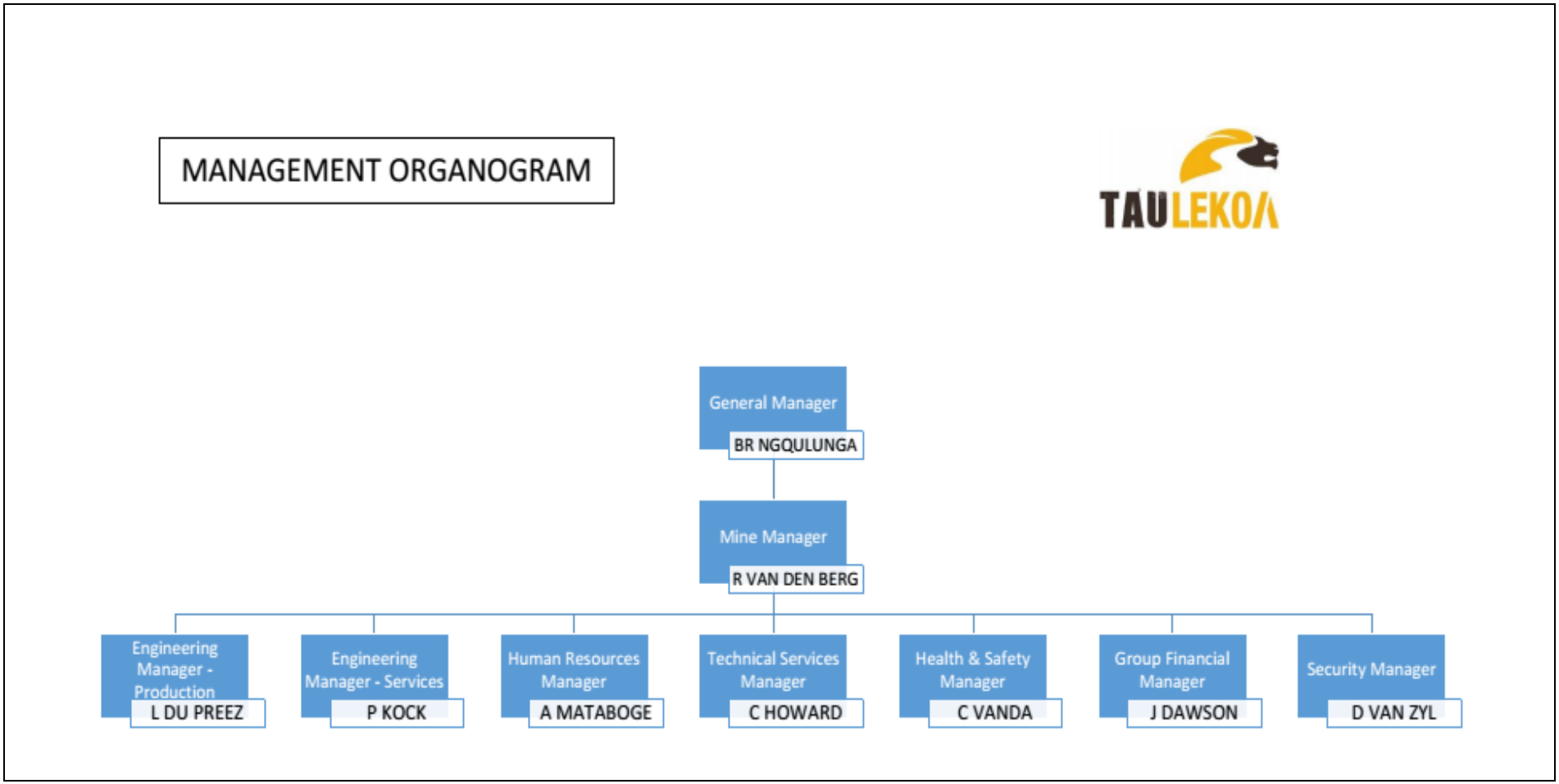
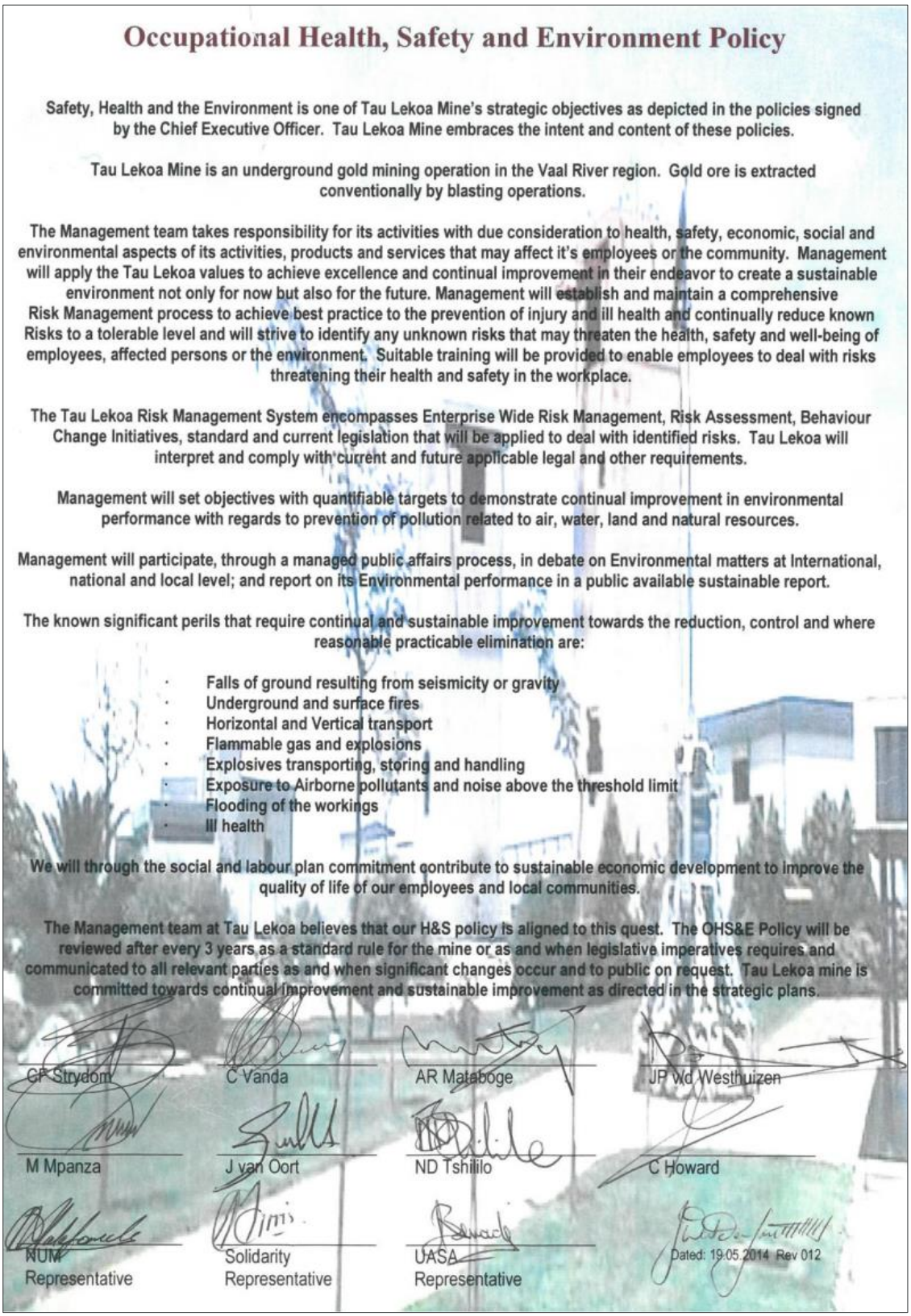


Figure 4: Organisational structure of Tau Lekoa

2.8 BUSINESS AND CORPORATE POLICIES

As an existing mine, Tau Lekoa has an Occupational Health, Safety, and Environmental (OSHE) Policy in place. Refer to Figure 5 below for the OSHE policy.



Occupational Health, Safety and Environment Policy

Safety, Health and the Environment is one of Tau Lekoa Mine's strategic objectives as depicted in the policies signed by the Chief Executive Officer. Tau Lekoa Mine embraces the intent and content of these policies.

Tau Lekoa Mine is an underground gold mining operation in the Vaal River region. Gold ore is extracted conventionally by blasting operations.

The Management team takes responsibility for its activities with due consideration to health, safety, economic, social and environmental aspects of its activities, products and services that may affect it's employees or the community. Management will apply the Tau Lekoa values to achieve excellence and continual improvement in their endeavor to create a sustainable environment not only for now but also for the future. Management will establish and maintain a comprehensive Risk Management process to achieve best practice to the prevention of injury and ill health and continually reduce known Risks to a tolerable level and will strive to identify any unknown risks that may threaten the health, safety and well-being of employees, affected persons or the environment. Suitable training will be provided to enable employees to deal with risks threatening their health and safety in the workplace.

The Tau Lekoa Risk Management System encompasses Enterprise Wide Risk Management, Risk Assessment, Behaviour Change Initiatives, standard and current legislation that will be applied to deal with identified risks. Tau Lekoa will interpret and comply with current and future applicable legal and other requirements.

Management will set objectives with quantifiable targets to demonstrate continual improvement in environmental performance with regards to prevention of pollution related to air, water, land and natural resources.

Management will participate, through a managed public affairs process, in debate on Environmental matters at International, national and local level; and report on its Environmental performance in a public available sustainable report.

The known significant perils that require continual and sustainable improvement towards the reduction, control and where reasonable practicable elimination are:

- Falls of ground resulting from seismicity or gravity
- Underground and surface fires
- Horizontal and Vertical transport
- Flammable gas and explosions
- Explosives transporting, storing and handling
- Exposure to Airborne pollutants and noise above the threshold limit
- Flooding of the workings
- Ill health

We will through the social and labour plan commitment contribute to sustainable economic development to improve the quality of life of our employees and local communities.

The Management team at Tau Lekoa believes that our H&S policy is aligned to this quest. The OHS&E Policy will be reviewed after every 3 years as a standard rule for the mine or as and when legislative imperatives requires and communicated to all relevant parties as and when significant changes occur and to public on request. Tau Lekoa mine is committed towards continual improvement and sustainable improvement as directed in the strategic plans.

CF Strydom | C Vanda | AR Mataboge | JP vd Westhuizen

M Mpanza | J van Oort | ND Tshililo | C Howard

NUM Representative | Solidarity Representative | UASA Representative

Dated: 19.05.2014 Rev 012

Figure 5: Occupational Health, Safety and Environmental policy for Tau Lekoa

3 REGULATORY WATER AND WASTE MANAGEMENT FRAMEWORK

Tau Lekoa has authorisation in terms of the following legislation:

- Two Mining Rights in terms of the Mineral and Petroleum Resources Development Act (MPRDA) (Act 28 of 2002).

3.1 SUMMARY OF ALL WATER USES

The following water uses have been identified and confirmed with the DWS during the pre-application site visit held on 26 October 2017 (Refer to minutes of the meeting attached in Appendix H):

- Tau Lekoa water use activities:
  - S21(g) – Waste rock dump;
  - S21(g) – Sewage plant;
  - S21(e) – Irrigation of manicured lawns with treated sewage water; and
  - S21(c&i) – Powerline crossing the Vaal River (between Weltevreden and Tau Lekoa).
- Weltevreden Section:
  - S21(a) – For the use of the water from the shaft (process water);
  - S21(c&i) – Powerline crossing the Vaal River (between Weltevreden and Tau Lekoa);
  - S21(g) – Earth dam upgrade to store water as part of Storm Water Management Plan (dirty water containment);
  - S21(g) – Concrete dam #1 (reservoir) to store mine water for reuse (process water);
  - S21(g) – Settling dams near shaft entrance (temporary settling before pumped to concrete dam #1);
  - S21(g) – Concrete dam #2 (reservoir) to store excess mine water;
  - S21(g) – Waste rock dump;
  - S21(g) – Product Stockpile;
  - S21(g) – Septic tank (depending on proximity to a water resource);
  - S21(g) – Dust suppression; and
  - S21(j) – Dewatering the shaft (shaft is currently flooded).

Visual representations of the various water uses are provided in the maps contained below as well as in Appendix A.

Figure 6: Tau Lekoa Section existing sewage treatment works (21g)

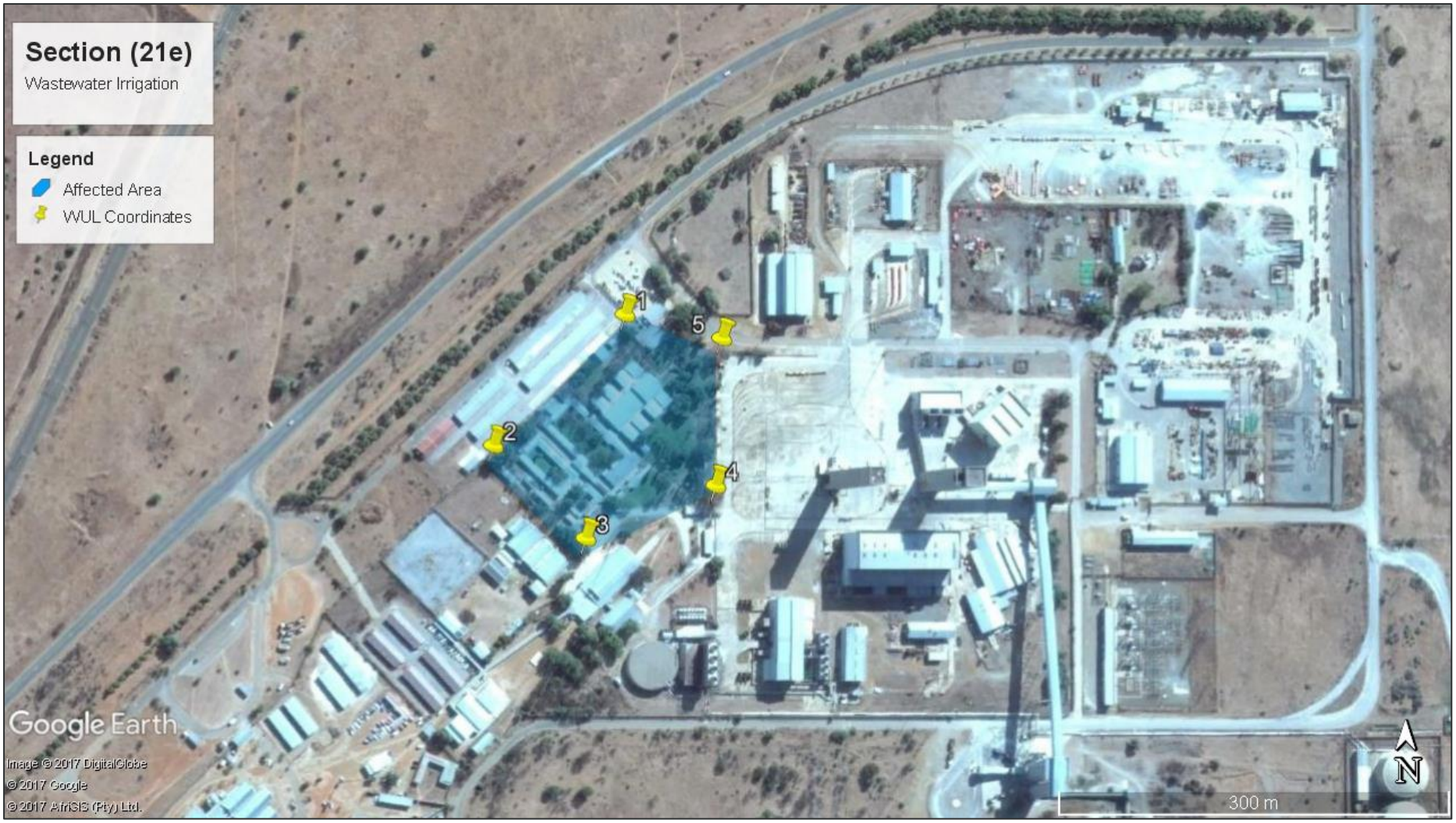


Figure 7: Tau Lekoa Section irrigation of lawns with treated waste from sewage treatment works (21e)

Figure 8: Tau Lekoa Section existing waste rock stockpile (21g)

Figure 9: Weltevreden Section location of new PCD to be constructed (21g)

Figure 10: Weltevreden Section dust suppression (21g)

Figure 11: Weltevreden Section taking of water and dewatering of shaft (21a and 21j respectively)

Figure 12: Weltevreden Section storage of mine water (21g)

Figure 13: Weltevreden Section product stockpile location (21g)

Figure 14: Weltevreden Section waste rock dump location (21g)

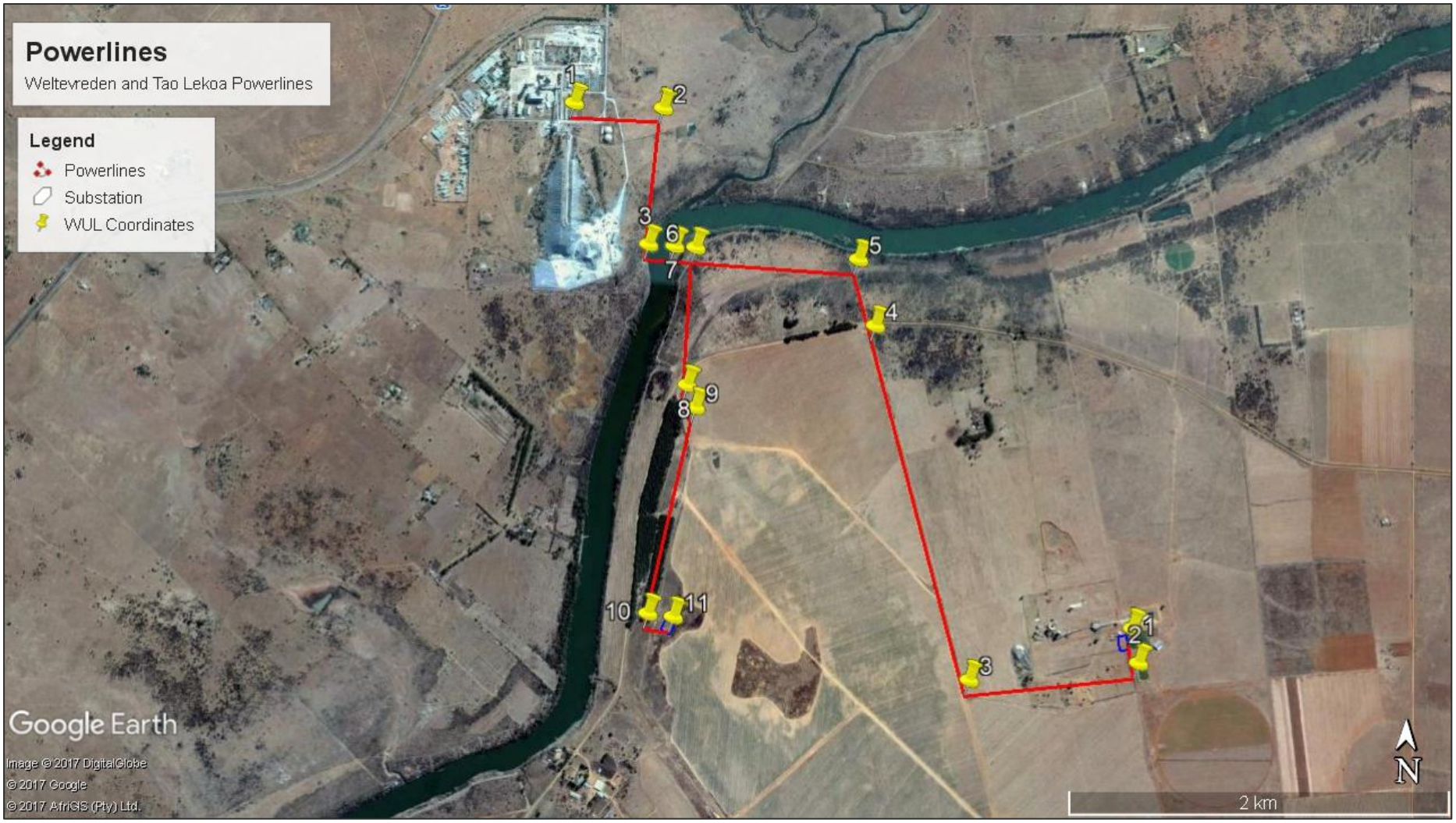


Figure 15: Tau Lekoa and Weltevreden powerline location (21a)

3.2 EXISTING LAWFUL WATER USES

The NWA (1998) makes provision for Section 21 Water Uses that could be considered to be Existing Lawful Water Uses, if they comply with the requirements of Section 32 of the NWA (1998), although the declaration of any water uses as Existing Lawful Water Uses is still at the discretion of the DWS.

Section 32(1) of the NWA (1998), defines an Existing Lawful Water Use as follows:

> *"An existing lawful water use means a water use -*
>
> *(a) which has taken place at any time during a period of two years immediately before the date of commencement of this Act and which;*
>
> *(i) was authorised by or under any law which was in force immediately before the date of commencement of this Act;*
>
> *(ii) is a stream flow reduction activity contemplated in section 36(1); or*
>
> *(iii) is a controlled activity contemplated in section 37(1)."*
>
> *or*
>
> *(b) which has been declared an existing lawful water use under section 33."*

Some of the water uses taking place at the Tau Lekoa Section have been regulated through an Exemption 1973B, which was granted to AngloGold Limited in terms of section 21(4) of the Water Act 1956 (Act 54 of 1956). Some of the mining and related activities taking place at Tau Lekoa commenced before 30 September 1998 and, therefore, Section 32(1)(a) of the NWA (1998) does apply and are considered as existing licenced water uses. In addition, some of the water uses activities have been included in an Integrated Water Use Licence (IWUL) issued to AngloGold Ashanti Limited in June 2009. However, through the acquisition of the mine by the Applicant from Buffelsfontein Gold Mines Limited, the water use licence relating to the affected properties was relinquished and as such, a water use licence is required.

Table 4: Existing Lawful Water Uses at Tau Lekoa mine

Section 21 Water Use	Water Use Name	Description / purpose
Tau Lekoa Section		
Section 21 (e)	Irrigation of lawn	Irrigating of manicured lawns with treated sewage water
Section 21 (g)	Waste rock dump	Storing of waste rock
Section 21 (g)	Sewage Plant	Treatment of effluence
Weltevreden Section		
Section 21 (g)	Earth dam	Earth dam upgrade to store dirty water as part of Storm Water Management Plan
Section 21 (g)	Concrete dam #1 (Reservoir)	Store mine water for reuse (process water)
Section 21 (g)	Concrete dam #2 (Reservoir)	Store excess mine water

Section 21 Water Use	Water Use Name	Description / purpose
Section 21 (g)	Settling dam	Settling dam near shaft entrance for temporary settling water before pumping it to Concrete dam #1
Section 21 (g)	Waste rock dump	Storing of waste rock

3.3 RELEVANT EXEMPTIONS

GN 704 and Regulation 77 of the NWA (Act 36 of 1998) place restrictions on the mining activities for the protection of water resources. Of relevance to the Applicant is the restrictions placed on locality (Section 4), which states:

"No person in control of a mine or activity may –

(a) locate or place any residue deposit, dam, reservoir, together with any associated structure or any other facility within the 1:100 year flood-line or within a horizontal distance of 100 metres from any watercourse or estuary, borehole or well, excluding boreholes or wells drilled specifically to monitor;

(b) except in relation to a matter contemplated in regulation 10, carry on any underground or opencast mining, prospecting or any other operation or activity under or within the l:50 year flood-line or within a horizontal distance of 100 metres from any watercourse or estuary, whichever is the greatest;

(c) place or dispose of any residue or substance which causes or is likely to cause pollution of a water resource, in the workings of any underground or opencast mine excavation, prospecting diggings, pit or any other excavation; or

(d) use any area or locate any sanitary convenience, fuel depots, reservoir or depots for any substance which causes or is likely to cause pollution of a water resource within the 1:50 year flood-line of any watercourse or estuary."

The wetland specialist has delineated the wetlands and watercourses associated with the study area. Some of the infrastructure (haul roads and the proposed powerline traverse watercourses and are, therefore, located in the "no-go" area in terms of section 4(b) of GN 704. Therefore, an exemption will be required from the requirements of Sections 4 of GN 704 as per Section 3 of GN 704.

3.4 GENERALLY AUTHORISED WATER USES

No General Authorisations are applicable to this project.

3.5 NEW WATER USES TO BE LICENSED

A summary of all new and proposed water uses that will be applied for is indicated in Table 5 The completed Water Use Licence Forms will be submitted to the DWS simultaneously with the submission of this IWWMP. A summary of the mine's new and proposed water uses for ease of reference is indicated in Table 5.

Table 5: New and proposed water uses on the mine

Section 21 Water Use	Water Use Name	Description / purpose
Tau Lekoa Section		
Section 21 (c) and (i)	Powerline Crossing	Powerline crossing the Vaal River and linking Tau Lekoa and Weltevreden Sections
Weltevreden Section		

Section 21 Water Use	Water Use Name	Description / purpose
Section 21 (a)	Removal of underground water from Shaft	For the use of water from the shaft (process water)
Section 21 (c) and (i)	Powerline Crossing	Powerline crossing the Vaal River and linking Tau Lekoa and Weltevreden Sections
Section 21 (g)	Product stockpile	Temporary storing of product stockpile
Section 21 (g)	Septic tank	Storing of effluent
Section 21 (g)	Dust suppression	Suppression of dust
Section 21 (j)	Dewatering	Dewatering of flooded shaft
Section 21 (g)	Waste Rock Dump	Waste rock dump to be expanded upon

3.6 WASTE MANAGEMENT ACTIVITY (NEMWA)

All hydrocarbon material (lubricants, grease, hydraulic oil, PCB oil, and PCB-free transformer oil), as well as all hydrocarbon contaminated waste (any waste that either contains or is polluted with hydrocarbon material) is disposed of by certified waste removal contractors. The mine has a procedure in place for the management of hydrocarbon waste.

3.7 WASTE RELATED AUTHORISATIONS

No waste related authorisations are held by the Applicant for non-mining waste related activities. Domestic waste generated on-site is transported and disposed of at the landfill site currently operated by Stilfontein Municipality (City of Matlosana).

3.8 OTHER AUTHORISATIONS

The operation is in possession of two Mining Rights (reference numbers: FS30/5/1/2/2/03MR and NW30/5/1/2/2/17MR) (refer to Appendix B) issued by the DMR under the provisions of the MPRDA. The Applicant conducted a performance audit on the EMPs compliance in 2017 (refer to Appendix C).

4 PRESENT ENVIRONMENTAL SITUATION

4.1 CLIMATE

Orkney lies on the South African highveld and has a large seasonal temperature range although temperatures in winter seldom drop below zero. The coldest months are during the dry winter period between June and July while the warm summer months of December, January and February coincide with the region's wettest period. There are, on average, 61 days annually with temperatures above 30^{o}C and 41 days in which temperatures of below zero are measured. The mean annual temperature ranges between 18°C in the west and 14°C in the east, with an average of about 16°C in the catchment. Maximum temperatures are experienced in January and minimum temperatures usually occur in July. The average temperature figures for Klerksdorp are indicated in Figure 16.

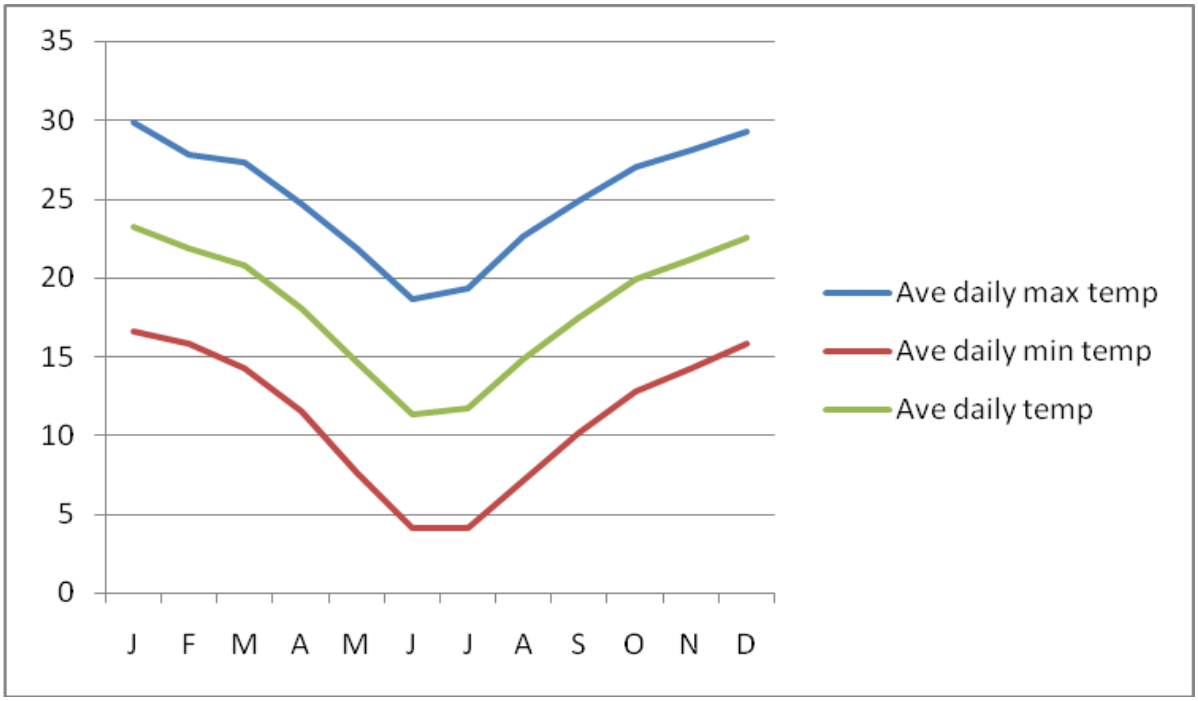
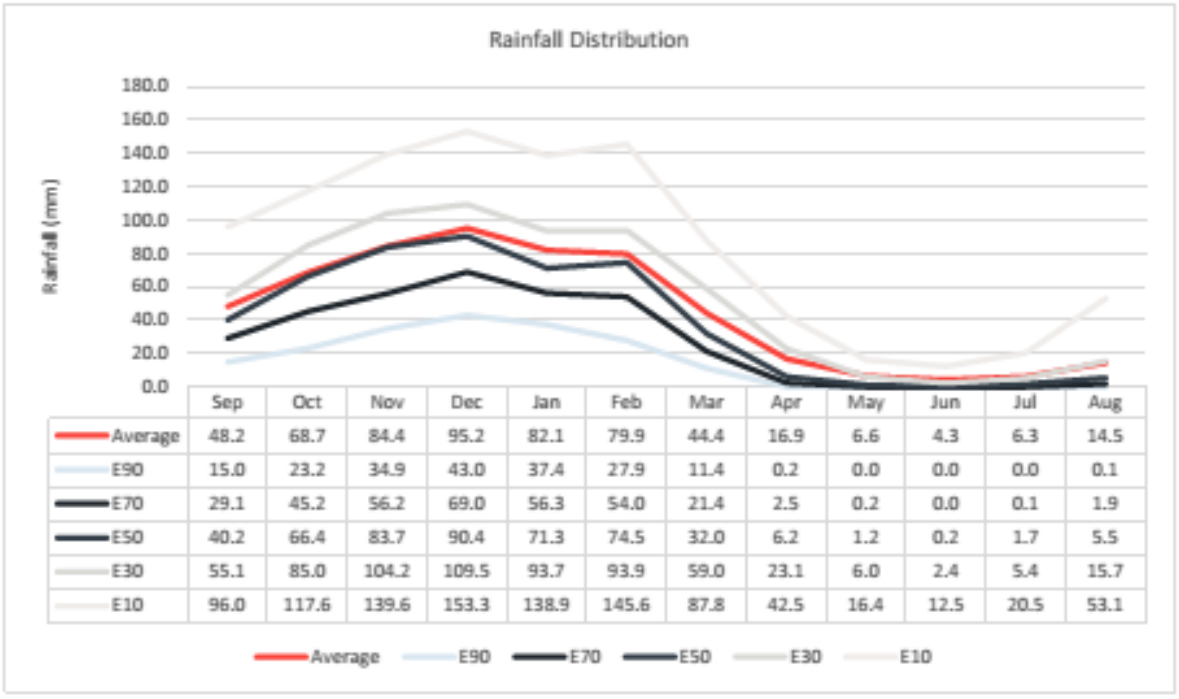


Figure 16: Average temperature figures for Klerksdorp

4.2 PRECIPITATION

Tau Lekoa falls within the C2G rainfall zone with a Mean Annual Precipitation (MAP) ranging between 552-619 mm. The MAP chosen to represent the site is 552mm as the majority of the site falls within C24J quaternary catchment. The monthly rainfall distribution is represented in Figure 17. The 'E' values show the probability of non-exceedance and, therefore, highlight the likelihood that the specific rainfall event will not be exceeded.



	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Average	48.2	68.7	84.4	95.2	82.1	79.9	44.4	16.9	6.6	4.3	6.3	14.5
E90	15.0	23.2	34.9	43.0	37.4	27.9	11.4	0.2	0.0	0.0	0.0	0.1
E70	29.1	45.2	56.2	69.0	56.3	54.0	21.4	2.5	0.2	0.0	0.1	1.9
E50	40.2	66.4	83.7	90.4	71.3	74.5	32.0	6.2	1.2	0.2	1.7	5.5
E30	55.1	85.0	104.2	109.5	93.7	93.9	59.0	23.1	6.0	2.4	5.4	15.7
E10	96.0	117.6	139.6	153.3	138.9	145.6	87.8	42.5	16.4	12.5	20.5	53.1

Figure 17: Monthly rainfall distribution for quaternary C24J (WR2012)

4.3 EVAPORATION

The mine falls within evaporation zones 9A and 10A. The evaporation zone selected by the hydrologist to represent the site is 9A with a mean annual evaporation (MAE) of 1800mm/annum due to majority of the site falling within C24J. The MAE is clearly considerably higher than the MAP, making this a dry area. The monthly evaporation distribution is presented in Figure 18.

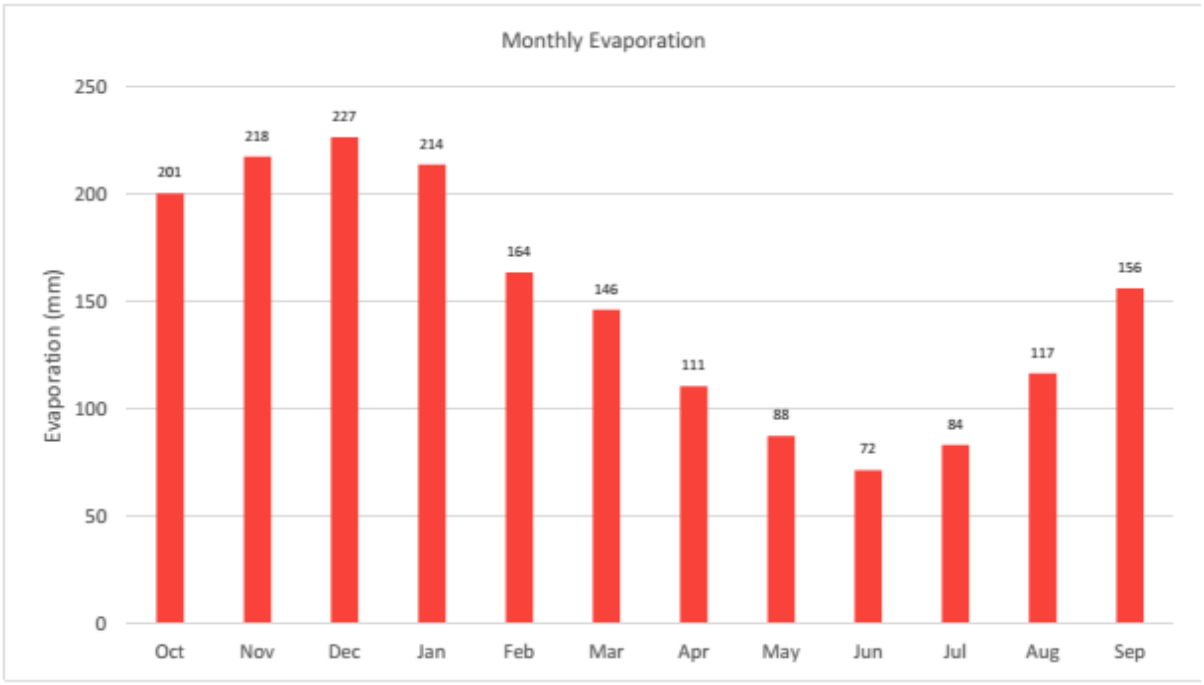


Figure 18: Monthly S-Pan Evaporation for Quaternary C24J (WR2012)

4.4 SURFACE WATER

A surface water study was conducted by WSP Environmental Consultants (Pty) Ltd. A copy of the study is attached in Appendix D. The Tau Lekoa Section falls on the boundary of the C24J and C24H quaternary catchments and the Weltevreden shafts falls on the boundary of C24J and C24B quaternary catchment. The majority of both sites fall within quaternary catchment C24J (refer to Figure 20). The Schoonspruit which is fed from the dolomitic springs passes the study area. The Koekemoerspruit, a non-perennial stream also falls within the study area. The Koekemoerspruit originates on the farms Rooipoort and Lustfontein. Both of these rivers are tributaries of the Vaal River.

4.5 WATER MANAGEMENT AREA

Tau Lekoa mine is located within the Middle Vaal Water Management Area (WMA). The Middle Vaal WMA is located downstream of the confluence of the Vaal and the Rietspruit Rivers and upstream of the Bloemhof dam. The Mean Annual Precipitation (MAP), Mean Annual Evaporation (MAE) and Mean Annual Runoff (MAR) for each quaternary catchment can be seen in Table 6.

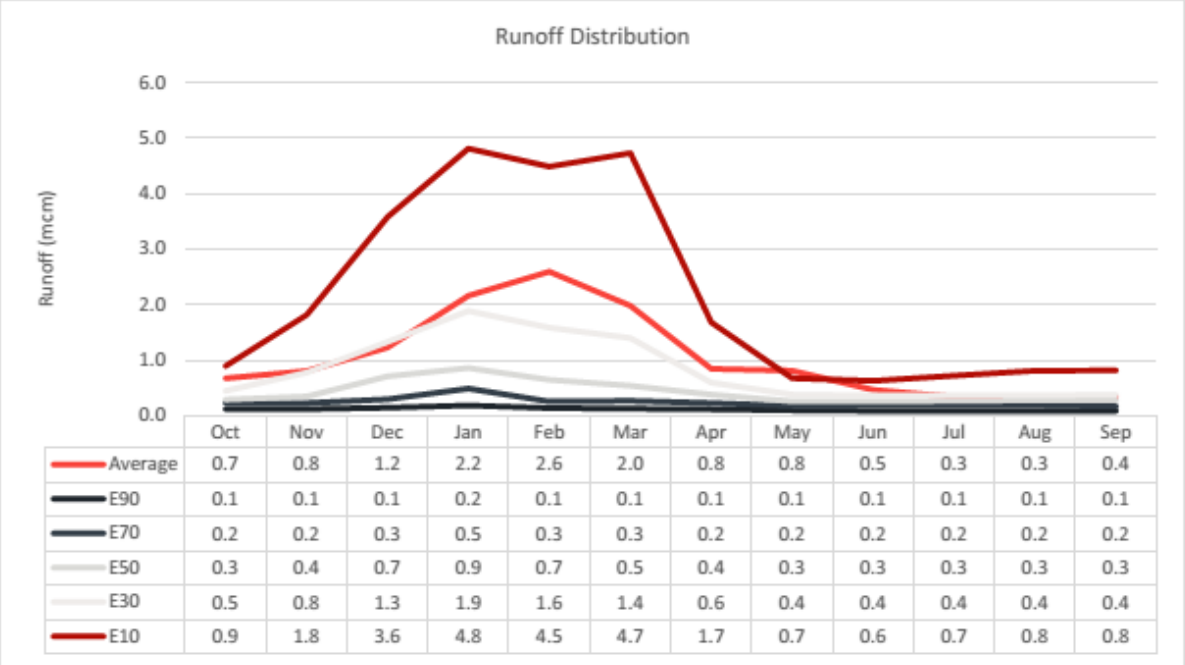
Table 6: Quaternary catchment descriptions

Quaternary Catchment	Catchment Area (km^2)	Rainfall Zone	MAP (mm)	Evaporation Zone	MAE (mm)	MAR (mcm)
C24B	530	C2G	619	10A	1750	17.50
C24H	840	C2G	576	10A	1820	13.31

C24J	2110	C2G	552	9A	1800	12.63

4.6 SURFACE WATER HYDROLOGY

As previously indicated the majority of both sites falls within quaternary C24J and the main river draining it is the Vaal River. WR2012 (WRC, 2015) simulates average runoff of this quaternary at 12.6 mcm per annum. The monthly runoff is presented in Figure 19. The 'E' values show the probability of non-exceedance.



	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Average	0.7	0.8	1.2	2.2	2.6	2.0	0.8	0.8	0.5	0.3	0.3	0.4
E90	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
E70	0.2	0.2	0.3	0.5	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2
E50	0.3	0.4	0.7	0.9	0.7	0.5	0.4	0.3	0.3	0.3	0.3	0.3
E30	0.5	0.8	1.3	1.9	1.6	1.4	0.6	0.4	0.4	0.4	0.4	0.4
E10	0.9	1.8	3.6	4.8	4.5	4.7	1.7	0.7	0.6	0.7	0.8	0.8

Figure 19: Simulated runoff for Quaternary C24J (WR2012)

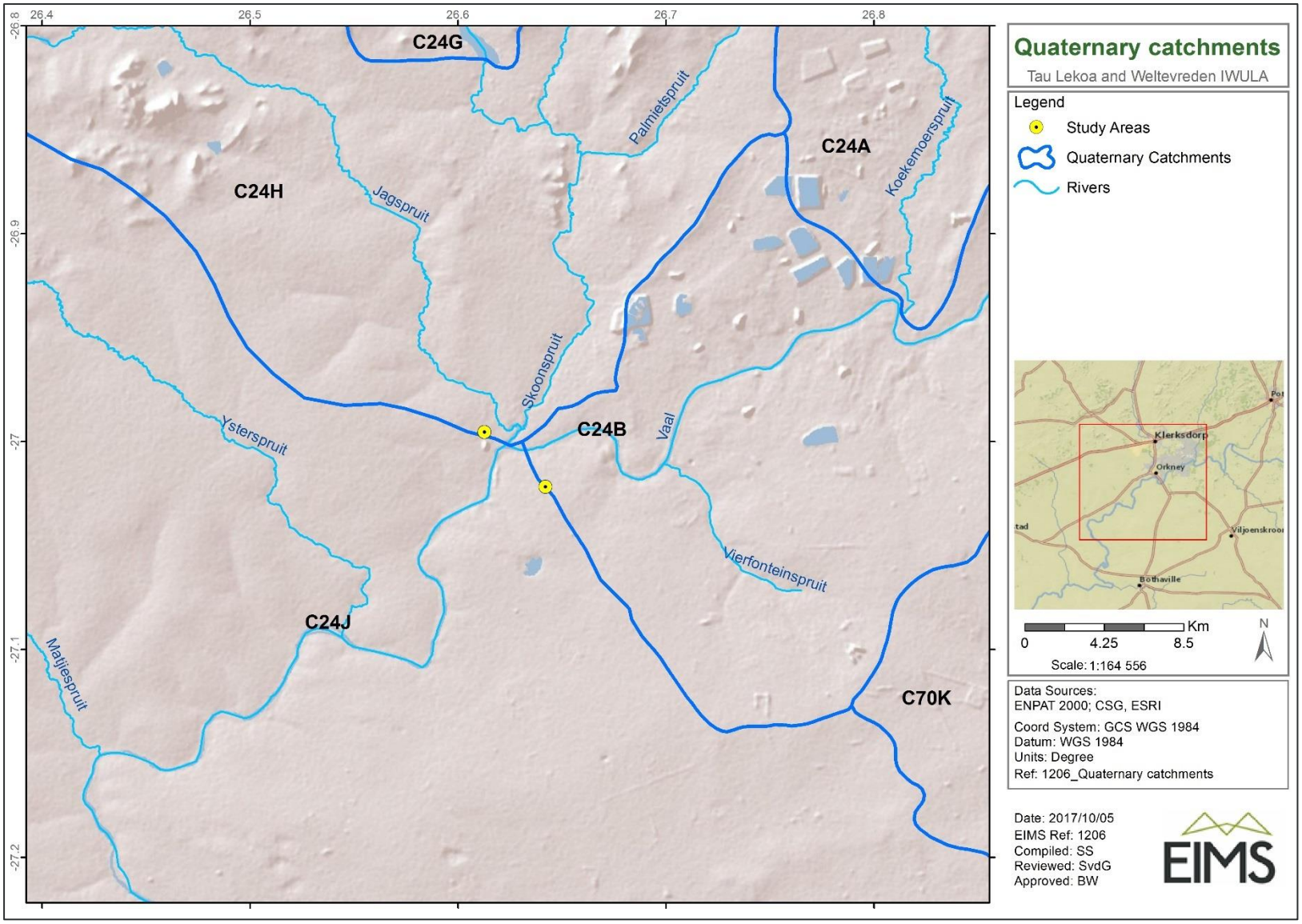


Figure 20: Quaternary catchment for Tau Lekoa gold mine

4.7 SURFACE WATER QUALITY

Six surface water samples were collected from surface water bodies surrounding the sites, which may be influenced by the Tau Lekoa Section and the Weltevreden Section. These surface water bodies are:

- The Jagspruit River, located to the east of the Operations, draining into the Skoonspruit River approximately 1.5km east of Tau Lekoa Mine;
- The Skoonspruit River, located to the east of the Operations, draining into the Vaal River approximately 350 m south east of Tau Lekoa Mine, upstream of the operations;
- The Swanepoel Dam, located approximately 500m east of the Operations; and
- The Vaal River, which flows roughly north east to south west past the Operations, approximately 200m south east of Tau Lekoa Mine.

A summary of the samples collected is provided in Table 7, and their locations are shown in Figure 21.

Table 7: Surface water bodies sample locations

Location	Description	Latitude	Longitude
TLSW01	Jagspruit, River upstream of operations	26°59'24.68"S	26°37'11.53"E
TLSW02	Skoonspruit, River upstream of operations	26°59'8.84"S	26°37'54.61"E
TLSW03	Confluence of Jagspruit and Skoonspruit Rivers, downstream of operations	26°59'55.07"S	26°37'30.37"E
TLSW04	Vaal River, upstream of operations	27°0'12.40"S	26°37'34.12"E
TLSW05	Vaal River, downstream of operations	27° 1'29.34"S	26°36'54.44"E
TLSW06	Swanepoel Dam, adjacent to operations	26°59'55.22"S	26°37'12.56"E

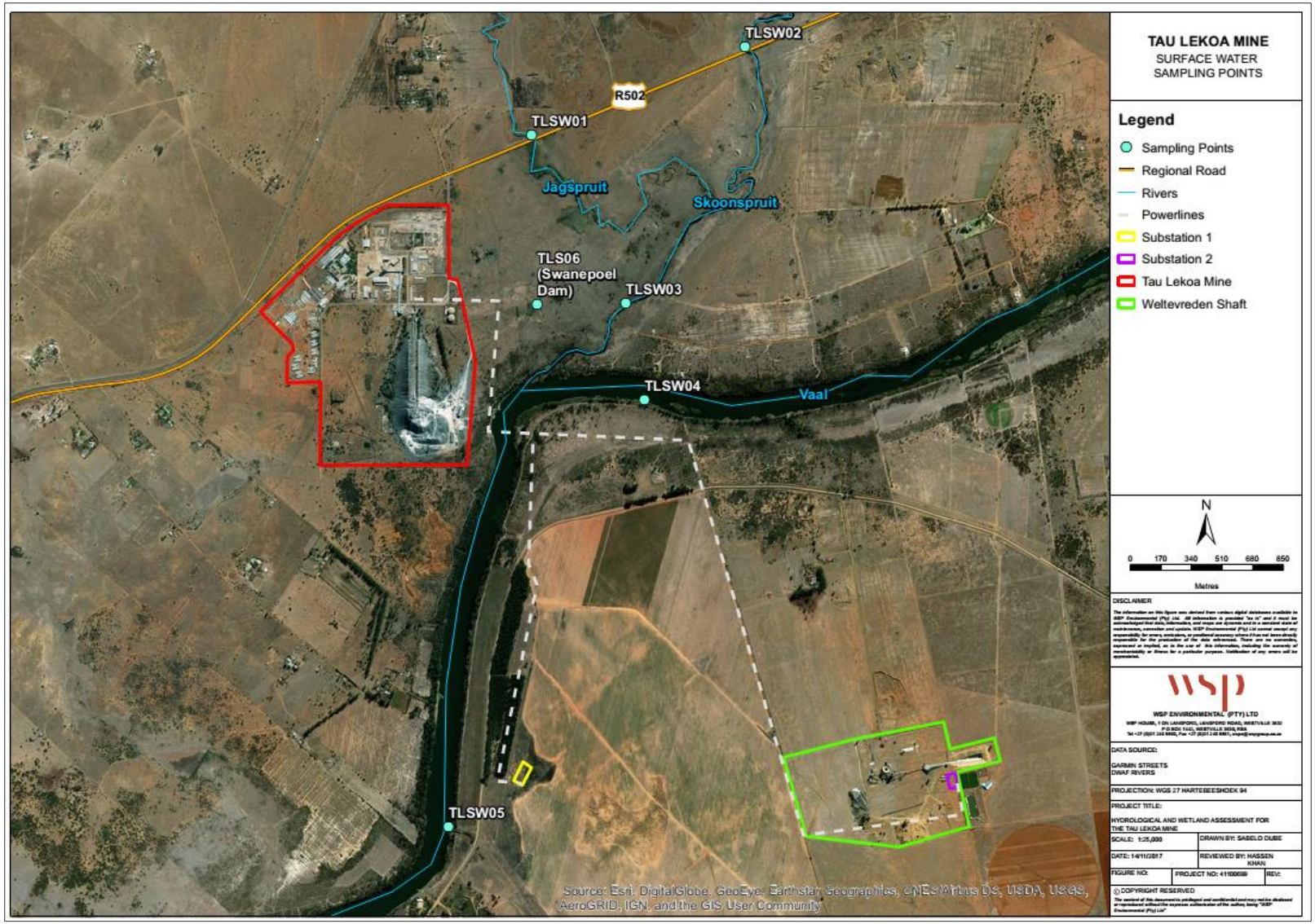


Figure 21: Surface water sampling points

Various DWS water quality guidelines were assessed in order to determine the most important receptors and/or potential surface water users in the area. In order to achieve this, a Most Sensitive User (MSU) analysis was carried out, and the following were determined to be of most relevance:

- Aquatic Ecosystems;
- Irrigation; and
- Livestock Watering.

The relevant water quality results are shown in Table 8. These results can be summarised as follows:

- Jagspruit River (TLSW01): The sample was collected in the Jagspruit River, upstream of the R502 road bridge crossing. The stream was relatively narrow and slow flowing, with a high degree of eutrophication. The electrical conductivity and concentrations of manganese, pH and sodium were recorded in concentrations exceeding the MSU guidelines. The recorded exceedances are only expected to pose a threat to very sensitive crops under irrigation using this water.
- Skoonspruit River (upstream of confluence with Jagspruit River) (TLSW02): The sample was collected in the Skoonspruit River, upstream of the R502 road bridge crossing and upstream of the confluence with the Jagspruit River. The stream was relatively shallow and fast flowing at the sampling point, with a small weir located approximately 150m upstream. The electrical conductivity and concentrations of manganese and sodium were recorded in concentrations exceeding the MSU guidelines. The recorded exceedances are only expected to pose a threat to very sensitive crops under irrigation using this water.
- Skoonspruit River (downstream of confluence with Jagspruit River) (TLSW03): This sample was collected in the Skoonspruit River, approximately 700 meters downstream of the confluence with the Jagspruit River and 650m upstream of the confluence with the Vaal River. The stream was relatively narrow and slow flowing at the sampling point. The electrical conductivity and concentrations of manganese and sodium were recorded in concentrations exceeding the MSU guidelines.
- Vaal River (upstream of Operations) (TLSW04): The sample was collected in the Vaal River, approximately 1km upstream of the Operations. The river was wide and relatively slow flowing at the sampling point. The electrical conductivity and manganese values were in excess of the MSU guidelines. It is likely that the source of the manganese is the dolomites of the Transvaal Supergroup, through which the Vaal River flows upstream of Tau Lekoa Mine, as these dolomites are known to have relatively high manganese content (Johnson, Anhaeusser, & Thomas, 2006). The electrical conductivity values are only expected to pose a threat to very sensitive crops under irrigation using this water.
- Vaal River (downstream of Operations) (TLSW05): The sample was collected in the Vaal River, approximately 2km downstream of the Operations. The river was wide and relatively slow flowing at the sampling point. The electrical conductivity and manganese values were in excess of the MSU guidelines. It is likely that the source of the manganese is the dolomites of the Transvaal Supergroup, through which the Vaal River flows upstream of Tau Lekoa, as these dolomites are known to have relatively high manganese content (Johnson, Anhaeusser, & Thomas, 2006). The electrical conductivity values are only expected to pose a threat to very sensitive crops under irrigation using this water.
- Swanepoel Dam (TLSW06): This sample was collected in the Swanepoel Dam, approximately 400 meters to the east of the operations. The dam was shallow, with a considerable amount of cattle excrement in the water. The dam appears to be used extensively for livestock watering. The electrical conductivity and concentrations of manganese, nickel, nitrate, nitrite, sodium, sulphate and total dissolved solids were recorded in excess of the MSU guidelines. However, it should be noted that it is unlikely that the water in the Swanepoel Dam will be used for irrigation purposes, and its main use appears to be for livestock watering. Taking the DWS Livestock Watering Guidelines into account, only the values of nitrate, sulphate and total dissolved solids exceed the guidelines. The high nitrate levels are likely due to the cattle excrement in the water. Given the shallow nature and the relatively low replenishment of the dam by surface water, it is likely that certain recorded constituents, such as sodium, sulphate and total dissolved solids, are elevated due to evaporative concentration. Water discharged to the Swanepoel Dam by Tau Lekoa Mine should be monitored in order to ensure that the water quality does

not deteriorate to a point where its use will likely have an adverse effect on livestock using it as a water source.

Table 8: Selected Water Quality Results

Determinant	MSU Guideline Value	Unit	Sample ID					
			TLSW01	TLSW02	TLSW03	TLSW04	TLSW05	TLSW06
Aluminium	5	µg/l	<20	<20	<20	<20	<20	<20
Arsenic	10	µg/l	3.0	<2.5	<2.5	<2.5	3.4	<2.5
Calcium	1000	mg/l	73.9	90.3	91.4	75.3	75.0	645.5
Chloride	1500	mg/l	101.2	120.3	121.6	65.9	66.6	517.1
Copper	0.3	µg/l	<7	<7	<7	10	<7	<7
Dissolved oxygen (field reading)	80% of Saturation	mg/l	8.09	16.59	9.65	4.61	2.93	3.5
Electrical Conductivity	400	µS/cm	1 062	1 386	1 394	910	915	6 730
Fluoride	0.75	mg/l	0.4	0.4	0.4	0.4	0.4	0.5
Lead	0.2	µg/l	<5	<5	<5	<5	<5	<5
Magnesium	500	mg/l	27.3	36.8	38.1	26.5	26.4	97.4
Manganese	20	µg/l	712	294	144	70	326	1 193
Mercury	0.04	µg/l	<1	<1	<1	<1	<1	<1
Nickel	20	µg/l	5	5	11	10	5	166

Determinant	MSU Guideline Value	Unit	Sample ID					
			TLSW01	TLSW02	TLSW03	TLSW04	TLSW05	TLSW06
Nitrate as N	5	mg/l	0.23	0.29	0.43	1.08	1.08	115.8
Nitrite as N	5	mg/l	<0.006	0.161	0.228	0.152	0.265	5.2
pH	6.5-8.4	pH units	8.95	8.38	8.15	8.23	7.93	7.9
Sodium	70	mg/l	101.2	117.0	116.9	75.9	75.8	918.2
Sulphate	1000	mg/l	171.6	205.3	220.5	218.5	215.3	2 559.1
Total Chromium	7	µg/l	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5
Total Cyanide	0.001	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Total Dissolved Solids	1 000	mg/l	629	803	802	584	593	5 707
Total Iron	5 000	µg/l	161	119	<20	31	74	41
Zinc	2	µg/l	<3	<3	<3	<3	<3	<3

4.8 MEAN ANNUAL RUNOFF (MAR)

The Tau Lekoa Mine falls on the boundary of the C24J and C24H quaternary catchments and the Weltevreden Shaft falls on the boundary of the C24J and C24B quaternary catchments, all of which fall within the Middle Vaal Water Management Area (WMA). The majority of both sites fall within quaternary catchment C24J. The Mean Annual Precipitation (MAP), Mean Annual Evaporation (MAE) and Mean Annual Runoff (MAR) for each quaternary catchment can be seen in Table 9 below.

Table 9: Quaternary catchment description (including MAR).

Quaternary Catchment	Catchment Area (km^2)	Rainfall Zone	MAP (mm)	Evaporation Zone	MAE (mm)	MAR (mcm)
C24B	530	C2G	619	10A	1750	17.50
C24H	840	C2G	576	10A	1820	13.31
C24J	2110	C2G	552	9A	1800	12.63

4.9 RESOURCES CLASS AND RIVER HEALTH RECEIVING WATER QUALITY OBJECTIVES AND RESERVE

The Resource class essentially describes the desired condition of the resource, along with the degree to which it can be utilized. These classes range from minimally used to heavily used. The Management class facilitates the balance between protection and use of the water resource and defined by taking into consideration the social, economic and ecological landscape.

Significant quantities of water are lost through infestations by alien vegetation, much of which occur on the banks of the Vaal River. The bulk of the surface water in the Middle Vaal WMA comes from the Upper Vaal WMA. This water contains a large proportion of urban and industrial return flows from Johannesburg area. The Present Ecological Status (PES) of the C24H (Schoonspruit after confluence with Jagspruit) and C24J (Vaal from Orkney to confluence with Vals) is class D, largely modified. The PES of the C25F (Bloemhof dam) is class E – F which is not an acceptable class.

4.10 SURFACE WATER USER SURVEY

The water users in the catchment include uses for industrial, potable, irrigation (of sports field; gardens and golf courses), aquatic life and agricultural (life stock watering).

4.11 SENSITIVE AREAS SURVEY

WSP Environmental (Pty) Ltd. conducted a wetland study for the proposed powerline construction from the Tau Lekoa Section to the Weltevreden Section of the mine. The wetland study is attached in Appendix E of this report.

4.11.1 WETLAND DELINEATION

In order to identify the wetland types, a characterisation of hydrogeomorphic (HGM) types was conducted. These have been defined based on the geomorphic setting of the wetland in the landscape (e.g. hillslope or valley bottom, whether drainage is open or closed), water source (surface water dominated or sub-surface water dominated), how water flows through the wetland (diffusely or channelled) and how water exits the wetland. Two wetland systems, namely Seep 1 and Seep 2, were identified onsite that may potentially be impacted upon by the construction and operation of the power lines and associated pylons (refer to Figure 22).

Seep 1 is a system with channelled outflow through concentrated surface flow, into the Schoonspruit River. Seep 1 is located on the Tau Lekoa Section of the mine (refer to Figure 23). The seep system has been significantly altered due to historic agricultural practices (including tilling, crop production, canals and berms) and current mining activities and infrastructure (e.g. mine, roads, pylons, power lines) within the system and its micro-catchment. According to pre-Tau Lekoa historic imagery, the system appears to be significantly smaller in extent, with no damming and no defined inflow (Figure 25).

Seep 1 current hydrology has been altered through artificial input from the mine's reservoir tanks, overflow from the storm water management sump and storm water runoff, concentrated through grassed canals. This has altered the natural flow path and the extent of permanent, seasonal and temporary wetland habitat and, therefore, the perennialism of the system. The natural vegetation was cleared for agricultural activities (as far back as 1975). Therefore, the current vegetation community does not represent what would be considered a natural vegetation community. In addition, there is a significant level of alien plant infestation.

Seep 2 is a seasonal seep system without channelled outflow. It is isolated from the Vaal River channel by a vegetated stable alluvial ridge associated with fluvial processes (e.g. infrequent overtopping and deposition of course alluvium). The seep system has been altered due to historic agricultural practices (crop production, forestry and informal road construction) within the system and its micro-catchment (refer to Figure 25). The system's current hydrology has been altered through increased water use by agricultural activities and increased bush encroachment. Historically the natural vegetation was cleared for agricultural activities. Therefore, the current vegetation community has been altered from its natural state

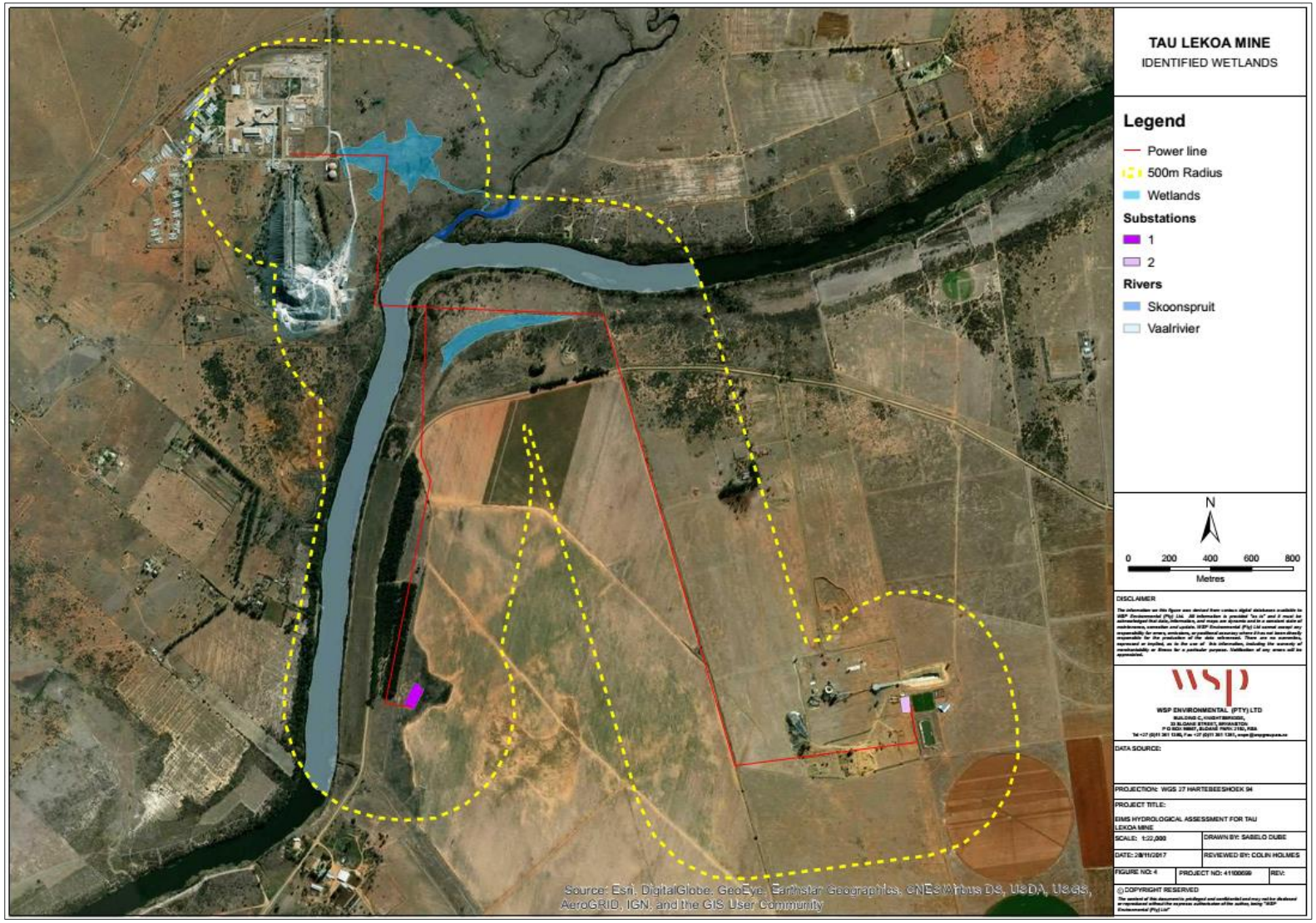


Figure 22: Wetlands delineated for the Tau Lekoa mine

Figure 23: Seep 1 located on the Tau Lekoa Section

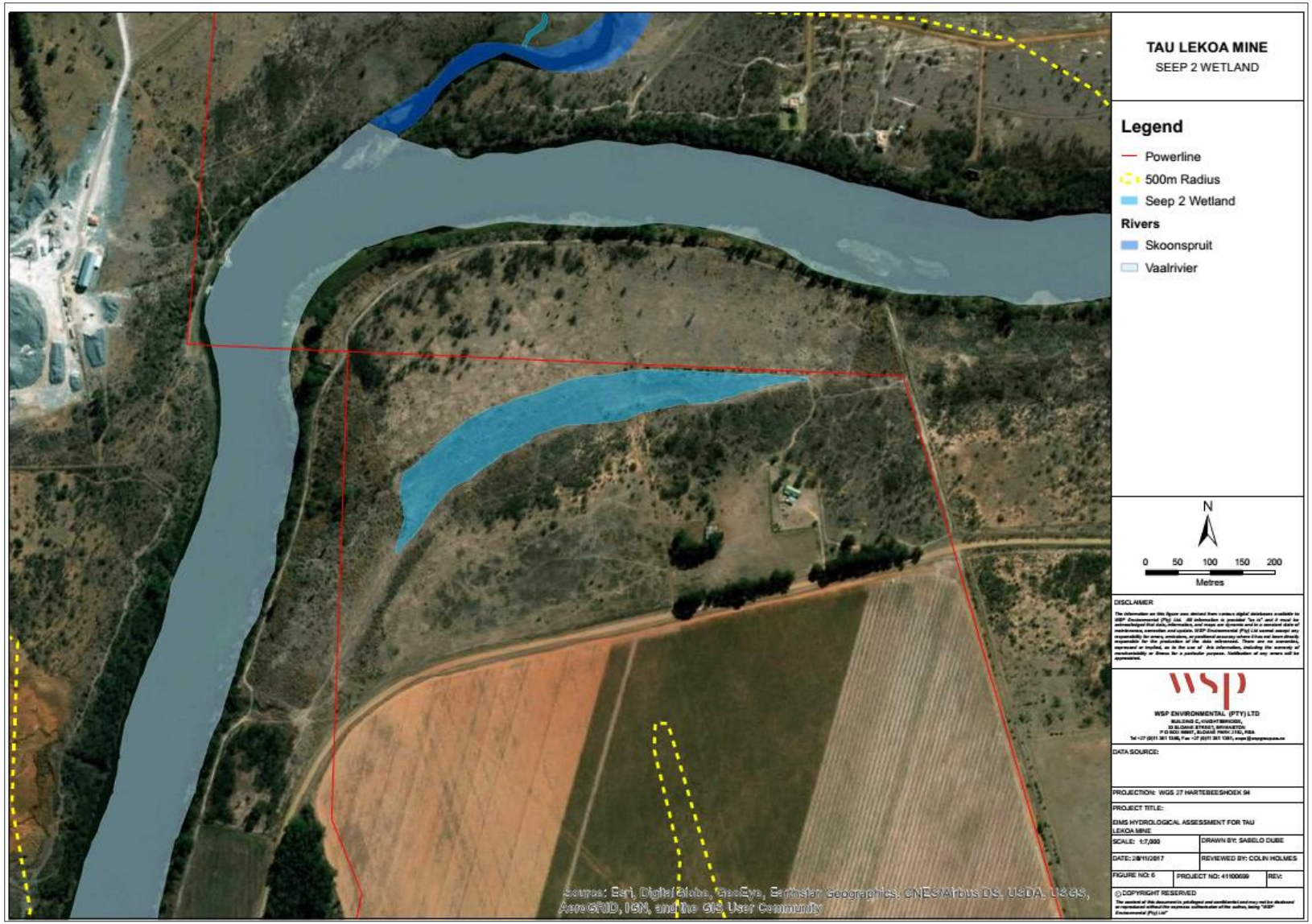


Figure 24: Seep 2 located on the Weltevreden Section

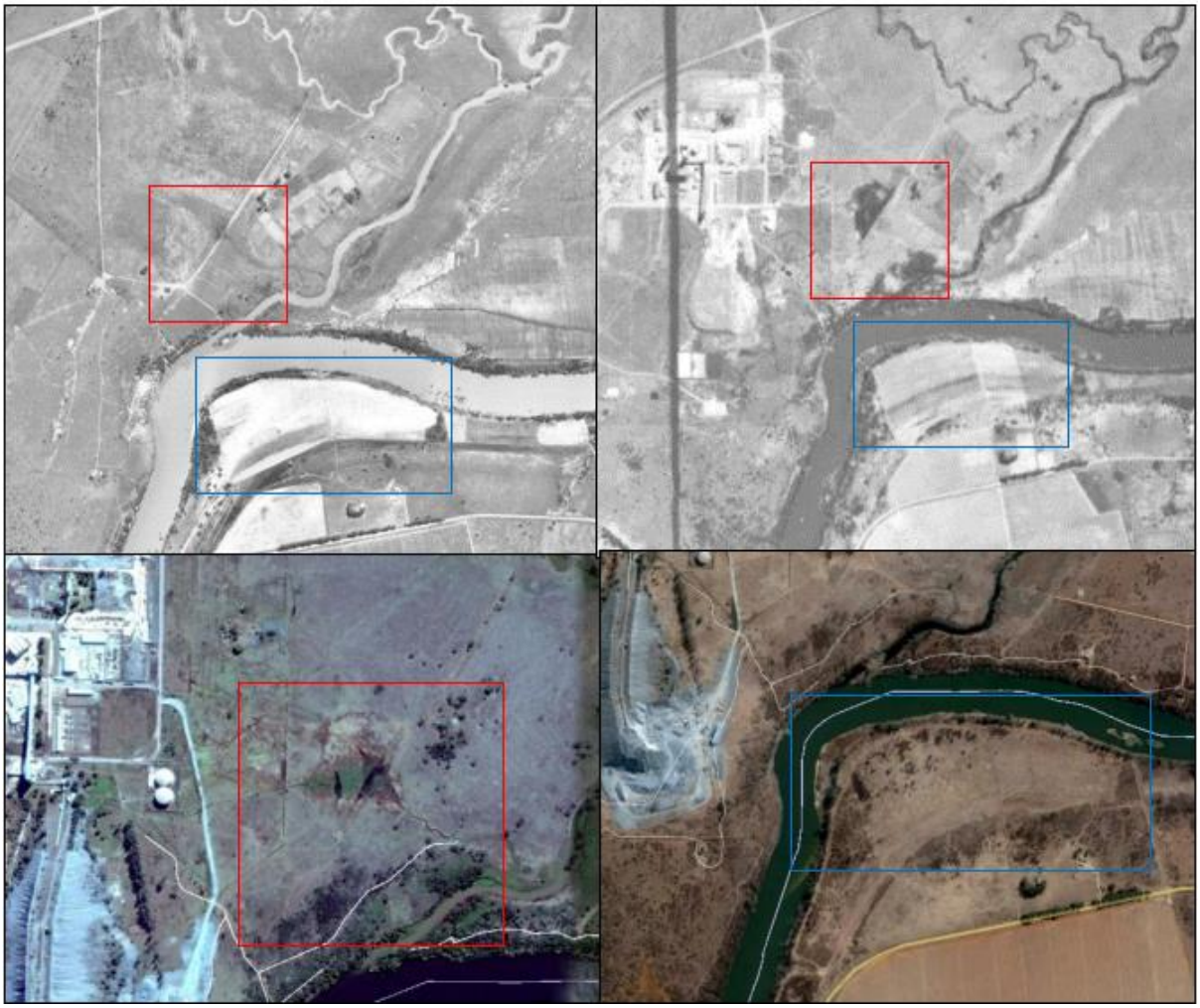


Figure 25: Historical imagery of the Tau Lekoa area (top left, clockwise: 1975, 1995, 2014, 2015). Red block indicates Seep 1 and Blue indicating Seep 2 (WSP, 2017)

4.11.2 THE PRESENT ECOLOGICAL STATUS OF THE WETLANDS

The present ecological status (PES) of the two wetlands is indicated in Table 10.

Table 10: PES of the wetlands delineated for the Tau Lekoa mine

System	PES Score and Class			
	Hydrology	Geomorphology	Vegetation	Overall
Seep 1	6.0 (E: Seriously Modified)	1.6 (B: Largely Natural)	4.8 (D: Largely Modified)	4.39 (D: Largely Modified) A large change in ecosystem processes and loss of natural habitat and biota and has occurred

Seep 2	2.0 (B / C: Moderately Modified)	0.5 (A: Unmodified)	2.9 (C: Moderately Modified)	1.81 (B: Largely Natural) Largely natural with few modifications.

Seep 1 experiences increased water input from the mine. The presence of historical berms and canals impacts a large extent of the system altering flow patterns and paths. The system is slightly affected by reduced water inputs from alien infestation within the system's catchment. Flood peaks have increased slightly due to hardened surfaces within the catchment resulting in reduced infiltration. The deposition/infilling associated with the road crossing and 'dam wall' has resulted in historical habitat loss and altered the movement and retention of flows. The increased water flows and slight change in flood patterns has resulted in a low intensity increase in runoff and therefore impacting on the geomorphological integrity of the system. There is no evidence of active erosion. The wetland and catchment vegetation has been moderately transformed, and currently consists of degraded grassland vegetation, and patches of alien vegetation.

The permanently wet portions are dominated by *Typha capensis* with the canals and surrounding areas being dominated by *Pennisetum clandestinum* resulting in overall low plant species diversity. There is a moderate level of alien plant species infestation in the greater catchment system consisting of species such as *Asclepias spp*. (milkweed). The hydrological and geomorphological integrity of the system is assessed to remain constant, with the vegetation integrity decreasing, over the next 5 years.

Seep 2 is slightly affected by reduced water inputs from alien infestation and agricultural activities within the systems catchment. The diffuse interflow has been altered due to the informal road traversing the system, resulting in concentration of surface water adjacent to the road. The geomorphology of the system has been impacted upon through the infilling of material from the construction of the informal road. This is however limited in extent. Although there is the deposition of material, there is no evidence of erosion within the system. The system was previously utilised for crop production but has since been abandoned and complete graminoid cover is currently present. There is a small community of the Red Listed 'Declining' *Crinum macowanii* (River Lilies). The hydrological, geomorphological and vegetation integrity of the system is assessed to remain constant over the next 5 years.

4.11.3 WETLAND ECOLOGICAL FUNCTIONAL ASSESSMENT

The overall goods and services provided by the seep systems were assessed as being mostly low to moderately-low, with only erosion control being consider moderately-high (refer to Figure 26). This is due to the effectiveness and opportunity for these systems to provide the erosion control service. Due to the representation of different hydrological zones within Seep 1 and the low level of current physical disturbance of the soil profile, carbon storage is considered moderate within Seep 1. There is no to minimal provision in terms of cultivated foods, tourism/recreation, education/research and/or socio-cultural aspects. Seep 2 is higher in maintaining biodiversity due to the community of River Lilies (*C. macowanii)*.

Ecosystem Goods & Services	Overall Score (out of 4)	
	Seep 1	Seep 2
Flood attenuation	1.6	1.7
Streamflow regulation	1.8	1.3
Sediment trapping	1.5	1.5
Phosphate trapping	1.4	1.9
Nitrate removal	1.3	1.9
Toxicant removal	1.5	1.5
Erosion control	**2.5**	**2.8**
Carbon storage	2.3	1.7
Maintenance of biodiversity	1.1	2.3
Water supply for human use	1.0	0.5
Natural resources	0.6	0.3
Cultivated foods	0.0	0.0
Cultural significance	0.0	0.0
Tourism and recreation	0.7	0.0
Education and research	0.3	0.5

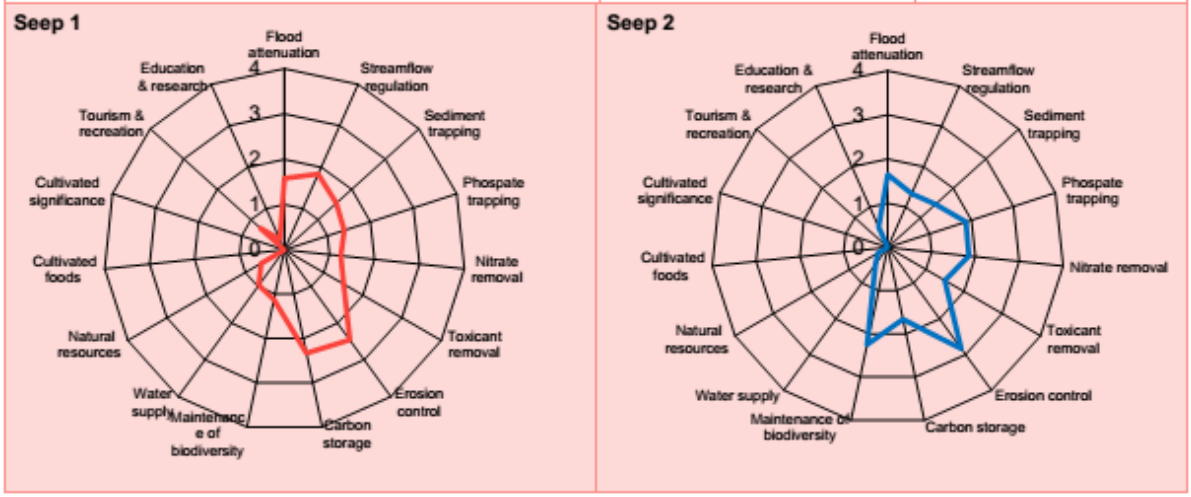


Figure 26: EcoServices Assessment of the Seep 1 and 2 wetland systems

4.11.4 THE ECOLOGICAL IMPORTANCE AND SENSITIVITY ASSESSMENT OF THE WETLAND SYSTEMS

As indicated in Table 11, the Seep 1 and 2 systems were assessed as having respective overall moderate and moderately-low EIS ratings. The Seep 1 system is driven by the hydrological functional importance, namely streamflow regulation, erosion control and carbon storage. This is due to the significantly modified state of the system, the lack of presence of important biodiversity features and the lack of the presence of red data species. The Seep 2 system is driven by the ecological / biological importance, due to the presence of red data species They are both not classified as 'Wetland Freshwater Ecosystem Priority Areas (FEPA)' (CSIR, 2011) and are, therefore, not considered important in meeting national wetland conservation targets. The systems have low direct benefits to society, due to the lack of harvestable resources and the lack of direct water use.

Table 11: The EIS assessment for the Seep 1 and 2 systems

Unit	Ecological / Biological Importance	Functional/ Hydrological Importance	Direct Benefits to Society	Overall Importance	
1	1.60	1.74	0.43	1.74	Moderately Low
2	2.00	1.79	0.22	2.00	Moderate

4.12 GROUNDWATER

A groundwater study has been conducted by MB Groundwater Consulting in 2017. Refer to Appendix F for a copy of the study.

4.13 AQUIFER CHARACTERISATION

The purpose of an aquifer classification system is to provide a framework and objective basis for identifying and setting appropriate levels of groundwater resource protection. This facilitates the adoption of a policy of differentiated groundwater protection. The aquifer classification system used to classify the aquifers in the study area, is the proposed National Aquifer Classification System of Parsons (1995), which has a certain amount of flexibility and can be linked to second classifications such as a vulnerability or usage classification. Based on this classification system, the aquifers in the study area have been classified as indicated in Table 12.

Table 12: Aquifer classification in the study area

Description	Aquifer	Vulnerability	Rating	Protection
Weathered Aquifer	Minor (2)	2	4	Medium
Fractured Aquifer	Minor (2)	1	3	Low

The aquifers underlying the Tau Lekoa Mine infrastructure are:

- Weathered Aquifer: A shallow, weathered aquifer exists in the weathered andesite at an average depth of 10m below ground level. The most consistent water strike is located at the fresh bedrock / weathering interface. The hydraulic conductivity of the weathered aquifer is typically in the order of 0.017 m/day.
- Fractured Aquifer: The primary porosity of the Andesite is very low. Any water bearing capacity is, therefore, associated with secondary joints, fractures and faults. The hydraulic conductivity of the fractured rock aquifer is typically in the order of 0.013 m/day. The depth to groundwater in this aquifer can be variable due to confining layers in parts of the study area.

4.14 HYDRO-CENSUS

A hydro census was undertaken within the immediate vicinity of Tau Lekoa Section, as well as the Weltevreden Section. The localities of the hydro census points are shown on Figure 27 and summarised in Table 13.

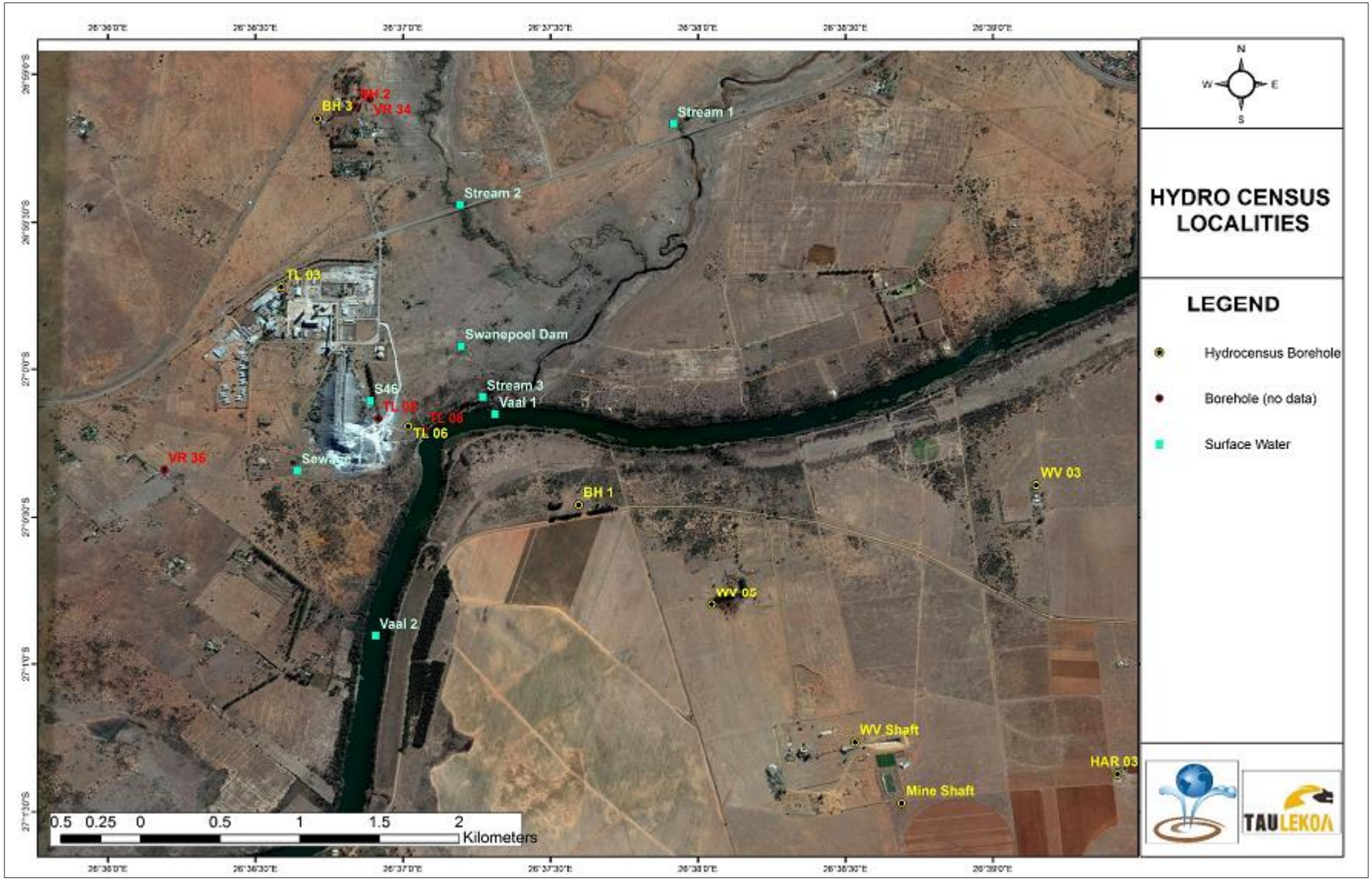


Figure 27 : Hydro census localities within the study area

Table 13: Hydro census information – Groundwater

BH ID	Coordinates		Water Level (mbgl)		Collar height (m)	Date drilled	Depth (m)	Comment	Water Use
	Latitude	Longitude	Static	Pumped					
Weltevreden Section									
H 1	27.00763	26.6266	-	-	-	Unknown	Unknown	Gate locked, able to get sample	Domestic and Irrigation
Mine Shaft	27.02452	26.64484	->100	0	-	Unknown	Unknown	Water level deeper than 100	Cattle, Game, Exotic Animals
WV Shaft	27.02109	26.64222	10.13	-	0.32	Unknown	64	BH open, but a piece of cement on top	Not in use
WV 03	27.00652	26.65245	-	-	-	Unknown	Unknown	Unable to measure water level due to BH construction	Cattle
WV 05	27.01331	26.6341	-	-	-	Unknown	Unknown	Houses empty, property of the Mine	Cattle
HAR 03	27.02288	26.65705	-	22.66	0.47	2015	36	Water Strike at 16 m	Domestic and Cattle
Tau Lekoa Section									
BH 3	26.98583	26.61183	11.7	-	0.2	Unknown	Unknow	No municipal water connection	Domestic, Cattle
TL 03	26.99531	26.60979	11.9	-	0.44	-	26	-	Monitoring
L 06	27.00321	26.61697	4.53	-	0.43	-	18	Water Strike @ 13m	Monitoring

4.14.1 GROUNDWATER QUALITY

Several water samples were collected during the hydro census that provides an overview of the regional water quality, as well as the current impacts from mine infrastructure. The water chemistry is compared to the South African National Standards (SANS) 241 (2015). The SANS 241 Drinking Water Specification is the definitive reference on acceptable limits for drinking water quality parameters in South Africa and provides guideline levels for a range of water quality characteristics. The SANS 241 (2015) Drinking-Water Specification effectively summarises the suitability of water for drinking water purposes for lifetime consumption. The chemistry of the groundwater is presented in Figure 28. Concentrations that exceed the SANS guideline limits are highlighted in red. The chemistry tables only show the most significant inorganic parameters associated with gold mining.

As indicated in Figure 28, the regional groundwater quality is good and within the recommended SANS 241 drinking water guidelines. Nitrate concentrations are, however, high in many of the boreholes. In some instances, this may be indicative of agricultural impacts, but the very high concentrations in borehole TL06 could also be indicative of a mining impact. Borehole TL06, which is located down-gradient from the WRD, does show impact from the WRD and the electrical conductivity (EC), total dissolved salts (TDS) and the sulphate concentrations are elevated. The uranium concentrations in all the samples are below detection limits.

Sample ID	Unit	SANS 241		BH1	Mine Shaft	WV Shaft	WV3	WV5	HAR3		BH3	TL03	TL06
Date				07-Jun-2017	07-Jun-2017	07-Jun-2017	07-Jun-2017	07-Jun-2017	07-Jun-2017		07-Jun-2017	07-Jun-2017	07-Jun-2017
pH	pH	<5 & >9.7	Weltevreden Area	7.42	7.46	7.76	7.80	7.58	6.89	Tau Lekoa Area	7.51	7.08	7.16
EC	mS/m	170		31	69	45	67	28	35		46	81	324
TDS	mg/ℓ	1200		251	539	317	490	226	282		316	571	3496
Alkalinity	$CaCO_3$	NG		63	157	185	270	106	102		235	226	282
Total Hardness	$CaCO_3$	NG		127	312	163	317	113	155		196	397	2411
Chloride	mg/ℓ Cl	300		16	43	11	33	10	16		20	94	219
Sulphate	mg/ℓ SO_4	500		36	82	49	54	17	17		5	110	931
Nitrate	mg/ℓ NO_3	11		13	31	6	12	6	18		4	5	274
Ammonia	mg/ℓ NH_4	1.5		0.028	0.197	0.227	0.404	0.061	0.077		0.042	0.022	0.142
Ortho-phosphate	mg/ℓ PO_4	NG		<0.005	0.028	0.044	0.020	0.027	0.045		0.019	<0.005	0.135
Fluoride	mg/ℓ F	1.5		0.297	0.295	<0.263	0.319	<0.263	<0.263		0.366	0.326	<0.263
Calcium	mg/ℓ Ca	NG		26	67	33	67	26	31		42	90	565
Magnesium	mg/ℓ Mg	NG		15	35	19	36	12	19		22	42	243
Sodium	mg/ℓ Na	NG		14	34	41	36	20	15		28	37	106
Potassium	mg/ℓ K	NG		0.66	1.35	1.41	0.66	0.41	1.04		0.96	0.81	0.86
Aluminium	mg/ℓ Al	0.3		<0.002	<0.002	<0.002	<0.002	0.088	<0.002		<0.002	<0.002	<0.002
Iron	mg/ℓ Fe	2		<0.004	<0.004	<0.004	<0.004	<0.004	<0.004		<0.004	<0.004	<0.004
Manganese	mg/ℓ Mn	0.4		<0.001	<0.001	0.004	<0.001	<0.001	<0.001		<0.001	0.004	0.021
Uranium	mg/ℓ U	0.03		<0.015	<0.015	<0.015	<0.015	<0.015	<0.015		<0.015	<0.015	<0.015

Note: NG = no guideline.

Figure 28: Groundwater quality

4.15 POTENTIAL POLLUTION SOURCE IDENTIFICATION

The WRDs at the mine are considered to be a primary contaminant source. However, classification of the WRDs at the mine as per the stipulations found in the NEMWA, GNR 635 & GNR 636 National Norms & Standards for Assessment and Disposal of Waste to Landfill (2013) determined the following:

- Tau Lekoa WRD 01 - >LCT0<LCT1 – Type 3 (Low Risk); and
- Tau Lekoa WRD 02 - >LCT0<LCT1 – Type 3 (Low Risk).

These two waste streams are, therefore, considered low risk waste and is suitable for disposal to a Class C Landfill, as per the specifications in GNR 634 & 636.

4.16 GROUNDWATER MODEL

A calibrated flow and mass transport model was developed to simulate the potential impact on the groundwater regime from the following sources:

- WRD;
- Swanepoel dam;
- Sewage water dam; and
- Tau Lekoa shaft area.

There is currently no activity at the Weltevreden Section and no impact. This area was, therefore, not included in the groundwater model. The boreholes sampled in and around this area is characterised by good quality water.

The impacts from the contaminant sources were simulated and evaluated for the following scenarios:

- Scenario 1: Simulation of the contaminant migration without any remedial options until 2027, based on the current LOM predictions (refer to Figure 29 for the current contaminant plume and Figure 30 for the contaminant plume in 2027);
- Scenario 2: It is assumed that at the end of the mining life the current sources (Swanepoel dam, sewage dam and shaft area) will be rehabilitated and removed and the WRD will be completely mined and removed. With all the sources removed the aquifer will clean up through natural attenuation and the state of the aquifer after 25 years (2052) (refer to Figure 31) and 50 years (2077) (refer to Figure 32) was assessed.

The results from this modelling showed that the primary contaminant sources are the WRD and Swanepoel dam. A waste assessment of the WRD indicated that the material is considered a low risk, but given enough time and exposure contaminants will leach from this area. Due to the aquifer characteristics and low aquifer parameters the contaminant migration is a slow process, but it is estimated that contaminants have reached the surface water sources.

The current salt load to the Vaal River is 7 kg/day (from the WRD) and 0.7 kg/day to the Schoonspruit (from Swanepoel dam). These loads will increase to a maximum of 16 kg/day to the Vaal River and 4 kg/day to the Schoonspruit at the time of mine closure (2027). These are very low loads and did not reflect in the upstream and downstream analyses of the rivers.

After closure and with the removal of the sources, the aquifer will clean up through natural attenuation. After 25 years (2052) the salt load to the Vaal River reduces to 10 kg/day and 2 kg/day to the Schoonspruit (compared to the end of mining life loads). At 50 years after closure there will be no impact to either river.

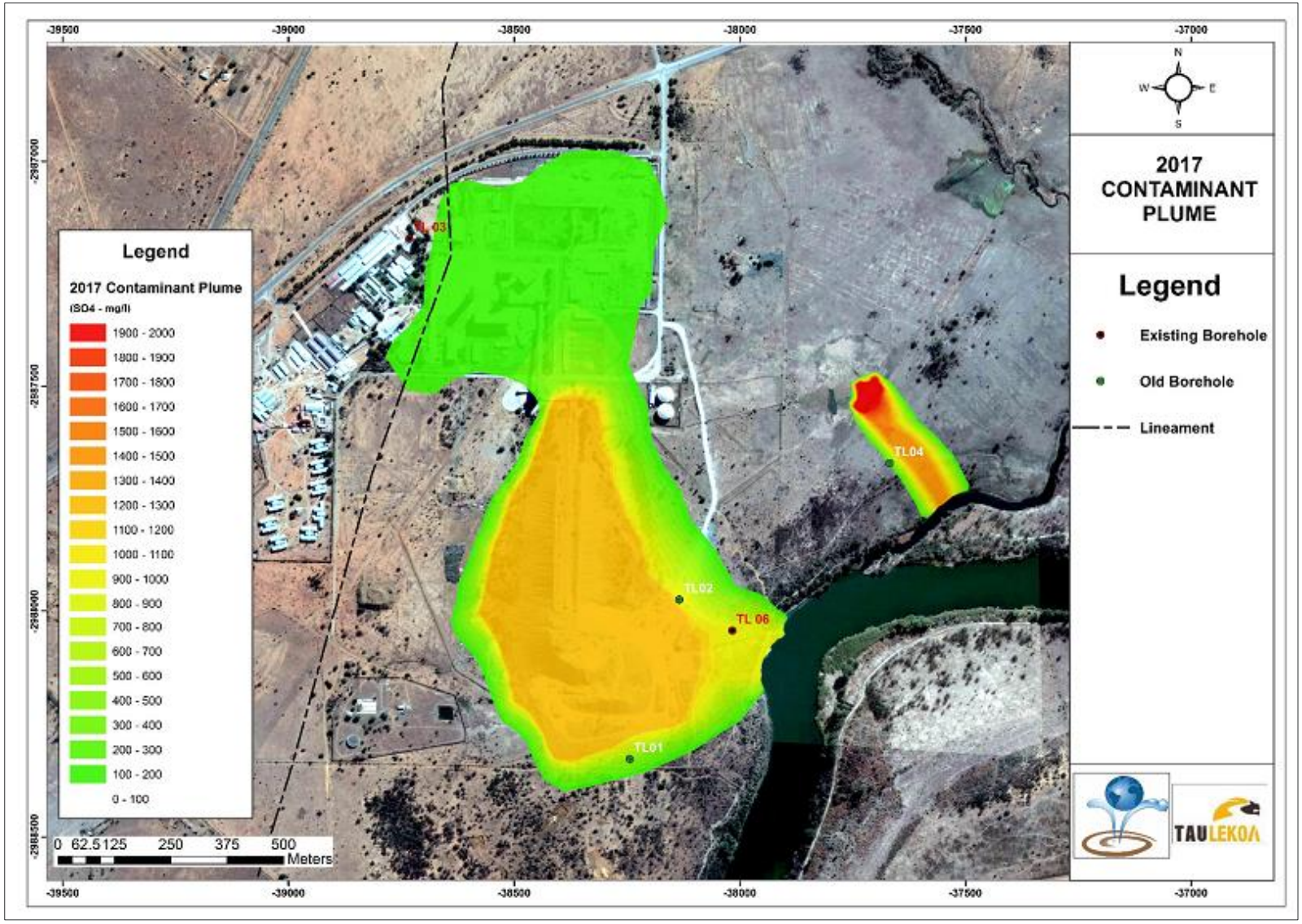


Figure 29:Current contaminant impact at Tau Lekoa Section mining infrastructure

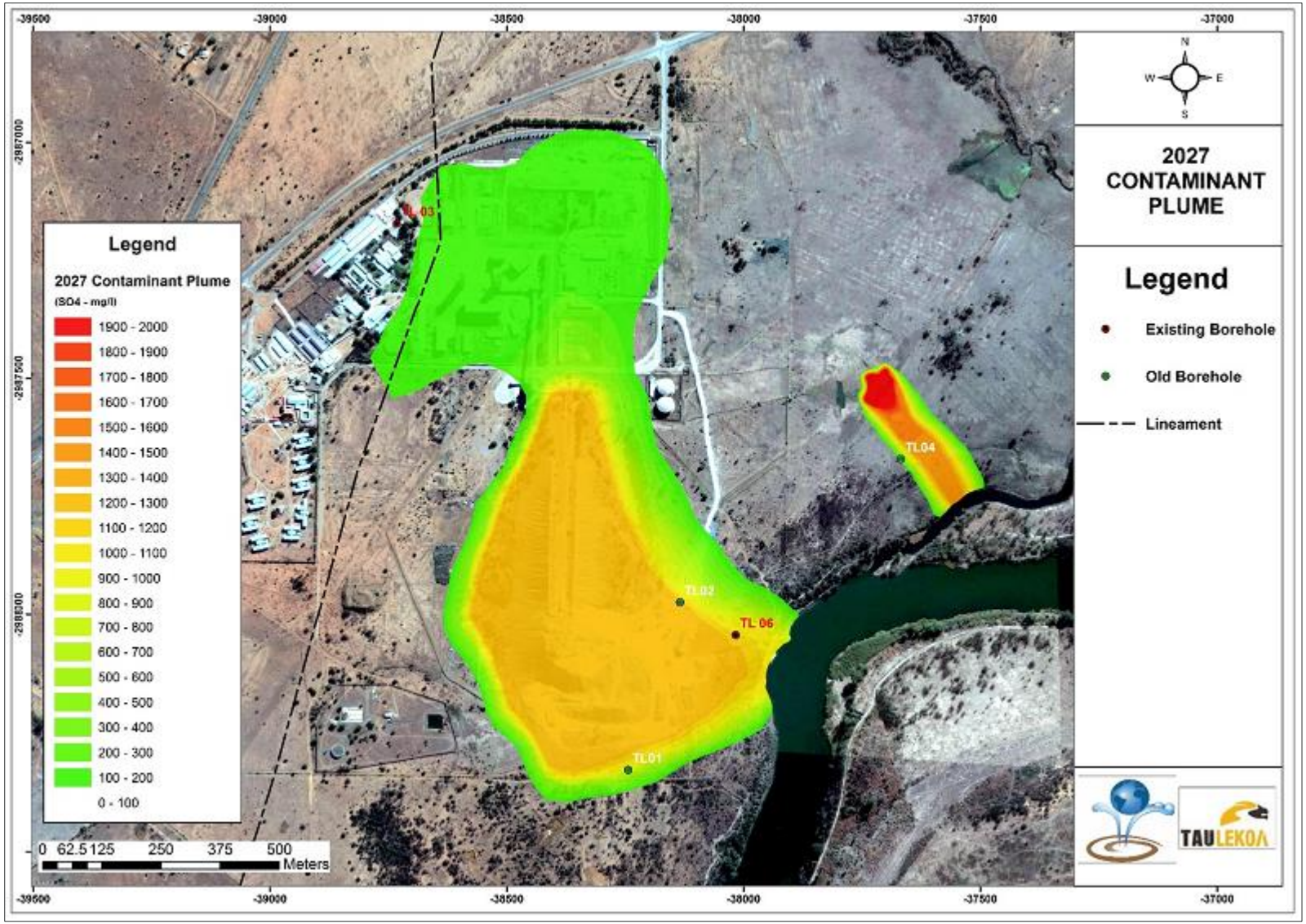


Figure 30: Scenario 1 – Simulated contaminant plume in 2027

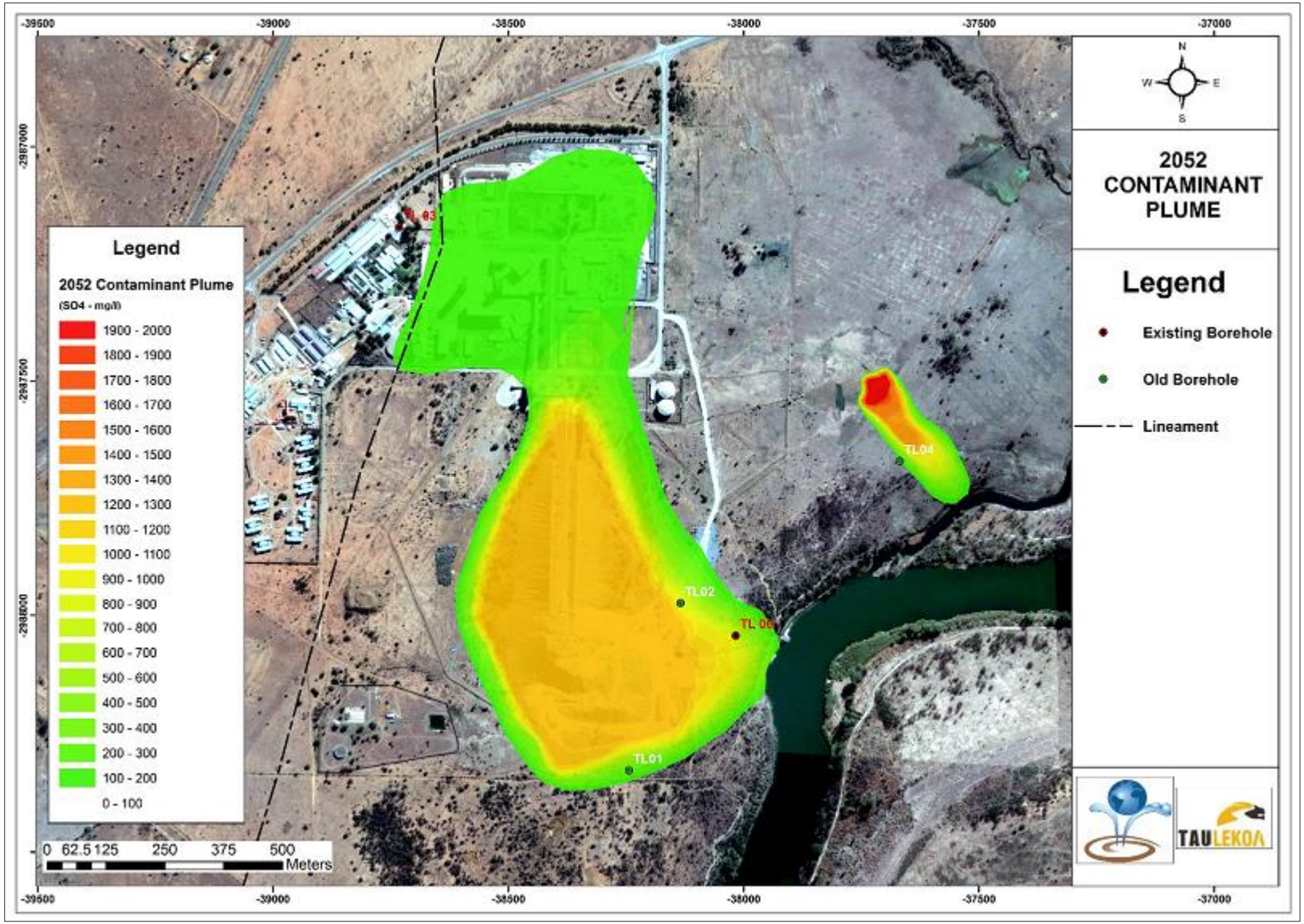


Figure 31: Scenario 2 – Simulated contaminant plume 25 years after closure and source removal

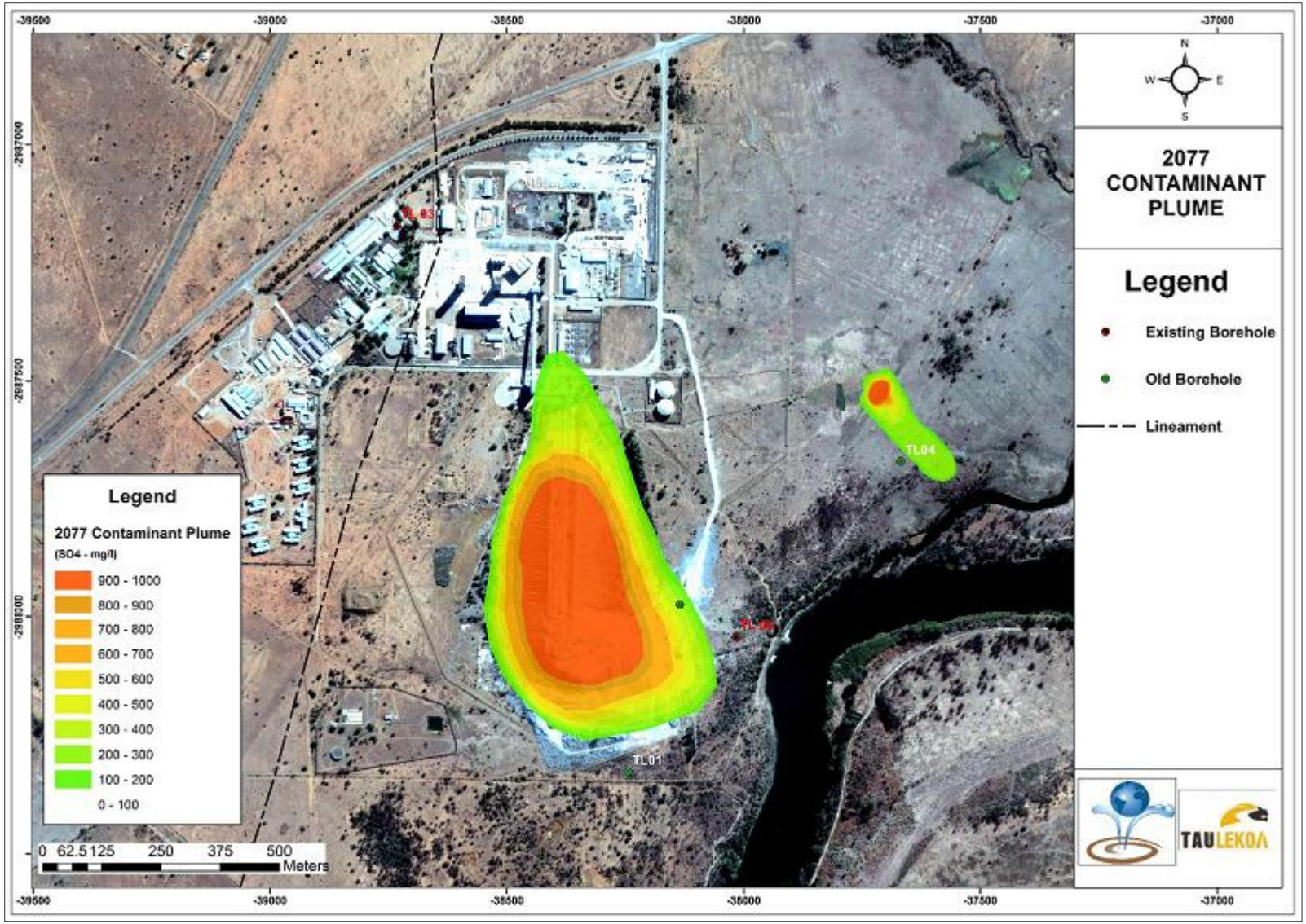


Figure 32: Scenario 2 – Simulated contaminant plume 50 years after closure and source removal

4.17 SOCIO-ECONOMIC ENVIRONMENT

Tau Lekoa is located within the city of Matlosana Municipality, which is situated is part of the Dr Kenneth Kaunda District Municipality in the North-West Province. Numerous mining activities take place around Orkney and Buffelsfontein. The City of Matlosana includes Klerksdorp, Jouberton, Alabama, Orkney, Kanana, Stilfontein, Khuma, Tigane and Hartbeesfontein and is the largest of all towns in the North West province. According to Statistics South Africa, 2011, the city of Matlosana Municipality has a total population of 398 676 people. Of this figure, 81.0% are black African; 14.5% are white; with coloured and Indian/Asian making up the remaining population.

It was further reported that of the people aged 20 and above,13,6% had some form of primary schooling. About 36,4% had some form of secondary schooling, 28,2% have completed matric and 9,0% have some form of higher education. As indicated in Figure 33, of the 158 896 economically active (employed and unemployed but looking for work) people in the municipality, 32,7% are unemployed. There are 11 311 discouraged work-seekers in the municipality.15–34, 44 305 are employed, 33 500 are unemployed and there are 7 199 discouraged work-seekers among the youth. The unemployment rate, therefore, in the municipality stands at 32,7%.

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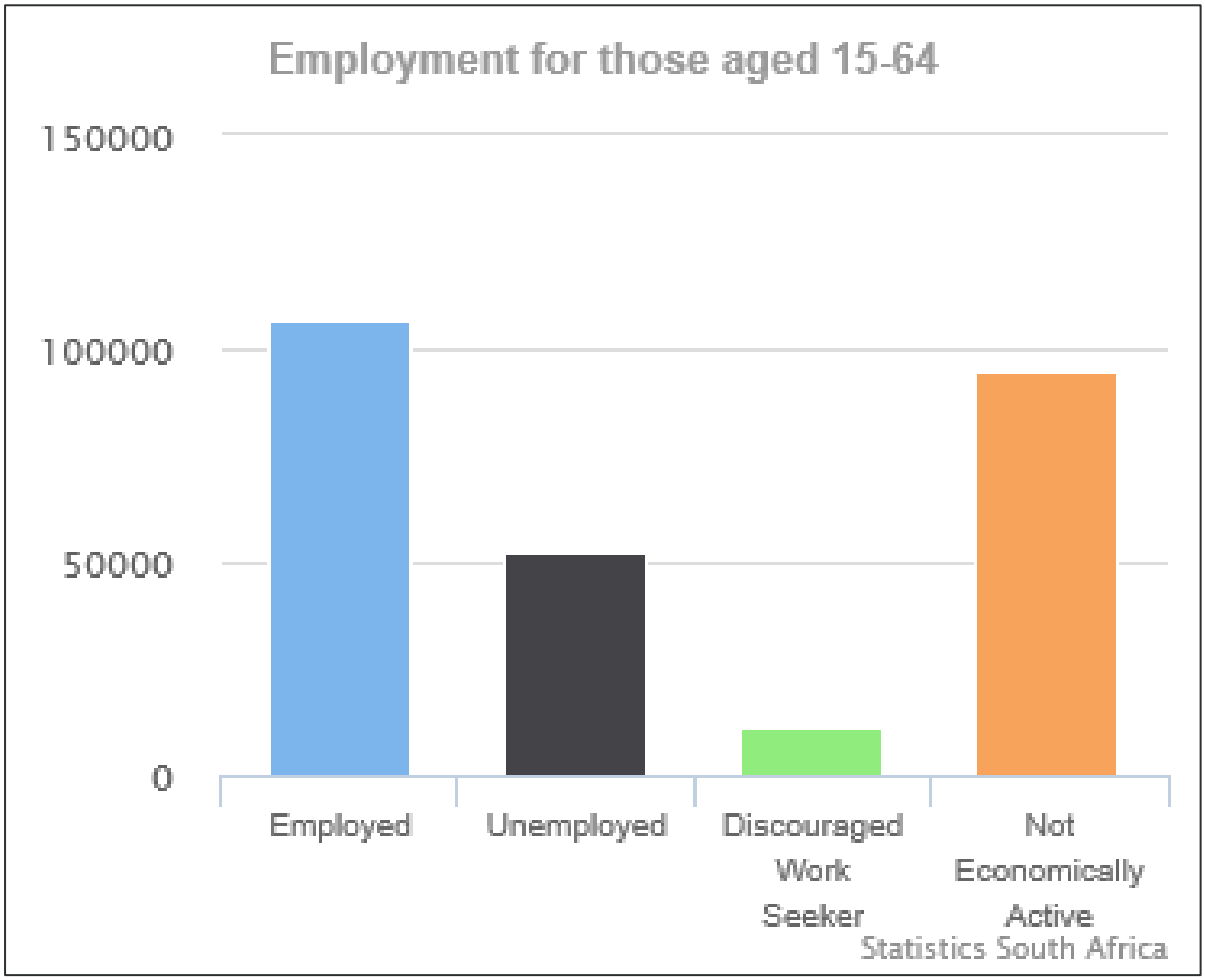

Figure 33: Employment figures for the city of Matlosana Municipality

The household income is indicated in Table 14. The larger part of the population (19,3%) has an income of between R19,601 - R38,200 per annum.

Table 14: Income of the people living in the Matlosona Municipality

Income	Percentage
None income	15,9%
R1 - R4,800	4,6%
R4,801 - R9,600	7,2%
R9,601 - R19,600	16,1%
R19,601 - R38,200	18,3%
R38,201 - R76,4000	15,9%
R76,401 - R153,800	10,2%
R153,801 - R307,600	7%
R307,601 - R614,400	3,4%
R614,001 - R1,228,800	0,8%
R1,228,801 - R2,457,600	0,3%
R2,457,601+	0,2%

In the municipality, there are 120 442 households with an average household size of 3,2 persons per household. The Census 2011 figures show that 50,1% of households have access to piped water in their dwellings and 46%have access to piped water in the yard. Only 1,1% of households do not have access to piped water. The main source of water is the municipality (93,4%) or other water services provider boreholes supplying 4,6% of water (refer to Table 15).

Table 15: Sources of water within the municipality

Source of water	Percentage
Regional/Local water scheme (operated by municipality or other water services provider)	93,4%
Borehole	4,6%
Spring	0,1%
Rain water tank	0,1%
Dam/Pool/Stagnant water	0,1%
River/Stream	0%
Water vendor	0,3%
Water tanker	0,7%

Source of water	Percentage
Other	0,7%

The main economic activities within the municipality is mining, agriculture, manufacturing and construction. The local economy has become more diverse over the last years. This can be ascribed to the fact that the local economy has become less dependent on the mining sector with the tertiary sectors growing in the long term.

5 ANALYSIS AND CHARACTERISATION OF THE WATER USE ACTIVITY

The following section describes the activity, its associated processes and infrastructure in more detail.

5.1 SITE DELINEATION AND CHARACTERISATION

The Tau Lekoa Section is located near Orkney within the North West Province while the Weltevreden Section is located in the Free State Province, separated by the Vaal River. The Tau Lekoa Section falls on the boundary of the C24J and C24H quaternary catchments and the Weltevreden Section falls on the boundary of C24J and C24B quaternary catchment both of which fall within the Middle Vaal Water Management Area (WMA). The majority of both sites fall within quaternary catchment C24J.

5.2 WATER AND WASTE MANAGEMENT

The aspects related to the management of waste and water at the Tau Lekoa gold mine are described in the following sections, including the relevant aspects related to process-, storm-, groundwater and waste.

5.3 PROCESS WATER

The Tau Lekoa Section obtains its water from Midvaal Water and all process water generated within the mine is reused or sent to the Gold Plant. The Tau Lekoa Section uses and processes an average of 3 million cubic metres of water per year. The process flow diagram for the Tau Lekoa Section is indicated in Figure 34. The process flow diagram for the Weltevreden Section indicates that the mine obtains its water from Midvaal Water and decant water from the underground shaft. The Weltevreden Section operations use and processes an average of 900,000 cubic metres of water per year.

5.3.1 SEWAGE PURIFICATION WORKS

Tau Lekoa has an existing sewage purification works (SPW), which treats domestic waste from the mine offices and shaft areas. The design capacity of the plant is approximately 35 625m^3 a day, and the average daily inflow into the plant is 34625m^3 a day. Flow within the purification works is subjected to the preliminary, primary and secondary treatment. The preliminary treatment focuses on the removal of large and aesthetically unpleasing objects from the wastewater. The primary treatment focuses on the removal of settleable and floatable solids and employs sedimentation technologies. Secondary treatment employs a variety of physico-chemical and biological treatment steps to mainly remove organic compounds, in this caste the biological filtration methods are employed. The effluent undergoes tertiary treatment during which it is dosed with 100g chlorine powder.

The final effluent is used in different areas at the mine, approximately 657 m^3 a month is used to irrigate the gardens as well as the WRD and approximately 14 522m^3 per month is re-used at Tau Lekoa mine during the metallurgical processes. The irrigation of the garden and WRD is considered as an approach to good water management and it supports the DWAF hierarchy of water management.

5.3.2 POTABLE WATER

Water supply to the mine is supplied by Midvaal Water and is stored in a potable reservoir for domestic purposes. Water is also used in various activities at the mine such as the machine water dam, for chilling and for underground cooling purposes.

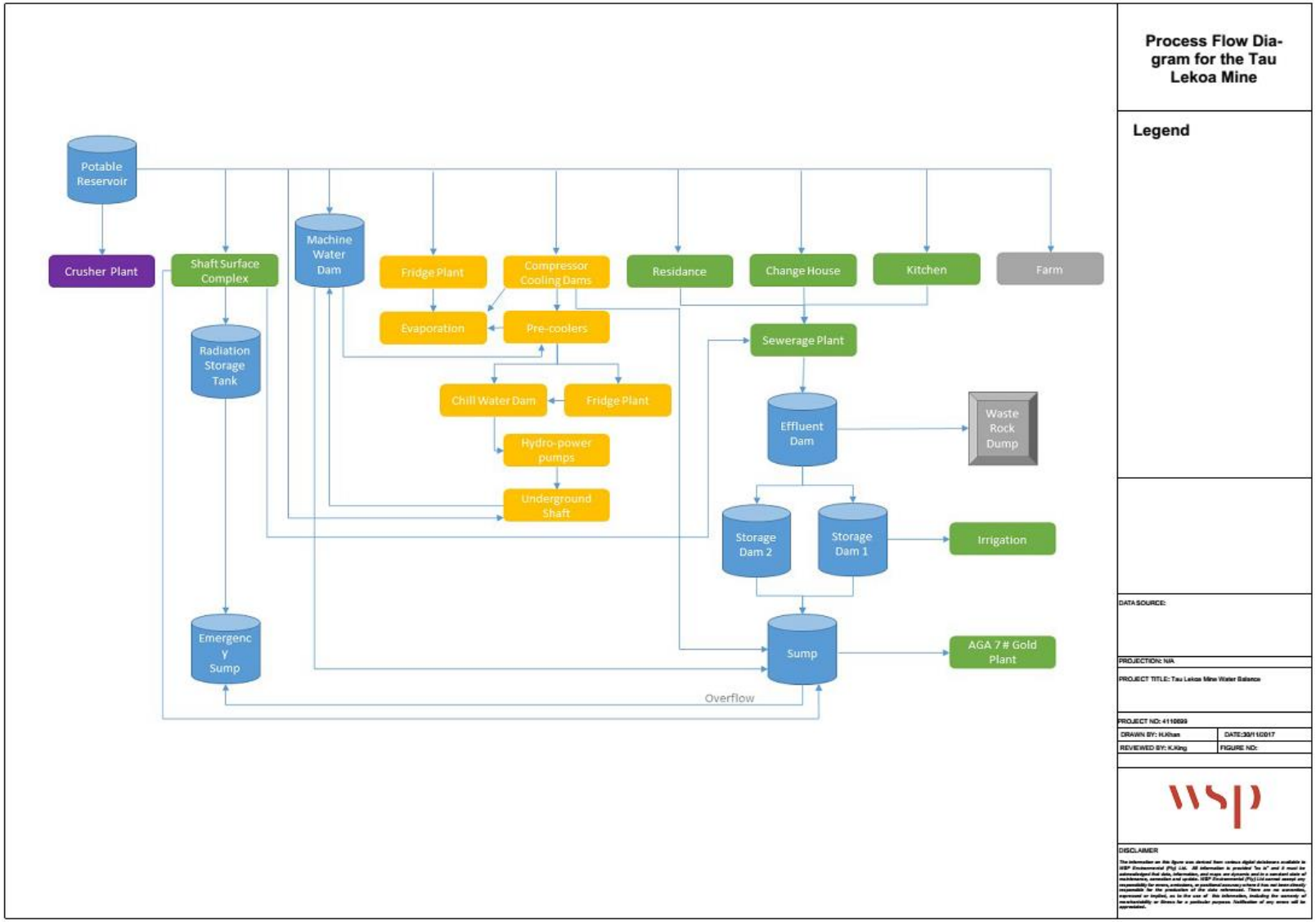

Figure 34: Process flow diagram for the Tau Lekoa Section

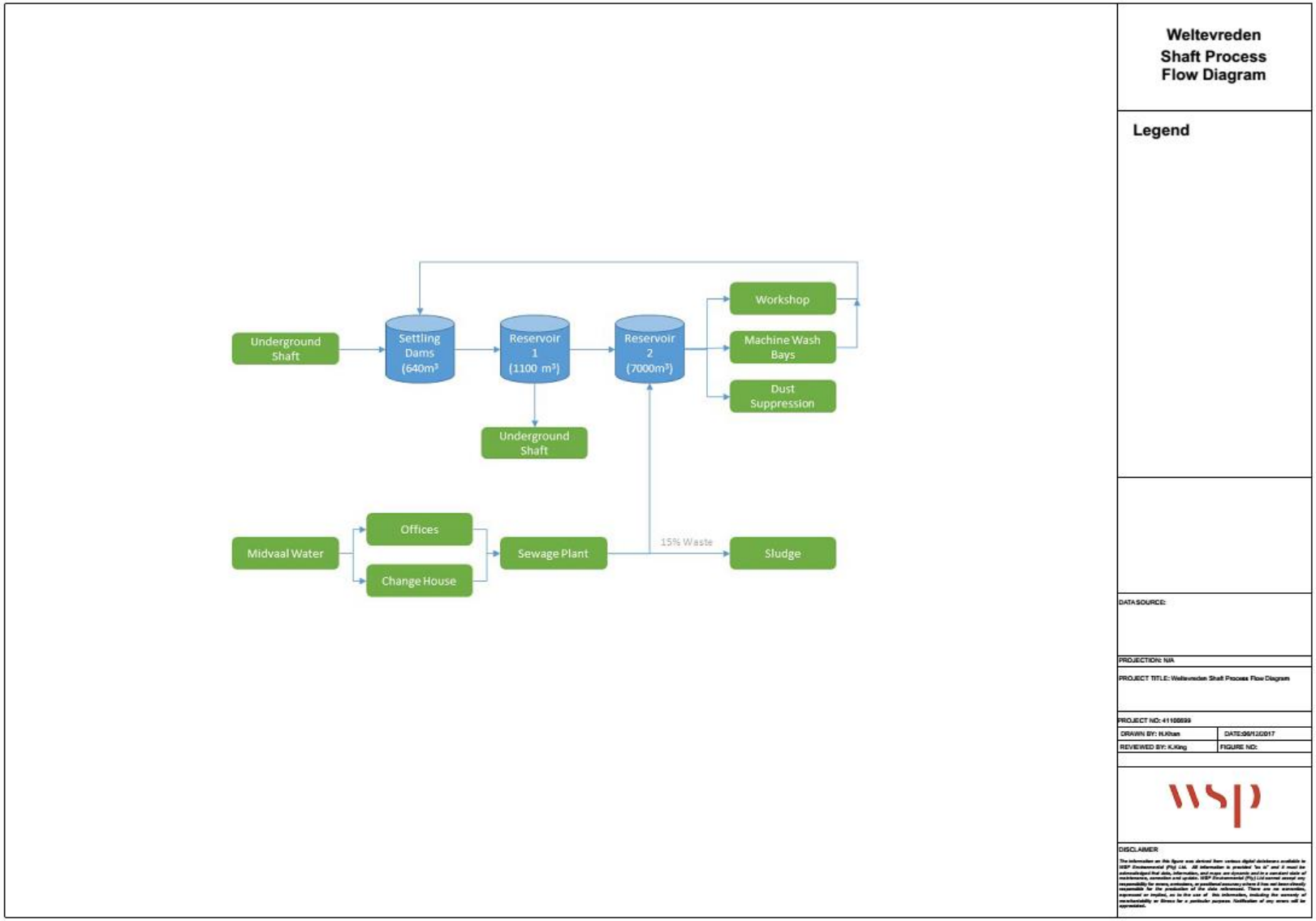

Figure 35: Process flow for the Weltevreden Section

5.4 STORM WATER

Storm water management forms an important aspect for the mine. The 'clean' and 'dirty' water generated from the sites is adequately contained and routed in accordance with the requirements of GN704 (1999). A conceptual storm water management plan has been developed for the Tau Lekoa Section and the Weltevreden Section. GN704 (1999) states the following regarding capacity requirements of clean and dirty water systems:

- To confine any unpolluted water to a clean water system, away from any dirty area;
- To design, construct, maintain and operate any clean water system at the mine or activity so that it is not likely to spill into any dirty water system more than once in 50 years;
- To collect the water arising within any dirty area, including water seeping from mining operations, outcrops or any other activity, into a dirty water system;
- To design, construct, maintain and operate any dirty water system at the mine or activity so that it is not likely to spill into any clean water system more than once in 50 years; and
- To design, construct, maintain and operate any dam or tailings dam that forms part of a dirty water system to have a minimum freeboard of 0.8 metres above full supply level, unless otherwise specified in terms of Chapter 12 of the NWA;
- To design, construct and maintain all water systems in such a manner as to guarantee the serviceability of such conveyances for flows up to and including those arising as a result of the maximum flood with an average period of recurrence of once in 50 years.

The conceptual storm water management plan includes the use of channels sediment traps and PCDs to manage the runoff from the various contributing catchment areas. In order to determine the required sizing of the storm water management infrastructure, continuous and storm event modelling using the PCSWMM model was undertaken. The numerical modelling was based on the current infrastructure and layout of the operations. Figure 36 and Figure 37 illustrate the conceptual storm water management plan for the Tau Lekoa Section and the Weltevreden Section respectively.

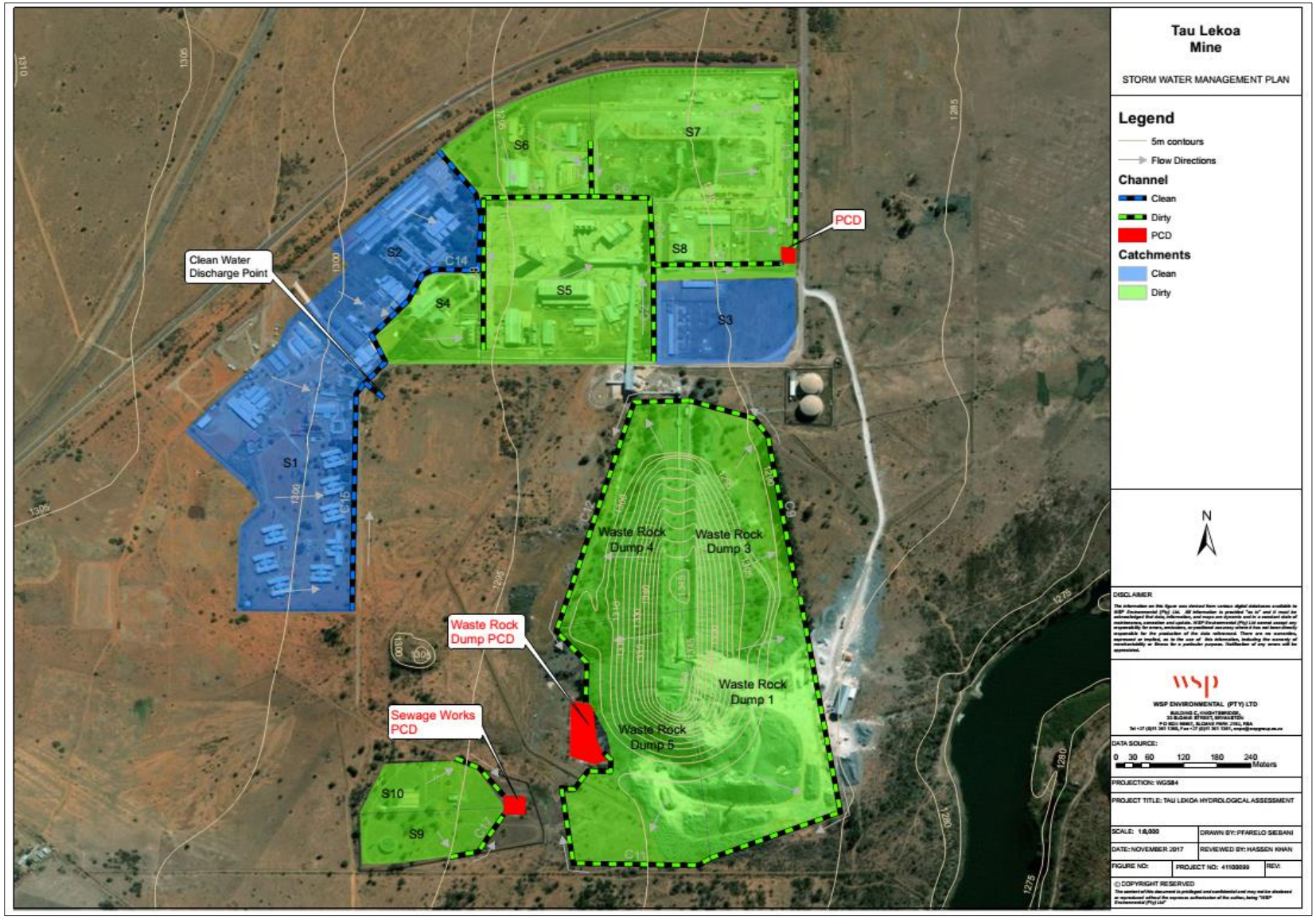

Figure 36: Storm water management plan for the Tau Lekoa Section

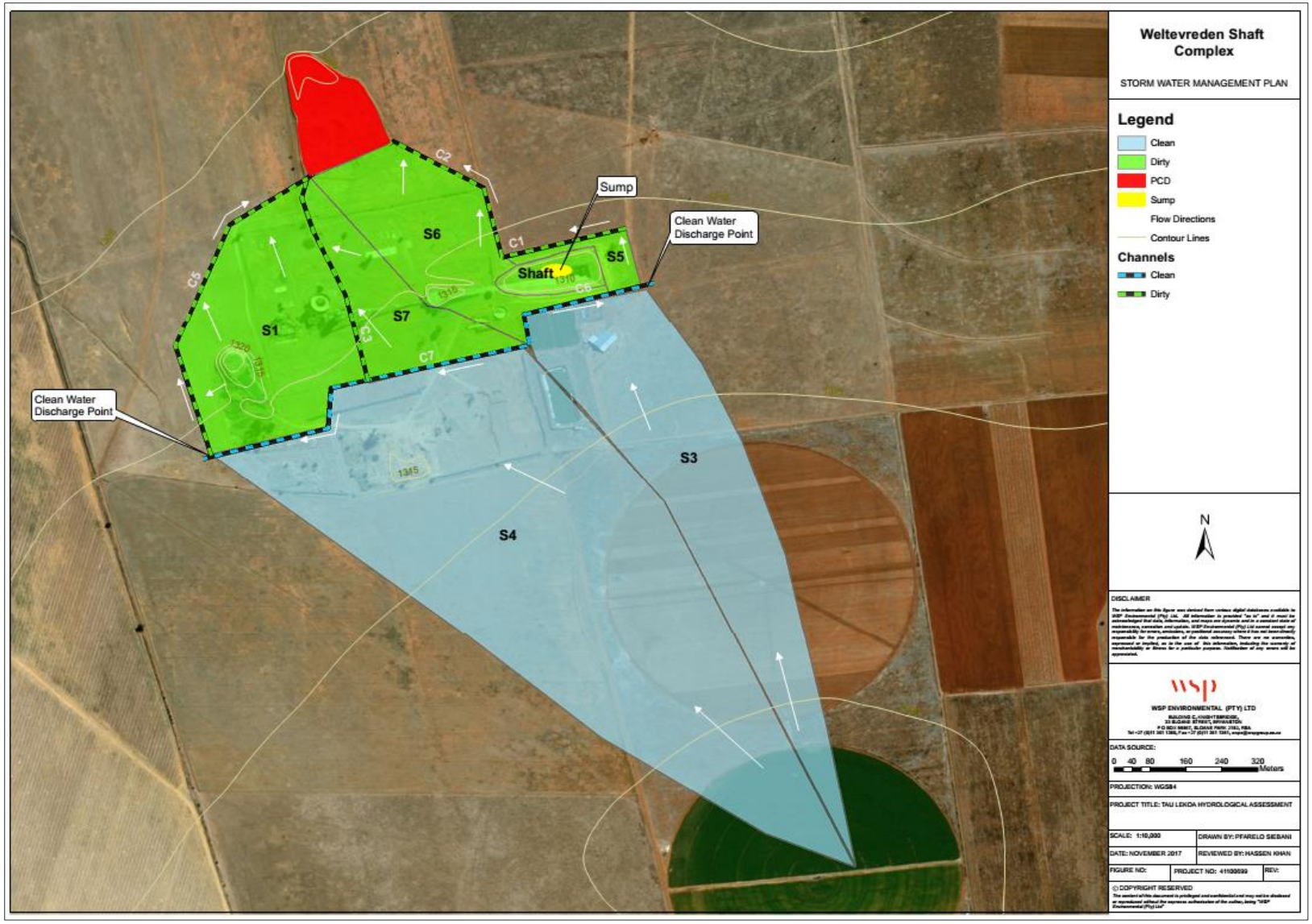

Figure 37: Storm water management plan for the Weltevreden Section

5.4.1 WATER AND SALT BALANCE

Annual average water and salt balances have been calculated separately for the Tau Lekoa Section and Weltevreden Section showing all the inflows and outflows associated with each component.

5.4.1.1 TAU LEKOA SECTION

The annual average water balance was calculated and depicted as stipulated in the DWS BPG G1. The Tau Lekoa Section operations use and process an average of 3 million cubic metres of water and 1233kg of salts per year. The annual average water and salt balance was calculated and is depicted as stipulated in DWS BPG G1, and indicated in Figure 38 and Figure 39.

5.4.1.2 WELTEVREDEN SECTION

The annual average water and salt balance was calculated and depicted as stipulated in the DWS BPG G1 (Figure 40 and Figure 41). The Weltevreden Section will use and process an average of 900,000 cubic metres of water and 520kg of salts per year. The water demand of the complex is approximately 440,000 m^3 from decant from the underground shaft and Midvaal Water.

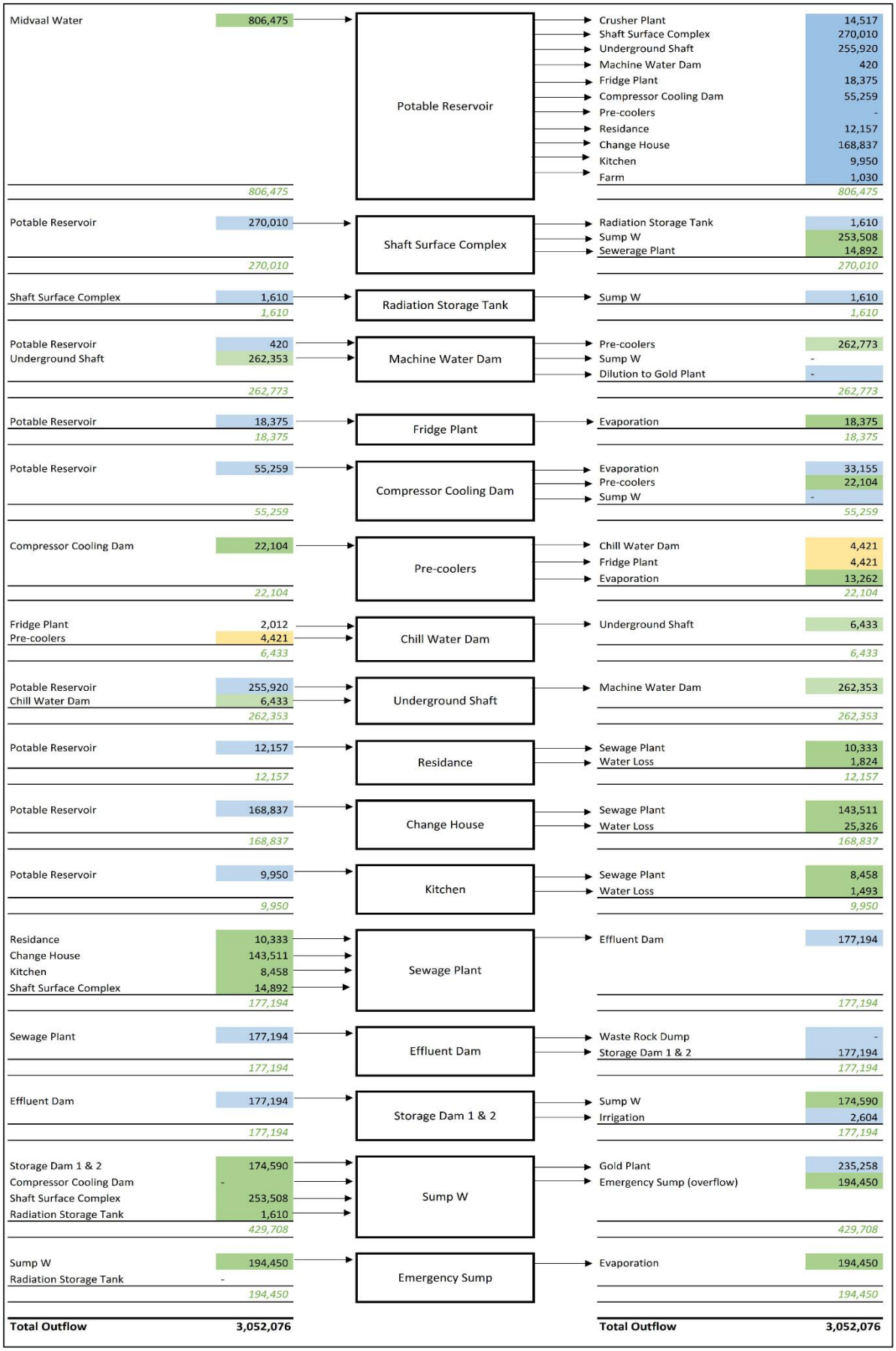

Figure 38: Water balance for the Tau Lekoa Section

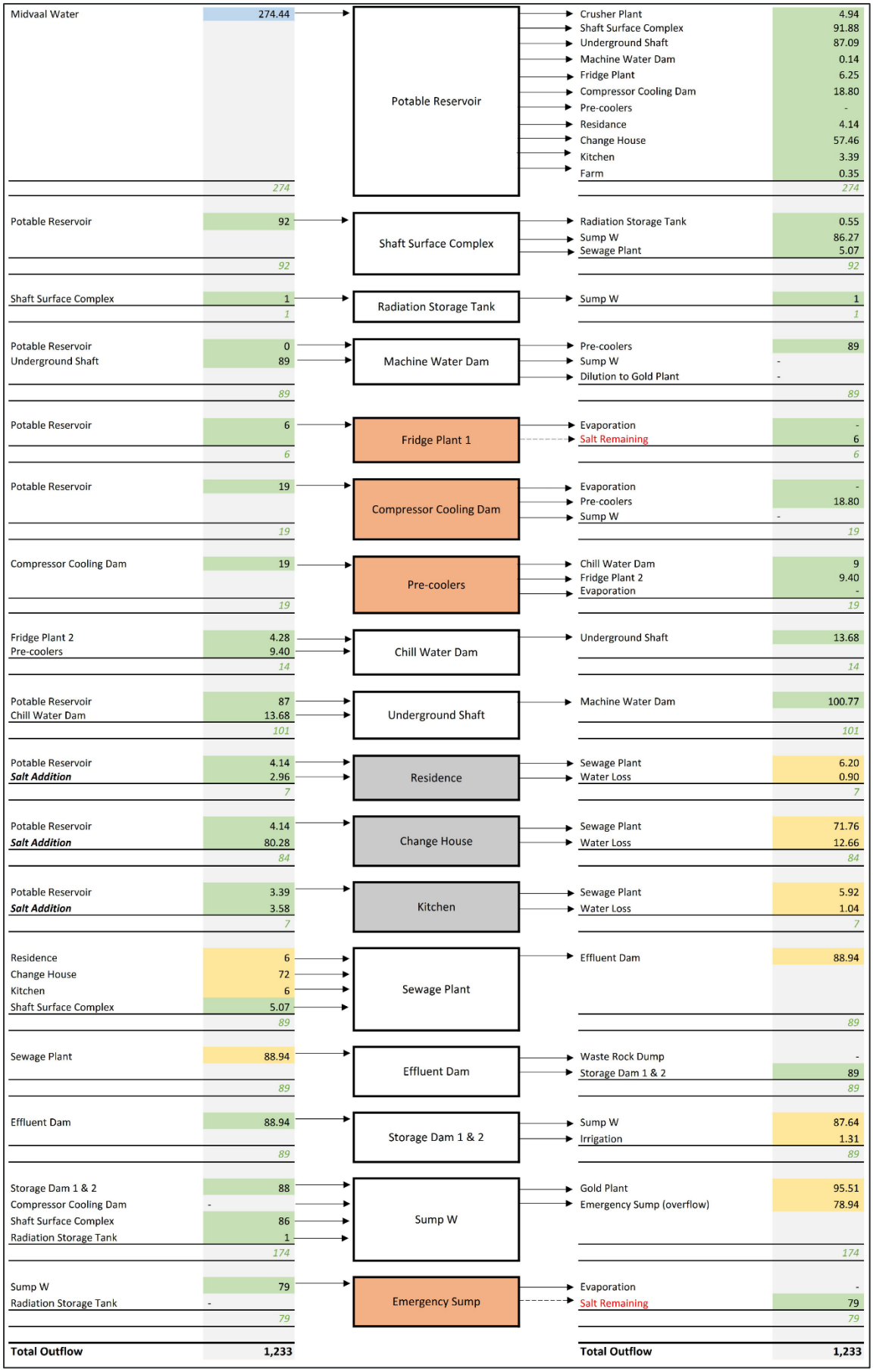

Figure 39: Salt balance for the Tau Lekoa Section

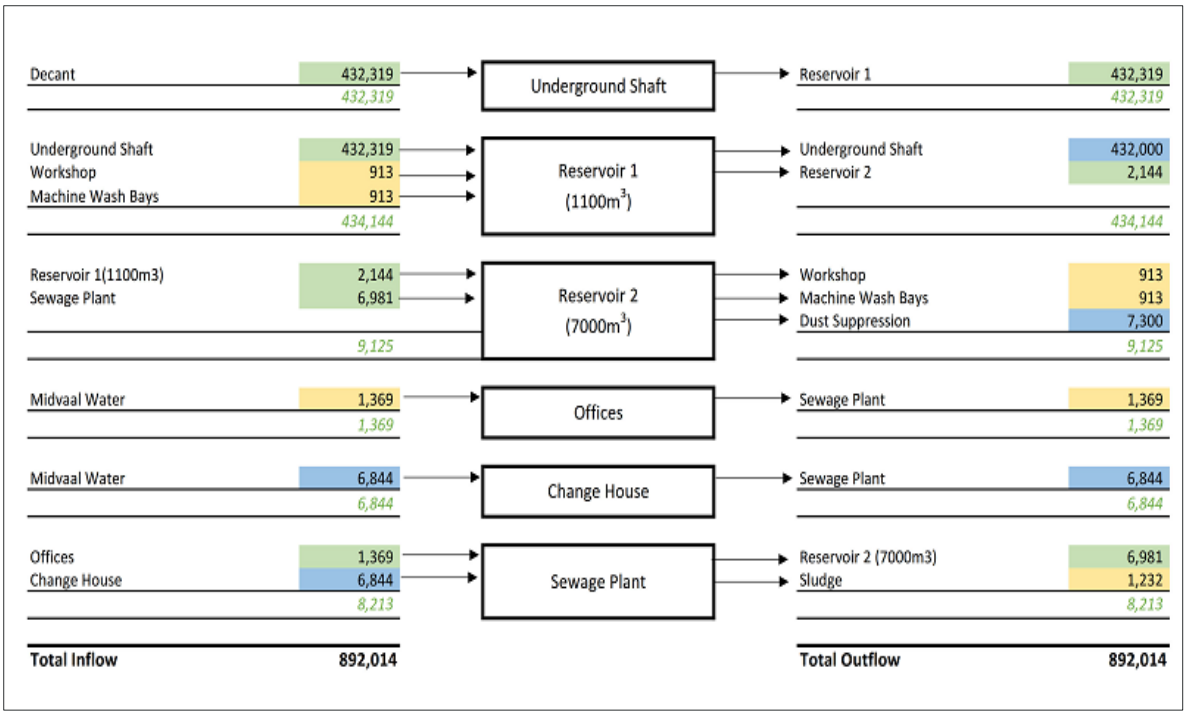

Figure 40: Water balance for the Weltevreden Section

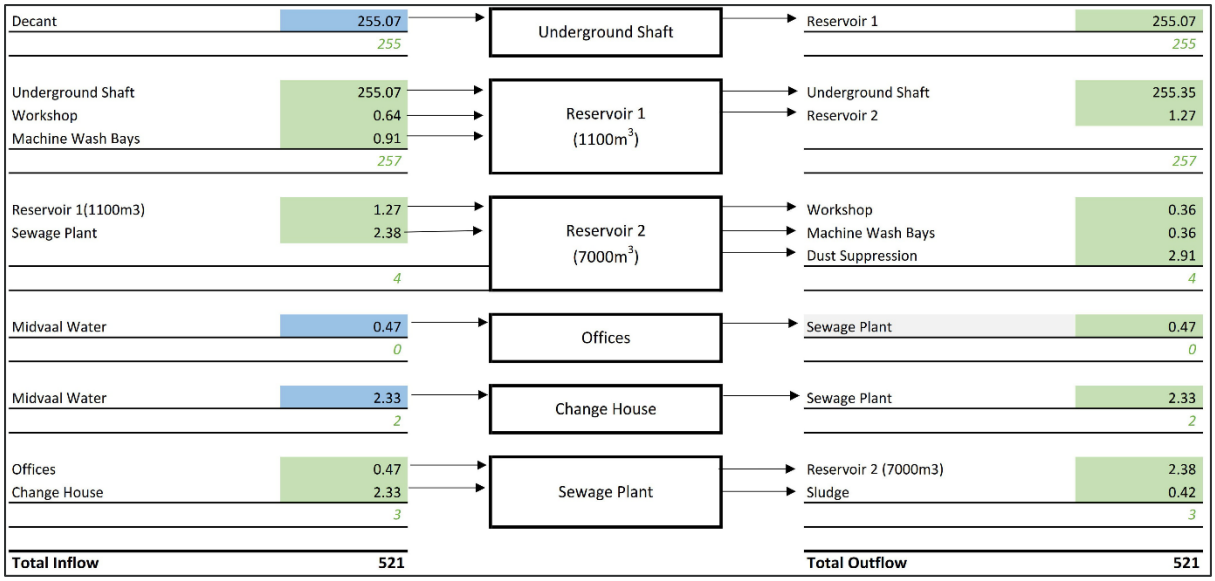

Figure 41: Salt balance for the Weltevreden Section

5.5 GROUNDWATER

Refer to Section 4.12, as well as Section 5.15. The Hydrogeological Study is attached in Appendix F.

5.6 WASTE

Tau Lekoa subscribes to a comprehensive waste management strategy, which essentially classifies waste into two (2) main categories namely non-mining (general) waste, and mining/process related waste.

Non-mining waste refers to, and is classified as:

- Domestic waste: waste generated from residential, educational, healthcare, sport or recreation purposes;
- Business waste: waste generated by commercial, retail, wholesale, entertainment or government administration purposes;
- Building waste: waste generated from construction, alteration, repair and demolition, including rubble, earth, rock and wood; and
- Garden waste.

Mining/process related waste refers to and is classified as:

- Discrete process waste: including scrap metal, plastics and PVC's, timer and rubber; and
- Hydrocarbon contaminated waste: waste material that contains or is polluted with hydrocarbon material, including but not limited to hydraulic oil, grease, polychlorinated bi-phenyls (PCBs) and transformer oil.

Tau Lekoa subscribes to the principles of waste minimization and recycling and waste streams are identifiable and quantifiable. The mine has a procedure in place for the management of hydrocarbon waste. The procedure has been developed to ensure that the mine identifies and manages all hydrocarbon waste generated as a result of its mining activities, products and services. The procedure aims to describe the various hydrocarbon waste stream, identifies applicable legislation and provides information pertaining to the correct storage, handling and disposal of hydrocarbon waste (refer to Appendix G for the procedure).

5.6.1 DOMESTIC WASTE

Non-mining (general) or domestic waste is generated at the following locations on the property:

- Hostels and married quarters currently occupied on Southern and Northern Sections;
- Offices and security complexes on all of the operational Shafts; and
- Operational plant at No. 9 Shaft (also referred to as South Plant).

All generated waste is transported and disposed of at the landfill site currency operated by Stilfontein Municipality.

5.6.2 DISCRETE PROCESS WASTE

The philosophy of discrete process waste is to ensure that these are reused and/or recycled. Discrete process waste (industrial waste) is disposed of by the mine in the following manner:

- Scrap steel (ferrous) generated are dispatched from central salvage yard to a licensed scrap processor;
- Stainless steel and non-ferrous scrap, are disposed of via a licenced steel processor;
- Underground timber, which, subsequent to washing and cleaning in accordance with a National Nuclear Regulator (NNR) approved procedure, is sold via the central salvage yard to the public;
- Plastics are disposed of via, a licensed facility; and
- Oils and greases are disposed of via a licenced contractor, for recycling.

5.6.3 WASTE ROCK DUMP

The waste rock from the Tau Lekoa Section is transported and disposed of at the Tau Lekoa WRD, south of the Tau Lekoa mine. The estimated volume of the WRD is in excess of two (2) million tons (Mt), and will continue to increase for as long as Tau Lekoa mine continues with production. Presently, the Life of Mine (LoM) for reclamation of the WRD is expected to be 12 – 15 years.

5.7 OPERATIONAL MANAGEMENT

The operational management of the activities in terms of the water and waste management are detailed in the following sections. This included the organisational structure, competence training and awareness and the internal and external communication.

5.8 ORGANISATIONAL STRUCTURE

The organizational structure for the Applicant is presented in Section 2.7 above and the below sections includes a discussion of resources and competencies, as well as the internal and external communication processes that are implemented by the Applicant.

5.9 RESOURCES AND COMPETENCE

The success of environmental management is dependent upon the commitment of the organization, at all levels, to environmental excellence. Commitment to this IWWMP will benefit both the organization's business success and the community in which it operates. This commitment requires that the organization provide the necessary resources for employee training, reference material and reporting procedures. Senior executives and line managers will be held responsible and accountable for the health and safety of personnel while on duty, as well as the environmental impacts caused by mining activities. Tau Lekoa will conduct its operations responsibly and with due care and regard to the impact on the environment. It is the policy of the Applicant to strive to eliminate

the adverse environmental effects of all its activities and take an active role in raising the environmental awareness and responsibility of all employees, suppliers, contractors and customers.

To achieve and surpass this objective, the company endeavours to:

- Conduct all its activities in an environmentally responsible manner;
- Conform to all relevant legislation as a minimum standard;
- Ensure that all its operations have appropriate policies, procedures and facilities so that such standards can be met;
- Promote environmental awareness by continuous training, motivation and leading by example;
- Implement effective environmental management and reporting systems at all operations, that encompasses auditing, monitoring and decisive intervention;
- Conduct regular review of conformance to requirements and achievement of objectives at Board level;
- Use raw materials and resources prudently;
- Promote the recycling of used and waste materials;
- Apply the principles of continuous improvement to environmental performance;
- Develop and maintain positive relationships with all affected and interested parties, governmental departments, environmental agencies and the public; and
- Participate in environmental governance.

5.10 EDUCATION AND TRAINING

Training and environmental awareness is an integral part of environmental management of a mine. The mine must ensure that all relevant employees are trained and capable of carrying out their duties in an environmentally responsible and compliant manner, and are capable of complying with the relevant environmental requirements. Environmental Awareness at Tau Lekoa is addressed and conducted by means of two (2) main components:

- Training; and
- Communication.

Environmental awareness training at the mine will be attended to during induction for new employees and in refresher courses for ex-leave employees by means of an audio visual environmental awareness video. Apart from Tau Lekoa's own employees, the operation will also make use of numerous contractors to undertake different components of their mining activities. Each contractor will be responsible for its own environmental awareness training for its employees.

The principles to be adhered to by the mine and the contractors are based on the following:

- Environmental awareness is addressed at top management level;
- Workers receive awareness training on all environmental and SHE procedures;
- Training aids includes the use of photographs, posters and live demonstrations;
- The workers whose jobs have the greatest potential for environmental impact are identified and receive specific training in impact prevention and remediation; and
- Records are kept of environmental awareness training and all new employees receive induction before they are allowed to work on site.

5.10.1 INDUCTION TRAINING

Environmental awareness training at the mine is conducted by means of induction training for all new employees, as well as employees returning from leave. The induction programme is comprised of the following elements (for surface employees):

- Occupation;
- Human Immunodeficiency Virus (HIV)/ Aids;
- Risk Awareness;
- First Aid;
- Torch Cutting;
- Lock out and Isolation;
- Human Resource Induction;
- Environmental Awareness Video;
- Fire Control Surface;
- Planned Maintenance;
- Personal Protective Equipment (PPE);
- Engineering Standards;
- Trade Related; and
- Planning and Control.

5.10.2 IN-HOUSE TRAINING

Tau Lekoa will define the Skills Development Plan, Adults Basic Education Training (ABET) Programme, Learnerships, Portable Skills, Career Progression Plan, Mentorship Plan, Employment Equity Plan and Bursary Schemes. The strategies will be developed to address core skills training and Historically Disadvantaged South Africans (HDSA's) in all categories, more particularly in management and women in mining.

Tau Lekoa will focus on the following:

- Uplifting of employees with minimal education by offering basic literacy / numeracy classes in the mother tongue and again in English;
- Establish proper job descriptions;
- Determine entry level requirements;
- Implementing more stringent recruitment strategy; and
- Determining possible career paths.

While determining critical posts and possible career paths, the mine will include the following programmes:

- Section 28, Recognition of prior learning (RPL) training for aide operations;
- Learnership for miners;
- Mining First Aid;
- Induction;
- Blasting assistants;
- Competency "A" and "B".

In view of the above, Tau Lekoa is committed to utilizing the Apprenticeship Programme in order to produce at least qualified electricians, fitters, diesel mechanics and boilermakers. Bursaries and mentorships will also be offered.

The process will involve consultations with representatives of organised labour, a Human Resource Development and Training Committee comprising of representatives from both Management and Unions. The Committee will oversee and monitor the Skills Development Plan.

The purpose of this Committee is to do the following:

- Identify people with potential;
- Provide these people with an opportunity to develop themselves;
- Produce employees with enhanced skills levels;
- Enhance employee's chances of internal promotion and better career prospects;
- Close the skills gap; and
- Identify and place suitable candidates as required by the Mining Charter.

5.10.3 ON THE JOB TRAINING

Employees will be given details of the expected environmental issues and concerns specifically related to their occupation. Employees will be trained on how to respond if an environmental problem or source of environmental pollution arises. The training will be on going, and all new employees will be provided with the same standard of training as existing employees.

5.11 INTERNAL AND EXTERNAL COMMUNICATION

The Public Participation Process (PPP) is a requirement of several pieces of South African Legislation. The aim of public participation is to ensure that all relevant interested and affected parties (I&AP's) are meaningfully notified, consulted and their opinions considered during the course of the project. The methodology applied to the PPP, must be one of openness, transparency and collaboration between the EAP and I&AP's. All documentation pertaining to the IWWMP will be made available to the public for comment in accordance with the relevant regulations. All comments received will be included in this IWWMP to be submitted to the DWS for adjudication, as well as in the Public Participation Report that will be attached as an Appendix to the IWWMP.

5.11.1 INTERNAL COMMUNICATION

The following communication channels and media will be used to communicate environmental issues within the mine:

- Head of Department (HOD) meetings: The mine manager communicates information to senior management on environmental issues and minutes will be taken;
- Health, Safety and Environmental Community (HSEC) meetings: 'Environmental issues' should be an agenda item on plant and section monthly SHE meeting agendas;
- Publications: Leaflets, posters etc. are produced by the relevant department or other designated persons. Email notifications and or relevant articles are also distributed;
- EMS database (if established): Feedback from line management on objectives, targets and actions;
- Daily/ Weekly Safety Meeting: All meetings are scheduled to commence with a discussion on safety, health & environmental topics; and
- Tau Lekoa's Intranet: Should the mine have the associated infrastructure, a database of environmental incidents and the respective control measures, linked to a continually updated environmental legislation database, should be kept and maintained at the mine.

5.11.2 EXTERNAL COMMUNICATION

The following communication channels and media will be used to communicate environmental issues to individuals who are not employed by the mine:

- Environmental Committee: An environmental committee will be established and used as a forum to keep (I&APs) informed of the significant environmental aspects identified through the EIA/EMP and the IWWMP. This should also be the forum where I&APs get the opportunity to raise environmental concerns. Records must be kept of all decisions and concerns. The Environmental Committee should be chaired by the Mine Manager, or another appropriately appointed competent individual;
- Publications: Selected publications should be produced and used to communicate environmental issues to outside parties. Examples include newsletters and annual reports;
- Communication from external parties and employees: A department should be established that will be responsible for liaison with the media in respect of any crisis that may arise within the mine. A complete procedure for media liaison must be made available to all employees. Communication from external I&APs may be received by e-mail, fax, telephonically or by mail. Where required, a written response will be sent, on receiving such communication, by the appropriately appointed individual under signature of the mine manager, to the respective interested and/or affected party. All telephonic or facsimile correspondence received on the mine must be forwarded to the relevant department for action. All events or concerns will be captured and captioned on an existing and/or future database;
- E-mail: E-mail communication received must be stored, with replies, in an appropriate folder on a server. E-mail messages, relevant to environmental management, should be kept for a minimum of two years before deletion;
- Mail: Correspondence received by mail must be filed, along with the response (where relevant), within the relevant department's filing system for a minimum period of two years. Paper correspondence will be archived in this department;
- Telephone: A register of telephonic environmental queries should be kept by the relevant department detailing caller, contact details, date, query, action taken and response. Furthermore, the person answering the call will be responsible for logging their particulars against the call, as well as ensuring that all communication that leads to an aspect or an impact, is entered on the database;
- Storage of correspondence: All original correspondence must be retained by the Mine Manager for a minimum period of two years;
- Environmental Reports: Copies of relevant specialist study reports and EIAs will be available on request from an external party by the mine manager.
- Queries from I&APs: Response to queries about environmental impacts and aspects will be addressed by the relevant department, and approved by the mine manager; and
- Queries and requests from the media: Requests for articles from the media on environmental issues at the mine will be co-ordinated by the HR manager, with input from the relevant department, as approved by the general manager, in line with the mine's communications strategy. Due to the environmental awareness generated by induction, on the job training etc., employees are able to identify environmental problems, issues, concerns and pollution timeously.

5.12 AWARENESS RAISING

All employees and contractors have to undergo environmental and awareness training, which broadens the base of people that acts as custodians of the environment. The mine supports the comprehensive set of policies, standards and guidelines that the company applies for the various facets of the business, amongst which are:

- Safety, health, environment and risk, quality and community;
- Equity in employment;

- Information Systems;
- Compliance with the law; and
- Relationships with Governments.

The Applicant has established and maintains procedures for the internal communication between the various levels and functions of the operation. Environmental incidents are reported by either employees or I&APs via two distinct routes:

- Incident reporting directly to the surface environmental officer: I&AP's or employees report directly to the surface environmental officer, who then reports to the technical services manager who finally reports to the general manager; and
- Incident reporting to the respective head of department: Any incident is reported by an I&AP or an employee to the employees' respective head of department, who in turns reports to the technical services manager. The technical services manager reports to the surface environmental officer and general manager respectively.

5.12.1 INCIDENT REPORTING STRUCTURE

Environmental incident reporting is a vital part of communication at the mine. Employees are required to report any and all environmentally related problems, incidents and pollution, so that the appropriate mitigatory action can be implemented timeously. In the event of an environmental incident the reporting procedure as indicated in the Table 16 should be followed.

Table 16: Environmental incident reporting procedures

Environmental Incident Reporting Structure	Action Required
Person causing or observing the incident	• Will report the incident to an immediate supervisor in the area/section where the environmental incident is observed.
Line Management in relevant area of responsibility where the incident occurred	• Will investigate the incident and record the following information: o How the incident happened; o The reasons for the incident; o How rehabilitation or clean up needs to take place; o The nature of the impact that occurred; o The type of work, process or equipment involved; o Recommendations to avoid future such incidents and/or occurrences; o Will inform the environmental manager and the mine manager on a daily basis of all incidents that were reported in the area/section; o Will consult with the relevant department / person for recommendations on actions to be taken or implemented where appropriate (e.g. clean-ups); and

Environmental Incident Reporting Structure	Action Required
	○ Will assist the environmental manager and/or mine manager with applicable data in order to accurately capture the incident into the reporting database.
Area / Line Managers	• Will forward a copy of the incident form to other line managers; • Will forward a copy of the incident form to the environmental manager and the mine manager; • Will inform the relevant department / person on a weekly basis of the incident by e-mail or by submitting a copy of the incident report. Once a High-Risk Incident (any incident which results from a significant aspect and has the potential to cause a significant impact on the environment) occurred it must be reported immediately to the environmental manager and the mine manager by telephone or email to ensure immediate response / action; and • Will forward a copy of the completed Incident Reporting Form (and where applicable a copy of the incident investigation) to the relevant department / person.
Environmental Manager / Mine Manager	• Will complete an incident assessment form to assess what level of incident occurred; • Will make recommendations for clean-up and / or appropriate alternate actions; • Will enter actions necessary to remediate environmental impacts into the database in conjunction with the responsible line manager; • Will enter the incident onto the database in order to monitor the root causes of incidents; • Will include the reported incidents in an appropriate monthly / quarterly report; and • Will highlight all incidents for discussion at HSEC meetings.

5.13 MONITORING AND CONTROL

Several environmental impacts will require on-going monitoring during various phases of the proposed project. The purpose of monitoring is not merely to collect data, but to provide information necessary to make informed decisions on managing and mitigating potential impacts. Monitoring, therefore, serves the following functions

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

5.14 SURFACE WATER MONITORING

The design and implementation of the surface water monitoring network will be undertaken in accordance with the Best Practice Guidelines G3: Water Monitoring Systems (DWAF, 2006). The aim of the surface water monitoring network is to assist with overall water management including but not limited to the following:

- Pollution prevention;
- Assess the performance of pollution prevention; and
- Develop a more holistic understanding of current, baseline water quality on site and the changes that result from mining activities.

The Vaal River and its tributaries (Jagspruit River and Skoonspruit River) must be monitored on a monthly basis. Six surface water sampling points have been selected in order to accurately describe the water quality surrounding the Operations. These samples have been selected in the Jagspruit, Skoonspruit and Vaal River s, both upstream and downstream of the Operations. Additionally, a sample point in the Swanepoel Dam to the east of the Operations was identified.

The surface water samples must be collected directly into laboratory-supplied sample containers. Surface water samples must be obtained from at least 10cm below the water surface wherever possible, with the bottle opening facing upstream. Sample containers must be kept closed and in a clean condition up to the point of sampling. Monitoring must be undertaken according to DWS Best Practice Guidelines, ensuring that the potential for cross contamination is minimised.

For each sampling point, the temperature, pH and electrical conductivity must be measured *in-situ* using a calibrated multi-parameter probe and recorded. This information, as well as the physical and environmental information of each sampling point (e.g. visual, olfactory observations and flow conditions) must be recorded on designated field data sheets.

On each sample, the following must be recorded to ensure proper identification:

- Site Name (e.g. Tau Lekoa Mine);
- Sample Location and Sample Type (e.g. TLSW01); and
- Sample Date and Time.

Sample containers must be kept closed and in a clean condition up to the point of sampling. Post sampling, all samples must be stored in a temperature controlled cooler box (below 4^{o}C), which is kept sealed and dust-free, until samples are dispatched to a South African National Accreditation System (SANAS) accredited laboratory for analysis.

The analytical schedule for the surface water samples is included in the below:

- Metals and metalloids: aluminium, arsenic, barium, beryllium, boron, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, potassium, selenium, vanadium and zinc;
- Cations and anions: chloride, phosphate, magnesium, sodium, sulphate, fluoride, cyanide, ammoniacal nitrogen as N and NH3, total oxidised nitrogen as N, nitrate as N and nitrite as N;
- Chemical Oxygen Demand (COD);
- Biological Oxygen Demand (BOD); and
- General: Total organic carbon, pH, electrical conductivity, dissolved oxygen, total dissolved solids, total hardness and total alkalinity.

The pH and electrical conductivity measured *in-situ* must be validated through laboratory testing.

5.15 GROUNDWATER MONITORING

A long-term monitoring programme should be developed based on the guideline documented in Best Practice Guideline G3 Water Monitoring Systems (2007) available from the Department of Water and Sanitation (DWS). These guidelines are summarised and implemented in the proposed monitoring plan.

A monitoring plan is necessary due to the following reasons:

- Accurate and reliable data forms a key component of many environmental management actions; • Water monitoring is a legal requirement;
- The most common environmental management actions require data and thus the objectives of water monitoring include the following:
  - Development of environmental and water management plans based on impact and incident monitoring (facilitate in decision-making, serve as early warning to indicate remedial measures or that actions are required in certain areas) for the mine and region;
  - Generation of baseline/background data before project implementation;
  - Identification of sources of pollution and extent of pollution (legal implications or liabilities associated with the risks of contamination moving off site);
  - Monitoring of water usage by different users (control of cost and maximising of water reuse);
  - Calibration and verification of various prediction and assessment models (planning for decommissioning and closure);
  - Evaluation and auditing of the success of implemented management actions (ISO 14000, compliance monitoring);
  - Assessment of compliance with set standards and legislation (EMPs, water use licenses); and
  - Assessment of impact on receiving water environment.

Effective groundwater monitoring systems on a mine consist of the following components:

- Groundwater quality monitoring system;
- Groundwater flow monitoring system; and
- Data and information management system.

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

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

Monitoring boreholes are available at Tau Lekoa and Weltevreden Sections (see Figure 27). There are, however, some shortcomings in the existing monitoring network and it is recommended that this be addressed as soon as possible. The following points discuss the deficiencies in the current monitoring network:

- There is no information on the construction of the monitoring boreholes. It is important to understand the nature of the aquifers that are being monitored. In this geological environment, there are typically two aquifers, a shallow weathered aquifer and a deeper fractured aquifer. These aquifers should be monitored independently to understand the distribution of the contaminant plume. Borehole pairs (a shallow and a deep borehole) are required to achieve this. It appears that the current monitoring boreholes were drilled through both aquifers. The water that is monitored is likely a mixture of weathered and fractured aquifer water and in some instances these boreholes may act as conduits for contaminants from the weathered aquifer into the fractured aquifer;
- There are currently insufficient monitoring boreholes available to fully quantify the impacts. There are no boreholes at Swanepoel dam and only one borehole at the WRD;
- Although the sewage plant area is considered to have a low potential risk to groundwater it is recommended that it be verified with a borehole pair.
- It is also important that at least one borehole pair is drilled in an area that is unaffected by mining for comparative purposes.

- There is currently no time-series data for groundwater levels or groundwater chemistry. Monitoring should be conducted on a regular basis, as described below.

The parameters that should be analysed in the groundwater are listed in Table 17. A comprehensive bi-annual analysis should be conducted on the monitoring boreholes (sample set A) and in addition samples should be tested for trace elements once a year (sample set B).

Table 17: Sampling parameters

A (Standard set of parameters)	B (Trace elements)
pH	Barium (Ba)
Electrical Conductivity (EC)	Arsenic (As)
Total Dissolved Solids	(TDS) Cobalt (Co)
Calcium (Ca)	Total Chromium (Cr)
Magnesium (Mg)	Nickel (Ni)
Sodium (Na)	Lead (Pb)
Potassium (K)	Selenium (Se)
Total Alkalinity	Strontium (Sr)
Fluoride (F)	Vanadium (V)
Chloride (Cl)	Zinc (Zn)
Ammonia (NH4)	Niobium (Nb)
Nitrate (NO3)	Copper (Cu)
Sulphate (SO4)	Gallium (Ga)
Aluminium (Al)	Germanium (Ge)
Iron (Fe)	Rubidium (Rb)
Manganese (Mn)	Yttrium (Y)
Uranium (U)	Zirconium (Zr)
	Tin (Sn)
	Tungsten (W)
	Bismuth (Bi)
	Thorium (Th)

5.16 WASTE MONITORING

The Applicant will develop and implement a waste management plan, which complies with the principles of the NEMWA and provides a mechanism for the effective management of waste throughout the LoM. This plan has to ensure that the appropriate management of all solid waste, including construction debris (cement bags, wrapping material, timber, cans, wire, nails, etc.), waste and surplus food, food packaging, organic waste, etc. The objectives of a waste monitoring programme are to identify and sufficiently manage waste related impacts through:

- Avoiding and minimising waste;
- Reducing and recycling waste; and
- The prevention of pollution.

Solid waste must be monitored in accordance with the waste management conditions detailed below:

- The Applicant shall develop and maintain a hazardous substance register for all hazardous materials that shall be kept on site. Material Safety Data Sheets (MSDS) must be available on site at the point of use and readily accessible for all hazardous substances stored;
- All equipment must be inspected regularly (daily) to ensure that it is in good working condition, clean, and free from leaks of oil, petrol, diesel, hydraulic fluid and contaminating compounds;
- Daily inspections shall be carried out to ensure such spill prevention measures are in place and remain effective;
- The Applicant shall maintain a waste register which shall be used to track all waste removed from site. Proof of appropriate waste disposal shall be kept on file at the site for auditing purposes.

5.16.1 STORM WATER MANAGEMENT STRUCTURES

Storm water structures (channels, silt traps, dirty water containment facilities and energy dissipaters) should be monitored every year in September, before the rainy season begins, for any blockages or breaches. They should further be monitored immediately after every storm event during the rainy season. Should blockages or breaches occur, immediate action should be undertaken to remove debris and / or repair breaches. Monitoring should be undertaken by the onsite Environmental Control Officer (ECO) or maintenance manager. Inspections should be recorded and should include the following:

- Date of inspection;
- Rainfall amount received;
- Photographs of blockages and / or breaches witnessed;
- What action were taken to fix issues and amount of time taken to address issues; and
- Photographs post action taken.

The inspection reports should be presented to the DWS.

5.17 RISK ASSESSMENT / BEST PRACTISE ASSESSMENT

An impact/risk assessment was undertaken for this IWWMP (refer to Appendix of this report for a copy of the impact assessment matrix). This section deals with the identification of risks/impacts and their mitigation measures. The following prediction and evaluation of impacts is based on the mining activities conducted at the project area.

The first stage of impact assessment is the identification of environmental activities, aspects and impacts. The receptors and resources are also identified, which allows for an understanding of the impact pathway and assessment of the sensitivity to change.

The purpose of the rating is to develop a clear understanding of influences and processes associated with each impact. The values for the likelihood and consequence (severity, spatial scope and duration) of the impact are then used to determine whether mitigation is necessary.

The following criteria have been used to describe magnitude and significance of impacts in a systematic manner:

Extent or spatial scale of the impact;

- Intensity or severity of the impact;
- Duration of the impact;
- Mitigatory potential;
- Acceptability;
- Degree of certainty; and
- Impact Magnitude/Significance.

Describing the impacts in terms of the above criteria, provides a consistent and systematic basis for the comparison and application of scoring impacts. The rating for each criterion is provided in Table 18.

Table 18: Criterion for Risk assessment

Rating	Comment
Impact criteria: Intensity or severity of the impact	
High:	Disturbance of pristine areas that have important conservation value.
	Destruction of rare or endangered species.
Medium:	Disturbance of areas that have potential conservation value or are of use as a resource.
	Complete change in species occurrence or variety.
Low:	Disturbance of degraded areas that little conservation value.
	Minor change in species occurrence or variety.
Impact criteria: Duration of the impact	
High (Long term) **(more than 15 years)**	Permanent
	Beyond decommissioning
	Long term (more than 15 years)
Medium (Medium term) (5 to 15 years)	Reversible over time
	Lifespan of the project
	Medium term (5-15 years)
Low (Short term) (0 to 5 years)	Quickly reversible

Rating	Comment
	Less than the project lifespan
	Short term (0-5 years)
Mitigatory potential	
High:	High potential to mitigate negative impacts to the level of insignificant effects
Medium:	Potential to mitigate negative impacts. However, the implementation of mitigation measures may still not prevent some negative effects.
Low:	Little or no mechanism to mitigate negative impacts.
Acceptability	
High (Unacceptable)	Abandon project in part or in its entirety
	Redesign project to remove impact or avoid impact
Medium (Manageable)	With regulatory controls
	With project proponent's commitments
Low (Acceptable)	No risk to public health
Degree of certainty	
Definite	More than 90% sure of a particular fact. Substantial supportive data exist to verify the assessment.
Probable	Over 70% sure of a particular fact, or of the likelihood of that impact occurring.
Possible:	Only over 40% sure of a particular fact, or of the likelihood of an impact occurring.
Unsure	Less than 40% sure of a particular fact, or the likelihood of an impact occurring.
Categories for the rating of impact magnitude and significance	
High	Of the highest order possible within the bounds of impacts that could occur. In the case of adverse impacts, there is no possible mitigation that could offset the impact, or mitigation is difficult, expensive, time- consuming or a combination of these. Social, cultural and economic activities or communities are disrupted to such an extent that these come to a halt. In the case of beneficial impacts, the impact is of a substantial order within the bounds of impacts that could occur.

Rating	Comment
Medium	Impact is real, but not substantial in relation to other impacts that might take effect within the bounds of those that could occur. In the case of adverse impacts, mitigation is both feasible and fairly easily possible. Social, cultural and economic activities of communities are changed, but can be continued (albeit in a different form). Modification of the project design or alternative action may be required. In the case of beneficial impacts, other means of achieving this benefit are about equal in time, cost and effort.
Low	Impact is of a low order and therefore likely to have a little real effect. In the case of adverse impacts, mitigation is either easily achieved or little will be required, or both. Social, cultural and economic activities of communities can continue unchanged. In the case of beneficial impacts, alternative means of achieving this benefit are likely to be easier, cheaper, more effective and less time-consuming.
No impact	Zero impact.

The impact assessment is available in Table 19. The section below discusses the various impacts and mitigation measures.

5.17.1 IMPACTS ON SURFACE WATER

5.17.1.1 CONSTRUCTION PHASE IMPACTS AND MITIGATION MEASURES

The following section describes the potential impacts on the surface water associated with the construction phase of the proposed project:

Impact:

- The removal of vegetation as well as the compaction of surfaces during construction at the Weltevreden Section will very likely result in increased runoff and erosion from the site. Runoff with higher sediment loads and the higher flood peaks will thus report to the local watercourses.

Mitigation Measures:

- Progressive rehabilitation of disturbed land should be carried out to minimize the amount of time that bare soils are exposed to the erosive effects of rain and subsequent runoff;
- Traffic and movement over stabilised areas should be controlled (minimised and kept to certain paths), and damage to stabilised areas should be repaired timeously and maintained; and
- The total footprint area to be cleared for the development should be kept to a minimum by demarcating the construction areas and restricting removal of vegetation to these areas only.

Impact:

- The spillage of oils, fuel and chemicals from heavy machinery and trucks can result in hydrocarbon pollution of the surrounding water resources.

Mitigation Measures:

- Drip trays should be placed under all standing machinery; and
- Oil recovered from any vehicle or machinery on site should be collected, stored and disposed of by accredited vendors for recycling.

Impact:

- Surface water resources are receptors of fine materials and contaminants arising from the construction of infrastructure and from earthworks transported through rainwater and surface runoff. This may be deposited in watercourses causing siltation and contaminating river water with chemical pollutants.

Mitigation measures:

- Construction should commence during the dry season;
- Traffic and movement over stabilised areas should be controlled (minimised and kept to certain paths), and damage to stabilised areas should be repaired timeously and maintained; and
- Silt traps should be established during this phase to trap sediments from construction. Trapped silt should be dredged and disposed of or used for other purposes such as construction.

5.17.1.2 OPERATIONAL PHASE IMPACTS AND MITIGATION MEASURES

The following section describes the potential impacts on surface water associated with the operational phase of the proposed project:

Impact:

- Increase in impervious areas could lead to an increase in runoff into the nearby streams and thus sedimentation and pollution of the watercourses.

Mitigation Measures:

- Progressive rehabilitation of disturbed land should be carried out to minimize the amount of time that bare soils are exposed to the erosive effects of rain and subsequent runoff;
- Traffic and movement over stabilised areas should be controlled (minimised and kept to certain paths), and damage to stabilised areas should be repaired timeously and maintained;
- Oil recovered from any vehicle or machinery on site should be collected, stored and disposed of by accredited vendors for recycling; and
- Compacted surfaces should be kept to a minimum and vegetation rehabilitation must be implemented within the site.

Impact:

- Water flowing from undisturbed areas which are up-gradient of the shaft and mine will be diverted around the infrastructure. This will cause naturally existing drainage patterns to be altered;
- Due to construction of water-retaining infrastructure up-gradient, storm water trapped in the early stages of rainfall will affect the runoff that generates stream flow.

Mitigation Measures

- The storm water management plan should not change the direction of the natural flow drainage of the catchment;
- The storm water management plan should maximise clean areas and minimize dirty area delineations;
- Energy dissipaters should be designed at each discharge point; and
- Drains should be designed to channel the runoff to a single discharge point into the nearby stream.

Impact:

- Surface water contamination in the form of runoff from stockpiles, if not captured, can contaminate the surrounding surface water systems.

Mitigation Measures:

- All dirty water generated on site should be captured and stored in a pollution control dam; and

- A groundwater and surface water quality monitoring plan should be implemented to determine any changes in the water quality.

5.17.1.3 DECOMMISSIOING PHASE IMPACTS AND MITIGATION MEASURES

The following section describes the potential impacts on the surface water associated with the decommissioning phase of the proposed project:

Impact:

- Compacted surfaces from moving vehicles and machinery during the decommissioning phase could lead to an increase in runoff into the nearby streams;

Mitigation Measures:

- Progressive rehabilitation of disturbed land should be carried out to minimize the amount of time that bare soils are exposed to the erosive effects of rain and subsequent runoff; and
- Traffic and movement over stabilised areas should be controlled (minimised and kept to certain paths), and damage to stabilised areas should be repaired timeously and maintained.

Impact:

- Water pollution from hydrocarbon and chemical leakage and spillage including oils, fuels and grease from machinery and vehicles used in the demolition and transfer of property during this phase.

Mitigation Measures:

- Drip trays should be placed under all standing machinery; and
- Oil recovered from any vehicle or machinery on site should be collected, stored and disposed of by accredited vendors for recycling.

Impact:

- Surface water resources are receptors of fine materials and contaminants arising from the demolition of infrastructure and from earthworks transported through rainwater and surface runoff. This may be deposited in watercourses causing siltation and contaminating river water with chemical pollutants.

Mitigation measures:

- The decommissioning phase should commence during the dry season;
- Traffic and movement over stabilised areas should be controlled (minimised and kept to certain paths), and damage to stabilised areas should be repaired timeously and maintained; and
- Silt traps should be established during this phase to trap sediments from construction. Trapped silt should be dredged and disposed of or used for other purposes such as construction.

The cumulative impacts for the site is predicted to be low as there does not seem to be much mining activity within the area. The activity and the footprint of the mine is mall in comparison to the catchment area of the Vaal River.

5.17.2 IMPACTS ON WETLANDS

5.17.2.1 CONSTRUCTION PHASE IMPACTS

The following section describes the potential impacts on the wetlands (Seep 1 and Seep 2) associated with the construction phase of the proposed project:

Impact:

- Direct loss/ degradation of natural wetland habitat & biota in Seep 1 and Seep 2 due to the direct removal and disturbance of wetland habitat due to the current location of the pylons. Subsequently, there is a potential for further infestation of alien invasive plant species, which alters the natural species

composition, hydrological functioning (usually have higher water use) and alters the soil chemical composition.

Mitigation measure:

- The power line and its associated pylons may be shifted to avoid wetland habitat. This will significantly reduce the potential for direct loss of wetland habitat and/or biota during both the construction and operational phases. Therefore, it is proposed that the power line be re-aligned outside the delineated wetland edge and as far as outside the regulated area of the wetlands;
- A construction work method statement is required to be compiled by the applicant/contractor for all activities and phases associated with the development. The applicant, engineer, contractor and environmental control officer (ECO) must agree and approve the statement as this will become a binding document which must be implemented onsite. This plan must indicate all the aquatic systems as no-go areas, which must be visually demarcated onsite before any construction activities take place (including site preparation);
- Where feasible, construction activities should be conducted during the drier months of the year (i.e. April through August) to minimise the potential impacts associated with disturbed areas and rainfall events; and
- The establishment and infestation of alien invasive plant species must be prevented, managed and eradicated. The type of species and location of that species will determine the type of methodology required for its management and eradication. This methodology should target all lifecycle phases and propagules of the specific species, e.g. seedlings/saplings, seeds, roots, etc

Impact:

- Erosion and sedimentation may occur due to the proximity of the current proposed alignment to the system within the system's catchment and subsequent sedimentation of the system.

Mitigation measures:

- The power line and its associated pylons may be shifted to avoid wetland habitat. This will significantly reduce the potential for sedimentation through erosion due to construction activities; and
- The existing road network must be utilised as far as possible.

Impact

- Due to the close proximity of the power line to the wetland, which means that vegetation clearance may result in potential erosion (i.e. decrease in soil particle cohesion and binding capacity) and subsequent sedimentation, and changes in local water quality (turbidity).

Mitigation measures:

- The power line and its associated pylons may be shifted to avoid wetland habitat. This will significantly reduce the potential or even prevent any impacts on water quality; and
- Portable toilets (if required) must be positioned outside the regulated extent of all watercourses.

Impact

- Increased runoff due to the removal of vegetation and compaction of soil surface layer may alter the natural flow regime and therefore impact on hydrological functioning/regime modifications.

Mitigation measures:

- The power line and its associated pylons may be shifted to avoid wetland habitat. There should be no impact on the hydrological functioning post the realignment.

5.17.2.2 OPERATIONAL PHASE IMPACTS ON WETLANDS

The following section describes the potential impacts on wetlands (Seep 1 and Seep 2) associated with the operational phase of the proposed project:

Impact:

- Due to the need for maintenance of the power line there is a potential for the degradation of the wetland habitat during the operational phase.

Mitigation measures:

- The shift in the power line and pylons will significantly reduce the potential risk associated with the operational phase of the line;
- A service/maintenance plan for the power line must be compiled and implemented. The plan must encompass procedures to minimise any impacts on the surrounding environment such as vegetation removal and ground compaction; and
- The extent of wetland habitat must be included in the plan in which they must be designated as 'No-go' areas. There should be no need to enter into the systems. The existing road network must be utilised as far as possible.

Impact:

- Vegetation clearance and ground compaction during maintenance activities may result in erosion and sedimentation.

Mitigation measures:

- A service/maintenance plan for the power line must be compiled and implemented. The plan must encompass procedures to minimise any impacts on the surrounding environment. The plan must also include post-maintenance requirements, which includes the management of alien invasive plant species.

Impact:

- Impacts on water quality may occur during operation due to maintenance activities within the wetland.

Mitigation measures:

- A service/maintenance plan for the power line must be compiled and implemented. The plan must encompass procedures to minimise any impacts on the surrounding environment such as vegetation removal and ground compaction.

5.17.3 IMPACTS ON GROUNDWATER

5.17.3.1 OPERATIONAL PHASE IMPACTS

The following section describes the potential impacts on the groundwater associated with the operational phase of the project:

Impact:

- The operational activities may result in impacts on groundwater quality through the infiltration of contaminated water.

Mitigation measures:

- The clean and dirty water separation structures need to be maintained to prevent contamination of water;
- All dirty water will be maintained in the "fit for purpose" designed facilities, which will limit infiltration of contaminated water to the groundwater;

- A groundwater monitoring procedure will continue to be implemented;
- Boreholes will be monitored for groundwater level and quality; and
- Should the groundwater monitoring reveal that the qualities of groundwater available to surrounding users are affected; an alternative water resource will be provided to replace the loss.

Impact:

- Mining may result in some inflow groundwater into the underground mine workings, which could decrease the availability of groundwater to farmers.

Mitigation measures:

- No discernible adverse effect on local boreholes has been encountered up to the present;
- A groundwater monitoring procedure will continue to be investigated and implemented;
- Boreholes will be monitored for groundwater level and quality;
- Should the groundwater monitoring reveal that the quality of groundwater available to surrounding users is affected, an alternative water resource will be provided to replace the loss; and
- Yield related monitoring of farm boreholes within the mine affected zone will be conducted annually in order to determine any long-term alteration in yields of boreholes situated in the zone of mine influence.

Impact:

- Seepage from the pollution control dams could adversely affect the groundwater quality.

Mitigation measures:

- Sources of water pollution will be identified and practical measures implemented to reduce or prevent further pollution;
- The water storage facilities will be regularly monitored for leaks and siltation and will be adequately maintained;
- Practical steps will be taken to minimize the losses of water through evaporation, leakage, seepage and wastage;
- Practical steps will be taken to maximize the return of rain and purified sewage effluent to natural water courses; and
- A detailed groundwater monitoring programme will be implemented.

Impact:

- Seepage from the WRD affects the groundwater quality; and
- Hazardous chemical spills may reach groundwater, thereby impacting its quality.

Mitigation measures:

- A detailed groundwater monitoring programme will be implemented;
- All hydrocarbons should be stored in designated, bunded areas with a capacity of at least 110% of the volume stored;
- Spill kits should be readily available and all employees must be trained in the utilisation thereof;
- Should a spill take place the area should be cleaned immediately and the contaminated area will be rehabilitated as appropriate;

- Employees will be educated by means of training and the Environmental Awareness Plan to make them aware of the necessity to prevent spillages by the implementation of good housekeeping practices;
- The management of chemicals and hydrocarbons should form part of the emergency preparedness and response programme;
- In the event of a major spill that could result in major soil and water contamination the DWAF should be informed immediately and a remediation strategy should be enforced;
- The management of chemicals and hydrocarbons should form part of the emergency preparedness and response programme; and
- No activities associated with hydrocarbons and or chemicals (i.e. wash bays etc.) may be undertaken outside of an effectively designed contained area.

5.17.3.2 DECOMMISSIONING PHASE IMPACTS

The following section describes the potential impacts on the groundwater associated with the decommissioning phase of the project:

Impact:

- The utilisation of hydrocarbons and other chemicals during the removal of the plant may lead to the contamination of groundwater through filtration.

Mitigation measures:

- All hydrocarbons should be stored in designated, bunded areas with a capacity of at least 110% of the volume stored;
- Spill kits should be readily available and employees must be trained in the utilisation thereof;
- Should a spill take place the area should be cleaned immediately and the contaminated area will be rehabilitated as appropriate;
- Employees will be educated by means of training and the Environmental Awareness Plan to make them aware of the necessity to prevent spillages by the implementation of good housekeeping practices;
- In the event of a major spill that could result in major soil and water contamination the DWAF should be informed immediately and a remediation strategy should be enforced;
- The management of chemicals and hydrocarbons should form part of the emergency preparedness and response programme; and
- No activities associated with hydrocarbons and or chemicals (i.e. wash bays etc.) may be undertaken outside of an effectively designed contained area.

Table 19: Impact Assessment.

IMPACT DESCRIPTION		PRE - MITIGATION							POST - MITIGATION							IMPACT PRIORITISATION				
Impact	Phase	Nature	Extent	Duration	Magnitude	Reversibility	Probability	Pre-mitigation ER	Nature	Extent	Duration	Magnitude	Reversibility	Probability	Post-mitigation ER	Public response	Cumulative Impact	Irreplaceable loss	Priority Factor	Final score
Increased runoff and erosion during construction	Construction	-1	3	4	3	2	3	-9	-1	2	1	1	2	2	-3	1	1	1	1.00	-3.00
Hydrocarbon Contamination during construction	Construction	-1	3	2	3	2	3	-7.5	-1	1	1	1	2	1	-1.25	1	1	1	1.00	-1.25
Sedimentation during construction	Construction	-1	3	4	3	2	3	-9	-1	2	1	2	2	2	-3.5	1	1	1	1.00	-3.50
Increased run-off during operations	Operation	-1	3	5	4	4	3	-12	-1	2	2	3	2	2	-4.5	1	1	1	1.00	-4.50
Change in flow regime during operation	Operation	-1	4	5	3	3	3	-11.25	-1	2	2	2	2	2	-4	1	1	1	1.00	-4.00
Surface Water Contamination during operation	Operation	-1	4	5	4	4	4	-17	-1	2	2	3	2	2	-4.5	1	2	1	1.17	-5.25
Increase in run-off during decommissioning	Decommissioning	-1	3	4	3	2	3	-9	-1	2	1	1	2	2	-3	1	1	1	1.00	-3.00

Hydrocarbon Contamination during decommissioning	Decommissioning	-1	3	2	3	2	3	-7.5	-1	1	1	1	2	1	-1.25	1	1	1	1.00	-1.25
Sedimentation during decommissioning	Decommissioning	-1	3	4	3	2	3	-9	-1	2	1	2	2	2	-3.5	1	1	1	1.00	-3.50
Destruction or disturbance of wetland habitat for Seep 1	Construction	-1	2	3	3	3	2	-5.5	-1	1	2	2	2	1	-1.75	1	2	2	1.33	-2.33
Increased erosion and sedimentation due to powerline construction for Seep 1	Construction	-1	2	3	3	2	2	-5	-1	1	2	2	2	1	-1.75	1	2	2	1.33	-2.33
Decreased water quality in Seep 1	Construction	-1	2	2	3	3	2	-5	-1	1	1	2	2	1	-1.5	1	2	1	1.17	-1.75
Hydrological functioning/regime modifications in Seep 1	Construction	-1	1	2	3	3	2	-4.5	-1	1	1	2	2	1	-1.5	1	2	1	1.17	-1.75
Degradation of wetland habitat due to maintenance of powerline for Seep 1	Operation	-1	2	2	3	3	2	-5	-1	1	1	2	2	1	-1.5	1	1	1	1.00	-1.50

Erosion and sedimentation due to vegetation clearance and ground compaction during maintenance for Seep 1	Operation	-1	2	2	3	3	2	-5	-1	2	1	2	2	1	-1.75	1	1	1	1.00	-1.75
Decreased water quality in Seep 1 due to maintenance activities	Operation	-1	2	2	3	3	2	-5	-1	1	1	2	2	1	-1.5	1	2	1	1.17	-1.75
Hydrological functioning/regime modifications in Seep 1 due to maintenance	Operation	-1	2	2	3	3	2	-5	-1	1	1	2	2	1	-1.5	1	2	1	1.17	-1.75
Direct loss/ degradation of natural wetland habitat & biota due to the location of pylons for Seep 2	Construction	-1	2	3	3	3	2	-5.5	-1	1	2	2	2	1	-1.75	1	2	2	1.33	-2.33

Erosion and sedimentation due to vegetation clearance and ground compaction during construction for Seep 2	Construction	-1	2	3	3	3	2	-5.5	-1	1	2	2	2	1	-1.75	1	1	1	1.00	-1.75
Decreased water quality and biota in Seep 2 due to erosion.	Construction	-1	2	2	3	3	2	-5	-1	1	1	2	2	1	-1.5	1	2	1	1.17	-1.75
Hydrological functioning/regime modifications in Seep 2 due to increased runoff due to removal of vegetation and compaction of soil altering natural flow regime	Construction	-1	2	2	3	3	2	-5	-1	1	1	2	1	2	-2.5	1	2	2	1.33	-3.33

Direct loss/ degradation of natural wetland habitat & biota due to the maintenance of pylons for Seep 2	Operation	-1	2	2	3	3	2	-5	-1	1	1	2	2	1	-1.5	1	1	1	1.00	-1.50
Erosion and sedimentation due to vegetation clearance and ground compaction during maintenance for Seep 2	Operation	-1	2	3	3	3	2	-5.5	-1	1	2	2	1	1	-1.5	1	1	1	1.00	-1.50
Impacts on water quality in Seep 2 due to maintenance within the wetland	Operation	-1	2	2	3	3	2	-5	-1	1	1	2	2	1	-1.5	1	2	1	1.17	-1.75
Impacts on hydrological regime due to maintenance activities within the wetland	Operation	-1	2	2	3	2	2	-4.5	-1	1	1	2	1	1	-1.25	2	2	1	1.33	-1.67

The operational activities may result in impacts on groundwater quality through the infiltration of contaminated water	Operation	-1	1	5	2	4	4	-12	-1	3	3	3	3	2	-6	2	2	1	1.33	-8.00
Mining may result in some inflow groundwater into the underground mine workings which could decrease the availability of groundwater to farmers.	Operation	-1	1	5	2	3	4	-11	-1	1	3	3	3	3	-7.5	2	1	1	1.17	-8.75
Possible seepage from the pollution control dams could adversely affect the groundwater quality.	Operation	-1	2	2	5	4	5	-16.25	-1	1	2	3	3	2	-4.5	1	1	1	1.00	-4.50

Seepage from the WRD affects the groundwater quality	Operation	-1	2	5	4	4	4	-15	-1	1	3	2	3	2	-4.5	1	2	1	1.17	-5.25
The utilisation of hydrocarbons and other chemicals during the removal of the plant may lead to the contamination of groundwater through filtration	Decommissioning	-1	1	2	3	2	4	-8	-1	1	1	2	2	3	-4.5	1	2	1	1.17	-5.25

5.18 ISSUES AND RESPONSES FROM PUBLIC CONSULTATION PROCESS

A PPP is being undertaken for the Applicant. I&AP's will be provided opportunities throughout the process to provide comment and thereby participate in the PPP. I&AP's will be afforded an opportunity to review and comment on the draft IWWMP. The draft IWWMP will be made available to all registered I&AP for a period of 60 days from the 12 December 2017 until 6 March 2018. The Public Participation Report describing the PPP for this WUL application shall be attached as Appendix H to this IWWMP on completion of the public review and comment period.

5.19 MATTERS REQUIRING ATTENTION / PROBLEM STATEMENT

As indicated by the groundwater specialist, there are currently shortcomings in the existing monitoring network and it is recommended that this be addressed as soon as possible Water monitoring requirements would also assist in identifying and highlighting any unforeseen issues and impact related to water resource management.

5.20 ASSESSMENT OF LEVEL OF CONFIDENCE OF INFORMATION

5.20.1 WETLANDS

The following gaps have been identified in terms of the wetlands:

- Wetlands identified for delineation were based on a desktop review of available information and a site inspection. This is reliant on various published data sources (e.g. aerial imagery and mapping), which have been assumed by the specialist to be representative of site conditions;
- Whilst the desktop review and site investigation aimed to identify and assess all wetlands within the study area, wetlands not identified during this process did not form part of this study;
- The Vaal River did not form part of the wetland study. It is assumed that the river and associated regulated area (1:100-year floodlines) will not be impacted upon by the construction and operation of the power line, i.e. no infrastructure will be placed within the 1:100-year floodlines;
- It has been assumed that international best-practice standards will be undertaken during design, construction and operation of the proposed power line;
- The wetland boundary comprises a gradually changing gradient of wetland indicators and varies both temporally and spatially; the wetland delineation thus occurs within a certain degree of tolerance;
- It should be recognised that there are several confounding effects on the interpretation of the historic and current extent and functioning of the respective systems such as the presence of infrastructure (roads, fencing, culverts etc.), crops and artificial damming/excavations of the system/s;
- The wetland boundaries within a specific study area in relation to the proposed power line and associated infrastructure were accurately delineated, based on the initial desktop review. The remaining watercourses were delineated at a desktop level and broadly verified in the field to obtain an extent of the wetland/riparian areas and
- The specialist report assessed the impact (on wetland habitats) of the proposed power line activities only.

5.20.2 SURFACE WATER

The following gaps have been identified for this surface water study:

- The site layout for the Weltevreden Section was only made available in a PDF format which was used to develop the SWMP. The placement and delineation of infrastructure may not be spatially accurate;
- The drainage of the Tau Lekoa Mine was not available and drainage of the conceptual SWMP was assumed based on topography and aerial imagery; and
- The best available contour data was at 5m intervals which limits detail within the SWMP.

The following assumptions were made during the calculation of the annual average water balance for the Tau Lekoa Section:

- It was assumed that 60% of the water entering the pre-coolers and fridge plant would be lost to evaporation. This was based on the water balance diagram from the mine;
- It was assumed that 15% of the water loss would occur within the residence, change house and kitchen systems. This was based on the water balance calculations from the client; and
- It was assumed that the remaining water entering the pre-coolers would be split equally between the chill water dam and fridge plant, based on a lack of alternative information.

The following assumptions were made during the calculation of the annual average water balance for the Weltevreden Section:

- It was assumed that 50% of the water used in the workshop and machine wash bay would report to the workshop and 50% would report to the machine wash bay, based on a lack of alternative information; and
- It was assumed that 50 people would be utilising the offices and consumption would be the same as the change house (75 litres per day), based on a lack of alternative information.

5.20.3 GROUNDWATER

Field data is essential in solving the conditions listed above and developing the numerical model into a site-specific groundwater model. Specific assumptions related to the available field data include:

- The top of the aquifer is represented by the generated groundwater heads;
- The available geological / geohydrological information was used to describe the different aquifers. The available information on the geology and field tests is considered as correct; and
- Many aquifer parameters have not been determined in the field and therefore have to be estimated.

In order to develop a model of an aquifer system, certain assumptions have to be made. The following assumptions were made with regards to the groundwater model:

- The system is initially in equilibrium and therefore in steady state, even though natural conditions have been disturbed;
- No abstraction boreholes were included in the initial model;
- The boundary conditions assigned to the model are considered correct; and
- The impacts of other activities (e.g. agriculture) have not been considered.

It is important to note that a numerical groundwater model is a representation of the real system. It is, therefore, at most an approximation, and the level of accuracy depends on the quality of the data that is available. This implies that there are always errors associated with groundwater models due to uncertainty in the data and the capability of numerical methods to describe natural physical processes.

6 WATER AND WASTE MANAGEMENT

The following section describes water and waste aspects at the Applicants project area, as well as the related operational processes.

6.1 WATER AND WASTE MANAGEMENT PHILOSOPHY

The general principle of water management is the recognition that water is a scarce resource. This in turn leads to the other principles, such as water use minimisation (water conservation) or reuse of water and pollution prevention or the limitation of pollution of water.

Water that exceeds the quality, as set by DWS shall not be released from site, with the exception of emergency conditions, but it must be reused, thus reducing the quantity of intake of clean water. The Applicant will endeavour to:

- Continually seeking ways to improve its performance in terms of consumption, and water related impacts;
- Reduce consumption of clean water;
- Implement pollution prevention at source;
- Maximise, recycling and reuse of dirty storm water and process water;
- Implementation of process water treatment to facilitate reuse; and
- Collect, contain dirty storm water and process water on site for preferential use as process water.

The hierarchical management approach comprises the implementation of best practice measures to minimise water consumption and reduce impacts on water resources, by:

- Implementing measures to ensure compliance with relevant water and waste legislation and with other standards to which the organisation subscribes;
- Proactively identifying and implement actions that are required to achieve the water and waste related objectives;
- Implement these actions in an open and transparent manner;
- Implement on-going water and waste related monitoring to support legal compliance;
- Continually seeking ways to improve the performance of water and waste management systems, process and objectives; and

Encourage open and transparent communication with regulatory authorities and other interested and affected parties within the context of the National Water Resource Strategy and Local Catchment Management Strategies.

6.2 STRATEGIES

6.2.1 SURFACE WATER

The general principle of water management is the recognition that is a scarce resource. This principal is guided by water use minimisation (water conservation) or re-use of water and pollution prevention or the limitation of pollution of water.

The goal of the Applicant is to minimise water consumption, impacts to the environment, running costs and to achieve environmental legal compliance, whilst maintaining adequate water supply as not to compromise the mining operations and supply of coal to industry. The following objectives are, therefore, set for the project:

- Water conservation by minimising water use. Water is reused wherever possible;
- Prevention of water pollution where possible;

- Minimise impacts on water resources and receiving water environment;
- Achieve and maintain legal compliance;
- Continuous mining operation to supply market need; and
- Production of quality coal for industry.

In order to achieve the above objectives, the Applicant is committed to uphold the following broad commitments:

- All water that can remain unpolluted will be kept separate and dirty water areas will be minimised;
- The use of water resources for processing and mining activities will constantly be evaluated to ensure that their use is optimised;
- No water will be discharged unless authorised by the DWS, especially water that exceeds the catchments water quality objectives, as set out by the National Authority, with the exception of emergency conditions if safety should demand so; and
- Dirty water catchments will be minimised and kept separate from clean catchments and all water contained here shall be re-used as far as possible, thus reducing the quality or raw water extracted;

All the relevant principles contained in DWA's Best Practice Guidelines (BPG) will be utilised to guide mine design and management practices. The Applicant will also ensure compliance with GNR 704 of the NWA, and is applying for the relevant exemptions indicated in Section 3.3 above.

6.2.2 WETLANDS AND AQUATIC ECOLOGY

Management actions should consider that the main impacts of the development are likely to be to water quality, as well as water quantity (flows) within receiving watercourses. As such, the main objectives for management are:

- To take all reasonable measures to prevent any disturbance, damage or impact to aquatic ecosystems outside of mining footprint;
- Minimise and prevent disturbance to wetlands and watercourses;
- Prevent impacts to water quality;
- Prevent and minimise erosion and sedimentation;
- Prevent flow changes in receiving watercourses;
- Effective bio-monitoring programme be implemented as soon as possible to assess and mitigate negative impacts on aquatic ecosystems;
- Manage biodiversity; and
- On-going rehabilitation.

6.2.3 GROUNDWATER

6.2.4 WASTE

The following waste management strategies will be implemented:

- The waste management plan will ensure the appropriate management of all solid waste, including construction debris (cement bags, wrapping material, timber, cans, wire, nails, etc.), waste and surplus food, food packaging, organic waste etc;
- The Mine and Contractor(s) will comply with the environmental management principles referenced in the NEMA. In respect of waste management, the 'cradle-to-grave' principle in particular must be adhered to so as to ensure accountability for correct waste handling, storage and disposal;

- The waste management system will provide for adequate waste storage (in the form of waste skips and bins with lids), waste separation for recycling, and frequent removal of non-recyclable waste for permanent disposal at an appropriately licensed waste disposal facility. No waste material is to be disposed of on site. Under no circumstances may there be any burial of waste underground or on the site;
- Waste will be separated into reusable, recyclable and non-recyclable waste, and shall be further separated as follows:
    - Hazardous waste, consisting of substances that may be harmful to the receiving environment, and, therefore, require precautionary measures when handled. Examples include (but not limited to) oil, paint, diesel.
    - General waste, consisting of non-hazardous substances and substances that cannot be recycled. Examples include (but are not limited to) construction rubble, excess construction materials that cannot be reused.
    - Recyclable waste, (where volumes are sufficient to make recycling feasible) will preferably be deposited in separate bins. Recyclable material includes paper, tins and glass.
- The mine will implement a waste removal regime that ensures waste containers do not exceed their capacity before being removed from site for disposal;
- Environmental awareness training given to workers on site will include appropriate waste management practices to be implemented on site;
- Particular caution is to be exercised with regards to handling of hazardous waste, to ensure that it does not spill or leak from the waste collection containers. Refuse must also be protected from rain, which may cause pollutants to leach out;
- Littering will be strictly prohibited. The site shall remain in a neat and tidy condition at all times. If required, the Applicant shall make use of regular litter patrols to remove litter and ensure the site remains clean, neat and tidy; and
- The mine will maintain a waste register which shall be used to track all waste removed from site. Proof of appropriate waste disposal shall be kept on file at the site for auditing purposes.

6.3 PERFORMANCE OBJECTIVES / GOALS

The Applicant has an Occupational Health, Safety and Environmental Policy in place, which outlines the mine's commitment towards environmental management and which provides the framework for all environmental activities on the mine. The policy is aimed at achieving excellence and ensuring continual improvement in the mine's endeavour to create a sustainable environment. There is a continual process of reviewing to assess the impacts of the mine's activities on the environment. The performance objectives are summarised in Table 20 below.

Table 20: Performance objective for The Applicant

Item:	Performance objective:
Process Water:	Required water quality standard
	Re-use and recycling of process water
	Accurate water balance (hour meter flows)
Ground Water:	Prevent deterioration of ground water quality
	Prevent aquifer contamination
Storm / Surface Water:	Clean and dirty water separation

Item:	Performance objective:
	Diversion of clean storm water runoff around the mine area
	Collection and containment of contaminated water
Waste:	Ensure legal proper disposal of waste at registered sites
	Minimize waste generation
	Re-use of recycle if possible
	Ensure proper storage before disposal to prevent pollution of environment

6.4 MEASURES TO ACHIEVE AND SUSTAIN PERFORMANCE OBJECTIVES

Tau Lekoa has a Health, Safety and Environmental Policy in place, authorised by the organisation's top management that clearly states overall health, safety and environmental strategies and a commitment to manage all environmental issues. The policy includes a commitment to continually improve and the prevention of pollution. Furthermore, through this policy Tau Lekoa is committed to comply with current applicable legislation and with all other requirements to which the organisation subscribes. The Policy is a document that is implemented and maintained, communicated to all employees, available to interested parties, and reviewed periodically to ensure that it remain relevant and appropriate to the mine.

6.5 OPTION ANALYSIS AND MOTIVATION FOR IMPLEMENTATION OF PREFERRED OPTIONS

According to the wetland specialist, the power line and its associated pylons may be shifted to avoid wetland habitat. This will significantly reduce the potential for direct loss of wetland habitat and/or biota during both the construction and operational phases. Therefore, it is proposed that the power line be re-aligned outside the delineated wetland edge and as far as outside the regulated area of the wetlands. There are potential realignments illustrated in Figure 42.

Figure 42: Proposed alternatives for the powerline

6.6 IWWMP ACTION PLAN

This part of the IWWMP details the actions that will be taken to ensure that the objectives and measures set out in Section 6.3 and Section 6.4 above, as well as the commitments made throughout the rest of this document, are achieved. The main purpose of this section of the IWWMP is to identify the direct actions to be taken by the mine, as well as to allocate responsibility for the implementation of these actions and set a target in terms of the timeline(s) within which the actions will be achieved. The action plan included in Table 21 focuses on the measures that will be implemented during the construction, operational and decommissioning phases of the mine. Specific action plans with regards to surface water management are indicated in Table 22 to Table 24.

Table 21: IWWMP action plan

Activity	Environmental Aspect	Mitigation measures	Monitoring frequency and tools	Monitoring Indicators	Responsible party for implementation and Monitoring Tool
STAFF AND MANAGEMENT AWARENESS					
Staff awareness program and training	Risk mitigation	The Applicant must inform its employees of risk associated with their operations and make sure that all employees are trained prior to undertaking any activity associated with their operations. Ensure that the Contractor and key personnel are aware of the relevant provisions of the EMPR, sensitive environmental features and agreements made with individual landowners and/or land users.	Permanent/ Continuous	• Reducing in incidents and identified risks	Management • EMPR
ii.) Appoint Contractors Environmental Officer (CEO)	Oversee and enforce EMPR.	The Applicant's management to assign a team that will monitor EMPR implementation and compliance by the employees. Enforcement should be applied to those employees that are not complying.	Permanent/ continuous	• Management satisfied with CEO performance based on EMPR implementation	Management • EMPR • Compliance checklists • Audit reports
SITE OPERATION					
Water for human consumption	Water and soil pollution, health	Water for human consumption shall be available at the site offices and at other convenient locations on site. All drinking water	Weekly monitoring of waste and	• Adequate quantities of potable water,	Management • EMPR

Activity	Environmental Aspect	Mitigation measures	Monitoring frequency and tools	Monitoring Indicators	Responsible party for implementation and Monitoring Tool
		must be from a legal source and comply with recognised standards for potable use. The Applicant shall comply with the provisions of the National Water Act, 1998 (Act 36 of 1998) and its Regulations pertaining to the abstraction of water from rivers and streams and the use thereof. All effluent from the office shall be collected and disposed of properly, (e.g. chemical toilets should be emptied). If this is not feasible (due to the construction duration or other difficulties), all effluent water from the camp / office sites shall be disposed of in a properly designed and constructed system, situated so as not to adversely affect water sources (streams, rivers, pans dams etc). Only domestic type wastewater shall be allowed to enter this drain. The effluent system should comply with provisions of the NWA.	effluent removal/ disposal	• Proper effluent disposal	• Compliance checklists
Sewage	Soil and water pollution; Waste disposal	Ensure that the sewage plant if working.	Weekly monitoring of sewage facilities, maintenance and disposal	• Adequate and operation sewage treatment/disposal	Management • EMPR • Compliance checklists

Activity	Environmental Aspect	Mitigation measures	Monitoring frequency and tools	Monitoring Indicators	Responsible party for implementation and Monitoring Tool
Waste Management	Soil and water pollution; Waste disposal	Where practically possible, general waste on-site must be reused or recycled. Bins and containers must be available on-site for collection, separation, and storage of waste streams (such as wood, metals, general refuse etc.).	Weekly monitoring of waste clean-up	• No waste or litter accumulation on site	Management • EMPR • Compliance checklists
Solid Waste	Soil and water pollution; Waste disposal	A refuse control system shall be established for the collection and removal of refuse. Bins and containers must be available on-site for collection, separation, and storage of waste (such as wood, metals, general refuse etc.). Solid waste shall be stored within a designated area that is covered, utilising plastic wheelie bins for collection and disposal. Disposal of solid waste shall be at a DWS licensed landfill site or at a site approved by DWS in the event that an existing operating landfill site is not within reasonable distance from the site. No waste shall be burned or buried at or near the site offices, or anywhere else on the site.	Weekly monitoring	• No waste or litter accumulation on site • Proof of disposal certificates. • No burning of waste.	Management • EMPR • Compliance checklists
Wastewater	Soil and water pollution;	The Applicant shall comply with the provisions of the NWA and its Regulations pertaining to the storage and reuse of wastewater collected on site.	Monthly monitoring	• No ground and water contamination	Management • EMPR • Compliance checklists

Activity	Environmental Aspect	Mitigation measures	Monitoring frequency and tools	Monitoring Indicators	Responsible party for implementation and Monitoring Tool
		Wastewater collection ponds should be lined and in compliance with the NEMWA and other legal requirements.			
Litter	Soil and water pollution; Waste disposal	No littering by construction workers shall be allowed. During the construction and operation period, the facilities shall be maintained in a neat and tidy condition and the site shall be kept free of litter. Measures shall be taken to reduce the potential for litter and negligent behaviour with regard to the disposal of all refuse. At all places of work the contractor shall provide litter collection facilities for later safe disposal at approved sites.	Bi weekly monitoring	• No waste or litter accumulation on site • Proof of disposal certificates. • Availability and maintenance of litter / refuse collection facilities. • No burning of waste.	Management • EMPR • Compliance checklists
Hazardous waste	Soil and water pollution Waste disposal	Hazardous waste such oils etc. shall be disposed of in a DWS approved landfill site. Any spillage shall be attended to immediately and affected areas shall be promptly reinstated to the satisfaction of the engineer.	Weekly monitoring	• No spillages or direct disposal. • No waste or litter accumulation on site • Proof of disposal certificates. • Proof of reinstatement following any spillages.	Management • EMPR • Compliance checklists

Activity	Environmental Aspect	Mitigation measures	Monitoring frequency and tools	Monitoring Indicators	Responsible party for implementation and Monitoring Tool
				• No burning of waste.	
Control at the workshop	Soil and water pollution; Waste disposal	Management and maintenance of plant and machinery will be strictly monitored according to the subsections below, regardless whether it is serviced on the site (i.e. at the place of construction activity or at a formalised workshop). All maintenance, including washing and refuelling of plant on site shall take place at designated locations at the workshop area. All machinery servicing areas shall be bunded.	Monthly monitoring	• Random visual inspection during site visits.	Management • EMPR • Compliance checklists
Hazardous Material Storage	Soil and water pollution Waste disposal	Petrochemicals, oils and identified hazardous substances shall only be stored under controlled conditions. All hazardous materials shall be stored in a secured, appointed area that is fenced and has restricted entry. The Applicant should ensure that they keep proof that relevant authorisation to store such substances has been obtained from the relevant authority. In addition, hazard signs indicating the nature of the stored materials shall be displayed on the storage facility or containment structure. Before containment or storage facilities can be erected the Applicant should ensure that preventative measures are put in place to mitigate against pollution of the	Weekly monitoring	• No hazardous waste accumulation on site • Proof of disposal certificates. • No burning of waste. • Suitable and adequate hazardous substance storage areas. • Proof of submission and approval from the Employers Environmental	Management • EMPR • Compliance checklists

Activity	Environmental Aspect	Mitigation measures	Monitoring frequency and tools	Monitoring Indicators	Responsible party for implementation and Monitoring Tool
		surrounding environment from leaks or spillage. The preferred method shall be a concrete floor that is bunded. Any deviation from the method will require proof from the relevant authority that the alternative method proposed is acceptable to that authority. The proposals shall also indicate the emergency procedures in the event of misuse or spillage that will negatively affect an individual or the environment.		Manager/Environmental Officer.	
Fuel and Gas Storage	Soil and water pollution; Waste disposal	Fuel shall be stored in a secure area in a steel tank supplied and maintained by the fuel suppliers. An adequate bund wall, at least 110% of the volume stored, shall be provided for fuel and diesel areas to accommodate any leakage spillage or overflow of these substances. The area inside the bund wall shall be lined with an impervious lining to prevent infiltration of the fuel into the soil. Any leakage, spillage or overflow of fuel shall be attended to immediately. Gas welding cylinders and LPG cylinders shall be stored in a secure, well-ventilated area. Storage of hazardous substances must comply with construction regulations under the OHSA.	Weekly monitoring	• Inspect bunded area for leaks / drainage • Proof of disposal certificates. • No burning of waste.	Management • EMPR • Compliance checklists

Activity	Environmental Aspect	Mitigation measures	Monitoring frequency and tools	Monitoring Indicators	Responsible party for implementation and Monitoring Tool
Oil and Lubricant Waste	Soil and water pollution; Waste disposal	Used oil, lubricants and cleaning materials from the maintenance of vehicles and machinery shall be collected in a holding tank and sent back to the supplier. Oils collected in this manner, shall be retained in a safe holding tank and removed from site by a specialist oil recycling company for disposal at approved waste disposal sites for toxic/hazardous materials. Oil collected by a mobile servicing unit shall be stored in the service unit's sludge tank and discharged into the safe holding tank for collection by the specialist oil recycling company. All used filter materials shall be stored in a secure bin for disposal off site. Any contaminated soil shall be removed and replaced. Soils contaminated by oils and lubricants shall be collected and disposed of at a facility designated by the local authority to accept contaminated materials.	Weekly monitoring	• Inspect bunded area for leaks / drainage • Proof of disposal certificates. • No burning of waste.	Management • EMPR • Compliance checklists
Soil and Stockpile Management	Soil erosion	Topsoil shall be removed from all areas where physical disturbance of the surface will occur and shall be stored and adequately protected. The Applicant will provide for the stripping and stockpiling of topsoil from the site for later re-use. Topsoil is considered to be the natural soil	Monthly monitoring	• Visual inspection of stockpiles	Management • EMPR • Compliance checklists

Activity	Environmental Aspect	Mitigation measures	Monitoring frequency and tools	Monitoring Indicators	Responsible party for implementation and Monitoring Tool
		covering, including all the vegetation and organic matter. Depth may vary at each site. The areas to be cleared of topsoil shall include the storage areas. All topsoil stockpiles and windrows shall be maintained throughout the contract period in a weed-free condition. Weeds appearing on the stockpiled or windrowed topsoil shall be removed by hand. Soils contaminated by hazardous substances shall be disposed of at an approved DWS waste disposal site. The topsoil stockpiles shall be stored, shaped and sited in such a way that they do not interfere with the flow of water to cause damming or erosion, or itself be eroded by the action of water. Stockpiles of topsoil shall not exceed a height of 2m, and if they are to be left for longer than 6 months, shall be analysed, and if necessary, fertility improved before replacement. Stockpiles shall be protected against infestation by weeds. The Applicant shall ensure that no topsoil is lost due to erosion – either by wind or water. Areas to be top-soiled and grassed shall be done so systematically to allow for quick cover and reduction in the chance of heavy topsoil losses due to unusual weather patterns.			

Activity	Environmental Aspect	Mitigation measures	Monitoring frequency and tools	Monitoring Indicators	Responsible party for implementation and Monitoring Tool
Drainage / Storm water Management	Soil erosion /storm water management	The quality, quantity and flow direction of any surface water runoff shall be established with the aid of a qualified engineer prior to disturbing any area for construction purposes. Cognisance shall be taken of these aspects and incorporated into the planning of all construction activities. Before a site is developed or expanded, it shall be established how this development or expansion will affect the drainage pattern. No water source shall be polluted in any way due to proposed development. No wastewater may run freely into any of the surrounding environment or neighbouring properties. The contractor shall implement the storm water design in accordance with the approved Storm Water Management Plan. The Applicant and Contractor(s) shall ensure compliance with the requirements of the NWA and GN 704. All areas susceptible to erosion shall be protected by ensuring that there is no undue soil erosion resultant from construction and/or mining activities. Berms shall be constructed where necessary to direct all runoff into the storm water system. Care must be taken to avoid scouring and erosion and suitable	Weekly monitoring	• Visual inspection, no excessive soil erosion or sedimentation.	Management • EMPR • Compliance checklists

Activity	Environmental Aspect	Mitigation measures	Monitoring frequency and tools	Monitoring Indicators	Responsible party for implementation and Monitoring Tool
		measures should be placed in areas where runoff concentrates, in order to detain the sediment load and slow down the runoff. All erosion damage shall be repaired as soon as possible as directed by the Environmental Representative. Consideration shall be given to the placement of silt traps or barriers where the soils are of a dispersive nature or where toxic fluids are used in the construction process. The silt traps must be large enough to contain runoff so that they function properly under heavy rain conditions.			
Stockpiles	Soil erosion Visual impact Noise	No construction and operation related activities including stockpiling, temporary storage areas, temporary and permanent access routes, and temporary working areas are to take place within the area beyond the demarcated site boundary. The Applicant shall plan their activities so that materials in so far as possible, can be transported directly to, and placed at, the point where they will be used. The areas for the stockpiling of excavated and imported material shall be indicated and demarcated on the site plan, together with the contractor's proposed	Weekly monitoring	• Visual inspection, no excessive dust	Management • EMPR • Compliance checklists

Activity	Environmental Aspect	Mitigation measures	Monitoring frequency and tools	Monitoring Indicators	Responsible party for implementation and Monitoring Tool
		measures for prevention, containment and rehabilitation against environmental damage. The areas chosen shall have no naturally occurring indigenous trees and shrubs present that may be damaged during operations. Care shall be taken to preserve all vegetation in the immediate area of these temporary stockpiles. During the life of the stockpiles the contractor shall at all times ensure that they are: • Positioned and sloped to create the least visual impact; • Structurally sound and present no safety risk; • Constructed and maintained so as to avoid erosion of the material and contamination of surrounding environment; and Kept free from all alien/undesirable vegetation. After construction, any areas no longer required for operation shall be re-instated to its original condition. No foreign material generated / deposited during construction shall remain on site. Areas affected by stockpiling shall be landscaped, top soiled, grassed and maintained until closure from the Environmental Advisor and the relevant National Authority is received.			

Activity	Environmental Aspect	Mitigation measures	Monitoring frequency and tools	Monitoring Indicators	Responsible party for implementation and Monitoring Tool
		In all cases, Environmental Advisor shall approve the areas for stockpiling and disposal of construction rubble before any operation commences and shall approve their clause only when they have been satisfactorily rehabilitated.			
Spillages	Soil & water pollution	Watercourses such as streams, rivers, dams, etc. shall be protected from direct or indirect spillage of pollutants such as refuse, garbage, cement, concrete, sewage, chemicals, fuels, oils, aggregate, wash water, and organic materials. In the event of a spillage, the Applicant should arrange for professional service providers to clear the affected area. All spills must be dealt with as per the Emergency Response Procedure. Should water downstream of the spill be polluted, and fauna and flora show signs of deterioration or death, specialist hydrological or ecological advice will be sought for appropriate treatment and remedial procedures to be followed.	Weekly monitoring	• Visual inspection	Management • EMPR • Compliance checklists

Activity	Environmental Aspect	Mitigation measures	Monitoring frequency and tools	Monitoring Indicators	Responsible party for implementation and Monitoring Tool
Areas of Specific Importance	• Loss of populations of threatened plant species • Loss of habitat of threatened animal species • Loss of indigenous natural vegetation (primarily grassland) • Erosion and siltation due to change in runoff and drainage patterns • Establishment and spread of declared weeds and alien invader plants. • Noise impacts on local residents	Any area, as determined and identified as sensitive or of special interest within the site (e.g. wetlands) shall be treated according to the express instructions contained in these specifications or the approved EMPR. The overriding principle is that such defined areas requiring protection shall not be changed. • No unnecessary vegetation clearing will be allowed in natural vegetation areas.	Weekly monitoring	• No vegetation has been unnecessary removed, (photo graphic evidence)	Management • EMPR • Compliance checklists

Activity	Environmental Aspect	Mitigation measures	Monitoring frequency and tools	Monitoring Indicators	Responsible party for implementation and Monitoring Tool
Dust Control	Nuisance pollution	Dust caused by strong winds and operational activities shall be controlled by means of water spray vehicles. Exposed soils and material stockpiles shall be protected against wind erosion. The location of stockpiles shall take into consideration the prevailing wind directions and locations of sensitive receptors A dust monitoring system needs to be put in place to ensure that dust falls within the acceptable limits as per the ambient air quality standards	Monthly monitoring	• Routine observation, no complaints from residents	Management • EMPR • Compliance checklists
Alien Vegetation	Habitat destruction	The Applicant shall establish an on-going monitoring programme to detect and quantify any alien species that may become established and identify the problem species (as per Conservation of Agricultural Resources Act and Biodiversity Act). The Applicant shall be held responsible for the removal of alien vegetation within the boundary of the site disturbed during construction. This includes, for example, service roads, stockpile areas, and wherever	Monthly monitoring	• Visual inspection, vegetation removal record by contractor, no unnecessary vegetation clearing	Management • EMPR • Compliance checklists

Activity	Environmental Aspect	Mitigation measures	Monitoring frequency and tools	Monitoring Indicators	Responsible party for implementation and Monitoring Tool
		material generated for or from construction has been stored temporarily.			
DECOMMISSIONING PHASE					
Decommissioning	Decommissioning and rehabilitation	Any additional licensing or permitting requirements must be identified prior to any decommissioning activities commence. Prior to the decommissioning a detailed decommissioning plan must be prepared. This plan should aim to follow the waste management hierarchy (reuse, recycle, reduce and dispose) in order to prevent unnecessary wastes. All waste which require disposal must be disposed of at a suitably licenced facility. An inventory of infrastructure and wastes together with the ultimate destination (e.g. recycler, waste disposal) should be kept for future records. A rehabilitation plan must be prepared by a suitably qualified specialist. The sites must be rehabilitated to the pre-construction condition or alternatively to align with the surrounding land-uses at the time. The rehabilitated site must be protected from future erosion.	Weekly	• Routine check for EMPR availability and awareness.	Management • EMPR • Compliance checklists

Activity	Environmental Aspect	Mitigation measures	Monitoring frequency and tools	Monitoring Indicators	Responsible party for implementation and Monitoring Tool
Decommissioning	Decommissioning and rehabilitation	The area where the site offices are placed will require rehabilitation at the end of the contract. All construction material, including concrete slabs shall be removed from the site on completion of the contract, to the Applicants satisfaction.	Weekly	• Routine check for EMPR availability and awareness.	Management • EMPR • Compliance checklists
Decommissioning	Decommissioning and rehabilitation	Any disturbed areas should be rehabilitated with natural vegetation endemic to the area as soon as possible after decommissioning.	Weekly	• Routine check for EMPR availability and awareness.	Management • EMPR • Compliance checklists

Table 22: Surface water action plan during construction

Phase	Management Action	Timeframe for implementation	Responsible Party for implementation	Timeframe	Responsible party for Monitoring / Audit / Review
Increase in Runoff					
Construction	Ensure total footprint area is kept to a minimum.	Planning and Construction	Contractor	Monthly	Mine manager/ ECO
Construction	Traffic and movement of machinery should be minimised and restricted to certain paths.	Construction	Contractor	Weekly	Mine manager/ECO

Phase	Management Action	Timeframe for implementation	Responsible Party for implementation	Timeframe	Responsible party for Monitoring / Audit / Review
Construction and ongoing	Progressive rehabilitation of disturbed land should be carried out.	As needed during construction and ongoing	ECO	Monthly	Mine manager/ECO
Surface Water Contamination					
Construction	Ensure proper collection and storage of oils and grease from construction vehicles and machinery, and facilitate disposal of these by accredited vendors for recycling.	Construction	ECO and Contractor	Daily	Mine manager/ECO
Construction	Drip trays should be placed under all standing machinery.	Construction	ECO and Contractor	Daily	Mine manager/ECO
Sedimentation					
Construction	Construction should commence during the dry season	Planning and Construction	ECO and Contractor	Monthly	Mine manager/ECO
Construction	Traffic and movement over stabilised areas should be controlled (minimised and kept to certain paths), and damage to stabilised areas should be repaired timeously and maintained.	Planning and Construction	ECO and Contractor	Daily	Mine manager/ECO
Construction	Silt traps should be established during this phase to trap sediments from construction. Trapped silt should be dredged and disposed of or used for other purposes such as construction.	Planning and Construction	ECO and Contractor	Monthly	Mine Manger/ECO

Table 23: Surface water action plan during operation

Phase	Management Action	Timeframe for implementation	Responsible Party for implementation	Timeframe	Responsible party for Monitoring / Audit / Review
Increase in Runoff					
Operational	Progressive rehabilitation of disturbed land should be carried out to minimize the amount of time that bare soils are exposed to the erosive effects of rain and subsequent runoff.	Planning, construction and operational	ECO	Monthly	Mine manager/Environmental Control Office (ECO)
Operational	Traffic and movement over stabilised areas should be controlled (minimised and kept to certain paths), and damage to stabilised areas should be repaired timeously and maintained.	Planning construction, and operational	ECO	Daily	Mine manager/ECO
Operational	Oil recovered from any vehicle or machinery on site should be collected, stored and disposed of by accredited vendors for recycling.	Operational	ECO	Daily/Monthly	Mine manager/ECO
Operational	Compacted surfaces should be kept to a minimum and vegetation rehabilitation must be implemented within the site	Planning construction, and operational	ECO	Monthly	Mine manager/ECO
Surface Water Contamination					
Operational	All dirty water generated on site should be captured and stored in a pollution control dam.	Planning construction, and operational	ECO and contractor	Daily	Mine manager/ECO
Operational	A groundwater and surface water quality monitoring plan should be implemented to determine any changes in the water quality	Planning, construction, operational, and decommissioning	ECO and Contractor	Bi-annually	Mine manager/ECO

Phase	Management Action	Timeframe for implementation	Responsible Party for implementation	Timeframe	Responsible party for Monitoring / Audit / Review
Change in flow regime					
Operational	The storm water management plan should not change the direction of the natural flow drainage of the catchment.	Planning and Construction	ECO and Contractor	Monthly	Mine manager/ECO
Operational	The storm water management plan should maximise clean areas and minimize dirty area delineations.	Planning and Construction	ECO and Contractor	Monthly	ECO
Operational	Energy dissipaters should be designed at each discharge point and need to be monitored.	Planning and Construction	ECO and Contractor	Monthly	Mine Manger/ECO
Operational	Drains should be designed to channel the runoff to a single discharge point into the nearby stream.	Planning and Construction	ECO and Contractor	Monthly	ECO

Table 24: Surface water action plan for decommissioning

Phase	Management Action	Timeframe for implementation	Responsible Party for implementation	Timeframe	Responsible party for Monitoring / Audit / Review
Increase in Runoff					
Decommissioning	Ensure total footprint area is kept to a minimum.	Planning and construction	Contractor	Daily	Mine manager/Environmental Control Office (ECO)
Decommissioning	Traffic and movement of machinery should be minimised and restricted to certain paths.	Construction	Contractor	Daily	Mine manager/ECO

Phase	Management Action	Timeframe for implementation	Responsible Party for implementation	Timeframe	Responsible party for Monitoring / Audit / Review
Decommissioning	Progressive rehabilitation of disturbed land should be carried out	As needed during construction and ongoing	ECO	Monthly	Mine manager/ECO
Surface Water Contamination					
Decommissioning	Ensure proper collection and storage of oils and grease from construction vehicles and machinery, and facilitate disposal of these by accredited vendors for recycling.	Construction	ECO and contractor	Daily	Mine manager/ECO
Decommissioning	Drip trays should be placed under all standing machinery.	Construction	ECO and Contractor	Daily	Mine manager/ECO
Sedimentation					
Decommissioning	Construction should commence during the dry season	Planning and construction	ECO and Contractor	Monthly	Mine manager/ECO
Decommissioning	Traffic and movement over stabilised areas should be controlled (minimised and kept to certain paths), and damage to stabilised areas should be repaired timeously and maintained.	Planning and construction	ECO and Contractor	Daily	ECO
Decommissioning	Silt traps should be established during this phase to trap sediments from construction. Trapped silt should be dredged and disposed of or used for other purposes such as construction.	Planning and construction	ECO and Contractor	Monthly	Mine Manger/ECO

6.7 MONITORING AND CONTROL

In order to determine the impact of the facility on the surface and groundwater regimes, monitoring systems have been implemented, by which data can be continually gathered and analysed, with corrective action being taken as required.

6.8 MONITORING OF CHANGE IN BASELINE INFORMATION

The results of the monitoring plan will be submitted to the relevant DWS directorates, as well as other government departments as required in terms of management objectives, action plan and applicable legislation and other legislative requirements.

6.8.1.1 SURFACE WATER MONITORING

As detailed in Section 5.14 above surface water monitoring is currently undertaken at Tau Lekoa. The Applicant will need to amend the surface water monitoring to ensure that it is in line with any conditions specified in the WUL.

6.8.1.2 GROUNDWATER MONITORING

As detailed in Section 5.15, groundwater monitoring is currently undertaken at Tau Lekoa. The groundwater monitoring plan should be amended as proposed by the Hydrogeologist (refer to Section 5.15 and Appendix F). The Applicant will need to amend the surface water monitoring to ensure that it is in line with any conditions specified in the WUL.

6.9 AUDIT AND REPORT ON PERFORMANCE

It is anticipated that the WUL or other applicable authorisations will require that regular formal audits be undertaken in order to assess the compliance with, amongst others, the WUL and IWWMP. As such, the applicant will cater for this requirement through regular internal and external audits in line with the frequency required by the WUL (usually on an at least an annual basis) and the other applicable authorisations. The EMP performance audit conducted in May 2017 is attached in Appendix C.

6.10 AUDIT AND REPORT ON RELEVANCE OF IWWMP ACTION PLAN

It is anticipated that the WUL will require that the efficacy of the measures proposed as part of the action plan be reviewed and updated where required. As such, the IWWMP action plan will be reviewed and updated in line with the frequency required by the WUL (usually on at least an annual basis) and the other applicable authorisations.

7 CONCLUSION

7.1 REGULATORY STATUS OF ACTIVITY

Tau Lekoa has a mining right in terms of the MPRDA. Through the acquisition of the mine from the previous owner Buffelsfontein Gold Mines Limited, the water use licence relating to the affected properties was relinquished and as such a new water use licence is required.

7.2 STATEMENT OF WATER USES REQUIRING AUTHORISATION, DISPENSING WITH LICENCENCING REQUIREMENT AND POSSIBLE EXEMPTION FROM REGULATION

In terms of the NWA, it is an offence to pollute any water resources to render it unfit for the propagation of fish and aquatic life, including rainwater, seawater, and subterranean water. An application for the exemption of the provision of GNR 704 is required for the proposed powerline and any other infrastructure that traverses a watercourse. This application and associated IWWMP covers a number of water uses relating to the operation of the Tau Lekoa mine and associated Weltevreden Shaft. Details of these water uses are presented in Section 3.5.

The subsections below provide contextualisation of the activities with respect to Section 27 of the NWA.

7.2.1 SECTION 27(1)(A) EXISTING LAWFUL WATER USES

Tau Lekoa mine previously belonged to Anglo Gold Ashanti and is, therefore, an existing mine. The water uses associated with the mine are considered existing lawful water uses. Anglo Gold was issued with Exemption 1973B of section 21(4) of the Water Act, 1956 (Act 54 of 1956). The relevant sections of the Exemption relating to Tau Lekoa mine include the use of 3 600 m^3 of water per annum from Tau Lekoa sewage works for industrial purposes.

7.2.2 SECTION 27 (1)(B) THE NEED TO REDRESS THE RESULTS OF PAST RACIAL AND GENDER DISCRIMINATION

Through the programmes and initiatives identified by the Tau Lekoa's Social Labour Plan (SLP), the mine promotes opportunities for historically disadvantaged persons, including women, to enter the mineral and petroleum industries and to benefit from the exploitation of South Africa's mineral and petroleum resources.

Tau Lekoa has a Skills Development Plan in place. The Skills Development Plan includes the following: an ABET Programme, Learnerships, Portable Skills, Career Progression Plans, a Mentorship Plan, and Employment Equity Plan and a Bursary Scheme. These strategies have been developed to address core skills training and HDSA's in all categories, more particularly in management and women in mining.

The programme is overseen by the Skills Development Committee. The committee oversees and monitors the following:

- Identifies people with potential;
- Give people the opportunity to develop themselves;
- Produce employees with enhanced skills;
- Enhance their chances of internal promotion and better career prospects;
- Close the skills gap; and
- Identify suitable candidates as required by the Mining Charter.

Through various community engagement processes, a list of impactful and positive community development initiatives. These include projects such as:

- The Ikageng School for Disabled Children;

- Textile Incubator and Economic Development in Stilfontein;
- The Tau Lekoa Farm Agricultural Project;
- The Free State Local Economic Development (LED) project;
- The Eastern Cape Education Building; and
- The Dinokhaya crushing/screening and washing plant;

A complete discussion of the various projects and initiatives for Tau Lekoa are included in the SLP (refer to Appendix I).

7.2.3 SECTION 27 (1)(C) EFFICIENT AND BENEFICIAL USE OF WATER IN THE PUBLIC INTEREST

The concept of "public interest" is a very complex one. Under the Water Act of 1956, permits were issued to users provided that they used the water beneficially. The use was considered beneficial if the mine was going to make a profit. Under the NWA, public interest goes much wider. The fact that the mine has to undertake a public participation process, and the public's opinion is to be elicited, means that, at least, the public opinion can be gauged by the response and the comments and concerns received.

As public trustee of the water resources, the DWS must ensure that the water is protected, used, developed, conserved, managed and controlled in a sustainable and equitable manner for the benefit of all users. The Minister, through the DWS has to ensure that the water is allocated equitably and used beneficially in the public interest, while promoting environmental values.

The beneficial use of the water is derived for the social and economic benefits resulting from the mining activity. Water will be used optimally to ensure minimum wastage. The water use will be undertaken, managed and controlled in such a way to ensure that pollution of the water resources is minimised and avoided. Social and economic development will be facilitated, which will ensure that the use of the water resource will be of benefit to the local communities. Goods and services will be sourced from local businesses as far as possible, to enhance the economic benefits of the project.

A public participation process relating to the water use application has been undertaken and all the identified impacts can be mitigated taking the other water users into consideration. The public consultation process will be on-going throughout the life of mine.

7.2.4 SECTION 27 (1)(D) THE SOCIO-ECONOMIC IMPACT OF THE WATER USE OR USES IF AUTHORISED OR OF THE FAILURE TO AUTHORISE THE WATER USE OR USES

Compliance to the NWA will be adhered to with the approval of the WUL. Mining of the reef at the Weltevreden sections, as well as continued mining operation at Tau Lekoa mine, will ensure the provision of employment and continued short- to long-term employment, and positive economic benefits to the local community.

A failure to authorise the water uses will result in a loss of a significant gold reef at Weltevreden, as well as the closure of Tau Lekoa mine. This will result in negative impacts such as an increase in the unemployment rate and a reduction in the production of gold, which will in turn impact the gold economic market.

7.2.5 SECTION 27 (1)(E) ANY CATCHMENT MANAGEMENT STRATEGY APPLICABLE TO THE RELEVANT WATER RESOURCES

The area of the Vaal River in which the mine falls, forms part of the Middle Vaal Water Management Area (WMA). The catchment management agency (CMA) for the Vaal River System was established on 29 January 2016, through the promulgation of GNR 81 in terms of the NWA, and is called the Vaal River Catchment Management Agency.

The following impacts have been considered:

- The direct impact of physical structures (environmental constraints to construction e.g. of weirs or dams);
- The implications of allocating and licensing water for use. Forestry and irrigation are examples of users where development based on water can mean the transformation of extensive areas of otherwise 'natural' environments;
- The allocation of water for equity. will include approaches towards the application of Schedule 1 Use, General Authorisations, the revitalisation of irrigation schemes, etc.;
- Failure to support equity, or appropriate development – noting the consequential impacts of poverty;
- Sanitation systems and the impacts on groundwater quality;
- The implementation of the Reserve; and
- The ability to monitor and manage compliance, thus protecting the resource and with it the environment.

All decisions regarding water are critical to the environment. Decisions must be made on a balance of social, economic and ecological costs and benefits, considering both the immediate and the long-term, and always with an eye out for the unintended consequence. It is the intention of the Internal Strategic Perspective (ISP) to provide the basis for integrated decision-making. The principles of environmental management underpin every strategy developed in this document.

There are a number of strategic areas with a particularly strong biophysical/ ecological emphasis. These include:

- The Reserve (groundwater, rivers, wetlands and estuaries);
- Water quality - surface and groundwater;
- The approach towards the clearing of Invasive Alien Plants;
- The management of wetlands;
- Land degradation. Erosion and sedimentation (land care); and
- Land use and especially how this is impacted by land reform and the re-allocation of water.

The roles of co-operative governance and the need for awareness raising and capacity building are key strategic elements of many strategies. In reality all strategies and all aspects of management have a strong interaction with the biophysical environment. This ISP endeavours to capture all of these concerns in discussion and through a strategic approach which emphasises the will of the DWS to manage the environment to the best benefit of the country and its people.

7.2.6 SECTION 27 (1)(F) THE LIKELY EFFECT OF THE WATER USE TO BE AUTHORISED ON THE WATER RESOURCE AND ON OTHER WATER USERS

The main potential impacts identified include (Refer to Section 5.17 above for a detailed description of the potential impacts);

- Surface Water quality may decrease due to contamination or the flow regime may change during operation;
- Wetlands may be impacted on due to increased sedimentation and erosion; and
- Groundwater may be impacted on by seepage from the WRD or the PCD or contamination from hydrocarbons.

All of these potential impacts will require mitigation, which is further addressed in the IWWMP action plan (Section 6.6 above).

7.2.7 SECTION 27 (1)(G) THE CLASS AND THE RESOURCE QUALITY OBJECTIVES OF THE WATER RESOURCE

In terms of Section 16 of the NWA, the Minister of DWS, must determine the reserve for the river system before any license can be issued. The Reserve consists of two parts, namely, the basic human needs and the ecological reserve, which must be determined for all or part of any significant water resource.

The PES of the Vaal River is Class D. The preliminary determination of the Reserve for the Drainage Region C24J within the Middle Vaal WMA was undertaken in May 2009. The Ecological Water Requirements (EWR) at site C24J was based on the natural flow contribution from the total upstream catchment. C2H018Q01 monitoring point was used as a monitoring point for water quality.

7.2.8 SECTION 27 (1)(H) INVESTMENT ALREADY MADE AND TO BE MADE BY THE WATER USER IN RESPECT OF THE WATER USE IN QUESTION

Tau Lekoa has invested significantly in their mining and processing activities in terms of gold production with the project initiating financial benefit to both the surrounding areas as well as the existing workers that depend on the mining operations for their livelihood. Tau Lekoa has also invested in the re-development of the Weltevreden shaft, as well as various specialist studies and a public participation process for the WUL Application.

7.2.9 SECTION 27 (1)(I) THE STRATEGIC IMPORTANCE OF THE WATER USE TO BE AUTHORISED

The strategic importance of the water uses to be authorised includes:

- Securing jobs and additional job creation in future;
- Contingency of training programmes provided to employees and external learner-ship programmes to improve skills base;
- Support to local economy and national economy with purchasing of services and goods;
- Continued production of gold for the gold industry; and
- Contingency of LED projects in conjunction with local municipality to the benefit and growth of local community.

7.2.10 SECTION 27 (1)(J) THE QUALITY OF WATER IN THE WATER RESOURCE WHICH MAY BE REQUIRED FOR THE RESERVE AND FOR MEETING INTERNATIONAL OBLIGATIONS

The water quality of the Vaal River is impacted on by mining activities in the Schoonspruit, Koekemoerspruit and Sand-vet systems in the Middle Vaal WMA. The sources are mine dewatering, discharges and seepage from tailings dams located close to the Vaal River. There are, however, large areas of the catchment where runoff water quality is good. Runoff water then serves as dilution water, which results in an acceptable water quality towards the Bloemhof dam.

The Middle Vaal is part of the Vaal River system. The Vaal River forms the main tributary to the Orange River and originates on the plateau west of the Drakensburg escarpment and drains much of the central Highveld of South Africa. The Vaal River is the most developed and regulated River in South Africa. A particular characteristic of the Orange /Vaal WMA is the extensive transfer of water within the WMA, as well as the inter-basin transfers between adjoining WMA. It is, therefore, imperative that the quality of water is improved in order to meet the demands of the catchment.

7.2.11 SECTION 27 (1) (K) THE PROBABLE DURATION OF ANY UNDERTAKING FOR WHICH A WATER USE IS TO BE AUTHORISED

The mining of the gold reef Tau Lekoa and at the Weltevreden shaft will provide the mine with a Life of Mine (LOM) for a period of 10 years. It is, therefore, proposed that the licence be issued for a period of at least twenty (20) years due to the long-term water management measures that are required to be put in place.

7.3 KEY COMMITMENTS

The Applicant is committed to implementing and reviewing the IWWMP action plan included into this document (Refer to 6.6 above).

8 REFERENCES

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