HYDROLOGICAL ASSESSMENT FOR THE PROPOSED HARMONY WEST WITS RECLAMATION AND DEPOSITION PROJECT

Version 2

24 JULY 2026

PROJECT NO. EIM-022

HYDROLOGIC CONSULTING

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HYDROLOGICAL ASSESSMENT FOR THE PROPOSED HARMONY WEST WITS RECLAMATION AND DEPOSITION PROJECT

Prepared For

EIMS (PTY) LTD

On Behalf Of

RANDFONTEIN ESTATES LIMITED

Prepared By

HYDROLOGIC CONSULTING (PTY) LTD

PROJECT NO. EIM-022

VERSION 2

24 JULY 2026

TABLE OF CONTENTS

1 INTRODUCTION 1
1.1 SCOPE OF WORK 1
1.2 PROJECT DESCRIPTION 1
1.3 REGIONAL SETTING AND LAYOUT 2
1.3.1 EXPERTISE OF PRIMARY AUTHOR AND DECLARATION OF INDEPENDENCE 3
2 BASELINE ENVIRONMENT 6
2.1 RAINFALL 6
2.2 1-DAY DESIGN RAINFALL DEPTHS 6
2.3 EVAPORATION 8
2.4 AVERAGE CLIMATE 8
2.5 TERRAIN 9
2.6 HYDROLOGY 11
2.7 SOILS, VEGETATION, AND LAND-COVER 11
3 APPLICABLE GUIDANCE 14
3.1 NATIONAL WATER ACT 14
3.2 DEPARTMENT OF WATER AND SANITATION NOTICE 4167 OF 2023 14
3.3 GN 704 15
3.3.1 IMPORTANT DEFINITIONS IN GN 704 15
3.3.2 APPLICABLE CONDITIONS IN GN 704 16
4 IDENTIFIED SITE SENSITIVITIES 18
5 HYDROLOGICAL IMPACTS AND MITIGATION MEASURES 23
5.1 METHOD OF ASSESSING IMPACTS 23
5.1.1 DETERMINATION OF ENVIRONMENTAL RISK 23
5.1.2 IMPACT PRIORITISATION 25
5.2 PROJECT PHASES 27
5.3 IDENTIFIED SURFACE WATER IMPACTS 27
5.3.1 EROSION OF SOILS 28
5.3.2 POLLUTANTS ENTERING THE SURFACE WATER ENVIRONMENT 30
5.3.3 DECREASE IN RUNOFF 35
5.3.4 FLOOD RISK 37
5.4 ALTERNATIVE LINEAR INFRASTRUCTURE ASSESSMENT 39
5.5 ADDITIONAL CONSIDERATIONS 39
6 ASSUMPTIONS AND LIMITATIONS 40
7 SURFACE WATER MONITORING 42
7.1 MONITORING PROGRAMME 42
8 CONCLUSION AND RECOMMENDATIONS 44
9 REFERENCES 47

LIST OF FIGURES

FIGURE 1-1: REGIONAL SETTING 4
FIGURE 1-2: LAYOUT 5
FIGURE 2-1: WEATHER STATIONS AND MEAN ANNUAL PRECIPITATION 7
FIGURE 2-2: AVERAGE MONTHLY CLIMATE FOR THE SITE (WEST-WITS) 9
FIGURE 2-3: HYDROLOGY AND TERRAIN 10
FIGURE 2-4: SOIL AND VEGETATION 12
FIGURE 2-5: LAND-COVER 13
FIGURE 4-1: SITE SENSITIVITIES (SURFACE WATER ENVIRONMENT) (WEST WEST-WITS) 20
FIGURE 4-2: SITE SENSITIVITIES (SURFACE WATER ENVIRONMENT) (CENTRAL WEST-WITS) 21
FIGURE 4-3: SITE SENSITIVITIES (SURFACE WATER ENVIRONMENT) (EAST WEST-WITS) 22
FIGURE 6-1: SURFACE WATER MONITORING 43

LIST OF TABLES

TABLE 2-1: AVERAGE MONTHLY RAINFALL DISTRIBUTION (PEGRAM, 2016) 6
TABLE 2-2: 24-HOUR STORM DEPTH 8
TABLE 2-3: AVERAGE MONTHLY A-PAN EQUIVALENT EVAPORATION 8
TABLE 5-1: CRITERIA FOR DETERMINING IMPACT CONSEQUENCE 24
TABLE 5-2: PROBABILITY SCORING 24
TABLE 5-3: DETERMINATION OF ENVIRONMENTAL RISK 25
TABLE 5-4: SIGNIFICANCE CLASSES 25
TABLE 5-5: CRITERIA FOR DETERMINING PRIORITISATION 26
TABLE 5-6: DETERMINATION OF PRIORITISATION FACTOR 26
TABLE 5-7: FINAL ENVIRONMENTAL SIGNIFICANCE RATING 26
TABLE 5-8: EROSION OF SOILS (CONSTRUCTION & REHAB/CLOSURE PHASE) 29
TABLE 5-9: EROSION OF SOILS (OPERATIONAL & DECOMMISSIONING PHASE) 29
TABLE 5-10: POLLUTANTS ENTERING THE SURFACE WATER ENVIRONMENT (CONSTRUCTION PHASE) 31
TABLE 5-11: POLLUTANTS ENTERING THE SURFACE WATER ENVIRONMENT (OPERATIONAL PHASE) 32
TABLE 5-12: POLLUTANTS ENTERING THE SURFACE WATER ENVIRONMENT (DECOMMISSIONING PHASE) 33
TABLE 5-13: POLLUTANTS ENTERING THE SURFACE WATER ENVIRONMENT (REHABILITATION/CLOSURE PHASE) 34
TABLE 5-14: DECREASE IN RUNOFF (CONSTRUCTION, OPERATION, & DECOMMISSIONING PHASE) 36
TABLE 5-15: DECREASE IN RUNOFF (REHABILITATION/CLOSURE PHASE) 36

TABLE 5-16: RIVER AND SURFACE WATER FLOOD RISK 38
TABLE 6-1: ADDITIONAL MONITORING POINTS RECOMMENDED 42

1 INTRODUCTION

Hydrologic Consulting has been appointed by Environmental Impact Management Services (Pty) Ltd (EIMS) to undertake a hydrological assessment for Randfontein Estates Limited (a subsidiary of Harmony Gold Mining Company) (hereafter referred to as the applicant), for the proposed new Deelkraal II Tailings Storage Facility (TSF) project and associated infrastructure (**refer to Section 1.3**) on a site located approximately 13 km southwest of Carletonville in the Merafong City Local Municipality, West Rand District Municipality, Gauteng Province (i.e., the Proposed Harmony West Wits Reclamation and Deposition Project).

This report will evaluate the hydrological impact of the proposed infrastructure relevant to the National Environmental Management Act (Act No. 107 of 1998), Department of Water and Sanitation Notice 4167 of 2023, and Government Notice 704 (Government Gazette 20118 of June 1999).

1.1 SCOPE OF WORK

The scope of work included in this study is as follows:

- Baseline Assessment – sourcing of baseline climatic and hydrological data. This included the interrogation of rainfall data, site-specific design rainfall (depth/duration/frequency), evaporation, soils, terrain, and land use, as well as a regional and local hydrological assessment.
- Site Examination – a site visit was conducted by Hydrologic Consulting on the 4th and 5th of February 2026;
- Hydrological Impact Assessment – this was undertaken using a recognised risk assessment methodology developed to enable effective communication of the potential consequences or impacts of activities on the hydrological (surface water) environment; and
- A technical report detailing the achieved scope of work (this report).

1.2 PROJECT DESCRIPTION

The following project description outlines the proposed works.

The applicant is a subsidiary of Harmony Gold Mining Company, which owns and operates numerous Gold Mines and Plants in the West Wits region in the Gauteng Province. One specific option to commence at the Feasibility level is to license and authorise the construction of the future Deelkraal II Tailings Storage Facility (TSF) to cater for the additional future capacity. This TSF will receive residue from Kusasalethu and Savuka plants and will also assist in returning process water for reclaiming the existing Deelkraal 1 TSF and Kusasalethu TSF for processing at the Kusasalethu plant.

To accommodate the West Wits region's planned Life of Mine (LOM), which exceeds current tailings deposition limits, the applicant proposes constructing the Deelkraal II Tailings Storage Facility (TSF). The proposed 430-hectare facility will be located on Harmony-owned land adjacent to the dormant Deelkraal 1 TSF.

The project is driven by the West Wits Reclamation Concept Study (SGS Bateman, 2024) to recycle historic gold tailings. Based on metallurgical testwork indicating higher accessible gold grades, the Deelkraal 1 TSF will be reclaimed first, followed by the Kusasalethu TSF. These materials will be processed at the Kusasalethu Plant, which will be upgraded to handle 500,000 tonnes per month (tpm). Concurrently, the Savuka Plant treats dormant tailings at a rate of 330,000 tpm.

The new Deelkraal II TSF will receive residue from both the Kusasalethu and Savuka plants. It will simultaneously assist in returning process water required for reclaiming the existing Deelkraal 1 and Kusasalethu TSFs. To support these operations, planned infrastructure includes a return water dam, pump stations, a power line, access roads, and dedicated pipelines for slurry, potable water, sewage, and return water.

1.3 REGIONAL SETTING AND LAYOUT

The proposed Harmony West Wits Reclamation and Deposition Project (hereafter also referred to as the 'site') is located at 26° 26' 34" S and 27° 20' 17" E. The regional setting is illustrated in **Figure 1-1,** while the layout of the site is presented in **Figure 1-2**.

The site encompasses the Savuka, Mponeng, Deelkraal I, Proposed Deelkraal II, and Kusasalethu TSFs and includes the following associated infrastructure:

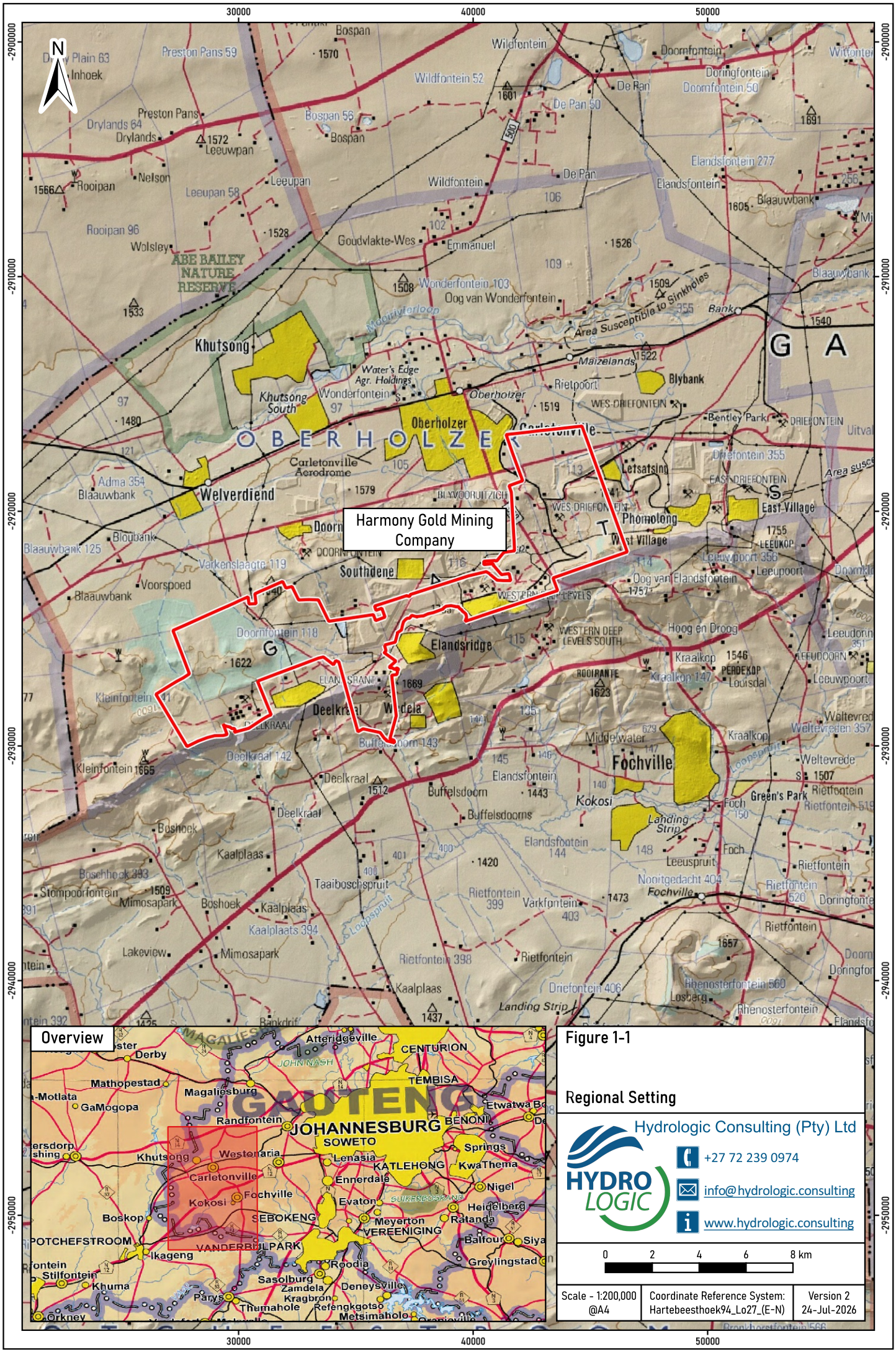
- Return Water Dam (RWD) (Near Deelkraal II TSF);
- Kusasalethu Plant Upgrades (nex/upgrade of gold and new uranium sections);
- Slurry Pipelines
  - Reclaimed Slurry from Deelkraal I to Kusasalethu (~10.6km);
  - Kusasalethu Barren Tailings to Deelkraal II and booster pump station (~10.2km);
  - Reclaimed Slurry from Kusasalethu TSF to Kusasalethu Plant (~2 km);
  - Slurry pipeline from Kusasalethu Plant to Savuka TSF (~4.97 km); and
  - Slurry pipeline from Savuka plant to DF5 TSF (~2.9 km)
- Power Lines
  - Powerline from Kusasalethu Plant to the existing Deelkraal TSF (~9.2 km);
  - Powerline from Kusasalethu Plant to the Kusasalethu TSF (~1.8 km);
  - Powerline from Savuka shaft to Kusasalethu Plant (~8.1km);
- Potable Water Pipelines
  - Rand Water supply point to the Deelkraal TSF (~8.52 km)
- Process Water Pipelines
  - Process Water Feed from Kusasalethu Plant to Deelkraal Reclamation(~9.54 km);
  - Return Water Feed to Kusasalethu Process Water Tank (~9.58 km);
  - Driefontein DP2 Pump Station to North Boundary Dam (~4.78km);
  - DP2 feed to Tau Tona Reverse Osmosis Plant (~0.1km);
  - Nursery Pumpstation #3 to Kusasalethu Process Water Tank (~9 km); and
  - 2 Process Water pipelines from Kusasalethu Plant to Savuka White Tanks (~8 km).
- Pump Station (Deelkraal I TSF Reclamation & Kusasalethu TSF Reclamation);
- Access Roads (2x 3.5 m double road) adjacent to pipeline routes/OH lines and around Deelkraal II TSF (where no access road is currently in place);
- Topsoil Stockpile and overburden stockpiles;
- Ancillary construction infrastructure (including workshops and laydown areas).

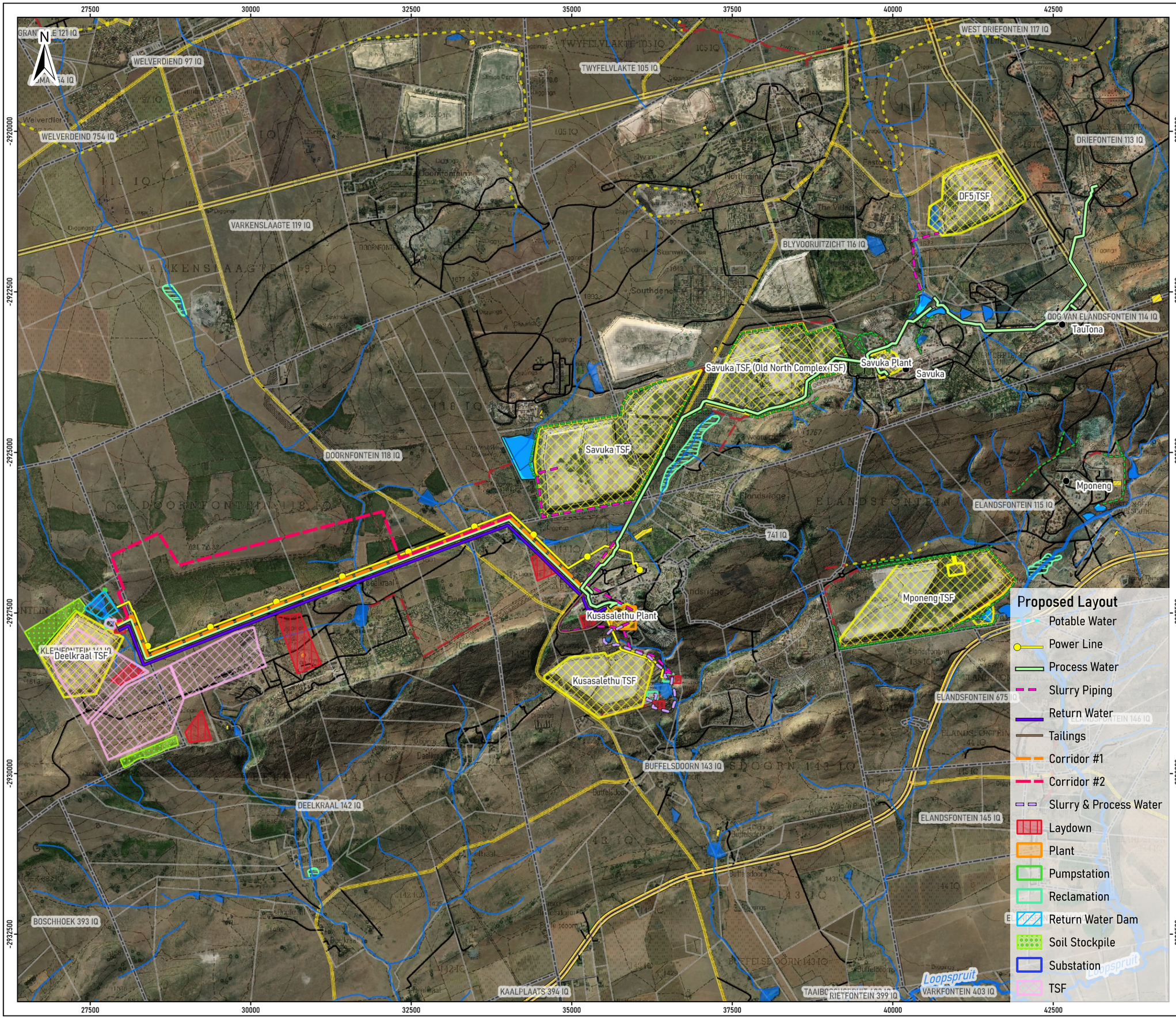
All pipelines listed above will be flanged steel pipelines installed above-ground on pre-cast concrete plinths, and two 3.5 m wide access roads (double road), adjacent to the pipelines, will be cleared/graded to provide access for construction, maintenance, and inspections (for areas where no access road is already in place). The diameter of the pipelines will be confirmed in the EIA phase once further design information becomes available.

1.3.1 EXPERTISE OF PRIMARY AUTHOR AND DECLARATION OF INDEPENDENCE

As the lead consultant for this assessment, Mark Bollaert brings over 17 years of specialised hydrological experience across the UK and South Africa. After completing his Master's in Hydrology at the University of KwaZulu-Natal, he achieved several professional charters, including Pr.Sci.Nat (South Africa), and CSci, CEnv, and C.WEM (UK), reflecting a commitment to ongoing professional development.

To ensure impartiality, both Hydrologic Consulting and Mr. Bollaert declare full independence. Their involvement is limited to providing objective, expert analysis, free from any conflicting financial or personal interests in the project's outcome.


30000
40000
50000
-2900000
-2910000
-2920000
-2930000
-2940000
-2950000
N
Harmony Gold Mining Company
Overview
GAUTENG
JOHANNESBURG
CENTURION
TEMBISA
SOWETO
KATLEHONG
Khutsong
Carletonville
Fochville
Kokosi
Westonaria
Randfontein
Magaliesburg
Mathopestad
GaMogopa
Derby
Atteridgeville
Springs
Nigel
Heidelberg
Ratanda
Balfour
Greylingstad
Sasolburg
Zamdela
Deneysville
Parys
Vanderbijlpark
Vereeniging
Sebokeng
Boskop
Potchefstroom
Ikageng
Khuma
Stilfontein
Orkney
Klerksdorp
Lenasia
Ennerdale
Evaton
Meyerton
Roodia
Kragbron
Thumahole
Refengkgotso
Metsimaholo
Figure 1-1
Regional Setting
Hydrologic Consulting (Pty) Ltd
+27 72 239 0974
info@hydrologic.consulting
www.hydrologic.consulting
0 2 4 6 8 km
Scale - 1:200,000 @A4
Coordinate Reference System: Hartebeesthoek94_Lo27_(E-N)
Version 2
24-Jul-2026



Legend

Existing TSF

- Existing TSF
- Trenches (Mponeng)
- Shafts (Mponeng)

Rivers

- Any Other Channel (50K Topo)
- Furrow (50K Topo)
- Non-Perennial River (50K Topo)
- Perennial River (50K Topo)

Roads

- Main Road (50K Topo)
- National Road (50K Topo)
- Other Road (50K Topo)
- Secondary Road (50K Topo)

Dams

- Dam (50K Topo)
- Non-perennial pan (50K Topo)
- Open Reservoir (50K Topo)
- Vlei (50K Topo)
- Dams (Mponeng)
- Pollution Dams (Mponeng)
- Parent Farm
- Farm Portion

Figure 1-2

Layout

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0 1 2 3 km

Scale - 1:55,000 @A3	Coordinate Reference System: Hartebeesthoek94_Lo27_(E-N)	Version 2 24-Jul-2026

2 BASELINE ENVIRONMENT

Baseline information in this section includes discussions on the rainfall, evaporation, design event rainfall, soils, vegetation, and land cover, as well as site topography and regional and local catchment hydrology.

2.1 RAINFALL

Various weather stations managed by both the South African Weather Services (SAWS) and the Department of Water and Sanitation (DWS) were considered in this project. These, together with their proximity to the site, can be seen in **Figure 2-1**.

South African Weather Services (SAWS) and Department of Water and Sanitation (DWS) stations are located near the site. SAWS data requires purchasing, and alternative sources of average monthly site-specific data were instead utilised, sourced from Pegram (2016). **Table 2-1** presents the summary of the site-specific average monthly rainfall distribution, while **Figure 2-1** illustrates the variation in rainfall in the region.

TABLE 2-1: AVERAGE MONTHLY RAINFALL DISTRIBUTION (PEGRAM, 2016)

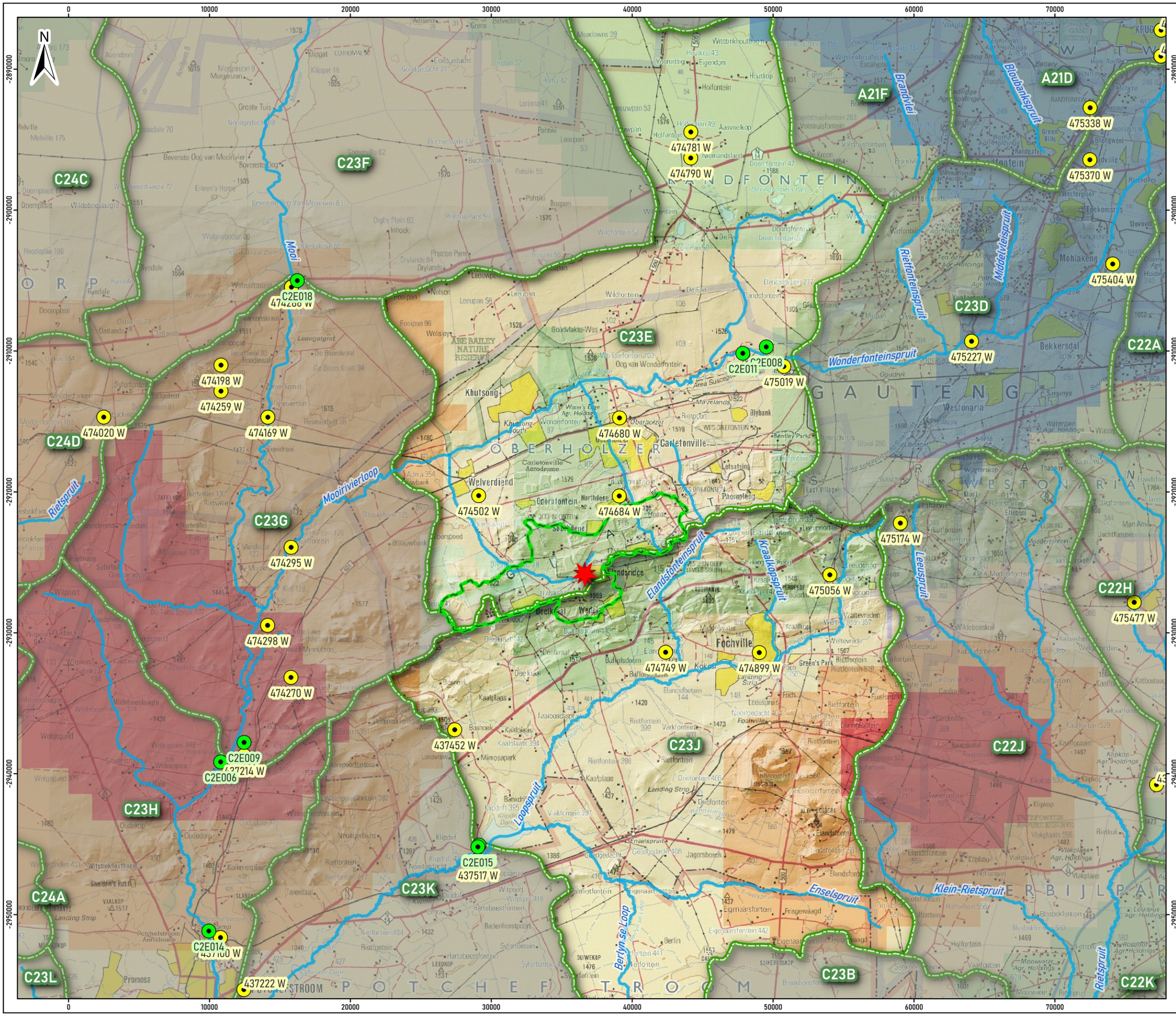
Month	Rainfall (mm)
Jan	113
Feb	91
Mar	83
Apr	44
May	19
Jun	7
Jul	6
Aug	8
Sep	19
Oct	59
Nov	88
Dec	101
Total	**640**

**Estimates were sourced at the centre of the site.*

2.2 1-DAY DESIGN RAINFALL DEPTHS

For the development of a stormwater management plan and assessment of flooding, design rainfall is the most important rainfall variable to consider, as it is the driver behind peak flows.

Design rainfall estimates for various recurrence intervals (RI) and storm durations were sourced from the Design Rainfall Estimation Software for South Africa (DRESSA), developed by the University of Natal (which has since been incorporated into the University of KwaZulu-Natal) in 2002 as part of a WRC project K5/1060 (Smithers and Schulze, 2002). This method uses a Regional L-Moment Algorithm (RLMA) in conjunction with a Scale Invariance approach to provide site-specific estimates of design rainfall (depth, duration, and frequency), based on surrounding station records. WRC Report No. K5/1060 (WRC, 2002) provides more detail on the verification and validation of the method. **Table 2-2** presents the 24-hour storm depths for various recurrence intervals.



Legend

- Quaternary Catchment
- Area of Hydrological Relevance
- Project Site Central Point
- SAWS
- DWS
- Rivers (500K Topo)

Mean Annual Precipitation (mm)

- <= 550
- 550 - 585
- 585 - 620
- 620 - 655
- > 655

Figure 2-1

Mean Annual Precipitation

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0 4 8 12 km

Scale - 1:250,000 @A3	Coordinate Reference System: Hartebeesthoek94_Lo27_(E-N)	Version 2 24-Jul-2026

TABLE 2-2: 24-HOUR STORM DEPTH

Recurrence Interval (Years)	Rainfall Depth (24-hour) (mm)
2	62.2
5	83
10	96.9
20	110.4
50	128.1
100	141.5
200	154.9

* Estimates were sourced for the area of hydrological relevance.

2.3 EVAPORATION

Evaporation data was sourced from the South African Atlas of Climatology and Agrohydrology (Schulze and Lynch, 2006) in the form of A-Pan equivalent potential evaporation[1]. The average monthly evaporation distribution is presented in **Table 2-3** and shows that the sites have an annual potential evaporation of 2,246 mm.

TABLE 2-3: AVERAGE MONTHLY A-PAN EQUIVALENT EVAPORATION

Month	Evaporation (mm)
Jan	236
Feb	191
Mar	181
Apr	150
May	129
Jun	102
Jul	118
Aug	163
Sep	220
Oct	258
Nov	247
Dec	251
Total	**2,246**

**Estimates were sourced at the centre of the site.*

2.4 AVERAGE CLIMATE

The average climate for the site is presented in **Figure 2-2** using the outcome of the investigation into rainfall and evaporation for the site. The combination of rainfall (Pegram, 2016) and evaporation and temperature (Schulze and Lynch, 2006) results in a temperate climate with dry winters and warm, wet summers according to the Köppen-Geiger climate classification[2].

[1] *Schulze* and *Lynch (2006) is the latest available dataset (Atlas, 2006) providing mean A-Pan Evaporation and Temperature data (1950-1999). The regional grids provide data that is not supplanted by newer remote sensed data.*

[2] *http://stepsa.org/climate_koppen_geiger.html*

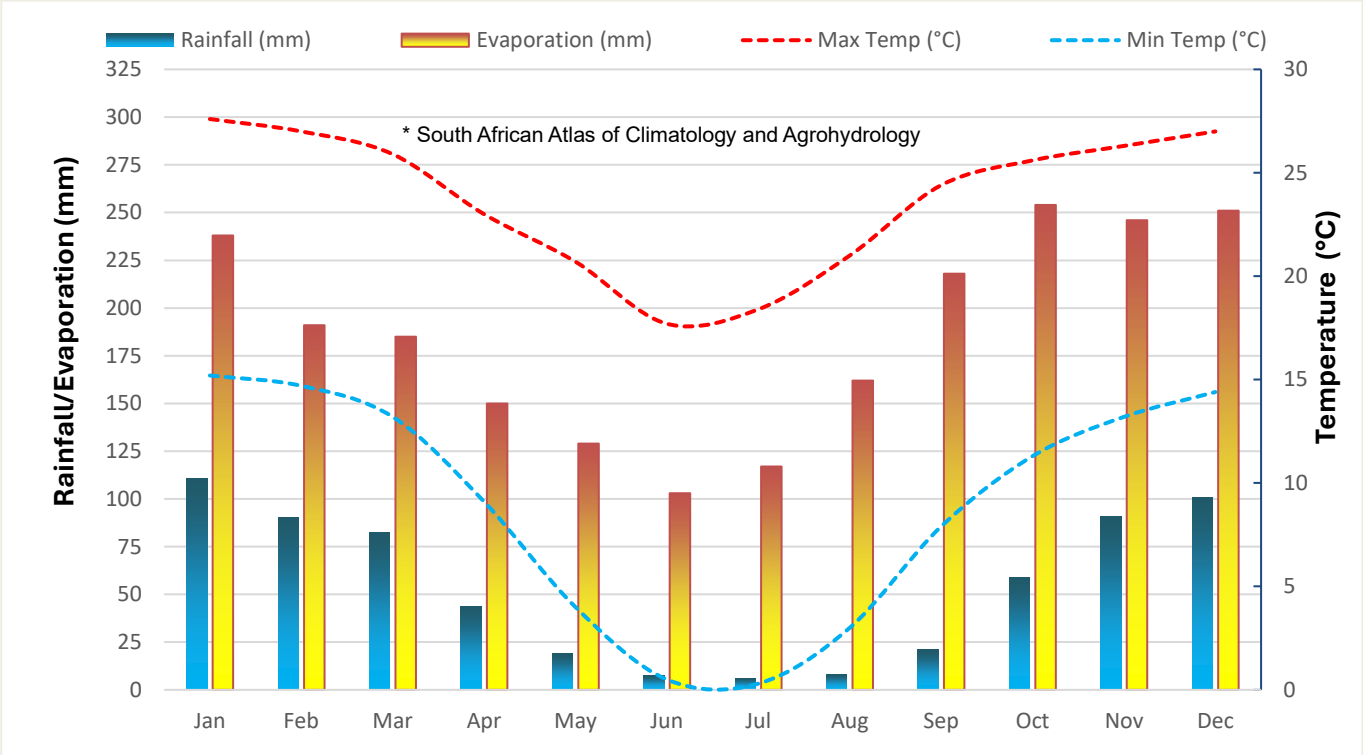


FIGURE 2-2: AVERAGE MONTHLY CLIMATE FOR THE SITE (WEST-WITS)

2.5 TERRAIN

Three terrain datasets were used to assess the terrain of the site and its surrounds, namely:

1. A 0.5 m digital terrain model (DTM) derived from the client-provided 2023 LiDAR point cloud dataset;
2. A 30 m DSM global digital surface model (DSM)[3]; and
3. National Geospatial Institute (NGI) 5 m contours.

Figure 2-3 illustrates the elevation datasets utilised.

To characterise the topography of the study area, both regional and high-resolution local datasets were utilised. Regional terrain was assessed using the Copernicus 30 m Digital Surface Model (COP30 DSM) and 5 m contours sourced from the National Geo-spatial Information (NGI) 1:50,000 topographical maps. The 30 m COP30 DSM provides a reliable, generalised representation of the broader landscape and was used to delineate sub-catchments and establish the Area of Hydrological Relevance (AHR) (**Figure 2-3**). The NGI contours were used to provide supplementary topographic context. For detailed, localised analysis within the site footprint, a high-resolution 0.5 m LiDAR-derived Digital Terrain Model (DTM) was employed, offering the bare-earth precision required to accurately assess micro-drainage dynamics.

Ground elevations of the site are approximately 1,500 m to 1,711 m AMSL.

Figure 2-3 also includes a calculation of slope with the site predominantly exhibiting slopes below 10%; however, the areas with existing TSFs are generally more undulating, with some slopes here falling between 10-30%.

[3] *https://www.eorc.jaxa.jp/*

30000 35000 40000

-2920000 -2925000 -2930000 -2935000

N

DF5 TSF
TauTona
Savuka Plant
Savuka
Savuka TSF (Old North Complex TSF)
Savuka TSF
Mponeng
Mponeng TSF
Kusasalethu Plant
Kusasalethu TSF
Deelkraal TSF

Legend

- Area of Hydrological Relevance
- Existing TSF
- Trenches (Mponeng)
- Shafts (Mponeng)
- Any Other Channel (50K Topo)
- Furrow (50K Topo)
- Non-Perennial River (50K Topo)
- Perennial River (50K Topo)
- Dam (50K Topo)
- Non-perennial pan (50K Topo)
- Open Reservoir (50K Topo)
- Vlei (50K Topo)
- Dams (Mponeng)
- Pollution Dams (Mponeng)
- 100m Watercourse Buffer (DWS)
- 500m Vlei/Pan Buffer (DWS)

Elevation (m AMSL)

1 711

1 500

- 0.5m Survey Extent
- 10m Contour (0.5m DTM Derived)
- 10m Contour (30m DSM Derived)

Proposed Layout

- Potable Water
- Power Line
- Process Water
- Slurry Piping
- Return Water
- Tailings
- Corridor #1
- Corridor #2
- Slurry & Process Water
- Laydown
- Plant
- Pumpstation
- Reclamation
- Return Water Dam
- Soil Stockpile
- Substation
- TSF

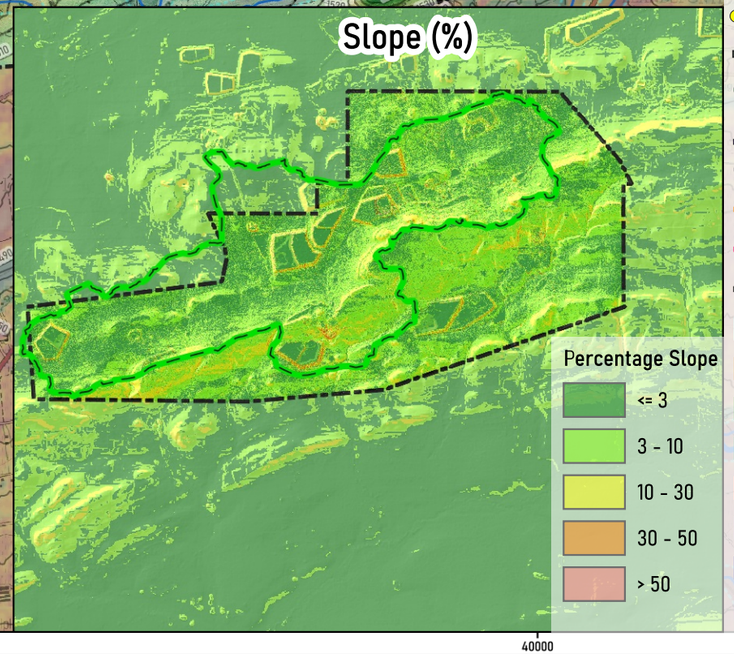


Figure 2-3

Terrain and Hydrology

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0 0.9 1.8 2.7 km

Scale - 1:55,000 @A3	Coordinate Reference System: Hartebeesthoek94_Lo27_(E-N)	Version 2 24-Jul-2026

2.6 HYDROLOGY

The hydrological setting of the site and the defined Area of Hydrological Relevance (AHR) are illustrated in **Figure 2-3**, whilst **Figure 2-1** presents the regional river network. The site falls primarily within Quaternary catchments C23E and C23J, with the AHR extending into catchment C23G across an approximate area of 80 km^2. The AHR represents the area from which rainfall and runoff contribute to drainage within the northern and southern river systems of interest. Perennial rivers within the study area include the Wonderfonteinspruit and Mooirivierloop (C23E) and the Elandsfonteinspruit (C23J), the latter of which, together with the Kraalkopspruit to the south-east, drains as a tributary into the Loopspruit River to the south of the site.

The northern drainage system is characterised by vleis along the Mooirivierloop, several dams, and furrows conveying runoff from the greater Mponeng Operation towards non-perennial rivers to the west. The southern system contains two larger dams, one being the proposed return water dam for the Mponeng TSF, and two further dams to the west, one of which is the proposed alternative return water dam location south of the proposed Deelkraal TSF, situated at the headwaters of a non-perennial tributary to the Loopspruit River. All hydrological features are presented in accordance with NGI 1:50,000 topographical map data, and no reclassification is intended.

All hydrological features have been presented according to the NGI's 1:50,000 topographical map data, and this report does not intend to alter their classification. This report also does not delineate or comment on the significance of any wetlands/vleis – consideration of this would require a wetland specialist. The NGI's 1:50,000 vleis are used for indicative purposes.

2.7 SOILS, VEGETATION, AND LAND-COVER

In considering the Soil Conservation Service for South Africa (SCS-SA) dataset of the area of hydrological relevance, soils are classified as being in hydrological soil group C (moderately high runoff potential). The TSFs have, however, covered the site's original soil. TSF soil conditions are expected to have high runoff potential.

The natural vegetation of the site is classified as Gauteng Shale Mountain Bushveld (according to SANBI, 2018). 'Grassland' is predominant over the area of hydrological relevance, followed by 'Forested Land', and 'Mines and Quarries', with most occurring in the study area according to the Department of Forestry, Fisheries and the Environment (DFFE's) 2022 land-cover dataset. 'Forested Land' and 'Built-up' are secondary land-covers surrounding the study area infrastructure.

The distributions of the SCS soil types and natural vegetation are illustrated in **Figure 2-4,** while **Figure 2-5** presents the land-cover at the site.

30000 35000 40000 45000

-2920000 -2925000 -2930000 -2935000

N

C23E

C23G

C23J

C23K

Kraalkloofspruit

Loopspruit

SCS Soils

Legend

- Quaternary Catchment
- Area of Hydrological Relevance
- Any Other Channel (50K Topo)
- Furrow (50K Topo)
- Non-Perennial River (50K Topo)
- Perennial River (50K Topo)

SANBI Vegetation Atlas (2018)

- Andesite Mountain Bushveld
- Carletonville Dolomite Grassland
- Gauteng Shale Mountain Bushveld
- Rand Highveld Grassland

SCS Soils Runoff Potential

- B/C - Moderately Low to Moderately High Runoff Potential
- C - Moderately High Runoff Potential

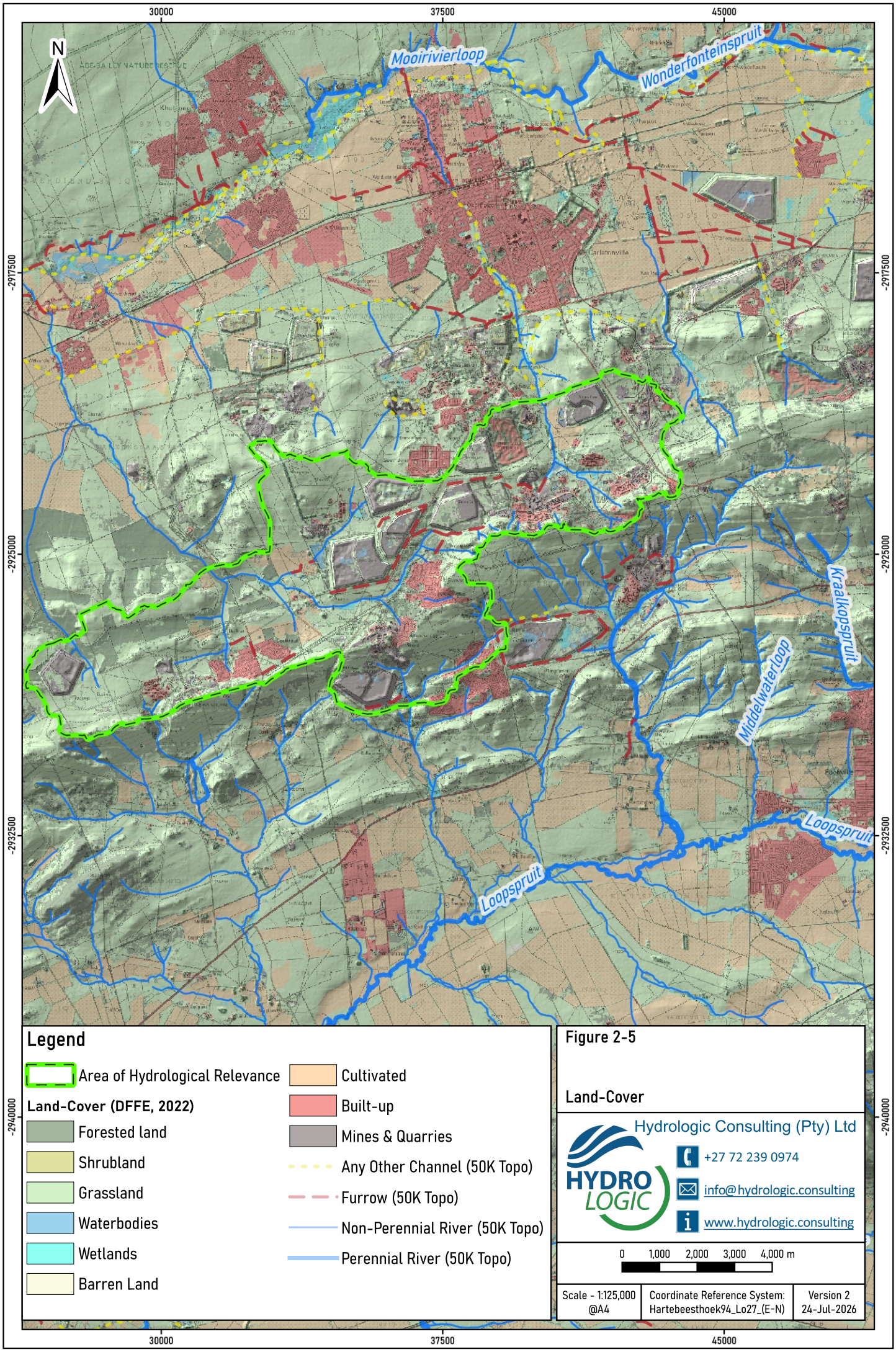
Figure 2-4

Vegetation and Soil Runoff Potential

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0 1 2 3 km

Scale - 1:70,000 @A3	Coordinate Reference System: Hartebeesthoek94_Lo27_(E-N)	Version 2 24-Jul-2026


30000
37500
45000
-2917500
-2925000
-2932500
-2940000
N
Mooirivierloop
Wonderfonteinspruit
Kraalkopspruit
Middelwaterloop
Loopspruit
Loopspruit
Legend
Area of Hydrological Relevance
Land-Cover (DFFE, 2022)
Forested land
Shrubland
Grassland
Waterbodies
Wetlands
Barren Land
Cultivated
Built-up
Mines & Quarries
Any Other Channel (50K Topo)
Furrow (50K Topo)
Non-Perennial River (50K Topo)
Perennial River (50K Topo)
Figure 2-5
Land-Cover
Hydrologic Consulting (Pty) Ltd
HYDRO LOGIC
+27 72 239 0974
info@hydrologic.consulting
www.hydrologic.consulting
0 1,000 2,000 3,000 4,000 m
Scale - 1:125,000 @A4
Coordinate Reference System: Hartebeesthoek94_Lo27_(E-N)
Version 2 24-Jul-2026

3 APPLICABLE GUIDANCE

The guidance that informs the hydrological assessment outlined in this report includes the following:

- National Environmental Management Act (Act No. 107 of 1998) as amended, states that "Every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring…"
- National Water Act (Act No. 36 of 1998) includes Section 21 water uses, which require authorisation from the Department of Water and Sanitation (DWS).
- Department of Water and Sanitation Notice 4167 of 2023 provides clarity on the regulated area of a watercourse;
- Government Notice 704 (Government Gazette 20118 of June 1999) provides regulations on the use of water for mining and related activities aimed at the protection of water resources;
- Department of Water and Sanitation (DWS) Best Practice Guideline G1 for Stormwater Management;
- Landcom Soils and Construction, Volume 1, 4th edition from 2004 (otherwise known as the Blue Book) has been widely used in the South African context in providing practical recommendations regarding the management of stormwater and associated erosion controls; and
- The South African Roads Agency Limited (SANRAL) 6th edition Drainage Manual (2013) provides some valuable insight specific to the construction and operation of roads.

3.1 NATIONAL WATER ACT

Definitions applicable to the identification of Section 21 water uses as defined by the National Water Act (Act No 36 of 1998) consist of:

- *"Watercourse"* including:
  - a river or spring;
  - a natural channel in which water flows regularly or intermittently; or
  - a wetland, lake, or dam into which, or from which, water flows.
- *"Water resource"* – which includes a watercourse, surface water, estuary, or aquifer;
- "*Waste*'' – which includes any solid material or material that is suspended, dissolved, or transported in water (including sediment) and which is spilled or deposited on land or into a water resource in such volume, composition, or manner as to cause, or to be reasonably likely to cause, the water resource to be polluted;

Section 21 water uses are not reviewed in this report, with EIMS undertaking to identify and authorise these.

3.2 DEPARTMENT OF WATER AND SANITATION NOTICE 4167 OF 2023

DWS Notice 4167 of 2023 "General Authorisation in Terms of Section 39 of the National Water Act 36 of 1998 for Water Uses as defined in Section 21(c) or Section 21(i)" includes the following:

- **Regulated area of a watercourse** – for section 21(c) or (i) of the Act, water uses in terms of this Notice means:

(a) The outer edge of the 1 in 100-year flood line or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, dams, or lakes;

(b) In the absence of a determined 1 in 100-year flood line or riparian area as contemplated in (a) above, the area within 100m distance from the edge of a watercourse, where the edge of the watercourse (excluding flood plains) is the first identifiable annual bank fill flood bench (subject to compliance with section 144 of the National Water Act 36 of 1998);

(c) In respect of a wetland: a 500 m radius around the delineated boundary (extent) of any wetland (including pans);

Where the applicable Section 21 water uses per the above are as follows:

- ***Section 21 (c)*** – impeding or diverting the flow of water in a watercourse;
- ***Section 21 (i)*** – altering the bed, banks, course, or characteristics of a watercourse.

3.3 GN 704

The Department of Water Affairs and Forestry (now the Department of Water and Sanitation) established GN 704 to provide regulations on the use of water for mining and related activities aimed at the protection of water resources.

3.3.1 IMPORTANT DEFINITIONS IN GN 704

- **Activity**: (a) any mining-related process on the mine, including the operation of washing plants, mineral processing facilities, mineral refineries, and extraction plants, and (b) the operation and the use of mineral loading and off-loading zones, transport facilities, and mineral storage yards, whether situated at the mine or not.
    - (i) in which any substance is stockpiled, stored, accumulated, or transported for use in such process; or
    - (ii) out of which process any residue is derived, stored, stockpiled, accumulated, dumped, disposed of, or transported;

- **Clean water system:** This includes any dam, other form of impoundment, canal, works, pipeline, and any other structure or facility constructed for the retention or conveyance of unpolluted water.

- **Dirty water system:** This includes any dam, other form of impoundment, canal, works, pipeline, residue deposit, and any other structure or facility constructed for the retention or conveyance of water containing waste.

- **Dirty area:** This refers to any area at a mine or activity which causes, has caused, or is likely to cause pollution of a water resource (i.e., polluted water).

3.3.2 APPLICABLE CONDITIONS IN GN 704

The principal conditions of GN 704 applicable to the site are:

Condition 4 – Restrictions on locality – 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 the pollution of groundwater, or on water-logged ground, or on ground likely to become water-logged, undermined, unstable or cracked;

(b) except in relation to a matter contemplated in regulation 10 (i.e., Additional regulations relating to winning sand and alluvial minerals from watercourse or estuary), carry on any underground or opencast mining, prospecting, or any other operation or activity under or within the 1:50 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.

Condition 5 – Restrictions on use of material

No person in control of a mine or activity may use any residue or substance that causes or is likely to cause pollution of a water resource for the construction of any dam or other impoundment or any embankment, road, or railway, or for any other purpose that is likely to cause pollution of a water resource.

Condition 6 - Capacity requirements of clean and dirty water systems

Every person in control of a mine or activity must:

(a) confine any unpolluted water to a clean water system, away from any dirty area;

(b) 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;

(c) collect the water arising within any dirty area, including water seeping from mining operations. outcrops or any other activity, into a dirty water system;

(d) 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

(e) 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 Act.

(f) 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.

Condition 7 – Protection of water resources

Every person in control of a mine or activity must take reasonable measures to:

(a) prevent water containing waste or any substance which causes or is likely to cause pollution of a water resource from entering any water resource, either by natural flow or by seepage, and must retain or collect such substance or water containing waste for use, re-use, evaporation, or for purification and disposal in terms of the Act;

(b) design, modify, locate, construct, and maintain all water systems, including residue deposits, in any area so as to prevent the pollution of any water resource through the operation or use thereof and to restrict the possibility of damage to the riparian or in-stream habitat through erosion or sedimentation, or the disturbance of vegetation, or the alteration of flow characteristics;

(c) cause effective measures to be taken to minimise the flow of any surface water or floodwater into mine workings, opencast workings, other workings or subterranean caverns, through cracked or fissured formations, subsided ground, sinkholes, outcrop excavations, adits, entrances or any other openings;

(d) design, modify, construct, maintain, and use any dam or any residue deposit or stockpile used for the disposal or storage of mineral tailings, slimes, ash, or other hydraulic transported substances, so that the water or waste therein, or falling therein, will not result in the failure thereof or impair the stability thereof;

(e) prevent the erosion or leaching of materials from any residue deposit or stockpile from any area and contain material or substances so eroded or leached in such area by providing suitable barrier dams, evaporation dams, or any other effective measures to prevent this material or substance from entering and polluting any water resources;

(f) ensure that water used in any process at a mine or activity is recycled as far as practicable, and any facility, sump, pumping installation, catchment dam or other impoundment used for recycling water, is of adequate design and capacity to prevent the spillage, seepage or release of water containing waste at any time;

(g) at all times keep any water system free from any matter or obstruction which may affect the efficiency thereof; and

(h) cause all domestic waste, including wash-water, which cannot be disposed of in a municipal sewage system, to be disposed of in terms of an authorisation under the Act.

The Minister of the DWS may, in writing, authorise an exemption to instances of GN 704 non-compliance.

4 IDENTIFIED SITE SENSITIVITIES

Sensitivity mapping was undertaken to identify sensitive features relating to the hydrological (surface water) environment within the study area. A 1000 m buffer of the proposed Harmony West Wits Reclamation and Deposition Project (**refer to Section 1.3**) was used as the area under consideration.

The trenches provided by the client for the layout indicate that a trench is situated along the original furrow line, which connects the non-perennial river system. In accordance with the topographic 1:50,000 map, this required the use of the aerial imagery, which provided clarification on this. 'Any other channels' and 'furrows' that appeared not to have a hydrological upstream connection were included only when draining to a natural dam, as indicated by the 1:50,000 dam dataset DWS.

The Department of Water Affairs and Forestry (now the Department of Water and Sanitation) established GN 704 to provide regulations on the use of water for mining and related activities aimed at protecting water resources. This includes the following condition:

Condition 4 – Restrictions on locality – No person in control of a mine or activity may:

(e) 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 the pollution of groundwater, or on water-logged ground, or on ground likely to become water-logged, undermined, unstable or cracked;

The 100 m watercourse buffer is consequently one of the main guiding aspects in the assessment of site sensitivities given its relevance to GN 704, and its applicability to both flooding and the potential for contaminants to enter a watercourse (i.e., a wider river buffer is more likely to keep infrastructure/works outside of areas prone to regular or irregular flooding while enabling more time for containments within runoff, to settle out before entering the watercourse). A 100 m watercourse buffer distance is, however, limited in its application since the proposed works/infrastructure will either fall within or outside of the buffer distance, with no grading in site sensitivity possible. An expanded approach to the 100 m river buffer was consequently adopted, utilising a variation in buffer distances modelled by flooding and contour analysis.

Buffers have been derived from the 1:50,000 topographical map watercourse features. Open and closed reservoirs have been excluded on the basis that inflows are managed (and that there is no significant upslope catchment area of relevance). Watercourse buffers are technically applicable from the edge (top of bank) of the watercourse and not from the centreline (as in the case of rivers, drainage canals, and furrows). The absence of a channel survey means that the river/furrow centreline has nevertheless been used to define buffers.

The following sensitivity bands were classified:

- Prevent Development
    - A 32 m watercourse buffer (also applicable to NEMA activities) was used to define the functional area of the watercourse.
    - This 32 m buffer factors in the potential error in the 1:50,000 topographical map dataset.

  - All development should be prevented in this area unless water-compatible or otherwise crossing over a watercourse (with flood risk factored in).

- High
  - The 1:100 RI defined flood-line (Project EIM-021) applies to both GN 704's and DWS Notice 4167 of 2023. The 1:100 RI event is a conservative estimate (where more flooding is conservative).
  - A 100m buffer distance matches GN 704's and DWS Notice 4167 of 2023 prescribed buffer distance and is the minimum distance to a watercourse requiring motivation if works/infrastructure are going to be permitted, including a written exemption from the Minister of the Department of Water and Sanitation.
  - There is a strong disincentive towards development within this area.
- Medium
  - The 1:50 RI defined flood-line[4] GN 704's and DWS Notice 4167 of 2023. The 1:50 RI event is moderately conservative (where more flooding is conservative).
  - A 200m buffer distance was included as an intermediate buffer distance between the 100m buffer distance above and the 500m buffer distance below.
  - There is a medium disincentive towards development within this area.
- Low
  - A 500 m buffer distance is a reasoned maximum distance from a watercourse, which in most instances will reflect the largest distance over which flooding would need to be considered.
  - DWS Notice 4167 of 2023 also outlines how a 500 m buffer distance applies to wetlands (which includes pans and vleis as present in this study area). This report, however, does not focus on wetlands and only considers the 1:50,000 topographical map of rivers.
  - There is a low disincentive towards development within this area.
- Remainder (Unclassified):
  - There is no sensitivity classification for the remainder of the site.

GN 704 restricts development within 100 m of a watercourse (e.g., dam or river), and the above outline does not attempt to remove this restriction but is instead a high-level 'scaled' version of this buffer distance.

This classification only partly considers the 500 m wetland buffer that applies. This wetland buffer is expected to be more comprehensively assessed as part of a wetland survey of the site, and not the higher-level datasets present with the NGI's 1:50,000 topographical map dataset. No assessment of wetlands has been undertaken in this report.

Figures 4-1 to **4-3** present the results of the identified site sensitivities relating to the surface water environment. As mentioned in **Section 2.6**, hydrological features have been defined according to the NGI's 1:50,000 topographical map data, and this report does not intend to alter their classification.

[4] Project EIM-021

27500 30000 32500

-2925000 -2927500 -2930000

N

DOORNFONTEIN 118

KLEINFONTEIN

Diggings

Sinkhole

DEELKRAAL

Legend

- Existing TSF
- Other Road (50K Topo)
- Secondary Road (50K Topo)
- Furrow (50K Topo)
- Non-Perennial River (50K Topo)
- Perennial River (50K Topo)
- Dam (50K Topo)
- Open Reservoir (50K Topo)

Site Sensitivity

- Prevent Development
- High
- Medium
- Low
- Least Concern

Proposed Layout

- Laydown
- Plant
- Pumpstation
- Reclamation
- Return Water Dam
- Soil Stockpile
- Substation
- TSF
- Potable Water
- Power Line
- Process Water
- Slurry Piping
- Return Water
- Tailings
- Corridor #1
- Corridor #2
- Slurry & Process Water

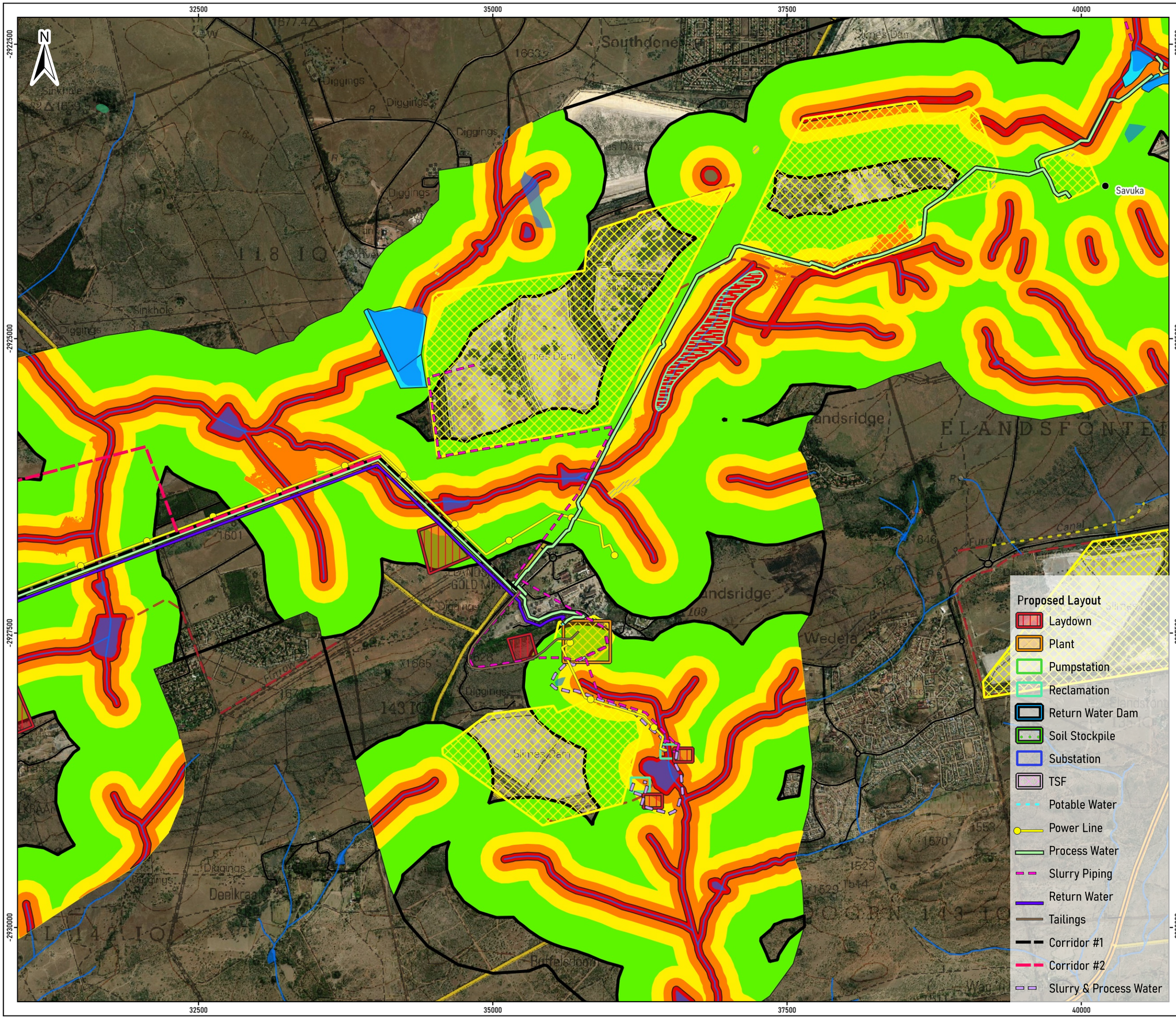
Figure 4-1

Site Sensitivity (West West-Wits)

Hydrologic Consulting (Pty) Ltd
+27 72 239 0974
info@hydrologic.consulting
www.hydrologic.consulting

0 0.4 0.8 1.2 km

Scale - 1:22,500 @A3	Coordinate Reference System: Hartebeesthoek94_Lo27_(E-N)	Version 2 24-Jul-2026



Legend

- Existing TSF
- National Road (50K Topo)
- Other Road (50K Topo)
- Secondary Road (50K Topo)
- Any Other Channel (50K Topo)
- Furrow (50K Topo)
- Non-Perennial River (50K Topo)
- Pollution Dams (Mponeng)
- Mponeng Shafts
- Dam (50K Topo)
- Non-perennial pan (50K Topo)
- Open Reservoir (50K Topo)
- Vlei (50K Topo)

Site Sensitivity

- Prevent Development
- High
- Medium
- Low
- Least Concern

Figure 4-2

Site Sensitivity (Central West-Wits)

Hydrologic Consulting (Pty) Ltd
+27 72 239 0974
info@hydrologic.consulting
www.hydrologic.consulting

0 0.5 1 1.5 km

Scale - 1:30,000 @A3	Coordinate Reference System: Hartebeesthoek94_Lo27_(E-N)	Version 2 24-Jul-2026

37500 40000 42500 45000

-2920000 -2922500 -2925000 -2927500

N

TauTona

Savuka

Mponeng

Legend

- Existing TSF
- Main Road (50K Topo)
- National Road (50K Topo)
- Other Road (50K Topo)
- Secondary Road (50K Topo)
- Any Other Channel (50K Topo)
- Furrow (50K Topo)
- Non-Perennial River (50K Topo)
- Perennial River (50K Topo)
- Pollution Dams (Mponeng)
- Mponeng Shafts
- Dams (Mponeng)
- Dam (50K Topo)
- Non-perennial pan (50K Topo)
- Open Reservoir (50K Topo)
- Vlei (50K Topo)

Site Sensitivity

- Prevent Development
- High
- Medium
- Low
- Least Concern

Proposed Layout

- Laydown
- Plant
- Pumpstation
- Reclamation
- Return Water Dam
- Soil Stockpile
- Substation
- TSF
- Potable Water
- Power Line
- Process Water
- Slurry Piping
- Return Water
- Tailings
- Corridor #1
- Corridor #2
- Slurry & Process Water

Figure 4-3

Site Sensitivity (East West-Wits)

Hydrologic Consulting (Pty) Ltd
+27 72 239 0974
info@hydrologic.consulting
www.hydrologic.consulting

0 0.6 1.2 1.8 km

Scale - 1:32,500 @A3	Coordinate Reference System: Hartebeesthoek94_Lo27_(E-N)	Version 2 24-Jul-2026

5 HYDROLOGICAL IMPACTS AND MITIGATION MEASURES

An impact is any change (positive or negative) to a resource or receptor brought about by the presence of the project component or the execution of a project-related activity.

The project's potential impacts have been evaluated using a recognised risk assessment methodology developed to ensure communication of the potential consequences or impacts of activities on the hydrological (surface water) environment as set out in the National Environmental Management Act (NEMA). A quantitative approach was taken in determining environmental significance since this enables a cross-disciplinary assessment of impact whereby the interpretation of impact significance is the same (i.e., a high impact on the surface water environment has the same interpretation as a high impact on ecology).

5.1 METHOD OF ASSESSING IMPACTS

The broad approach to the significance rating methodology is to determine the environmental risk (ER) by considering the consequence (C) of each impact (comprising Nature, Extent, Duration, Magnitude, and Reversibility) and relating this to the probability/likelihood (P) of the impact occurring. This determines the environmental risk. In addition, other factors, including cumulative impacts, public concern, and potential for irreplaceable loss of resources, are used to determine a prioritisation factor (PF), which is applied to the ER to determine the overall significance (S).

5.1.1 DETERMINATION OF ENVIRONMENTAL RISK

The significance (S) of an impact is determined by applying a prioritisation factor (PF) to the environmental risk (ER).

The environmental risk is dependent on the consequence (C) of the particular impact and the probability (P) of the impact occurring. Consequence is determined through the consideration of the Nature (N), Extent (E), Duration (D), Magnitude (M), and reversibility (R) applicable to the specific impact.

For the purpose of this methodology, the consequence of the impact is represented by:

$$C = \frac{E + D + M + R}{4} \times N$$

Each individual aspect in the determination of the consequence is represented by a rating scale as defined in **Table 5-1.**

TABLE 5-1: CRITERIA FOR DETERMINING IMPACT CONSEQUENCE

Aspect	Score	Definition
Nature	- 1	Likely to result in a negative/ detrimental impact
	+1	Likely to result in a positive/ beneficial impact
Extent	1	Activity (i.e., limited to the area applicable to the specific activity)
	2	Site (i.e., within the development property boundary),
	3	Local (i.e., the area within 5 km of the site),
	4	Regional (i.e., extends between 5 and 50 km from the site
	5	Provincial / National (i.e., extends beyond 50 km from the site)
Duration	1	Immediate (<1 year)
	2	Short term (1-5 years),
	3	Medium term (6-15 years),
	4	Long-term (the impact will cease after the operational life span of the project),
	5	Permanent (no mitigation measure of natural process will reduce the impact after construction).
Magnitude/ Intensity	1	Minor (where the impact affects the environment in such a way that natural, cultural, and social functions and processes are not affected),
	2	Low (where the impact affects the environment in such a way that natural, cultural, and social functions and processes are slightly affected),
	3	Moderate (where the affected environment is altered but natural, cultural, and social functions and processes continue, albeit in a modified way),
	4	High (where natural, cultural, or social functions or processes are altered to the extent that they will temporarily cease), or
	5	Very high / don't know (where natural, cultural, or social functions or processes are altered to the extent that they will permanently cease).
Reversibility	1	Impact is reversible without any time or cost.
	2	Impact is reversible without incurring significant time and cost.
	3	Impact is reversible only by incurring significant time and cost.
	4	Impact is reversible only by incurring prohibitively high time and cost.
	5	Irreversible Impact

Once the C has been determined, the ER is determined in accordance with the standard risk assessment relationship by multiplying the C and the P. Probability is rated/scored as per **Table 5-2**.

TABLE 5-2: PROBABILITY SCORING

Probability Score	Description
1	Improbable (the possibility of the impact materialising is very low as a result of design, historic experience, or implementation of adequate corrective actions; <25%),
2	Low probability (there is a possibility that the impact will occur; >25% and <50%),
3	Medium probability (the impact may occur; >50% and <75%),
4	High probability (it is most likely that the impact will occur- > 75% probability), or
5	Definite (the impact will occur),

The result is a qualitative representation of the relative ER associated with the impact. ER is therefore calculated as follows:

$$ER = C \; x \; P$$

TABLE 5-3: DETERMINATION OF ENVIRONMENTAL RISK

Consequence						
	5	5	10	15	20	25
	4	4	8	12	16	20
	3	3	6	9	12	15
	2	2	4	6	8	10
	1	1	2	3	4	5
		1	2	3	4	5
	Probability					

The outcome of the environmental risk assessment will result in a range of scores, ranging from 1 to 25. These ER scores are then grouped into respective classes as described in **Table 5-4**.

TABLE 5-4: SIGNIFICANCE CLASSES

Environmental Risk Score	Description
< 9	Low (i.e., where this impact is unlikely to be a significant environmental risk),
≥9 & <17	Medium (i.e., where the impact could have a significant environmental risk),
≥ 17	High (i.e., where the impact will have a significant environmental risk).

The impact ER will be determined for each impact without relevant management and mitigation measures (pre-mitigation), as well as post-implementation of relevant management and mitigation measures (post-mitigation). This allows for a prediction of the degree to which the impact can be managed/mitigated.

5.1.2 IMPACT PRIORITISATION

Further to the assessment criteria presented in the section above, it is necessary to assess each potentially significant impact in terms of:

- Cumulative impacts; and
- The degree to which the impact may cause irreplaceable loss of resources.

To ensure that these factors are considered, an impact prioritisation factor (PF) will be applied to each impact ER (post-mitigation). This prioritisation factor does not aim to detract from the risk ratings but rather to focus the attention of the decision-making authority on the higher priority/significance issues and impacts. The PF will be applied to the ER score based on the assumption that relevant suggested management/mitigation impacts are implemented.

TABLE 5-5: CRITERIA FOR DETERMINING PRIORITISATION

Cumulative Impact (CI)	Low (1)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.
	Medium (2)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.
	High (3)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/definite that the impact will result in spatial and temporal cumulative change.
Irreplaceable Loss of Resources (LR)	Low (1)	Where the impact is unlikely to result in irreplaceable loss of resources.
	Medium (2)	Where the impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources, but the value (services and/or functions) of these resources is limited.
	High (3)	Where the impact may result in the irreplaceable loss of resources of high value (services and/or functions).

The value for the final impact priority is represented as a single consolidated priority, determined as the sum of each individual criterion represented in Table 5-5. The impact priority is therefore determined as follows:

$$Priority = CI + LR$$

The result is a priority score which ranges from 2 to 6 and a consequent PF ranging from 1 to 1.5 (Refer to **Table 5-6**).

TABLE 5-6: DETERMINATION OF PRIORITISATION FACTOR

Priority	Prioritisation Factor
2	1
3	1.125
4	1.25
5	1.375
6	1.5

To determine the final impact significance, the PF is multiplied by the ER of the post-mitigation scoring. The ultimate aim of the PF is an attempt to increase the post-mitigation environmental risk rating by a factor of 0.5 if all the priority attributes are high (i.e., if an impact comes out with a high medium environmental risk after the conventional impact rating, but there is significant cumulative impact potential and significant potential for irreplaceable loss of resources, then the net result would be to upscale the impact to a high significance).

TABLE 5-7: FINAL ENVIRONMENTAL SIGNIFICANCE RATING

Rating	Description
≤ -17	High negative (i.e., where the impact must have an influence on the decision process to develop in the area).
> -17 ≤ -9	Medium negative (i.e., where the impact could influence the decision to develop in the area).
> -9 < 0	Low negative (i.e., where this impact would not have a direct influence on the decision to develop in the area).
0	No impact

>0 <9	Low positive (i.e., where this impact would not have a direct influence on the decision to develop in the area).
≥ 9 < 17	Medium positive (i.e., where the impact could influence the decision to develop in the area).
≥ 17	High positive (i.e., where the impact must have an influence on the decision process to develop in the area).

5.2 PROJECT PHASES

The impact assessment covers the following phases, applicable to the proposed Deelkraal II TSF, return water dam, and associated infrastructure only. Existing infrastructure (Kusasalethu TSF and plant, Mponeng plant, Deelkraal 1 TSF, Savuka TSF, and DF5 TSF) is excluded from the phase assessment as these are already established footprints.

- **Construction** – Applies to the proposed Deelkraal II TSF and associated pipelines only; existing TSFs (Kusasalethu, Mponeng, Deelkraal 1, Savuka, and DF5) are excluded as they are already in existence
- **Operation** – Commencement of additional TSF deposition capacity beyond the existing approved infrastructure
- **Decommissioning** – Cessation of all TSF, plant, and pipeline operations, with certain surface infrastructure removed
- **Rehabilitation/Closure** – Rehabilitation of disturbed surface areas following decommissioning

5.3 IDENTIFIED SURFACE WATER IMPACTS

The following proposed infrastructure has been assessed for potential surface water impacts and grouped by the nature and magnitude of those impacts.

TSF & RWD

- Deelkraal II TSF
- Associated Return Water Dam (RWD)

Linear Infrastructure

- 5 slurry pipelines (ranging from ~2 km to ~10.6 km)
- 6 process water pipelines (ranging from ~0.1 km to ~9.58 km)
- Potable water pipeline (~8.52 km)
- 3 power lines (ranging from ~1.8 km to ~9.2 km)
- Access roads adjacent to pipeline and power line routes and around the Deelkraal II TSF

Point and Ancillary Infrastructure

- Kusasalethu Plant Upgrades (new gold and uranium processing sections)
- Pump stations (Deelkraal I and Kusasalethu TSF Reclamation)
- Topsoil and overburden stockpiles
- Ancillary construction infrastructure (workshops and laydown areas)

5.3.1 EROSION OF SOILS

Disturbed soils have the potential to generate surface runoff and cause sedimentation in downstream watercourses. The construction, operation, and decommissioning of all proposed infrastructure will result in areas of ground disturbance, creating conditions conducive to soil erosion during rainfall events or through persistent streamflow. The rehabilitation/closure phase carries a similar erosion risk to the construction phase. The moderately high runoff potential of the soils across the study area (see **Section 2.7**) exacerbates this risk, as a higher proportion of rainfall is converted to runoff, increasing its erosivity. It is noted that not all soils are inherently prone to erosion; erosion potential is further governed by soil texture, structure, cohesion, and organic matter content, all of which influence the erodibility of a given soil.

If not adequately mitigated, erosion could persist into the operational phase; however, it is expected that disturbed soils will consolidate over time, progressively reducing the volume of material mobilised per rainfall event.

TSF & RWD

The construction of the Deelkraal II TSF and associated Return Water Dam (RWD) will involve the largest areas of ground disturbance within the project footprint, and consequently carry the highest potential for soil erosion and sediment mobilisation. These facilities will be designed with engineered containment systems, including toe paddocks, diversion drains, and the RWD itself, to intercept and retain runoff and sediment during and after construction. Topsoil stripped during construction should be stockpiled separately and retained for use in rehabilitation, with stockpile areas themselves stabilised to prevent secondary erosion.

Linear Infrastructure (Pipelines, Power Lines, and Access Roads)

Pipeline, power line, and access road corridors will result in elongated strips of ground disturbance. The linear nature of these corridors increases the likelihood of intersecting drainage lines, river channels, and other natural flow paths, which represent points of elevated erosion risk. Infrastructure should not be placed within river channels, furrows, or trenches unless essential; where crossings are unavoidable, enhanced erosion protection measures must be implemented. Following installation, all disturbed surfaces within the pipeline and access road corridors should be stabilised promptly and revegetated as part of the rehabilitation programme. The defined and relatively narrow footprint of these corridors will limit the total surface area of disturbance.

Plant Upgrades, Pump Stations, and Ancillary Infrastructure

Ground disturbance associated with the Kusasalethu Plant Upgrades, pump stations, and ancillary construction infrastructure (workshops and laydown areas) will be localised and confined to existing disturbed or operational footprints where possible. Erosion risks are therefore comparatively lower for this group, provided that drainage from these areas is directed away from sensitive receptors and that disturbed surfaces are stabilised upon completion of construction activities.

Across all infrastructure groups, disturbed areas should be stabilised as soon as practicable, with erosion and sediment control measures implemented where immediate stabilisation is not possible. Rehabilitation should incorporate topsoil replacement and revegetation of all disturbed areas. With the consistent application of these measures, erosion risks associated with the proposed infrastructure are expected to be effectively managed across all project phases.

TABLE 5-8: EROSION OF SOILS (CONSTRUCTION & REHAB/CLOSURE PHASE)

Impact Name	Erosion of Soils				
Phase	Construction & Rehab/Closure				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature	-1	-1	Magnitude	3	2
Extent	4	3	Reversibility	3	2
Duration	4	2	Probability	4	3
Environmental Risk (Pre-mitigation)					-14
Mitigation Measures					
The following mitigation measures are expected to already be part of the existing operational management and apply to the proposed recommissioning and construction of the TSF, RWD, and associated infrastructure. • *Ensure all existing infrastructure has a stormwater management plan that is sufficient per GN 704 and any applicable TSF-specific requirements, and that all proposed infrastructure — including new TSFs, pipelines, power lines, access roads, and associated facilities — is designed and constructed in accordance with GN 704.* • *Limit the extent of clearing and earthworks to approved construction footprints across all infrastructure components.* • *Appropriate erosion and sediment control measures must be implemented for all construction activities, scaled to the nature and footprint of the infrastructure being constructed.* • *Where possible, construction activities across all infrastructure components should be scheduled outside of peak rainfall periods. For construction periods exceeding six months, activities should be phased such that soil exposure (prior to the addition of hardstanding or rehabilitation) occurs predominantly within the dry season.* • *Clearing of vegetation and associated excavation should be kept to a minimum across all infrastructure corridors and footprints, particularly in areas where soils are identified as unstable or erosion-prone.* • *All construction activities should be monitored to ensure that areas of potential erosion are identified early and managed appropriately, including along pipeline and power line corridors where linear disturbance increases drainage line crossing risks.* • *Where erosion cannot be avoided, settling facilities or silt fences should be installed to capture mobilised sediment before it reaches downstream watercourses.* • *Pipeline stability must be maintained by ensuring that the integrity of pre-cast concrete plinths and other pipeline support structures is not compromised by erosion of surrounding soils.* • *All disturbed areas, including those associated with all infrastructure construction zones, must be rehabilitated as soon as practically possible to restore pre-disturbance conditions in terms of soil profile, land cover, and slope.* • *Rehabilitated and disturbed areas must be stabilised promptly using vegetation (such as grass cover) or mechanical methods such as slope profiling or erosion control blankets.*					
Environmental Risk (Post-mitigation)					-6.75
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Cumulative Impacts					3
High: Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/definite that the impact will result in spatial and temporal cumulative change					
Degree of potential irreplaceable loss of resources					1
Low: Where the impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1.25
Final Significance					-8.44

TABLE 5-9: EROSION OF SOILS (OPERATIONAL & DECOMMISSIONING PHASE)

Impact Name	Erosion of Soils				
Phase	Operational & Decommissioning				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature	-1	-1	Magnitude	2	2
Extent	3	3	Reversibility	2	2
Duration	4	2	Probability	4	3
Environmental Risk (Pre-mitigation)					-11
Mitigation Measures					
The following mitigation measures are expected to already be part of the existing operational management and apply to the proposed recommissioning and construction of the TSF, RWD, and associated infrastructure. • *Ensure the existing stormwater management plan is sufficient and maintained per GN 704 and any applicable TSF-specific requirements, and that stormwater drainage associated with plant upgrade areas and pump stations is similarly maintained throughout the operational phase.*					

• *Monitor the TSFs to ensure areas of potential erosion are identified and managed appropriately.* • *Monitor pipeline corridors throughout the operational phase, with particular attention to drainage line and watercourse crossings where scour and undermining of pipe support structures, including pre-cast concrete plinths, present a persistent erosion risk. Erosion protection at crossing points must be maintained and repaired where necessary.* • *Maintain road drainage structures, including culverts, cut-off drains, and road camber, associated with access roads to prevent road-related erosion and sediment runoff during the operational phase. Road verges and disturbed shoulders should be monitored and stabilised where erosion is identified.* • *Vegetation cover within power line servitudes should be maintained where practicable to limit erosion of exposed soils in areas subject to periodic clearing.* • *Rehabilitation should include topsoil replacement, revegetation, and maintenance and aftercare for all disturbed areas across all infrastructure components, including pipeline corridors, access road verges, pump station areas, and plant upgrade footprints, and should not be limited to TSF footprints alone.* • *Concurrent rehabilitation of the TSFs should ideally occur during the operational life of the TSFs, including cladding of side slopes and subsequent revegetation, with final rehabilitation resulting in a fully vegetated site.* • *A rehabilitation plan should be developed for linear infrastructure, covering topsoil replacement, re-grading of trenches to restore natural slope and drainage patterns, and revegetation of all disturbed corridors following decommissioning.* • *Rehabilitated areas across all infrastructure components must be monitored post-closure and corrective actions implemented where erosion persists, with sign-off only once erosion has demonstrably stabilised.*	
Environmental Risk (Post-mitigation)	-6.75
Degree of confidence in impact prediction:	Medium
Impact Prioritisation	
Cumulative Impacts	3
High: Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/definite that the impact will result in spatial and temporal cumulative change	
Degree of potential irreplaceable loss of resources	1
Low: Where the impact is unlikely to result in irreplaceable loss of resources.	
Prioritisation Factor	1.25
Final Significance	-8.44

5.3.2 POLLUTANTS ENTERING THE SURFACE WATER ENVIRONMENT

With the construction and operation of the proposed infrastructure, there is an increased potential for pollutants to enter the surface water environment prior to the implementation of mitigation measures. Pre-mitigation risks are elevated due to construction activities, disturbed surfaces, and the expanded footprint of water management infrastructure across the project area.

TSF & RWD

Two potential locations for new Return Water Dams (RWDs) have been identified, both designed to provide equivalent containment capacity and surface water management functionality. These systems will direct runoff and seepage away from the surrounding environment and into controlled containment structures. Potential contaminants associated with the TSFs and RWDs include tailings material, suspended solids, and process-affected water. A stormwater management plan compliant with GN 704 and TSF-specific requirements will be in place to ensure appropriate containment, diversion, and management of clean and dirty water, and the design of each TSF and associated RWD will limit the potential for uncontrolled releases or contaminated runoff reaching the receiving environment.

While the uncontrolled release of tailings or contaminated return water remains a residual risk, it is expected to be very low following implementation of mitigation measures. A TSF failure remains a highly unlikely but potentially severe event that could result in significant downstream pollution. Similarly, poor operation or inadequate maintenance of TSFs or RWDs could lead to localised spills or discharge of contaminated water. It is important to recognise that the potential severity of a TSF failure is not fully reflected in the impact significance score, as the low probability of occurrence reduces the overall significance rating below what the potential consequence alone would suggest.

Linear Infrastructure (Pipelines, Power Lines, and Access Roads)

The construction and operation of slurry and process water pipelines introduce the potential for localised chemical and process-related pollutant releases into the surface water environment, particularly where pipelines traverse or cross drainage lines and watercourses. Potential contaminants associated with pipeline infrastructure include slurry, process-affected water, and hydrocarbons from construction plant and equipment. The risk of spills or leaks is greatest during construction, at watercourse crossings, and at pump station connections. During operation, the integrity of pipeline infrastructure must be maintained to prevent uncontrolled releases of slurry or process-affected water into the surrounding environment. Power line and access road corridors present a comparatively lower pollution risk, primarily limited to hydrocarbon spills from vehicles and plant during construction and maintenance activities.

Plant Upgrades, Pump Stations, and Ancillary Infrastructure

The Kusasalethu Plant Upgrades, including the new uranium processing section, pump stations, and ancillary construction infrastructure, present localised risks of pollutant entry into surface waters through stormwater runoff from operational areas, chemical spills, or inadequate containment of process-affected water. These risks are confined to the immediate footprints of these facilities and are expected to be managed through site-specific containment and drainage controls.

Following the implementation of mitigation measures across all infrastructure groups, the risk of pollutants entering surface waters is expected to be significantly reduced through effective design, monitoring, and operational controls. However, the residual risk associated with a TSF failure, while low in probability, warrants ongoing recognition given the severity of potential downstream consequences.

Important to note that the potentially severe impact of a TSF failure is not adequately conveyed by the impact table below since the probability is low, resulting in the impact appearing less significant than may be warranted.

TABLE 5-10: POLLUTANTS ENTERING THE SURFACE WATER ENVIRONMENT (CONSTRUCTION PHASE)

Impact Name	Pollutants Entering the Surface Water Environment				
Phase	Construction				
Impact Name					
Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature	-1	-1	Magnitude	3	1
Extent	5	4	Reversibility	3	3
Duration	2	1	Probability	4	2
Environmental Risk (Pre-mitigation)					-13
Mitigation Measures					
The following mitigation measures are expected to already be part of the existing operational management and apply to the proposed recommissioning and construction of the TSF, RWD, and associated infrastructure. • *Ensure all existing infrastructure has a stormwater management plan that is sufficient and maintained per GN 704 and any applicable TSF-specific requirements, and that all proposed infrastructure, including new TSFs, pipelines, pump stations, and associated facilities, is designed and constructed in accordance with GN 704.* • *Pollution potential to watercourses must be considered in the designs of all infrastructure components to prevent uncontrolled releases resulting from an unforeseen leak, rupture, or structural failure.* • *Develop the TSFs using sound engineering principles to limit the likelihood of failure and ensure structural integrity throughout the operational life of the facilities.* • *Ensure RWDs or temporary containment facilities are operational prior to major earthworks commencing on TSF and associated infrastructure.* • *All slurry and process water pipelines must be pressure tested before commissioning to confirm structural integrity before introduction of process-affected water or slurry.* • *Install flow monitoring and leak detection measures along pipeline routes, with particular attention to watercourse crossings and pump station connection points, and establish emergency isolation and shut-off procedures in the event of a pipeline rupture or leak.*					

• *Provide secondary containment or bunding at pump stations and pipeline connection points where process-affected water or slurry is handled.* • *Inspect pipeline corridors and watercourse crossings regularly during construction for signs of seepage or uncontrolled discharge into the surrounding environment.* • *Chemical and reagent storage areas associated with plant upgrades, including the new uranium processing section, must be bunded and all drainage from these areas directed to a contained dirty water management system. A chemical spill response procedure specific to plant upgrade areas must be established.* • *Restrict all construction and operational activities to within designated dirty water management areas wherever possible.* • *Implement spill prevention and response procedures across all infrastructure components, including the availability of spill kits at all active construction areas.* • *Ensure that concrete washout water and other construction wastewater generated across all infrastructure components are contained and not discharged to watercourses or drainage lines.* • *Store hydrocarbons off-site where possible, or otherwise in bunded storage facilities. Handle hydrocarbons carefully to limit spillage, designate a single location for refuelling and maintenance where possible, and use drip trays for stationary vehicles or park over areas fitted with oil interceptors.* • *Ensure vehicles and plant are regularly serviced to limit the risk of hydrocarbon leaks. Remove any soil contaminated by hydrocarbon spillage from the site promptly.* • *All construction personnel must be trained on spill prevention and response procedures applicable to their work area and infrastructure component.* • *Undertake surface water monitoring throughout the construction phase to enable change detection through regular data review relative to contaminants originating from the site.* • *Develop and implement a maintenance plan to monitor the integrity of all infrastructure components and prevent leaks or ruptures during construction and into the operational phase.*	
Environmental Risk (Post-mitigation)	-4.5
Degree of confidence in impact prediction:	Medium
Impact Prioritisation	
Cumulative Impacts	3
High: Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/definite that the impact will result in spatial and temporal cumulative change	
Degree of potential irreplaceable loss of resources	1
Low: Where the impact is unlikely to result in irreplaceable loss of resources.	
Prioritisation Factor	1.25
Final Significance	-5.63

TABLE 5-11: POLLUTANTS ENTERING THE SURFACE WATER ENVIRONMENT (OPERATIONAL PHASE)

Impact Name	**Pollutants Entering the Surface Water Environment**				
Phase	Operational				
Impact Name					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature	-1	-1	Magnitude	5	5
Extent	5	4	Reversibility	5	5
Duration	4	2	Probability	3	2
Environmental Risk (Pre-mitigation)					-14.25
Mitigation Measures					
The following mitigation measures are expected to already be part of the existing operational management and apply to the proposed recommissioning and construction of the TSF, RWD, and associated infrastructure. • *Ensure the existing stormwater management plan is sufficient and maintained per GN 704 and any applicable TSF-specific requirements, and that drainage associated with plant upgrade areas, pump stations, and pipeline infrastructure is similarly maintained throughout the operational phase.* • *Monitor TSFs regularly to detect any signs of instability, slumping, or unusual movement, and ensure that any remedial actions are implemented promptly.* • *Maintain all engineered containment systems, including toe paddocks, underdrainage, seepage collection systems, and RWDs, in good working order throughout the operational and decommissioning phases.* • *Maintain adequate freeboard and stormwater diversion capacity across all water management infrastructure for extreme rainfall events.* • *Maintain the integrity of all slurry and process water pipelines through a scheduled inspection and maintenance programme, with emergency isolation and shut-off procedures in place and readily accessible in the event of a rupture or leak.* • *Inspect pipeline corridors and watercourse crossings regularly during operation and decommissioning for signs of leakage or seepage, and implement repairs promptly where uncontrolled discharge is identified.* • *Maintain secondary containment and bunding at pump stations and pipeline connection points throughout the operational phase, and ensure these are decommissioned in a controlled manner that prevents residual contamination from entering the surrounding environment.* • *Ensure that bunding and contained drainage systems associated with plant upgrade areas, including the uranium processing section, are maintained and inspected regularly throughout operation and remain functional until decommissioning is complete.*					

• *Establish and maintain buffer zones between all infrastructure and natural watercourses throughout the operational and decommissioning phases.* • *Restrict all activities to within designated dirty water management areas wherever possible.* • *Store hydrocarbons off-site where possible, or otherwise in bunded storage facilities. Handle hydrocarbons carefully to limit spillage, designate a single location for refuelling and maintenance where possible, and use drip trays for stationary vehicles or park over areas fitted with oil interceptors.* • *Ensure vehicles and plant are regularly serviced to limit the risk of hydrocarbon leaks. Remove any soil contaminated by hydrocarbon spillage from the site promptly.* • *Spill kits must be maintained and readily accessible at all operational areas across all infrastructure components.* • *During decommissioning, ensure that all residual process-affected water, slurry, and chemical inventories are removed and disposed of in a controlled manner prior to dismantling of containment infrastructure.* • *Undertake surface water monitoring throughout the operational and decommissioning phases to enable change detection through regular data review relative to contaminants originating from the site.* • *Develop and implement a decommissioning water management plan that addresses the controlled removal of all process-affected water and the progressive rehabilitation of dirty water management areas to prevent post-closure pollutant releases.*	
Environmental Risk (Post-mitigation)	-8
Degree of confidence in impact prediction:	Medium
Impact Prioritisation	
Cumulative Impacts	3
High: Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/definite that the impact will result in spatial and temporal cumulative change	
Degree of potential irreplaceable loss of resources	3
High: Where the impact may result in the irreplaceable loss of resources of high value (services and/or functions).	
Prioritisation Factor	1.5
Final Significance	-12

TABLE 5-12: POLLUTANTS ENTERING THE SURFACE WATER ENVIRONMENT (DECOMMISSIONING PHASE)

Impact Name	**Pollutants Entering the Surface Water Environment**				
Phase	Decommissioning				
Impact Name					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature	-1	-1	Magnitude	5	5
Extent	5	4	Reversibility	5	5
Duration	2	2	Probability	3	2
Environmental Risk (Pre-mitigation)					-12.75
Mitigation Measures					
The following mitigation measures are expected to already be part of the existing operational management and apply to the proposed recommissioning and construction of the TSF, RWD, and associated infrastructure. • *Ensure the existing stormwater management plan is sufficient and maintained per GN 704 and any applicable TSF-specific requirements, and that drainage associated with plant upgrade areas, pump stations, and pipeline infrastructure is similarly maintained throughout the operational phase.* • *Monitor TSFs regularly to detect any signs of instability, slumping, or unusual movement, and ensure that any remedial actions are implemented promptly.* • *Maintain all engineered containment systems, including toe paddocks, underdrainage, seepage collection systems, and RWDs, in good working order throughout the operational and decommissioning phases.* • *Maintain adequate freeboard and stormwater diversion capacity across all water management infrastructure for extreme rainfall events.* • *Maintain the integrity of all slurry and process water pipelines through a scheduled inspection and maintenance programme, with emergency isolation and shut-off procedures in place and readily accessible in the event of a rupture or leak.* • *Inspect pipeline corridors and watercourse crossings regularly during operation and decommissioning for signs of leakage or seepage, and implement repairs promptly where uncontrolled discharge is identified.* • *Maintain secondary containment and bunding at pump stations and pipeline connection points throughout the operational phase, and ensure these are decommissioned in a controlled manner that prevents residual contamination from entering the surrounding environment.* • *Ensure that bunding and contained drainage systems associated with plant upgrade areas, including the uranium processing section, are maintained and inspected regularly throughout operation and remain functional until decommissioning is complete.* • *Establish and maintain buffer zones between all infrastructure and natural watercourses throughout the operational and decommissioning phases.* • *Restrict all activities to within designated dirty water management areas wherever possible.* • *Store hydrocarbons off-site where possible, or otherwise in bunded storage facilities. Handle hydrocarbons carefully to limit spillage, designate a single location for refuelling and maintenance where possible, and use drip trays for stationary vehicles or park over areas fitted with oil interceptors.* • *Ensure vehicles and plant are regularly serviced to limit the risk of hydrocarbon leaks. Remove any soil contaminated by hydrocarbon spillage from the site promptly.* • *Spill kits must be maintained and readily accessible at all operational areas across all infrastructure components.*					

• *During decommissioning, ensure that all residual process-affected water, slurry, and chemical inventories are removed and disposed of in a controlled manner prior to dismantling of containment infrastructure.* • *Undertake surface water monitoring throughout the operational and decommissioning phases to enable change detection through regular data review relative to contaminants originating from the site.* • *Develop and implement a decommissioning water management plan that addresses the controlled removal of all process-affected water and the progressive rehabilitation of dirty water management areas to prevent post-closure pollutant releases.*	
Environmental Risk (Post-mitigation)	-8
Degree of confidence in impact prediction:	Medium
Impact Prioritisation	
Cumulative Impacts	3
High: Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/definite that the impact will result in spatial and temporal cumulative change	
Degree of potential irreplaceable loss of resources	3
High: Where the impact may result in the irreplaceable loss of resources of high value (services and/or functions).	
Prioritisation Factor	1.5
Final Significance	-12

TABLE 5-13: POLLUTANTS ENTERING THE SURFACE WATER ENVIRONMENT (REHABILITATION/CLOSURE PHASE)

Impact Name	**Pollutants Entering the Surface Water Environment**				
Phase	Rehabilitation/Closure				
Impact Name					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature	-1	-1	Magnitude	4	3
Extent	5	4	Reversibility	4	4
Duration	2	2	Probability	4	2
Environmental Risk (Pre-mitigation)					-15
Mitigation Measures					
The following mitigation measures are expected to already be part of the existing operational management and apply to the proposed recommissioning and construction of the TSF, RWD, and associated infrastructure. • *Ensure the stormwater management plan remains sufficient and maintained per GN 704 and any applicable TSF-specific requirements throughout the rehabilitation and closure phase, and that drainage associated with all rehabilitated infrastructure footprints, including pipeline corridors, and plant areas, is managed accordingly.* • *Maintain and operate TSFs and associated RWDs to prevent overtopping, seepage, or uncontrolled releases until such time as they are fully rehabilitated and closed.* • *Monitor TSFs regularly throughout the rehabilitation and closure phase to detect any signs of instability, slumping, or unusual movement, and implement remedial actions promptly where required.* • *Ensure that all residual slurry, process-affected water, and chemical inventories within pipelines, pump stations, and plant upgrade areas are removed and disposed of in a controlled manner before dismantling or abandonment of these structures.* • *Decommission pipeline infrastructure in a controlled manner, ensuring that all pipeline corridors are cleared of residual fluids and that watercourse crossings are reinstated to prevent ongoing pollutant pathways.* • *Ensure that bunding, containment systems, and drainage controls associated with pump stations and plant upgrade areas, including the uranium processing section, remain functional until all contamination risks have been addressed and are removed or rehabilitated in a controlled manner.* • *Avoid rehabilitation and closure activities during periods of high rainfall where practical, to limit the risk of pollutant mobilisation from exposed areas.* • *Restrict all activities to within designated dirty water management areas wherever possible.* • *Store hydrocarbons off-site where possible, or otherwise in bunded storage facilities. Handle hydrocarbons carefully to limit spillage, designate a single location for refuelling and maintenance where possible, and use drip trays for stationary vehicles or park over areas fitted with oil interceptors.* • *Ensure vehicles and plant are regularly serviced to limit the risk of hydrocarbon leaks. Remove any soil contaminated by hydrocarbon spillage from the site promptly.* • *Spill kits must be maintained and readily accessible at all active rehabilitation and closure work areas.* • *Undertake surface water monitoring throughout the rehabilitation and closure phase to enable change detection through regular data review relative to contaminants originating from the site, and continue post-closure monitoring until background water quality conditions are demonstrably restored.*					
Environmental Risk (Post-mitigation)					-6.5
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Cumulative Impacts					3

High: Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/definite that the impact will result in spatial and temporal cumulative change	
Degree of potential irreplaceable loss of resources	2
Medium: Where the impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.	
Prioritisation Factor	1.38
Final Significance	-8.94

5.3.3 DECREASE IN RUNOFF

The proposed construction of new infrastructure will alter natural runoff patterns across the project area. During construction, decommissioning, and rehabilitation/closure, temporary alterations to runoff patterns may occur due to earthworks, infrastructure placement, and dewatering activities. These impacts are expected to be localised, short-term, and manageable through staged construction, diversion channels, and temporary containment measures.

TSF & RWD

The proposed construction of the Deelkraal II TSF and associated RWD will increase impermeable hardstanding within the project footprint; however, existing TSFs operate under a containment philosophy, incorporating self-contained basins, toe paddocks, and associated RWDs. These systems capture and retain surface runoff within the TSF footprints, resulting in minimal discharge to the surrounding environment under normal conditions. The proposed location of the Deelkraal II TSF would additionally result in the removal of the upstream catchment contributing to the area. The proposed Deelkraal II TSF and RWD will continue this approach through the implementation of similar containment and water management infrastructure, with runoff from TSF areas expected to remain significantly reduced compared to natural pre-development conditions.

Linear Infrastructure (Pipelines, Power Lines, and Access Roads)

Pipeline corridors, power line servitudes, and access roads will introduce localised areas of compaction and reduced infiltration along their routes. While the individual footprint of each corridor is relatively narrow, the cumulative length of linear infrastructure across the project area means that alterations to natural drainage patterns may occur at multiple points, particularly where corridors traverse or cross natural drainage lines. These impacts are expected to be managed through the reinstatement of natural drainage patterns following pipeline installation and the maintenance of road drainage structures to prevent prolonged ponding or flow diversion.

Plant Upgrades, Pump Stations, and Ancillary Infrastructure

The Kusasalethu Plant Upgrades, pump stations, and ancillary construction infrastructure will introduce additional hardstanding within largely already disturbed operational footprints. The incremental increase in impermeable surfaces associated with these facilities is expected to be limited and confined to existing disturbed areas, with a correspondingly minor effect on local runoff patterns.

A decrease in runoff is a typical impact associated with the containment of dirty areas on mines, and the mitigation of this impact is often not practical or possible, with a reduction in mean annual runoff being an expected outcome. Overall, while the total volume of runoff leaving the site will be reduced relative to pre-development conditions, the potential environmental consequences are limited and effectively managed through robust containment, stormwater management, and adaptive operational practices across all project phases. Pre-mitigation and post-mitigation significance scores are therefore considered equivalent except for the rehabilitation.

TABLE 5-14: DECREASE IN RUNOFF (CONSTRUCTION, OPERATION, & DECOMMISSIONING PHASE)

Impact Name	**Decrease in Runoff**				
Phase	Construction, Operation, & Decommissioning				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature	-1	-1	Magnitude	2	2
Extent	4	4	Reversibility	5	5
Duration	4	4	Probability	5	5
Environmental Risk (Pre-mitigation)					-18.75
Mitigation Measures					
The following mitigation measures are expected to already be part of the existing operational management and apply to the proposed recommissioning and construction of the TSF, RWD, and associated infrastructure. • *Ensure the stormwater management plan is sufficient and maintained per GN 704 and any applicable TSF-specific requirements across all project phases, and that drainage associated with all infrastructure components is managed accordingly.* • *Limit the total area of hardstanding and compacted surfaces across all infrastructure components to the minimum necessary to reduce cumulative impacts on infiltration and natural runoff contribution to downstream systems.* • *Divert clean water run-on away from disturbed areas and maintain a clear distinction between clean and dirty water management systems across all infrastructure footprints and corridors.* • *Limit the time and area over which machinery operates to reduce soil compaction across all construction areas. Laydown areas and ancillary construction footprints should similarly be kept to a minimum in terms of area and duration.* • *Design and maintain road drainage structures, including culverts and cut-off drains, along access road corridors to prevent prolonged interception or diversion of natural runoff patterns.* • *Reinstate natural drainage patterns and restore infiltration capacity along pipeline corridors following installation, including careful backfilling and compaction management within trenches to approximate pre-disturbance soil conditions.* • *Maintain watercourse crossing structures along pipeline and access road corridors to prevent flow obstruction or unintended diversion of natural drainage.* • *Maintain RWDs and spillways to release water gradually, reducing the magnitude of downstream flow reductions where discharge is appropriate.* • *Operate TSFs to optimise retention while maintaining minimum environmental flows downstream where applicable.* • *Progressively rehabilitate all disturbed areas, including pipeline corridors, access road verges, and ancillary infrastructure footprints, as soon as practically possible to restore infiltration capacity and natural runoff contribution.* • *Discharge excess water of an acceptable quality back into the downstream surface water environment where water quality criteria are met, and release is environmentally appropriate.*					
Environmental Risk (Post-mitigation)					-18.75
Degree of confidence in impact prediction:					High
Impact Prioritisation					
Cumulative Impacts					3
High: Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/definite that the impact will result in spatial and temporal cumulative change					
Degree of potential irreplaceable loss of resources					1
Low: Where the impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1.25
Final Significance					-23.44

TABLE 5-15: DECREASE IN RUNOFF (REHABILITATION/CLOSURE PHASE)

Impact Name	**Decrease in Runoff**				
Phase	Rehabilitation/Closure				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature	-1	-1	Magnitude	2	1
Extent	4	1	Reversibility	5	1
Duration	4	1	Probability	5	5
Environmental Risk (Pre-mitigation)					-18.75
Mitigation Measures					
The following mitigation measures are expected to already be part of the existing operational management and apply to the proposed recommissioning and construction of the TSF, RWD, and associated infrastructure. • *Ensure the stormwater management plan remains sufficient and maintained per GN 704 and any applicable TSF-specific requirements throughout the rehabilitation and closure phase, and that drainage associated with all rehabilitated infrastructure footprints, including pipeline corridors, access roads, and plant areas, is managed accordingly.* • *Maintain clean water diversion systems to direct run-on away from rehabilitating areas and ensure the distinction between clean and dirty water is upheld until all contamination risks have been addressed.*					

• *Where possible, avoid capturing excessive runoff during rehabilitation and closure activities to progressively restore natural flow paths and downstream runoff contributions.* • *Progressively rehabilitate all disturbed areas, including TSF footprints, pipeline corridors, access road verges, pump station areas, and plant upgrade footprints, to restore vegetation cover, natural drainage patterns, and infiltration capacity as soon as practically possible.* • *Reinstate natural drainage patterns along pipeline corridors during decommissioning, including re-grading of trenches to restore pre-disturbance slope and drainage, and removal or appropriate management of any flow obstructions introduced during construction or operation.* • *Remove or rehabilitate road drainage structures, including culverts and cut-off drains, associated with access roads where these are no longer required, to restore natural runoff pathways and prevent ongoing interception of drainage.* • *Use engineered and natural systems, including re-vegetation, slope re-profiling, and infiltration restoration measures, to moderate runoff reductions and progressively return the site towards pre-development hydrological conditions.* • *Limit the time and area over which machinery operates during rehabilitation and closure activities to minimise additional soil compaction and further reduction of infiltration capacity.* • *Monitor rehabilitated areas post-closure to confirm that natural runoff patterns and infiltration capacity are being restored, and implement corrective measures where runoff remains significantly altered relative to pre-development conditions.*	
Environmental Risk (Post-mitigation)	-5
Degree of confidence in impact prediction:	High
Impact Prioritisation	
Cumulative Impacts	3
High: Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/definite that the impact will result in spatial and temporal cumulative change	
Degree of potential irreplaceable loss of resources	1
Low: Where the impact is unlikely to result in irreplaceable loss of resources.	
Prioritisation Factor	1.25
Final Significance	-6.25

5.3.4 FLOOD RISK

Flood risk is both an impact on the proposed infrastructure (flooding originating beyond the infrastructure) and on the environment (flooding originating from the infrastructure). This risk is present across all project phases, with flooding originating beyond the infrastructure relevant during construction, operational, decommissioning, and rehabilitation/closure phases, and flooding originating from the infrastructure relevant during the operational, decommissioning, and rehabilitation/closure phases. The site sensitivity grading presented in **Section 4** provides a qualitative indication of potential flood risk and should be considered in conjunction with this section. This section expands the definition of relevant watercourses to include furrows and drainage canals, and additionally reviews dams and pans that may present a flood risk.

TSF & RWD

Flood risk associated with the TSFs and RWDs manifests in two directions. Flooding originating beyond the TSFs, from either the river systems to the north or south or through surface water run-on, has the potential to compromise toe paddock and RWD storage capacity, leading to an uncontrolled spill of pollutants. This risk is expected to be mitigated to at least a degree through the addition of stormwater toe paddocks and associated bunding that hydraulically separates the TSFs from the adjacent environment. The proposed recommissioning and construction of TSFs and RWDs may influence the overall flood risk profile, with the potential for increased TSF volume to elevate the consequence of a failure event.

Flooding originating from the TSFs, resulting from a structural failure, while highly unlikely to occur, carries both flooding and pollutant implications as discussed in **Section 5.3.2**. The consequence of such an event is potentially severe, and it is important to recognise that the low probability of occurrence may cause the overall significance score to appear lower than the potential consequence alone would suggest.

Linear Infrastructure (Pipelines, Power Lines, and Access Roads)

Pipeline infrastructure introduces an additional flood risk pathway. Flooding originating beyond the TSFs, particularly from surface water run-on or river system inundation, could cause a rupture of proposed pipelines, resulting in an uncontrolled release of slurry or process-affected water into the surrounding environment. This represents feedback to **Section 5.3.2** (pollutants entering the surface water environment) and should be considered in pipeline route design and flood risk assessments, particularly where pipelines are located within or adjacent to floodplains or drainage lines. Access road corridors and power line servitudes present a comparatively lower flood risk, primarily related to the potential for flow obstruction at drainage line crossings during high rainfall events.

Plant Upgrades, Pump Stations, and Ancillary Infrastructure

The Kusasalethu Plant Upgrades and pump stations present a localised flood risk where these facilities are situated within or adjacent to areas of surface water run-on or natural drainage. Inundation of pump stations could interrupt the operation of water management infrastructure, with potential knock-on effects for TSF and RWD management during flood events. Ancillary construction infrastructure, including workshops and laydown areas, should be sited outside of flood-prone areas wherever possible.

The consequence of flooding is potentially severe across all infrastructure groups, particularly where a flood event triggers secondary impacts such as pollutant releases or pipeline ruptures. Flood risk is therefore closely linked to the impacts discussed in **Section 5.3.2** and should be assessed in an integrated manner. Pre-mitigation and post-mitigation significance scores reflect the implementation of robust containment, hydraulic separation, and flood management measures across all project phases.

Important: It should be noted that the potentially severe impact of flood risk is not adequately conveyed by the impact table below since the probability of extreme flooding is low, resulting in the impact appearing less significant than may be warranted.

TABLE 5-16: RIVER AND SURFACE WATER FLOOD RISK

Impact Name	**Flood Risk**				
Phase	Construction, Operational, Decommissioning, and Rehabilitation/Closure				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature	-1	-1	Magnitude	5	5
Extent	4	4	Reversibility	5	5
Duration	1	1	Probability	2	1
Environmental Risk (Pre-mitigation)					-7.5
Mitigation Measures					
The following mitigation measures are expected to already be part of the existing operational management and apply to the proposed recommissioning and construction of the TSF, RWD, and associated infrastructure. • *Ensure the stormwater management plan is sufficient and maintained per GN 704 and any applicable TSF-specific requirements across all project phases, including adequate capacity and a clear distinction between clean and dirty water diversion channels. Consider flood protection berms around the TSF and RWD where necessary.* • *Ensure that flood protection of the TSFs and RWDs is sufficient to manage flood risk from both adjacent river systems to the north and south and from surface water run-on, including provision for extreme rainfall events.* • *Develop the TSF, RWD, and all associated infrastructure using sound engineering principles to limit the likelihood of failure, ensuring that containment structures, spillways, and pipelines are designed with sufficient capacity for design flood events.* • *Works should, where possible, not take place nor infrastructure be placed within 100 m of any defined watercourse or within the 1:100 year flood line, given the applicability of GN 704. The linear nature of pipeline infrastructure means that some watercourse crossings, proximity to watercourses, or intersection with flood lines are expected; in these instances, enhanced flood protection and crossing design measures must be applied.* • *All pipeline watercourse crossings must be designed to accommodate the 1:100-year flood event, including appropriate pipe sizing, elevation above flood level, and scour protection at crossing points. Above-ground pipelines installed on pre-cast concrete plinths must make adequate allowance for flooding, whether from a river, drainage canal, furrow, or surface water runoff.*					

• *Inspect pipeline crossings, plinth integrity, and scour protection following significant flood or rainfall events, and implement repairs promptly where damage or undermining is identified. Emergency isolation and shut-off procedures must be in place and readily accessible if a flood event causes a pipeline rupture.* • *Design and maintain road drainage structures, including culverts and cut-off drains, at all watercourse crossings along access road corridors to prevent flow obstruction during flood events. Restrict access road construction within floodplains where alternative routes are available.* • *Ensure pump stations are designed and located to remain operational during flood events, or that documented backup procedures exist should a pump station be inundated, to prevent disruption to TSF and RWD water management during high rainfall periods.* • *Ensure plant upgrade areas, including pump stations, are protected from surface water run-on through adequate site drainage design, with drainage directed away from sensitive infrastructure and into appropriate containment.* • *Monitor the TSFs and RWDs regularly to identify any signs of potential failure, slumping, or compromised flood protection capacity, and implement remedial actions promptly.* • *Monitor and maintain the capacity of culverts, channels, and diversion structures across all infrastructure components to ensure the unobstructed drainage and downstream movement of water to natural watercourses.* • *Progressively rehabilitate all disturbed areas to restore vegetation cover and natural runoff patterns, reducing the volume and velocity of surface water run-on towards infrastructure during rainfall events.* • *Undertake post-closure monitoring of all rehabilitated infrastructure footprints and drainage structures to confirm that flood risk remains low and that natural drainage patterns have been successfully restored.*	
Environmental Risk (Post-mitigation)	-3.75
Degree of confidence in impact prediction:	Medium
Impact Prioritisation	
Cumulative Impacts	1
Low: Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.	
Degree of potential irreplaceable loss of resources	3
High: Where the impact may result in the irreplaceable loss of resources of high value (services and/or functions).	
Prioritisation Factor	1.25
Final Significance	-4.69

5.4 ALTERNATIVE LINEAR INFRASTRUCTURE ASSESSMENT

Sensitivity mapping indicates that the primary hydrological constraint on the site is proximity to watercourses and their associated floodlines and buffer zones, as defined in GN 704 and related guidance. Within this context, linear infrastructure that introduces additional watercourse crossings or fragments buffer areas is considered to carry a higher risk of surface-water impact. The site sensitivity analysis was undertaken at a broad scale for the project area as a whole and does not distinguish separate sensitivity ratings for individual grid corridors. Based on the review of the two grid alignment options (Corridor #1 and Corridor #2), Corridor #1 is therefore preferred from a hydrological and site-sensitivity perspective. Aligning the grid infrastructure alongside the other proposed pipelines consolidates disturbance within an existing services corridor, avoids the need for an additional watercourse crossing, and is expected to reduce overall environmental sensitivity and risk of impact to the watercourse.

Given that the impact assessment was undertaken at a composite scale encompassing all proposed infrastructure components, the selection of Corridor #1 does not alter the overall significance ratings assigned; it represents the lower-risk alignment within an already characterised project footprint.

5.5 ADDITIONAL CONSIDERATIONS

Flooding and pollutant entry into surface water are the two primary impacts identified by the impact assessment. Both impacts are poorly represented in the impact assessment due to their probability of occurrence (improbable).

6 ASSUMPTIONS AND LIMITATIONS

Various assumptions were required in the development of the site sensitivity analysis, with resultant limitations in the accuracy of the site assessment. They included the following:

- *Climatic Inputs* – rainfall, evaporation, and temperature are based on regional long-term datasets, not continuous site-specific monitoring.
- *Rainfall distribution* – the rainfall distribution used is hypothetical, with a symmetrical S-curve approach adopted (centred at the 12-hour mark). Extreme rainfall may occur differently with greater spatial variability from this, which may affect predicted volumes.
- *Rainfall depth* – DRESSA rainfall depths are assumed to be accurate, with normal DRESSA values applied to this study. DRESSA also includes upper values representative of upper confidence limits. In addition, rainfall duration up to the 24-hour event has been considered. Longer event rainfall could exacerbate flooding; however, this may be limited due to the balance of infiltration loss compared to longer-duration rainfall.
- *Site Sensitivity Grading* – grading of the surface water environment is based on buffers applied to mapped rivers, drainage lines, and other hydrological features from regional topographic datasets. Unless specified, the inclusion of 'Any other channels' and 'furrows' that appeared not to have a hydrological upstream connection were included only when draining to a natural dam, as indicated by the 1:50,000 dam dataset DWS.
- *Buffer Distances* – are applied uniformly from mapped feature centre-lines or indicative edges; actual top-of-bank positions and riparian extents may differ locally.
- *Sensitivity Classes* – reflect relative hydrological and regulatory considerations at the scale of the project; they are intended as a planning tool and do not determine legal compliance or authorisation outcomes.
- *Sensitivity mapping* – focuses on rivers and artificial drainage features; it does not include a detailed assessment of wetlands, vleis or pans, which would require separate specialist investigation and may change the perceived sensitivity in certain areas.
- *Sensitivity Bands* – defined with reference to the current project layout and infrastructure footprints; any substantial changes in the positioning, elevation, or design of TSFs, RWDS, pipelines, or roads may alter the distribution and interpretation of sensitivities.
- *Flood Lines* – the 1:100 and 1:50-year flood lines used in this assessment were adopted from the previous flood line assessment (Project EIM-021) and are not recalculated here; all conclusions about flood risk are contingent on the assumptions and methods used in that original study.
- *Wetlands, pans and vleis* – these were not delineated in detail; only their indicative presence from national mapping is shown. A dedicated wetland study is required to define wetland extents, buffers and functional importance.
- *Water Quality* – No quantitative water quality modelling was undertaken; pollutant impacts are assessed qualitatively based on generalised tailings and process water characteristics from mining operations in the area.
- *Impact Assessment* – The impact assessment uses a risk-based significance methodology combining consequence and probability; numerical scores are based on professional judgement given the available

data. The scores are based on proposed impact as it is assumed that existing footprints have already been assessed.

7 SURFACE WATER MONITORING

Regular surface water quality monitoring is required to enable change detection resulting from the potential contamination of surface water by the TSFs. Surface water monitoring points are expected to be present, given the existing greater operation.

7.1 MONITORING PROGRAMME

Potential contaminants of concern that need to be monitored are expected to have already been identified based on the historical quarterly surface water quality monitoring that has been undertaken. The understanding of the mine's processes and the associated contaminants that might be released in the event of a failure in an aspect of the TSF (e.g., toe paddock rupture or RWD overflow) is likewise expected to be clearly understood, with monitoring reflecting this.

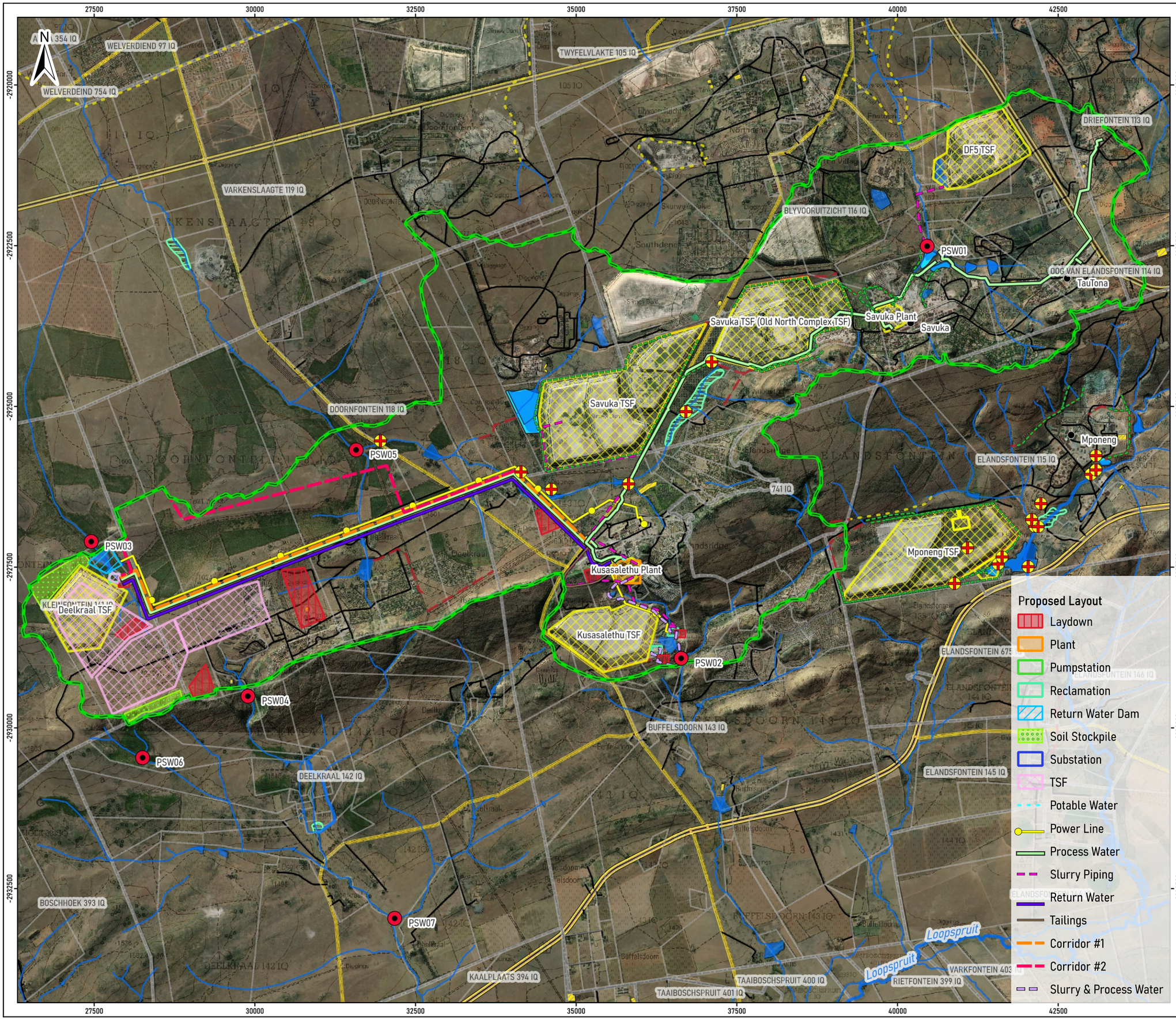
Quarterly monitoring reports should be produced to differentiate seasonal variations and general trends due to the mining activities, with a comparison of water samples to standards and guidelines set by the Department of Water and Sanitation (DWS), and an analysis of parameters over time so that trends can be established.

Suggested monitoring points are proposed at seven locations downstream of the proposed construction and operation areas.

The recommended monitoring point is illustrated in **Figure 6-1** and is presented in **Table 6-1**.

TABLE 7-1: ADDITIONAL MONITORING POINTS RECOMMENDED

Monitoring Point	Coordinate
PSW01	26° 24' 42" S, 27° 24' 20" E
PSW02	26° 28' 11" S, 27° 22' 3" E
PSW03	26° 27' 12" S, 27° 16' 31" E
PSW04	26° 28' 30" S, 27° 17' 59" E
PSW05	26° 26' 25.79" S, 27° 18' 59.68" E
PSW06	26° 29' 01.56" S, 27° 17' 00.14" E
PSW07	26° 30' 22.45" S, 27° 19' 21.98" E



Legend

- Area of Hydrological Relevance
- Existing TSF
- Trenches (Mponeng)
- Mponeng Shafts

Rivers

- Any Other Channel (50K Topo)
- Furrow (50K Topo)
- Non-Perennial River (50K Topo)
- Perennial River (50K Topo)

Roads

- Main Road (50K Topo)
- National Road (50K Topo)
- Other Road (50K Topo)
- Secondary Road (50K Topo)

Dams

- Dam (50K Topo)
- Non-perennial pan (50K Topo)
- Open Reservoir (50K Topo)
- Vlei (50K Topo)
- Dams (Mponeng)
- Pollution Dams (Mponeng)
- Proposed Surface Water Sampling Points
- Proposed Surface Water Sampling Points

Figure 6-1

Surface Water Monitoring

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0 1 2 3 km

Scale - 1:55,000 @A3	Coordinate Reference System: Hartebeesthoek94_Lo27_(E-N)	Version 2 24-Jul-2026

8 CONCLUSION AND RECOMMENDATIONS

The applicant is undertaking a pre-feasibility assessment to increase deposition through the construction of the Deelkraal II TSF, Return Water Dam, and associated infrastructure.

Baseline information, including rainfall, evaporation, design event rainfall, soils, vegetation, terrain, and land-cover, as well as site terrain, flooding, and regional and local catchment hydrology, has been considered for the proposed pipelines.

Applicable Guidance

The primary guidance applicable to this assessment is as follows:

- National Environmental Management Act (Act No. 107 of 1998) as amended, states that "Every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring…";
- National Water Act (Act No. 36 of 1998) includes Section 21 water uses which require authorisation from the Department of Water and Sanitation (DWS);
- Department of Water and Sanitation Notice 4167 of 2023 provides clarity on the regulated area of a watercourse; and
- Government Notice 704 (Government Gazette 20118 of June 1999) provides regulations on the use of water for mining and related activities aimed at the protection of water resources.

Site Sensitivities

Figures 4-1 to 4-3 present the results of the identified site sensitivities as they relate to the surface water environment. This figure illustrates that portions of the proposed infrastructure are within sensitive areas. This primarily includes the influence of the northern and southern river systems adjacent to the TSFs.

Identified Impacts

Flooding and pollutants entering the surface water environment are the two primary impacts, whether or not indicated by the impact assessment. Both impacts are poorly represented in the impact assessment due to their probability of occurrence (improbable). In the case of flooding, there is flooding originating beyond the TSFs (from the northern and southern river systems and surface water run-on) and flooding originating from the TSFs (due to a TSF failure). The latter presents the largest risk to this study (that of flood risk and pollutants entering the surface water environment). A secondary pollutant risk is poor management of the TSFs (and by association the RWD and pipelines), resulting in a spill.

In reviewing the proposed grid corridors (Corridor #1 and Corridor #2), Grid Corridor #1 is hydrologically preferred, as its alignment alongside the other proposed pipelines avoids an additional watercourse crossing and is therefore expected to reduce overall site sensitivity and environmental impact.

Surface Water Monitoring

Regular surface water quality monitoring is required to enable change detection, concerning the potential contamination of surface water by any pipeline leaks. Surface water monitoring points presently active over the greater Proposed Harmony West Wits Reclamation and Deposition Project footprint have been provided and are presented in **Figure 6-1**. Sampling points are laid out to either capture flows towards the TSFs or flows away from the TSFs (pre- and post-pollutant potential, respectively).

Authorisation

The proposed construction of the Deelkraal II TSF and associated infrastructure (**refer to Section 1.3**) can be authorised concerning the hydrological (surface water) environment, inclusive of the recommended mitigation measures presented in **Section 5**. A review of the Proposed Harmony West Wits Reclamation and Deposition Project surface water monitoring plan will also be required to ensure that the TSFs are adequately considered (as it relates to monitoring positions).

We propose the development of a stormwater management plan to better control the runoff of 'clean' water diversion.





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