Rustenburg Platinum Mines - AngloAmerican Platinum Ltd

SURFACE WATER IMPACT ASSESSMENT TO SUPPORT ENVIRONMENTAL AUTHORISATION

Mortimer Smelter – Additional Slag Cleaning and Sulphur Dioxide Abatement

41107629
MAY 2025

CONFIDENTIAL

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ABBREVIATIONS

ASC	Additional Slag Cleaning
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EC	Ecological Category
EMP	Environmental Management Plan
EWR	Ecological Water Requirements
GN	Government Notice
km	kilometres
mamsl	Metres above mean sea level
mm/a	Millimetres per annum
m^3/a	Cubic meters per annum
NIWIS	National Integrated Water Information System
NWA	National Water Act
RDM	Resource Directed Measures
REC	Recommended Ecological State
RQOs	Resource Quality Objectives
RWD	Return Water Dam
WACS	Converter Slag
WACSt	Converter Slag tailings
WMA	Water Management Area
WUL	Water Use License

EXECUTIVE SUMMARY

Rustenburg Platinum Mines Limited (RPM) - AngloAmerican Platinum is planning for additional slag cleaning (ASC) at Mortimer smelter that will entail the re-purposing of the existing furnace to slag cleaning duty. WSP is assisting with the Environmental Authorisation (EA).

Mortimer Smelter straddles quaternary catchments A24D, A24E and A24, however the project area falls within quaternary catchment A24E. The topography of the area is flat to gently undulating with gentle elevations sloping from west to east.

The area around the smelter is highly developed with predominantly dry-land agriculture and mining up and downstream of the site, and some natural areas that are used for grazing.

Water Resource Protection

Classification and resource quality objectives have been set for the Crocodile (West) Catchments, with the following gazette being relevant: National Water Act (36/1998): Determination of Water Resource Classes and Resource Quality Objectives for Mokolo, Matlabas, Crocodile (West) and Marico Catchments – GN 42775, 18 October 2019.

The goal of the classification process is the implementation of the water resource classification system which has as its final product the selection of one of three water resource classes. The water resource class for the area in which the site is located is a Class III, which means that the water resource is one which is heavily used, and the overall condition of that water resource is significantly altered from its pre-development condition.

Resource Quality Objectives (RQOs) that establish clear goals relating to the quality of the relevant water resources have been set for water quality, instream and riparian habitat, and biota (fish).

In respect of the Köppen Geiger climate classification, the project area is located predominantly in the Arid, steppe, hot (BSh) area, with some overlap of portions of Temperate, dry winter, hot summer (Cwa). The average high temperatures range between 20°C and 30°C with the highest temperatures from October to February, and average low temperatures between 6°C and 18°C with the lowest temperatures from May to September. Rainfall for the catchment is highly seasonal. Water Resources 2012 data describe a rainfall of 592 mm/a for quaternary catchment A24E, and evaporation is 1 800 mm/a.

The Department of Water and Sanitation, National Integrated Water Information System (NIWIS), climate change assessment indicates that while the rainfall is not expected to decrease by more than 2-3%, increased temperature, evaporation and reduced wet spells mean that the streamflow is expected to reduce by as much as 29%.

Water Quality at a downstream site on the Bierspruit highlights salts that are considerably elevated above the RQOs based on the 95th percentile data; nutrients that are elevated but within the 50th percentile RQOs for orthophosphate. The data also indicate that there are no definite water quality trends with spikes occurring at regular intervals, and an overall poor water quality over the last 10 years.

It is noted that no new stormwater management infrastructure will be constructed as part of the ASC and SO_2 abatement plant, and stormwater management in the area in which the additional infrastructure will be constructed will therefore tie into this existing stormwater management plan. Channels/ trenches will however be constructed as part of the project in order to tie into the existing stormwater management infrastructure.

The following aspects are expected to have some impact on the environment.

Construction phase

- Construction of project infrastructure, and
- Transportation and use of equipment.

Operational Phase

- Stockpiling of feed material
- Stormwater management structures and Return Water Dams, and
- Storage and use of hydrocarbons and hazardous chemicals.

Closure/ decommissioning phase

- Removal of redundant infrastructure and contaminated soils
- Grading of project site to ensure long-term drainage conditions, and
- Soil placement and revegetation of project site.

The impact assessment indicated that considering the location of the plant area the impacts identified would have a low impact significance for the construction, operation and decommissioning phases.

The objectives for the surface water component should include:

- Maintaining vehicles and machinery to limit contaminated run-off from the site during all phases of the project,
- Maintaining the existing stormwater management system to ensure that Game Farm Flood Storage Dam is maintained as empty as possible to prevent overflows, and
- Practicing good housekeeping in all areas to limit the volume of contaminated run-off to downstream water resources.

The following mitigation is proposed to reduce the impacts:

- Reduce areas that need to be cleared for the laydown area during construction
- Rehabilitate as soon as possible once construction is complete in an area and ensure adequately designed berms and stormwater collection facilities to capture contaminated sediment before water is released to the environment; and
- Throughout the life cycle of the project, ensure clean-up of hydrocarbon spills from machinery is done immediately, and contaminated soils disposed of to a permitted site, or rehabilitated in-situ as needed.
- Divert clean run-off around the dirty water system and release it below the Game Farm Flood Storage Dam to enter the Brakspruit.

- Maintain the existing stormwater management facilities so that Game Farm Flood Storage Dam is kept as empty as possible.
- Design and maintain storage facilities adequately for hazardous chemicals and hydrocarbons. Maintain any upstream silt traps and oil and water separators if used.
- Undertake water quality sampling for analyses at an accredited laboratory from the dirty water facilities, at least every quarter, as well as at a point downstream in the Brakspruit, such as at the Swartklip Road, when water is present
- Undertake sediment sampling from the Barbers Dam and Game Farm Dam to get a good understanding of the quality of sediment that may be flushed downstream during high rainfall events, and to inform a rehabilitation plan for the dams during the closure phase, and

Considering the existing impacts to the Brakspruit and the downstream Bierspruit, and ultimately the Crocodile (West) River, the additional cumulative impact of potential contamination (hydrocarbons, metals and sediments) to surface water resources, and considering the improvements that the area will have on dirty stormwater, the proposed ASC and SO_2 abatement project, is likely to have a positive impact on the system, and there is unlikely to be any further adverse impacts to the surface water resources if good management practices are practiced.

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1 INTRODUCTION

AngloAmerican Platinum is planning for additional slag cleaning (ASC) and the SO_2 Abatement Project at Mortimer smelter. This entails the re-purposing of the existing furnace to slag cleaning duty. WSP is assisting with the Environmental Authorisation (EA).

The ASC and SO_2 Abatement project will require additional infrastructure adjacent to the existing furnace, within the current boundaries of the site, on disturbed land. Anglo believes that the proposed changes will require an amendment to the existing atmospheric emissions licence (AEL), an application for environmental authorisation (EA), supported by a basic assessment (BA) process, and possibly an amendment to the existing water use licence (WUL).

Mortimer Smelter as an existing smelter has the following existing and valid EAs:

- Water use license (WUL) for S21g water uses
- Atmospheric emissions license (AEL) for activities 4.1 (Drying and calcining of mineral solids, including ore) for the flash dryer and 4.16 (smelting and converting of sulphide ores) for the existing furnace, and
- EA/Environmental Management Plan (EMP) for existing facilities and the SO_2 abatement project which has been paused.

1.1 PURPOSE OF THIS REPORT

The purpose of this report is to describe the catchment baseline, legislative requirements and the impact the ASC and SO_2 Abatement facilities at Mortimer smelter, will have on the on the downstream Bierspruit and water users.

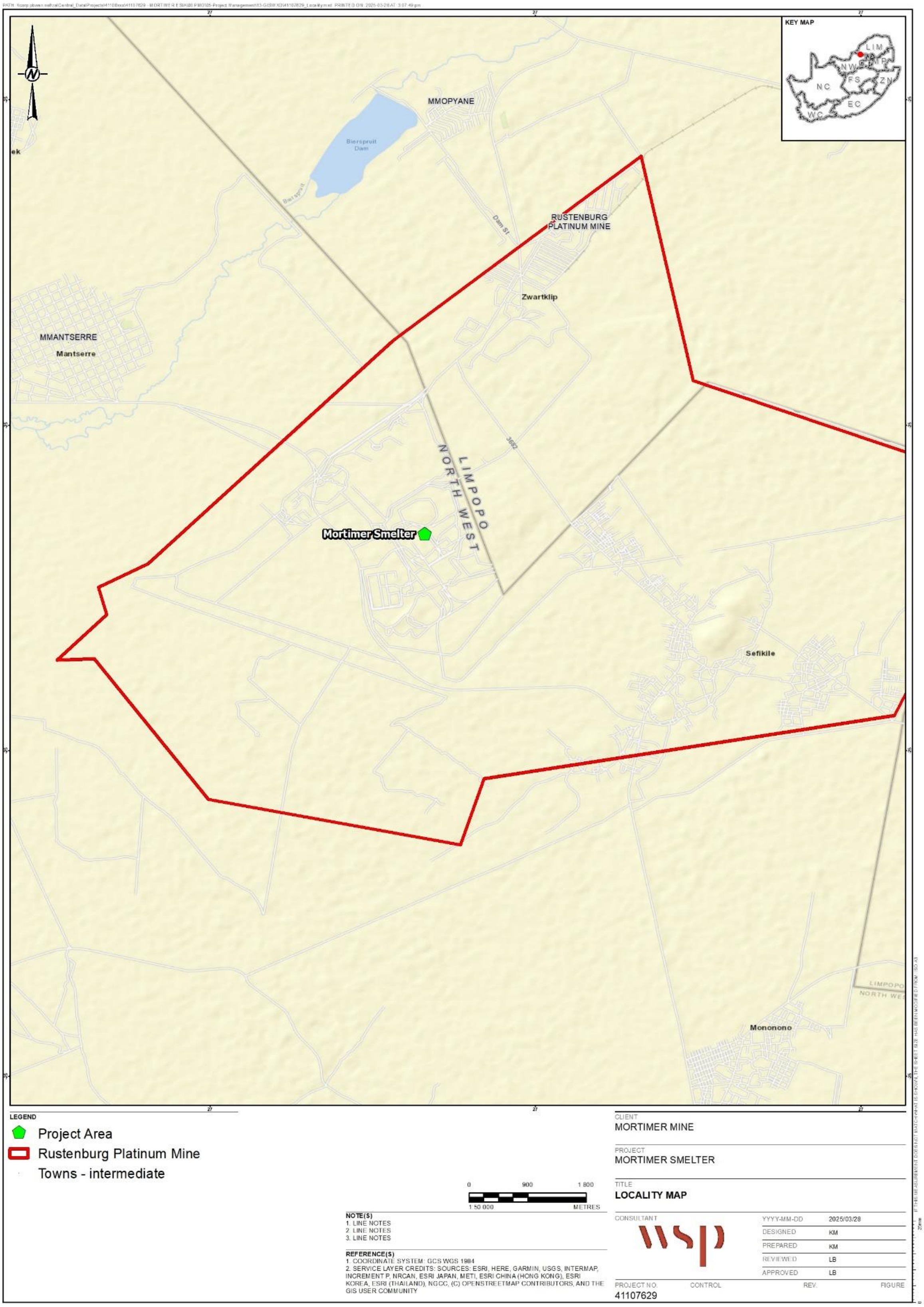

Figure 1-1 - Project Locality

2 BACKGROUND

2.1 PROJECT DESCRIPTION

Mortimer Smelter is located on the farm Turfbult 404 KQ in close proximity to the provincial boundary of the Northwest and Limpopo provinces., and on the on the boundary of the Thabazimbi Local Municipality in Limpopo Province and Moses Kotane Local Municipality in Northwest Province.

The Mortimer Smelter operates one primary smelting furnace. The ASC project will require additional infrastructure adjacent to the existing furnace, within the current boundaries of the site, on disturbed land, and entails the re-purposing of the existing furnace to slag cleaning duty.

The offgas modifications will include the installation of an SO_2 abatement plant, and Anglo American Platinum is currently investigating different options in terms of the available technical solutions to reduce SO_2 emissions from the converted Mortimer furnace to achieve the Minimum Emission Standards (MES), set out in Listed Activities and Associated Minimum Emission Standards identified in terms of section 21 of the NEM:AQA Number 39 of 2004 published in Government Notice Regulation (GNR) 893.

The exhaust from the SO_2 Abatement plant (containing reduced SO_2 concentrations) will be vented into the atmosphere via a new stack.

2.1.1. WATER SUPPLY

Water supply for the site will be taken from the existing water allocation from the municipality. No additional water will be required.

3 LEGISLATIVE CONTEXT: WATER RESOURCE PROTECTION

3.1 RESOURCE DIRECTED MEASURES

Resource Directed Measures (RDM) is enabled through Chapter 3 of the National Water Act (Act No. 36 of 1998) (NWA) that provides for the protection of water resources through the classification of water resources, determination of resource quality objectives (RQOs) and determination of the Reserve. These measures collectively aim to ensure that a balance is reached between the need to protect and sustain water resources on one hand and the need to develop and use them on the other.

The classification system and the Reserve are intended to ensure comprehensive protection of all water resources. Once the water resources class and the Reserve have been established, RQOs are established to give effect to determined water resources classes and the Reserve.

The definition of a water resource, as in the NWA, includes a watercourse, surface water, estuary, or aquifer, and a watercourse is defined as a river or spring, a natural channel in which water flows regularly or intermittently, a wetland, lake or dam into which, or from which, water flows; and any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks.

Classification and resource quality objectives have been set for the Crocodile (West) Catchments, with the following gazette being relevant:

- National Water Act (36/1998): Determination of Water Resource Classes and Resource Quality Objectives for Mokolo, Matlabas, Crocodile (West) and Marico Catchments – GN 42775, 18 October 2019.

3.1.1. Water Resource Class

The goal of the classification process is the implementation of the water resource classification system which has as its final product the selection of one of three water resource classes (Table 3-1). The purpose of the water resource class is to establish clear goals relating to the quantity and quality of the relevant water resource, and conversely, the degree to which it can be utilised by considering the economic, social, and ecological goals from an integrated water resource management perspective.

The water resource classification system places the following principles at the forefront of implementation:

- Maximising economic returns from the use of water resources
- Allocating and distributing the costs and benefits of utilising the water resource fairly, and
- Promoting the sustainable use of water resources to meet social and economic goals without detrimentally impacting on the ecological integrity of the water resource.

Table 3-1 – Water Resource Classes

Class	Description of use	Ecological Category	Description of resource
I	Minimally used	A-B	Water resource is one which is minimally used, and the overall condition of that water resource is minimally altered from its pre-development condition
II	Moderately used	C	Water resource is one which is moderately used, and the overall condition of that water resource is moderately altered from its pre-development condition
III	Heavily used	D	Water resource is one which is heavily used, and the overall condition of that water resource is significantly altered from its pre-development condition

3.1.2. Resource Quality Objectives

The purpose of Resource Quality Objectives (RQOs) is to establish clear goals relating to the quality of the relevant water resources. Resource quality objectives provide statements about:

- what the quantity of water should be (water level, pattern, timing)
- what the water quality should be (physical, chemical, biological)
- what the condition of the instream and riparian (riverbank) habitat should be, and
- what the condition of the aquatic (water) animal and plant life should be.

3.1.3. Reserve

The Reserve (quantity and quality of water resources) which has priority over other water uses, provides for two components:

- Basic human needs (BHN), ensuring that the essential needs of individuals served by the water resource in question are provided for; and

- The ecological Reserve ensuring the water required to protect aquatic systems of the water resource are provided for.

In terms of the NWA the preliminary determinations of Reserves may be made if a water resource has not been classified. However, once water resources have been classified the preliminary Reserve must be superseded by the Reserve.

3.1.4. Project site RDM requirements

As part of the classification and RQO process the first step is to delineate the catchments into integrated units of analysis (IUA) and define Resource Units (RUs). Each integrated IUA represents a homogenous catchment area of similar impacts which must be considered in the determination of RQOs. A RU on the other hand is a water resource component within an IUA that is sufficiently ecologically distinct to warrant its own specification in respect of RQOs. For example, groundwater RUs are defined separately and are based on several specific groundwater related factors, and similarly, wetlands may be prioritised for higher protection, even within a Class III River system.

The IUA delineation of Mokolo, Matlabas, Crocodile (West) and Marico catchments within the Limpopo WMA resulted in 17 IUAs. In respect of RU delineation, 82 RUs were delineated incorporating the groundwater priority areas and priority wetlands/ wetland clusters, and based on resource unit prioritisation undertaken, 57 RUs were prioritised (incorporating the groundwater priority areas and priority wetlands/ wetland clusters), and 18 dam RUs were prioritised (Figure 3-1). The area in which the project site is located is shown as a red box. RQOs are set for the prioritised RUs which define the catchment goals that are to be achieved.

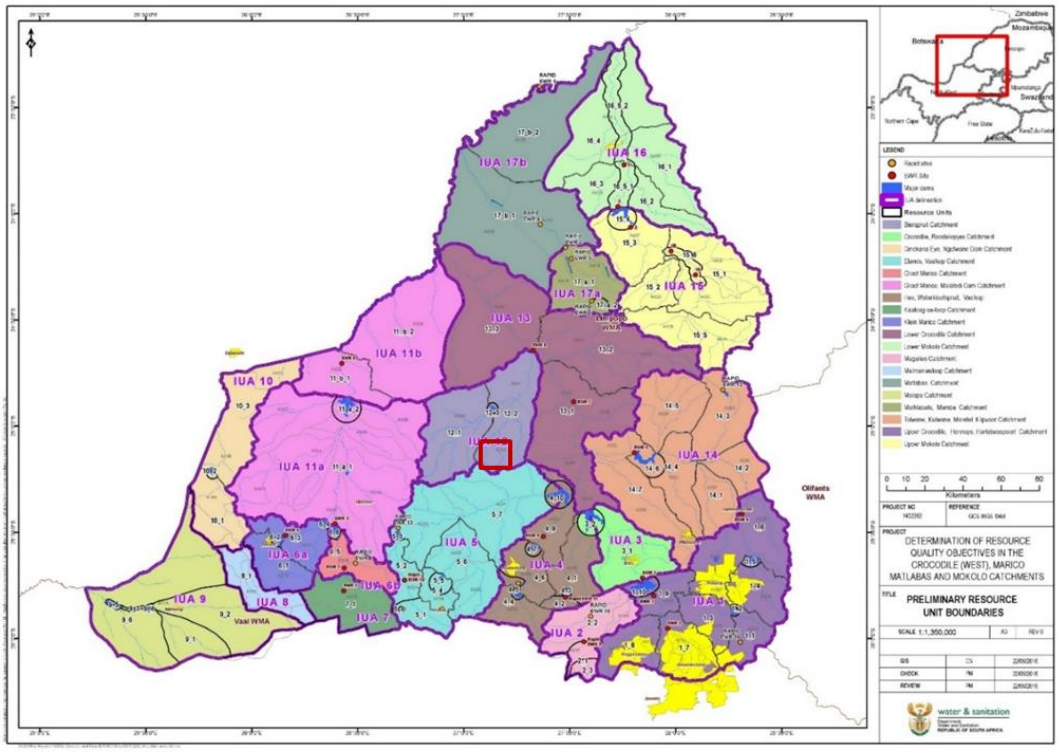

Figure 3-1 - IUAs and RUs for the Crocodile (West) catchments (DWS, 2019)

The site falls within IUA 12, Bierspruit catchment, that has been classified as a Class III, which means that it is a workhorse river. The RU is RU 12-2 that includes quaternary catchments A24E and A24F, described as the Bierspruit to confluence with Crocodile River, Brakspruit, Phufane, Sefatlhane, Lesobeng, lower reach Bofule River. The Recommended Ecological Category for has been set as a D category.

The RQOs set for the quaternary catchment in which Mortimer Smelter operations fall are set out in Table 3-2, for Bierspruit catchments. It is important to note that not every variable is included as an objective, and if necessary, where additional variables are identified as a concern for a specific activity, could be included as water quality planning limits at a finer scale (sub-catchment level).

Table 3-2 - Resource Quality Objectives relevant to the Mortimer Smelter operations

Variable	Units	Percentile	A24E,F
Water Resource Class			Class II!
Resource Unit			RU 12_2
Ecological Category			D Category
Flows	m^3/s	N/A	No RQO set for flow
Chloride	mg/L	95th percentile	≤ 100
Electrical Conductivity	mS/m	95th percentile	≤ 85
Sulphate	mg/L	95th percentile	≤ 100
Sodium	mg/L	95th percentile	≤ 100
pH	units	5th and 95th percentile	6 - 8.5
Orthophosphate	mg/L as P	50th percentile	≤ 0.125
Nitrate-Nitrite	mg/L as N	50th percentile	≤ 1.0
Turbidity	NTU	95th percentile	10% variation from background
Iron	mg/L	95th percentile	≤ 0.3
Aluminium	mg/L	95th percentile	≤ 0.1
Copper (hard*)	mg/L	95th percentile	≤ 0.0073
Manganese	mg/L	95th percentile	≤ 0.15
Lead (hard*)	mg/L	95th percentile	≤ 0.0095
Nickel	mg/L	95th percentile	≤ 0.07
Cobalt	mg/L	95th percentile	≤ 0.05
Zinc	mg/L	95th percentile	≤ 0.002
Pathogens (*Escherichia coli*)	counts/100mL	95th percentile	130
Habitat			
Instream Habitat	Index of Habitat Integrity, Rapid Habitat Assessment Method and Model (RHAMM)		Instream Habitat Integrity EC = D ≥ 42%
Riparian Habitat	Vegetation Response Assessment Index		VEGRAI EC = D ≥ 42%
Biota			
Fish	Fish Response Assessment Index (FRAI).		Fish ecology category= D; FRAI ≥ 42% (collect 4+ species in a 20-minute sampling effort)

**refers to the hardness of the water*

4 CATCHMENT DESCRIPTION

4.1 HYDROLOGICAL DESCRIPTION

The catchment in which Mortimer Smelter is located forms part of the Crocodile (West) Catchment which falls within the Limpopo-Olifants Water Management Area (WMA01). Mortimer Smelter straddles quaternary catchments A24D, A24E and A24.

However, the operations are predominantly in quaternary catchment A24E with drainage to the southeast to the non-perennial Sefathlane River which drains from the north through the villages of Moruleng, Koedoespruit and Manamakhotheng upstream of the site, and then through the villages of Ga-Ramosidi and Sefikile east of the project site, to join the Brakspruit.

An ephemeral unnamed tributary of the Brakspruit, runs through the Mortimer Smelter lease area and is referred to as Mortimerspruit (or Union Stream). The Mortimerspruit and the Sefathlane River confluence to form the Brakspruit downstream of the Union Mine boundary, and then the Bierspruit which enters the Crocodile (West) River some 26 kilometres downstream (**Figure 4-1**).

4.2 TOPOGRAPHY

The topography of the area is flat to gently undulating with gentle elevations sloping from west to east, ranging from approximately 1050 metres above mean sea level (mamsl) in the west to 990 mamsl at the Sefathlane River southeast of the smelter. The Spitskop and a low ridge approximately 7 km north-west of the site are the only points of significant elevation within a 10 km radius. Mortimer Smelter's lease area is located on a gentle sloping watershed that divides the Bierspruit and Brakspruit catchments.

There are no sensitive areas, however, the riparian zones along drainage lines are classified as wetlands but are not considered significant.

4.3 WATER USERS

The area around the smelter is highly developed with predominantly dry-land agriculture and mining up and downstream of the site, and some natural areas that are used for grazing.

The villages of Ga-Ramosidi and Sefikile are located approximately 2.5 kilometres (km) southeast of the smelter along the river with subsistence land further downstream where the Sefathlane River joins the Brakspruit. As the river is non-perennial it is unlikely that the villagers would take water from the river for domestic purposes, and they are supplied by a Water Services Supplier. However, some water abstraction may occur especially for subsistence crop irrigation during the wet season when the river may be flowing.

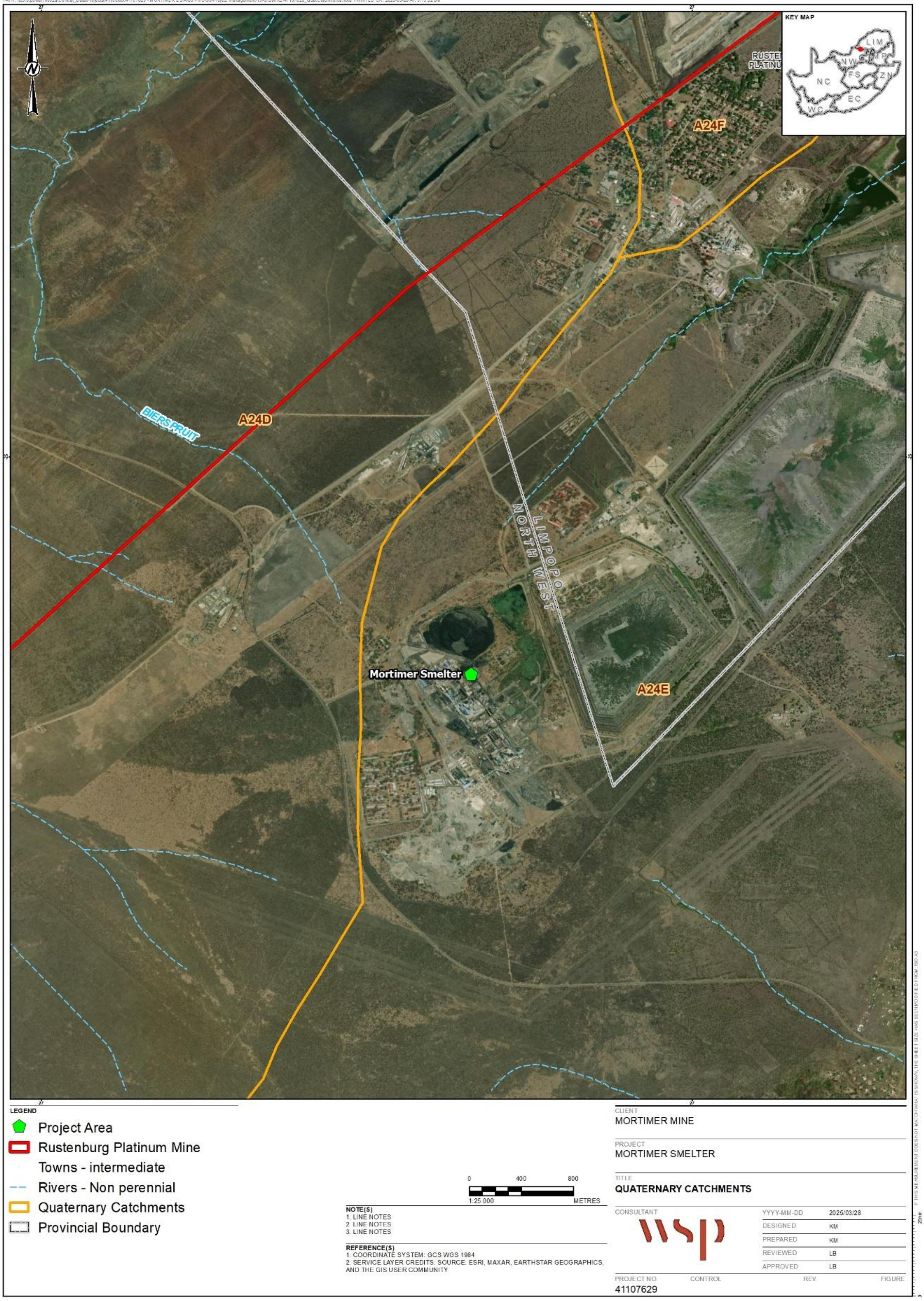

Figure 4-1 – Mortimer Smelter in relation to the quaternary catchments

4.4 CLIMATE

In respect of the Köppen Geiger climate classification, the project area is located predominantly in the Arid, steppe, hot (BSh) area, with some overlap of portions of Temperate, dry winter, hot summer (Cwa) (Figure 4-2).

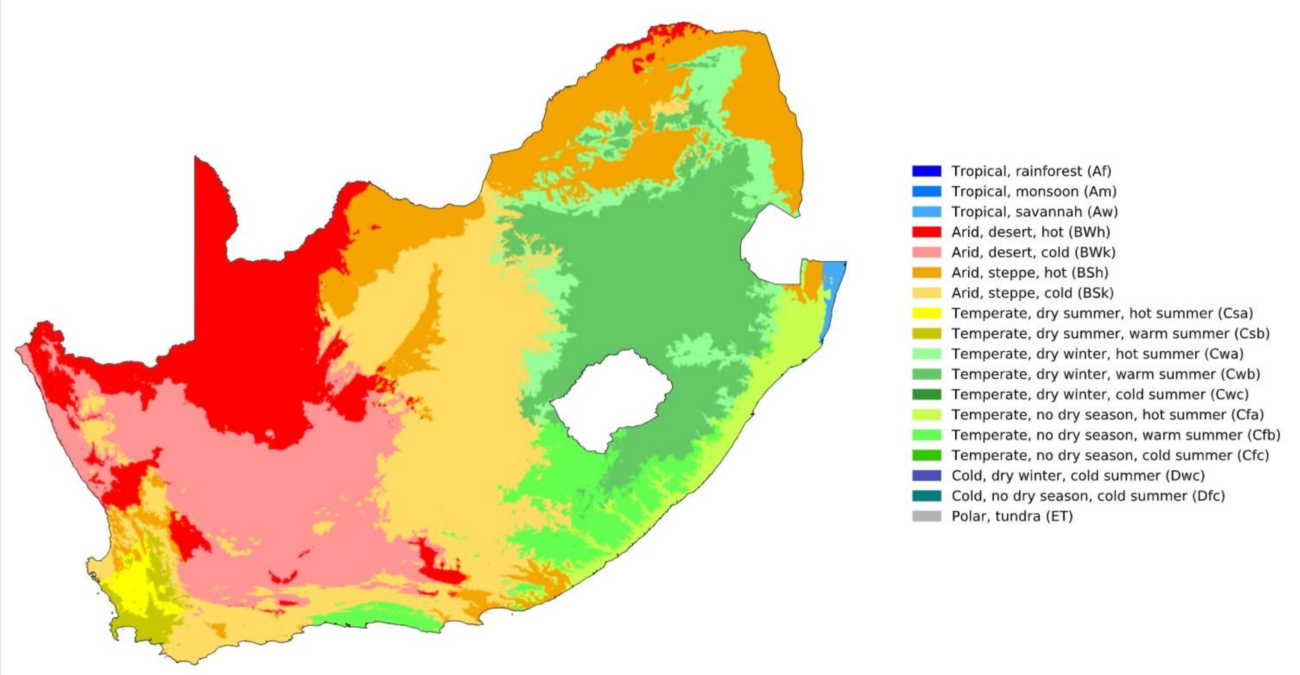

Figure 4-2 - Köppen Geiger climate classification for South Africa

4.4.1. Temperature

The average high temperatures range between 20°C and 30°C with the highest temperatures from October to February, and average low temperatures between 6°C and 18°C with the lowest temperatures from May to September.

Table 4-1 – Average minimum and maximum temperatures (°C) for the period January 2009 to February 2025[1]

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Max	30	30	29	25	23	20	20	24	28	30	30	30
Min	18	18	17	14	11	7	6	9	13	16	17	18

4.4.2. Rainfall

Rainfall for the catchment is highly seasonal. Water Resources 2012 data (WR2012) describe a rainfall of 592 mm/a for quaternary catchment A24E. The closest meteorological station with recent

[1] Rustenburg Weather Averages - North-West, ZA

data (1971 to 2025) is near Rustenburg some 64km south of the project site, DWS Station A2E022 at coordinates: Latitude: -25.71736 and Longitude: 27.18781, however this station is at a much higher altitude than the site in the Kgaswane Mountain Nature Reserve.

DWS meteorological station A2E008, is at a lower altitude at Kroondal in Rustenburg at coordinates - Latitude: 25.72388 and Longitude: 27.29083, with data for the period 1955 to 2007 with several gaps, and DWS meteorological station A2E012 at the Bierspruit Dam, just north of the site at Latitude: -24.900278 and Longitude: 27.150278, has data only for 10-year period 1960 to 1970.

Rainfall and evaporation data was downloaded for the latter two sites from the Department and Sanitations' hydrology website. The daily rainfall data at site A2E008 for the 52-year period indicated the data to be: 49.8% - good continuous data, ed, 45.77% good monthly readings, 2.1% is unaudited and 2.1% permanent gaps.

The mean annual precipitation for sites A2E008 and A2E012, described below is an average 641 mm/a and 542 mm/ a respectively as illustrated in Figure 4-3.

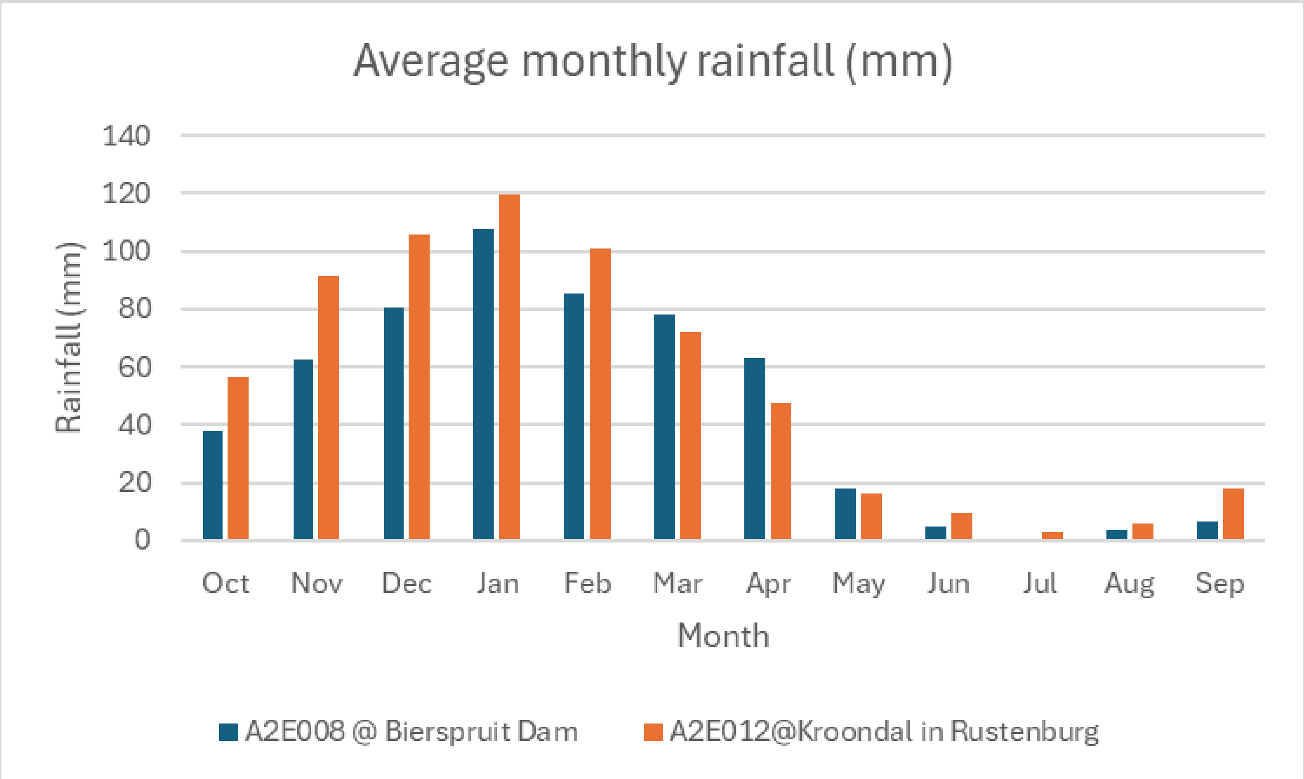

Figure 4-3 - Monthly average rainfall at Stations A2E008 and A2E012

4.4.3. Evaporation

Average evaporation was noted to be 1 774 mm/a at site A2E012 and 1 720 mm/a at site A2E008, and the WR2012 data sets out an evaporation rate of 1 800 mm/a.

4.4.4. Climate Change

The Department of Water and Sanitation, National Integrated Water Information System (NIWIS[2]), undertook a study to assess climate change aspects related to water, including changes in temperature, wet spells, dry spells, irrigation demand, potential evaporation, mean annual precipitation and streamflow. The Climate Change dashboard relates to climate change indicators including changes in temperature, wet spells, dry spells, irrigation demand, potential evaporation, mean annual precipitation and streamflow. The available climate change data used is at quinary scale (i.e., sub-division of the quaternary), and in this case is for quinary catchments A24E1, 2 and 3). The site is located in quinary A24E3.

Figure 4-4 and Table 4-2 illustrate and summarise the predicted climate change aspects for quinary catchments A24E1, 2 and 3. While the rainfall is not expected to decrease by more than 2-3%, increased temperature, evaporation and reduced wet spells mean that the streamflow is expected to reduce by as much as 29%.

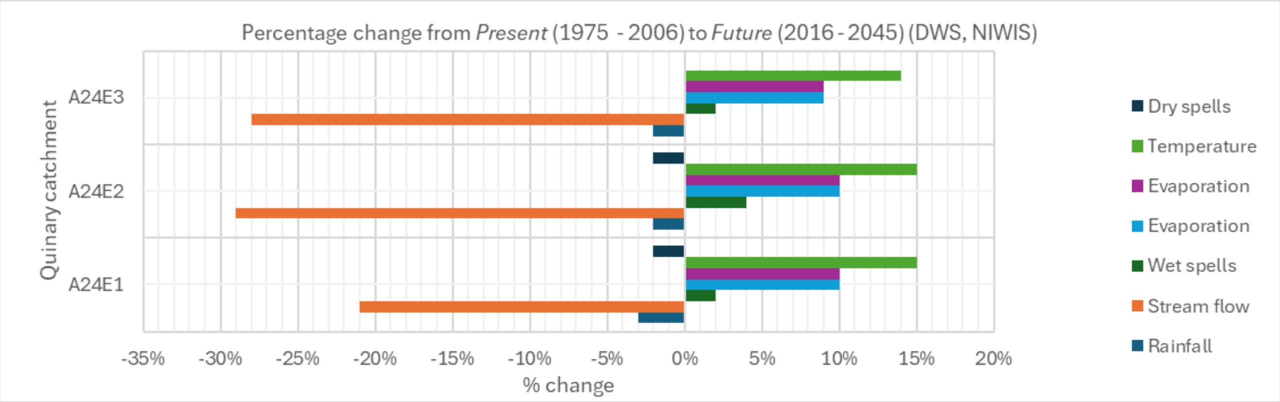

Figure 4-4 - Percentage change in climate aspects (DWS, NIWIS)

Table 4-2 – Climate change predictions (NIWIS[1])

Quinary Catchment	A24E1	A24E2	A24E3
Present Rainfall 1975 - 2006	657.7	628.2	609.9
Future Rainfall 2016 - 2045	639.9	614.7	596.7
% Change	-3%	-2%	-2%
Present Streamflow 1975 - 2006	121.6	91	95.6
Future Streamflow 2016 - 2045	95.8	64.9	68.5
% Change	-21%	-29%	-28%
Present Temperature 1975 - 2006	18.2	19.2	19.6
Future Temperature 2016 - 2045	21	22	22.4
% Change	15%	15%	14%

[2] - DWS - NIWIS - Climate and Weather -

Quinary Catchment	A24E1	A24E2	A24E3
Present Evaporation 1975 - 2006	1 884	1 971	2 008
Future Evaporation 2016 - 2045	2 071	2 160	2 199
% Change	10%	10%	9%
Present Dry spells 1975 - 2006	41.8	41.8	42.3
Future Dry spells 2016 - 2045	40.8	41	42.3
% Change	-2%	-2%	0%
Present Wet spells 1975 - 2006	41.8	41.8	41.8
Future Wet spells 2016 - 2045	42.8	43.3	42.8
% Change	2%	4%	2%

4.5 SURFACE WATER ASSESSMENT

4.5.1. Water Quality

Water quality data for this area is sparse because there is seldom flow in the Sefathlane River. DWS site A24_192756 on the Bierspruit just downstream of the confluence with the Brakspruit, has data for the period February 2012 to March 2024. Due to the non-perennial nature there are several gaps. Table 4-3 sets out the 5, 50th and 95th percentile data, and highlights the following for the catchment:

- Salts are considerably elevated based on the 95th percentile data. This is not unexpected because of the non-perennial nature of the systems and the impacts from the mines and to a lesser extent from the urban areas in the upstream catchment, and
- Nutrients are elevated but within the 50th percentile RQOs for orthophosphate and within the acceptable limit for domestic use for nitrate.
- There are no definite water quality trends as illustrated in Figure 4-5 with spikes occurring at regular intervals, and an overall poor water quality over the last 10 years.

Table 4-3 – Water Quality at the downstream site, A24_192756 on the Bierspruit

Parameter	Units	RQO/ water quality guidelines	5th percentile	50th percentile	95th percentile
Calcium	mg/L	***80***	32.4	70	123
Chloride	mg/L	***100***	36	145	566.8
Total Dissolved Solids	mg/L	***550****	316	810	1 618
Electrical Conductivity	mS/m	***85***	43	114	267
Fluoride	mg/L	***1***	0.32	0.81	2.00
Potassium	mg/L	***50***	3.59	7.79	18
Magnesium	mg/L	***50***	17.7	45.4	111
Sodium	mg/L	***100***	28.82	88	311
Ammonium	mg/L	-	0.05	0.05	0.6

Parameter	Units	RQO/ water quality guidelines	5th percentile	50th percentile	95th percentile
Nitrate/ nitrite	mg/L	***10****	0.05	5.5	33
pH	mg/L	***6-8.5***	7.7	8.2	8.6
Orthophosphate	mg/L	***0.125***	0.01	0.1	0.7
Silica	mg/L	**-**	1.5	5.7	8.7
Sulphate	mg/L	***100***	30	128	259
Total Alkalinity	mg/L	**-**	93	131	219

*calculated using the factor of 6.5; ** based on the acceptable water quality guidelines limit for the stricter value for either aquatic ecosystems or domestic use (DWS, 1996); - no guidelines set.

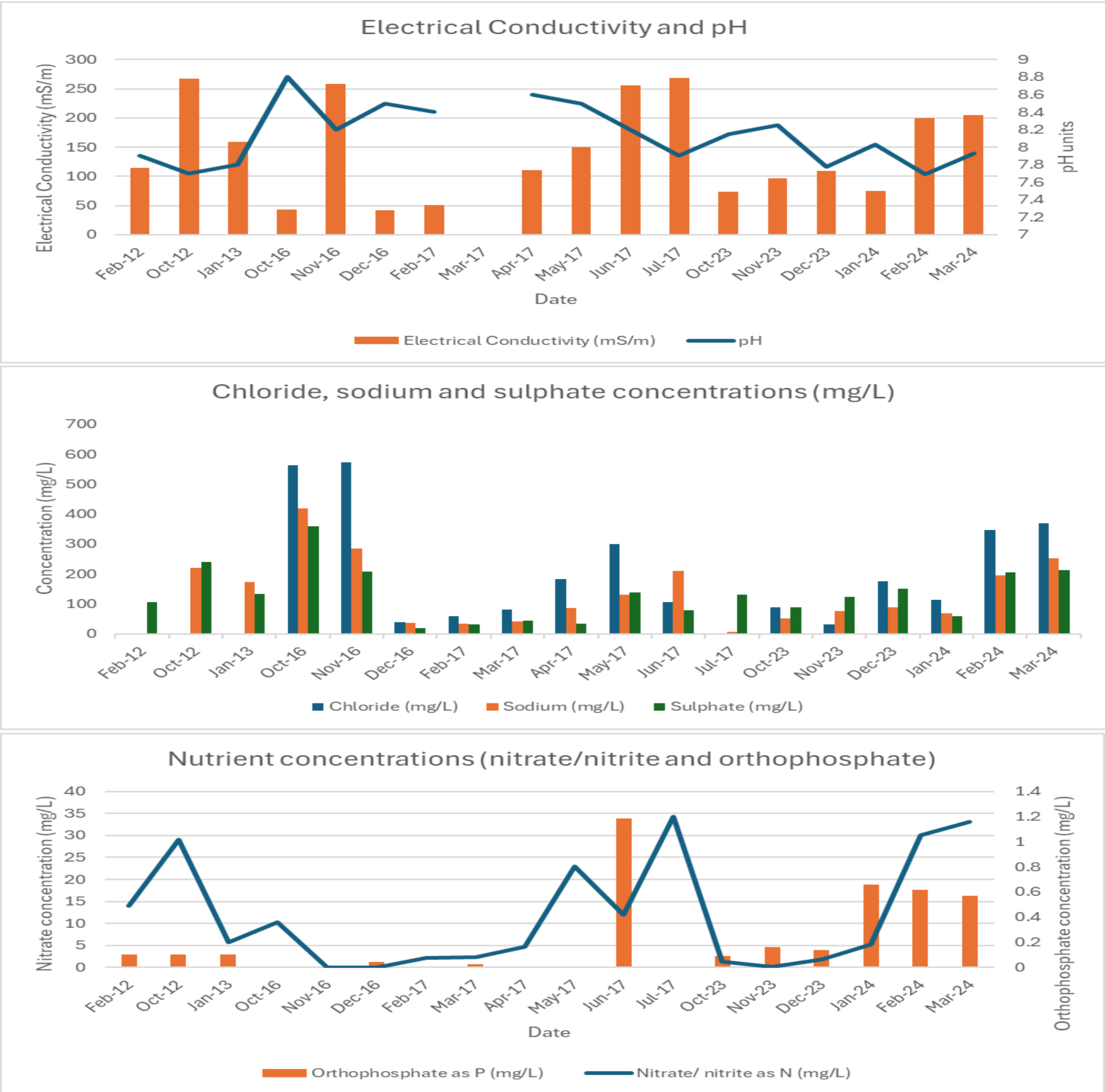

Figure 4-5 - Water quality trends at site A24_192756

4.6 STORMWATER MANAGEMENT

Due to the historical nature of Mortimer Smelter and use of in-stream return water dams, the Mortimerspruit within the lease area is operated as a dirty water channel.

The stormwater system includes (Figure 4-6):

- Fraser Alexander Return Water Dam (RWD) adjacent to the existing Slag dump and the most upstream dirty water dam
- Barber's RWD, downstream of Fraser Alexander RWD, and where dirty water is contained under normal operating conditions, and
- Game Farm Flood Storage Dam, the most downstream dirty water containment facility within the lease area which receives any overflow from Barbers Dam.

The Environmental Management Programme (EMPR) (WSP, 2021) notes that Game Farm flood storage dam should be kept as dry as possible to allow major flood events to be stored and settled in the dam before overflowing into the natural watercourse. However, it was also noted in the EMPR (WSP, 2021) that overflows to the Brakspruit from Game Farm flood storage dam do occur after intense rainfall events.

There are no stormwater dams at the concentrators or smelters as runoff is drained to the tailings return water dams. No new stormwater management infrastructure will be constructed as part of the ASC and SO_2 abatement plant. The additional infrastructure is part of the Slag Cleaning project, and the infrastructure will be tied into the existing stormwater system. Channels/ trenches will however be constructed as part of the project to tie into the existing stormwater management infrastructure.

Clean water diverted around the west of Barbers RWD and Game Farm flood storage dam flows to the Brakspruit immediately downstream of Game Farm flood storage dam.

Figure 4-6 – Mortimerspruit and Return Water Dams

5 IMPACT ASSESSMENT

5.1 MAJOR AREAS OF CONCERN FOR SURFACE WATER IMPACTS

The following aspects are expected to have some impact on the environment.

Construction phase

- Construction of project infrastructure, and
- Transportation and use of equipment.

Operational Phase

- Stockpiling of feed material
- Stormwater management structures and Return Water Dams, and
- Storage and use of hydrocarbons and hazardous chemicals.

Closure/ decommissioning phase

- Removal of redundant infrastructure and contaminated soils
- Grading of project site to ensure long-term drainage conditions, and
- Soil placement and revegetation of project site.

5.2 CONSIDERATION OF IMPACTS AND APPLICATION OF MITIGATION MEASURES

Following the assessment of the surface water systems associated with the proposed ASC and SO_2 abatement activities, a risk assessment matrix was applied to ascertain the significance of perceived impacts on the key drivers and receptors of the surface water.

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

The purpose of an impact assessment is to identify and evaluate the likely significance of the potential impacts on identified receptors and natural resources according to defined assessment criteria, to develop and describe measures that will be taken to avoid, minimise, reduce, or compensate for any potential adverse environmental effects, and to report the significance of the residual impacts that remain, following mitigation. The assessment of impacts proceeds through an iterative process considering four key elements:

- Prediction of the magnitude of impacts (the consequences of the project on the natural and social environment),
- Evaluation of the importance (or significance) of impacts taking the sensitivity of the environmental resources and human receptors into account,
- Development of mitigation to avoid, reduce or manage the impacts; and
- Assessment of residual significant impacts after the application of mitigation.

Where significant residual impacts remain, further options for mitigation may be considered and impacts re-assessed until they are as low as reasonably practicable (ALARP) for the project and would be deemed to be within acceptable levels.

The evaluation of baseline data gathered during the desktop assessment provides information for the process of evaluating and describing how the project could affect the biophysical and socio-economic environment. A clearly defined methodology is used to accurately determine the significance of the predicted impact on, or benefit to, the surrounding natural and/or social environment. For this, the project must be considered in the context of the area and the people that will be affected.

5.2.1. Risk Assessment Methodology

The significance of the identified impacts from the proposed project on the various environmental components were determined using the approach outlined below. This incorporates two aspects for assessing the potential significance of impacts (terminology from the Department of Environmental Affairs and Tourism Guideline document on Environmental Impact Assessment (EIA) Regulations, April 1998), namely occurrence and severity, which are further sub-divided as follows:

- Occurrence which relates to the probability and duration of occurrence, and
- Severity which relates the magnitude and the scale or extent of the impact.

To assess each of these factors for each impact, the following four ranking scales were used (Table 5-1).

Table 5-1 - Impact ranking scales

Magnitude	Duration
10- Very high/ unknown	5- Permanent (>10 years)
8- High	4- Long term (7-10 years, impact ceases after site closure has been obtained)
6- Moderate	3- Medium-term (3 months- 7 years, impact ceases after the operational life of the activity)
4- Low	2- Short-term (0-3 months, impact ceases after the construction phase)
2- Minor	1- Immediate
Scale	**Probability**
5- International	5- Definite/ Unknown
4- National	4- Highly Probable
3- Regional	3- Medium Probability
2- Local	2- Low Probability
1- Site Only	1- Improbable
0- None	0- None

Definitions

Magnitude is a measure of the degree of change in a measurement or analysis (e.g., the area of pasture, or the concentration of a chemical in water compared to the water quality guideline value for that chemical), and is classified as none/ negligible, low, moderate, or high. The categorization of the impact magnitude may be based on a set of criteria (e.g., health risk levels, ecological concepts and/or professional judgment) pertinent to each of the discipline areas and key questions analysed. The specialist study must attempt to quantify the magnitude and outline the rationale used. Appropriate, widely recognised standards are to be used as a measure of the level of impact.

Scale/ Geographic extent refers to the area that could be affected by the impact and is classified as site, local (within the quaternary catchment), regional, national, or international. Note that the reference is only to physical extent and does not include extent in a more abstract sense, such as an impact with regional policy implications which occurs at local level.

Duration refers to the length of time over which an environmental impact may occur i.e., immediate/transient, short-term (0 to 7 years), medium term (8 to 15 years), long-term (greater than 15 years with impact ceasing after closure of the project), or permanent; and

Probability of occurrence is a description of the probability of the impact occurring as improbable (less than 5% chance), low probability (5% to 40% chance), medium probability (40% to 60% chance), highly probable (most likely, 60% to 90% chance) or definite (impact will occur).

Once these factors have been ranked for each impact, the significance of the two aspects, occurrence, and severity, will be assessed using the following formula:

SP (significance points) = (magnitude + duration + scale) x probability

Table 5-2 - Significance of impact based on points allocation

Points	Significance	Description
SP>60	High environmental significance	An impact which could influence the decision about whether to proceed with the project regardless of any possible mitigation.
SP 30-60	Moderate environmental significance	An impact or benefit which is sufficiently important to require management, and which could have an influence on the decision unless it is mitigated.
SP<30	Low environmental significance	Impacts with little real effect and which will not have an influence on or require modification of the project design.
+	Positive impact	An impact that is likely to result in positive consequences/ effects.

5.3 CONSTRUCTION PHASE IMPACTS

5.3.1. Increased Contaminated Run-Off during Construction

While it is noted that the rainfall is low, considering anomalous rainfall events throughout South Africa over the past several years, and that the rainfall events are often heavy downpours, leading to flash floods in the areas in which they occur, erosion of exposed areas is likely during such events. However, as the area to be used is within an old plant area that has already been cleared and levelled, it is unlikely that extensive erosion will occur. Sediment run-off is however still expected during heavy rainfall events due to the windblown sediment that collects in the areas from the operations and increased compacted areas, reducing natural infiltration. The sediment is likely to end up in the RWDs with the potential of being washed further downstream during high rainfall events.

Contaminants, specifically hydrocarbons, from construction vehicles and equipment may be spilled or leak during use leading to contaminated soils. Run-off from these areas during high rainfall events, which are extremely unlikely, may lead to hydrocarbon contaminated sediment entering the return water dams and eventually the Brakspruit with overflow from the Game Farm Flood Storge Dam.

During construction it is expected that the magnitude of the impact will be minor due to the topography of the area and potential hydrocarbon contamination from equipment and trucks being likely but limited to small spills/ leaks on the site only.

In addition, the duration is likely to be short-term for the cleared areas construction occurs and as revegetation takes place once infrastructure is complete. The probability is low resulting in a **low** impact significance.

MITIGATION

The following mitigation is proposed to reduce the impacts:

- Reduce areas that need to be cleared for the laydown area.
- Rehabilitate as soon as possible once construction is complete in an area and ensure adequately designed berms and stormwater collection facilities to capture contaminated sediment before water is released to the environment; and
- Ensure clean-up of hydrocarbon spills from machinery is done immediately, and contaminated soils disposed of to a permitted site, or rehabilitated in-situ as needed.

Should the measures described above be implemented during construction, then the impact significance will reduce further to **negligible**.

5.4 OPERATIONAL PHASE IMPACTS

5.4.1. Contaminated run-off reaching water resources

Stockpiling of feed material, inadequate stormwater management structures and RWDs, and storage and use of hydrocarbons and hazardous chemicals can all impact on surface water resources.

No new stormwater management infrastructure will be constructed as part of the SO_2 abatement plant as the additional infrastructure is part of the Slag Cleaning project and will therefore tie into the existing stormwater system. Channels/ trenches will however be constructed as part of the project to tie into the existing stormwater management infrastructure.

It is expected that the run-off from the new area will be cleaner because of the increased roofing and concrete structures, and it is noted that the granulation process will change from wet to dry granulation, meaning that there will be less water required as part of the process and therefore no discharge to the RWDs.

There is however a probability that hydrocarbons from workshops and areas where heavy machinery is used, as well as incorrect storage and handling of hazardous chemicals used in the process can contribute to downstream contamination.

In this respect the probability of overflow from Game Farm Flood Storage Dam may decrease and under normal circumstances, is seen as low probability, considering the low rainfall and very few anomalous rainfall events. Should an incident occur, the magnitude is likely to be low and depending on the quality of the water at the time, the duration would be short-term, and the scale would be local. With a low probability, the impact significance is therefore **low**.

MITIGATION

The following mitigation is proposed:

- Clean run-off should continue to be diverted around the dirty water system and released below the Game Farm Flood Storage Dam to enter the Brakspruit.
- The existing stormwater management facilities should be operated to ensure that Game Farm Flood Storage Dam is kept as empty as possible.
- Any storage facilities for hazardous chemicals and hydrocarbons used in the process or in heavy equipment, must be adequately designed and maintained.
- Water samples should be taken for analyses at an accredited laboratory from the dirty water facilities, at least every quarter, as well as at a point downstream in the Brakspruit, such as at the Swartklip Road, when water is present.
- Sediment samples should also be taken from the Barbers Dam and Game Farm Dam to get a good understanding of the quality of sediment that may be flushed downstream during high rainfall events. This data should inform a rehabilitation plan for the dams during the closure phase.
- Maintain any upstream silt traps, and
- Maintenance of oil and water separators where present.

This will ensure that the impact significance is maintained as low.

5.5 CLOSURE/ DECOMMISSIONING PHASE IMPACTS

5.5.1 Contaminated Run-Off during Rehabilitation

Run-off during the rehabilitation (decommissioning/ closure) phase may still contain contaminants and the RWDs will need to be maintained until rehabilitation of the plant footprint. Ultimately the stormwater management system can then be rehabilitated. Contaminants in the sediments in the dams may include concentrated chemicals including dissolved solids, metals and hydrocarbons.

The magnitude of the impact at closure is rated as moderate, with a medium-term duration, on a local scale. The probability is low with the resultant impact significance of the run-off during rehabilitation expected to be low.

MITIGATION

The following mitigation is proposed to reduce the impacts:

- Maintain relevant stormwater system as needed while rehabilitation proceeds
- Rehabilitate areas as soon as possible as infrastructure is removed and areas are cleared, and
- Ensure clean-up of hydrocarbon spills from machinery is done immediately, and contaminated soils disposed of to a permitted site, or rehabilitated in-situ as needed.

5.6 IMPACT ASSESSMENT SUMMARY

The predicted environmental impacts resulting from the proposed project activities within the existing plant area are listed in Table 5-3 along with their significance ratings before and after mitigation.

Table 5-3 – Risk assessment for the potential risks to surface water resources

ACTIVITY	POTENTIAL IMPACT	ASPECT AFFECTED	Magnitude	Duration	Scale	Probability	Significance	Significance without Mitigation	Magnitude	Duration	Scale	Probability	Significance	Significance with Mitigation
Construction Phase														
Construction of project infrastructure and use of vehicles and use of equipment/ machinery	Run-off containing soil contaminated by hydrocarbon spills from vehicles and equipment used during construction.	Downstream water resources	4	2	1	2	14	Low	4	2	1	2	14	Low
Operational phase														
Operation of Stormwater Management System	Contamination of water resources from overflow from RWDs	Downstream water resources	4	2	2	2	16	Low	4	2	1	1	7	Low
Decommissioning & Closure Phase														
Contaminated run-off during closure	Contaminated run-off from the removal of infrastructure and rehabilitation of waste rock dumps.	Downstream water resources	4	3	2	2	18	Low	4	3	1	1	7	Low

6 ENVIRONMENTAL MANAGEMENT PROGRAMME: SURFACE WATER

6.1 OBJECTIVES

This Environmental Management Programme (EMPr) addresses the management of potential environmental impacts related to the proposed project in respect of surface water and should be used for managing, mitigating, and monitoring of the environmental impacts associated with construction, operational and rehabilitation phases of the site.

6.2 ENVIRONMENTAL MANAGEMENT AND MITIGATION MEASURES IDENTIFIED

The objectives for the surface water component should include:

- Maintaining vehicles and machinery to limit contaminated run-off from the site during all phases of the project,
- Maintaining the stormwater management system to ensure that Game Farm Flood Storage Dam is maintained as empty as possible to prevent overflows, and
- Practicing good housekeeping in all areas to limit the volume of contaminated run-off to downstream water resources.

Table 6-1 – Environmental Management Programme for Surface Water

Activity	Potential Impact	Aspect Affected	Mitigation	Responsible Department
Construction Phase				
Construction of project infrastructure and use of vehicles and use of equipment/ machinery	Run-off containing soil contaminated by hydrocarbon spills from vehicles and equipment used during construction.	Downstream water resources and water users	■ Reduce areas that need to be cleared. ■ Rehabilitate as soon as possible once construction is complete in an area and ensure adequately designed berms and stormwater collection facilities to capture contaminated sediment before water is released to the environment; and ■ Ensure clean-up of hydrocarbon spills from machinery is done immediately, and contaminated soils disposed of to a permitted site, or rehabilitated in-situ as needed.	Environmental Department
Operational Phase				
Operation of Stormwater Management System	Contamination of water resources from overflow from RWDs	Downstream water resources and water users	■ Clean run-off should continue to be diverted around the dirty water system and released below the Game Farm Flood Storage Dam to enter the Brakspruit. ■ The existing stormwater management facilities should be operated to ensure that Game Farm Flood Storage Dam is kept as empty as possible. ■ Any storage facilities for hazardous chemicals and hydrocarbons used in the process or in heavy equipment, must be adequately designed and maintained. ■ Water samples should be taken for analyses at an accredited laboratory from the dirty water facilities, at least every quarter, as well	Environmental Department

Activity	Potential Impact	Aspect Affected	Mitigation	Responsible Department
			as at a point downstream in the Brakspruit, such as at the Swartklip Road, when water is present. ▪ Sediment samples should also be taken from the Barbers Dam and Game Farm Dam to get a good understanding of the quality of sediment that may be flushed downstream during high rainfall events. This data should inform a rehabilitation plan for the dams during the closure phase. ▪ Maintain any upstream silt traps, and ▪ Maintenance of oil and water separators where present.	
Closure Phase				
Contaminated run-off during closure	Contaminated run-off from the removal of infrastructure and rehabilitation of waste rock dumps.	Downstream water resources and water users	▪ Maintain relevant stormwater system as needed while rehabilitation proceeds ▪ Rehabilitate areas as soon as possible as infrastructure is removed and areas are cleared, and ▪ Ensure clean-up of hydrocarbon spills from machinery is done immediately, and contaminated soils disposed of to a permitted site, or rehabilitated in-situ as needed.	Environmental Department

6.3 POTENTIAL CUMULATIVE IMPACTS IDENTIFIED

The current situation is that the catchment is already highly developed and impacted with water resources bearing the brunt of the contamination, specifically from the mines in the sub-catchment, and to a lesser extent the urban areas.

Considering the existing impacts to the Brakspruit and the downstream Bierspruit, and ultimately the Crocodile (West) River, the additional cumulative impact of potential contamination (hydrocarbons, metals and sediments) to surface water resources, and considering the improvements that the area will have on dirty stormwater, the proposed ASC and SO_2 abatement project, is likely to have a positive impact on the system, and there is unlikely to be any further adverse impacts to the surface water resources if good management practices are practiced.

6.4 RECOMMENDED MONITORING PROGRAMME

It is proposed that surface water monitoring be undertaken at the sites set out in Table 6-2.

Table 6-2 – Proposed surface water monitoring sites

Site	Reason for monitoring	Coordinates		Type of sample
		Latitude	Longitude	
Fraser Alexander RWD	To understand the main contaminants of concern and to inform a rehabilitation plan for the dams during the closure phase	-24.965892°	27.146862°	Quarterly surface water samples and once-off sediment samples
Barber's RWD		-24.937776°	27.171112°	
Game Farm Flood Storage Dam		-24.934193°	27.176074°	
Brakspruit at Spitskop Road	To understand the impact from the site on the Brakspruit	-24.917887°	27.213931°	Quarterly surface water sample or a grab sample when water is available
Upstream site on the Sefathlane River		Best site to be identified		Quarterly surface water sample or a grab sample when water is available

7 CONCLUSIONS

From a catchment perspective, the catchment is highly developed with the main activities being mining and subsistence agriculture.

The impact assessment has indicated that considering the location of the plant area the impacts identified would have a low impact significance for the construction, operation and decommissioning phases.

The objectives for the surface water component should include:

- Maintaining vehicles and machinery to limit contaminated run-off from the site during all phases of the project,
- Maintaining the stormwater management system to ensure that Game Farm Flood Storage Dam is maintained as empty as possible to prevent overflows, and
- Practicing good housekeeping in all areas to limit the volume of contaminated run-off to downstream water resources.

The following mitigation is proposed to reduce the impacts:

- Reduce areas that need to be cleared for the laydown area during construction
- Rehabilitate as soon as possible once construction is complete in an area and ensure adequately designed berms and stormwater collection facilities to capture contaminated sediment before water is released to the environment; and
- Throughout the life cycle of the project, ensure clean-up of hydrocarbon spills from machinery is done immediately, and contaminated soils disposed of to a permitted site, or rehabilitated in-situ as needed.
- Divert clean run-off around the dirty water system and release it below the Game Farm Flood Storage Dam to enter the Brakspruit.
- Maintain the existing stormwater management facilities so that Game Farm Flood Storage Dam is kept as empty as possible.
- Design and maintain storage facilities adequately for hazardous chemicals and hydrocarbons. Maintain any upstream silt traps and oil and water separators if used.
- Undertake water quality sampling for analyses at an accredited laboratory from the dirty water facilities, at least every quarter, as well as at a point downstream in the Brakspruit, such as at the Swartklip Road, when water is present
- Undertake sediment sampling from the Barbers Dam and Game Farm Dam to get a good understanding of the quality of sediment that may be flushed downstream during high rainfall events, and to inform a rehabilitation plan for the dams during the closure phase, and

Considering the existing impacts to the Brakspruit and the downstream Bierspruit, and ultimately the Crocodile (West) River, the additional cumulative impact of potential contamination (hydrocarbons, metals and sediments) to surface water resources, and considering the improvements that the area will have on dirty stormwater, the proposed SO_2 abatement project, is likely to have a positive impact on the system, and there is unlikely to be any further adverse impacts to the surface water resources if good management practices are practiced.

8 REFERENCES

WSP, 2021. Mortimer Smelter Sulphur Dioxide Abatement Project, Environmental Management Programme. Project No.: 41103087

Department of Water Affairs and Forestry (DWAF)(1996). South African Water Quality Guidelines (second edition). Volume 1, Domestic Use and Volume 7: Aquatic Ecosystems

Appendix A

DOCUMENT LIMITATIONS

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