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Exxaro Grootegeluk Complex Integrated Water Use Licence Application (IWULA) and Integrated Water and Waste Management Plan (IWWMP)

Report

Version – For Public Review

31 January 2024

Exxaro Coal (Pty) Ltd - Grootegeluk

GCS Project Number: 21-0835

DWS Ref Number. WU32698

GCS (Pty) Ltd. **Reg No:** 2004/000765/07 Est. 1987
Offices: **Johannesburg** (Head Office) | Durban | Gaborone | Lusaka | Maseru | Windhoek | Ostrava
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Non-Executive Director: B Wilson-Jones

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EXECUTIVE SUMMARY

Background

Exxaro Coal (Pty) Ltd ("Exxaro"): Grootegeluk Coal Mine (Grootegeluk) is an existing open pit mine situated 25km from Lephalale in South Africa's Limpopo Province. Grootegeluk produces mainly thermal coal for electricity generation, which is transported directly to Eskom's Matimba power station as well as metallurgical coal which is sold to the metallurgical and other industries.

Exxaro Reductants (Pty) Ltd (Exxaro Reductants) operates as a Reductant Manufacturing Plant, within the boundaries of the Grootegeluk Coal Mine. Char, a carbonaceous agent, is used in the metals industry as a Reductants of iron ore [rock containing iron and its oxides (FeO_3) and other metals and their oxides] in the presence of heat at melting point, by allowing the oxides contained in the ore to react with the carbon. It should be noted that the Reductant Manufacturing Plant has not been in operation since March 2018 when a large portion of the plant was damaged due to a fire.

Licensing of Water Uses

Exxaro Grootegeluk Coal Complex which includes the Reductants (Char) is in possession of a Water Use Licence (WUL) (Licence No. 07/A42J/GB/6418) dated 5 July 2018. An amendment of the WUL was also issued in terms of Section 50 of the National Water Act, 1998 (Act No. 36 of 1998) (NWA) on the 30th November 2018. The WUL was issued for various water uses being undertaken on site in terms of Section 21 of the NWA. The license was issued for the following water uses:

- Section 21(a) – Taking of water from a water resource;
- Section 21 (b) – Storing water;
- Section 21(g) – Disposing of waste in a manner which may detrimentally impact on a water resource; and
- Section 21(j) – Removing, discharging or disposing of water found underground.

Additional water uses have been identified that require authorisation in terms of Section 21 of the NWA in the form of an Integrated Water Use License Application (IWULA). The following additional water uses are required to be licenced for the Grootegeluk Complex:

- Section 21(a) – Taking of water from a water resource;
- Section 21(g) – Disposing of waste in a manner which may detrimentally impact on a water resource; and
- Section 21(j) – Removing, discharging or disposing of water found underground.

In addition to the new water uses triggered, several amendments are required to some of the existing authorised water uses. An audit undertaken by Golder Associates Africa (Pty) Ltd in 2021 recommended that various conditions of the license be amended. These amendments have been included in this report and where licensed volumes are required to be increased, these water uses have been applied for as new water uses as part of this application.

It is in this regards that GCS Water and Environment (Pty) Ltd (GCS) have been contracted to compile the Integrated Water Use License Application (IWULA) for submission to the Department of Water and Sanitation (DWS) in order to apply for authorisation of the new water use activities and amend existing water uses were necessary that are applicable to the Grootegeluk Mine Complex. This report serves as the technical document to authorise and amend all water uses triggered at Grootegeluk. This document has been compiled in the format of an Integrated Water and Waste Management Plan (IWWMP) in line with the requirements of the DWS operational Guideline dated 2010.

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1 INTRODUCTION

1.1 Activity Background

Exxaro Resources Limited is one of the largest South African-based diversified resources groups. It is listed on the Johannesburg Stock Exchange (JSE) Limited where it is a constituent of the Socially Responsible Investment (SRI) index. The group's current business interests span South Africa, Botswana, Republic of the Congo and Australia. At present, Exxaro Resources Limited produces over 39 million tonnes of coal per annum (Mtpa).

Exxaro Coal (Pty) Ltd ("Exxaro"): Grootegeluk Coal Mine (Grootegeluk) is an existing open pit mine situated 25km from Lephalale in South Africa's Limpopo Province. Grootegeluk produces mainly thermal coal for electricity generation, which is transported directly to Eskom's Matimba power station as well as metallurgical coal which is sold to the metallurgical and other industries.

Exxaro Reductants (Pty) Ltd (Exxaro Reductants) operates as a Reductant Manufacturing Plant, within the boundaries of the Grootegeluk Coal Mine. Char, a carbonaceous agent, is used in the metals industry as a Reductants of iron ore [rock containing iron and its oxides (FeO_3) and other metals and their oxides] in the presence of heat at melting point, by allowing the oxides contained in the ore to react with the carbon. It should be noted that the Reductant Manufacturing Plant has not been in operation since March 2018 when a large portion of the plant was damaged due to a fire.

In 1920, coal was found in the Ellisras Basin, but at first little was done to investigate the size of the resource. During 1941 - 1952, 143 diamond-drill holes and two prospecting shafts were sunk to obtain a geological map of the Waterberg coalfield. In 1957 Iscor bought surface rights on six farms located in the coalfield. In 1973 Iscor began detailed exploration of the deposits below the farms to determine the quality and quantity of coal. During 1979 Iscor obtained the mining leases on the farms and in 1980 established the Grootegeluk Coal Mine. The mining activities represent typical open pit coal mining operations and have commenced some 28 years ago. During 2019, the Grootegeluk Reserve was reviewed and the new 30-year LOM plan was approved (2020 – 2050). The current approved Mining Authorisation covers the next 22 years.

The mining area, consisting of six adjoining farms, consists of a total of 6528.54 hectares (ha). The current mining pit cover a surface area of approximately 1223,98 ha and the current depth of mining in the open pit is approximately 132 m. Appelvlakte 448LQ and Goedehoop

457 LQ was included into the Grootegeluk Mining Right in 2018, bringing the total area to 8703.35 hectares (ha), however this portion of the right still needs to be executed.

The mine currently produced a total of 27.2 mtpa of product at the end of 2021 and provides jobs for approximately 3931 permanent employees and some 2853 employed as contractors. The mine provides approximately 23.7 mtpa of power station coal to the Eskom's Matimba and Medupi Power stations.

Currently, Grootegeluk has the world's largest beneficiation complex where 9 000 tonnes per hour of run-of-mine (ROM) of run-of-mine (ROM) coal is upgraded in nine different plants. Grootegeluk produced 1.9 Mtpa of semi-soft coking coal, the bulk of which is railed directly to Mittal SA under a long-term supply agreement. Approximately 1.6 Mtpa of steam coal is exported through Richards Bay Coal Terminal or sold domestically in 2021.

When it was operational the Reductants plant received metallurgical coal from Grootegeluk via conveyor belts and the coal is placed in an input stockpile where it was put through the plant to produces a high-quality semi-coke that was used in the ferro manganese, titanium and platinum industries. The reductants process generates off products such as tar, which is sold to generate additional revenue. The waste gas that generated is being burnt off but can be used to generate electricity. The reductants plant has not been operational since 2018.

Exxaro Grootegeluk Coal Complex which still includes the Reductants (Char) is in possession of a Water Use Licence (WUL) (Licence No. 07/A42J/GB/6418) dated 5 July 2018 (**Annexure A**). An amendment of the WUL was also issued in terms of Section 50 of the National Water Act, 1998 (Act No. 36 of 1998) (NWA) on the 30th November 2018. The WUL was issued for various water uses being undertaken on site in terms of Section 21 of the NWA. The license was issued for the following water uses:

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1.2 Contact Details

The applicant for this IWULA and Amendment is Exxaro Coal (Pty) Ltd. The environmental consultant compiling this application is GCS Water and Environmental (Pty) Ltd (GCS). Refer Table 1.1 the contact details of the applicant and the consultant.

Table 1.1 Contact Details

Contact Details of the Applicant	
Name of the Company	Exxaro Coal (Pty) Ltd.
Registration Number	2000/011078/07
Name of the Mine	Grootegeluk Coal Mine
Physical Address (Head Office)	The ConneXXion 263B, West Avenue Die Hoewes Centurion 0163
Postal Address (Head office)	PO Box 9229 Pretoria 0001
Physical Address (Mine)	Grootegeluk Complex Farm Enkelbult LQ 462 Limpopo Province

Postal Address (Mine)	Grootegeluk Coal Mine PO Box 178 Lephalale 0555
Telephone	014 763 9000 / 9100
Contact Person	Lazarus Ramashilabele
Fax Number	014 763 9108
Email	Lazarus.Ramashilabele@exxaro.com
Contact Details of the Environmental Consultant	
Name of the Company	GCS (Pty) Ltd
Physical Address	63 Wessel Road, Rivonia, 2128
Postal Address	P.O. Box 2597, Rivonia, 2128
Telephone	(011) 803 5726
Fax Number	(011) 803 5745
Contact Person	Tarryn Dale (Environmental Consultant) tarrynd@gcs-sa.biz

1.3 Regional Setting and Location of Activity

Grootegeluk is situated in the Limpopo Province of South Africa, approximately25 km west of the town Lephalale and falls within the Mokolo River catchment area. The infrastructure is located within the A42J quaternary drainage region within the Limpopo Water Management Area (WMA).

Grootegeluk is located within the boundaries of the Lephalale Local Municipality, near the mining suburb of Onverwacht. It is situated 18km west of the town Lephalale, covering a surface area of approximately 3 758 hectares (ha). The mine is accessed from the west via a sealed tarmac road, linking it with Onverwacht, which in turn is connected with the rest of the bushveld towns i.e. Thabazimbi (120km to the south), Modimolle (150km to the south-east) and Mokopane (160km east-southeast) via tar roads. A portion of the mine's product is railed from site by a single-gauge railway line that extends southward to Thabazimbi. The regional location of the mine and the surrounding farms are illustrated in Figure 1.1.

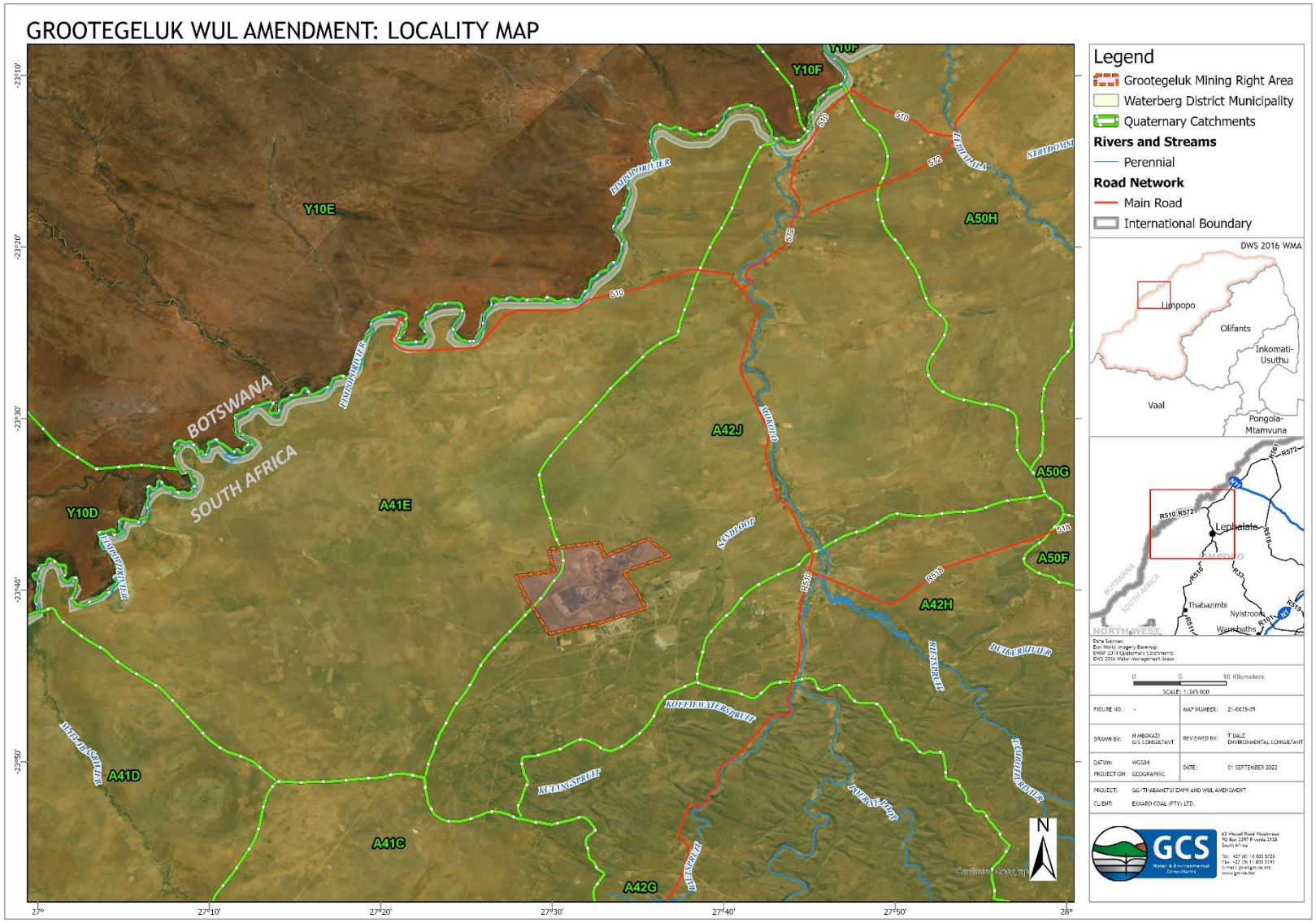

Figure 1.1 Locality Map

1.4 Property Description

The landscape surrounding Grootegeluk is entirely undeveloped and comprises open bushveld, portioned into various individual farms that are principally under game production. These areas are managed by Ferroland, a subsidiary company of Exxaro, as a nature reserve/lodge called the Manketti Reserve. Ferroland manage their land according to conservation principles and maintain breeding stocks of a variety of large wildlife species (Natural Scientific Services, 2011).

See Table 1.2 for the information of the properties on which Grootegeluk is situated and Figure 1, shows the locations of the relevant farms to each other with the infrastructure associated with the Grootegeluk in relation to Lephalale (the nearest town) as well as all other property owned by Exxaro.

The other developments and land uses nearby include two major Grootegeluk Coal Mine clients, namely Eskom Matimba and Medupi Power Stations. Neighbouring properties include private farms which are mainly used as game farms. As of January 2015, the Reductants / Semi-coke Manufacturing Plant was operated as an additional process plant within the Grootegeluk Mine premises however the product is still marketed under the Exxaro Reductants (Pty) Ltd. The facility has then also been in operational since March 2018, after it was damaged in a fire.

Table 1.2 Farm portions related to existing infrastructure

Property information	Title deed	Size of property	Surface right propertyowner
Daarby 458 LQ portion 0	T136805/2001	1178.4196 ha	Exxaro Coal (Pty) Ltd.Iscor Coal (Pty) Ltd. Owner
Enkelbult 462 LQ portion 0	T136805/2001	1255.2248 ha	Exxaro Coal (Pty) Ltd. Owner
Appelvlakte 448 LQ portion 0	T136805/2001	881.8068 ha	Exxaro Coal (Pty) Ltd.Iscor Coal (Pty) Ltd. Owner
Appelvlakte 448 LQ portion 1	T136805/2001	256.9596 ha	Exxaro Coal (Pty) Ltd.Iscor Coal (Pty) Ltd. Owner
Turfvlakte 463 LQ portion 0	T136805/2001	968.6235 ha	Exxaro Coal (Pty) Ltd. Owner
Hieromtrent 460 LQ	T136805/2001	1016.7435 ha	Exxaro Coal (Pty) Ltd.Iscor Coal (Pty) Ltd.

Property information	Title deed	Size of property	Surface right propertyowner
portion 0			Owner
Grootegeluk 459 LQ portion 0	T136805/2001	1091.2432 ha	Exxaro Coal (Pty) Ltd. Iscor Coal (Pty) Ltd.Owner
Leeuwdrift 312 LQ portion 0	T136805/2001	1019.4715 ha	Exxaro Coal (Pty) Ltd. Owner
Goedehoop 457 LQ portion 0	T136805/2001	1036.3823 ha	Exxaro Coal (Pty) Ltd. Iscor Coal (Pty) Ltd.Owner

1.5 Purpose of the Report

This document serves as the technical report to motivate the authorisation of the water uses triggered by the Grootegeluk Coal Mine and Reductants (Char).

As there are waste related uses associated with the proposed development, this report has been structured in line with the approved Integrated Water and Waste Management Plan (IWWMP) Operational Guideline compiled by the DWS.

The purpose of the IWWMP includes:

- Compilation of a site specific, implementable, management plan addressing all the identified water use and waste management related aspects of a specific activity, in order to meet set goals and objectives in accordance with Integrated Water Resource Management (IWRM) principles;
- Provision of a management plan to guide a water user regarding the water and waste related measures which must be implemented on site in a progressive, structured manner in the short, medium and long term;
- Documentation of all the relevant information, as specified in the IWWMP Guideline as compiled by the DWS, to enable DWS to make a decision regarding the authorisation of a water use;
- Clarification of the content of the IWWMP for DWS officials and the water users, as the various regional offices of DWS might have different interpretations regarding the contents of the IWWMP;
- Standardisation of the format of supporting documentation which DWS requires during the submission of a WULA;
- Provision of guidance on the content if information required in an IWWMP as part of the water use authorisation process and level of detail that DWS requires to enable

them to evaluate the supporting documentation to make a decision on authorising a water use; and

- Ensuring that a consistent approach is adopted by DWS and the various Regional Offices and Catchment Management Agencies (CMA) with regards to IWWMPs.

The IWWMP also strives to show the DWS that the selected management measures included into the IWWMPs action plan adhere to the SMART concept which refers to:

- S – Sustainable;
- M – Measurable;
- A – Achievable;
- R – Resources Allocated; and
- T – Timeframe Specific.

2 CONCEPTUALISATION OF THE ACTIVITY

2.1 Description of the Activity

Mining at Grootegeluk can be described as conventional truck and shovel method. The open pit is located to the west of the plant and is being developed from an east to westerly direction. The primary loading equipment consists of both rope and hydraulic shovels. Topsoil is removed prior to mining new areas and either stockpiled or transported directly to areas in the mine requiring rehabilitation.

The overburden bench is approximately 16m thick and consists of weathered and blue shale. The topsoil and weathered material are stripped with the aid of a hydraulic shovel. The rest of the overburden is drilled and blasted. This material is loaded by shovel into haul trucks and transported to the mine residue facilities. Figure 2.1 illustrates the pit liberation strategy of Grootegeluk.

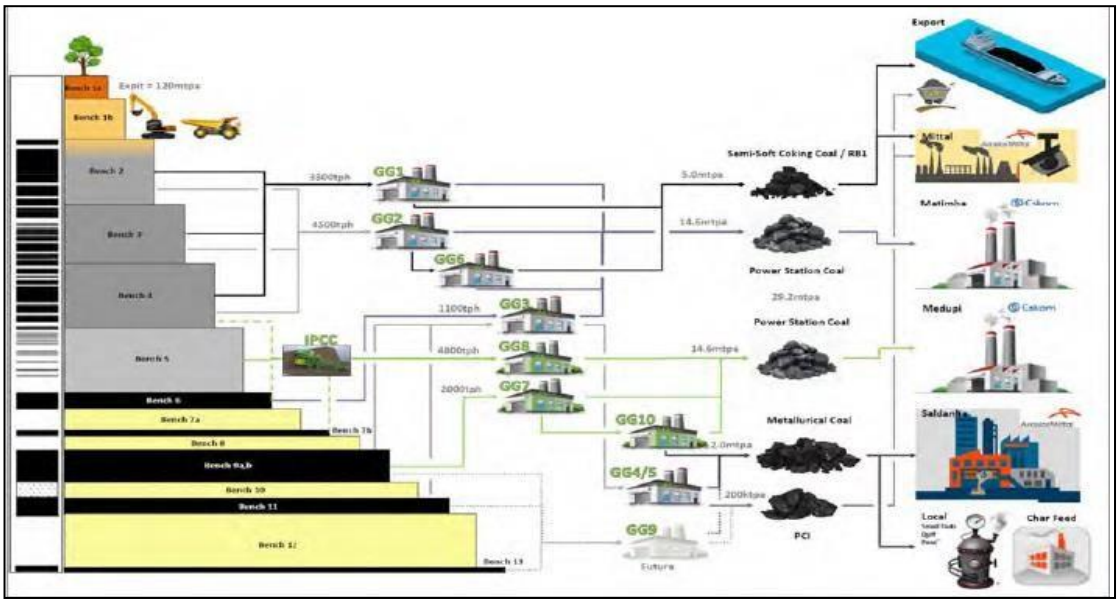

Figure 2.1 Schematic illustration explaining the bench liberation inside the Grootegeluk Pit

Coal is either temporarily stored on stockpiles or fed directly into the tipping bins for use and processing in the plant. The coal is transported via conveyor from the tipping bins to the plants. There are also various workshops across the plant and mining area where equipment is maintained and serviced on a scheduled basis.

The GG7 & 8 in-pit crushing systems is operational and was installed to maximise the turnaround of the trucks providing coal to these new facilities.

The mine has also completed the refurbishing of the footprint of Slimes Dam 3 and the COCSPS/Cyclic Pond system has been operational since October 2015. The Cyclic Operated Coal Slurry Pond System (COCSPS) consists of four geomembrane lined compartments designed specifically to recover water from the coal slurry for re-use in the plant and recover coal fines as product. The coal slurry is pumped into the compartments via the existing coal slurry pipeline (currently feeding slimes dams 1 and 2). The slurry is pumped into one compartment at a time, and once the first compartment is full, the slurry is pumped to the next compartment in the sequence. The coal slurry in the first compartment is allowed to settle and the coal water gravitates to the solution trench and from there to the Return Water Dam (RWD), which consist of two separate but connected paddocks.

After approximately 6 months the coal slurry in the first cyclic pond compartment is sufficiently dry and is recovered by hydraulic excavator. A hydraulic excavator loads the truck

fleet and the dray slurry is trucked back to the existing coal stockpiles or taken to the footprint of Slimes dam 5 from where it is recovered to the plant stockpile areas. The recovered coal fines are blended with product from the beneficiation plants and sold. Water in the RWD is pumped to the existing Concrete Dam via a new pipeline, and from there is returned to the plant for reuse in the process.

When operational, the Reductants/Semi-coke manufacturing process involves the conversion of lumpy coal blends to high quality carbon Reductants (char) through de-volatilisation. De-volatilisation involves releasing volatile compounds through heating the coal at approximately 950°C. The process takes place in a closed circuit and involves the re-application of gaseous heat in the absence of oxygen, which maximises the recovery of lumpy carbon. This reaction takes place in vertical retort. The Reductants production plant is designed to recycle and use the off-gas (waste gas) from the process.

2.2 Extent of the Activity

The current open pit area is approximately 1223,98 ha with depths up to 132m being mined. According to the new 30-year LOM plan, the mine pit is estimated to reach its most western extent in 2028/2029 at which time haul distances to the processing plant will be the greatest. After reaching its western most extent, mining will continue back in an easterly direction to recover coal in the north and south of the pit.

Currently both in-pit backfilling spreader systems are operational and dump 4 &5 is still used as a back-up to the in-pit system. The bottom potion of dump 4&5 can currently be rehabilitated the design of this planned rehabilitation is underway. It is also estimated that once the in-pit back filled system has progressed far enough the final capping and rehabilitation of the pit area will be able to commence. The overburden and topsoil from each successive cut will be used to seal and fill the areas behind the spreaders to natural ground level, where after the area will be shaped to be free draining, after the stockpiled topsoil is analysed and treated appropriately it will be places and the surface re-vegetated. Currently concurrent rehabilitation is focused on the backfilling of the pit as well as the Pan Creation Proof of concept study. See GG Annual Rehab Plan 2020-2025 (Annexure R). The mine is also in the process of updating its Annual Rehabilitation Plan so that it can be submitted to the DMRE as per the requirements of the NEMA Financial Closure Regulations in 2023.

Grootegeluk has eight existing beneficiation plants, known as GG1 to GG8 & GG10. The site layout of the mine is indicated in Figure 2.2.

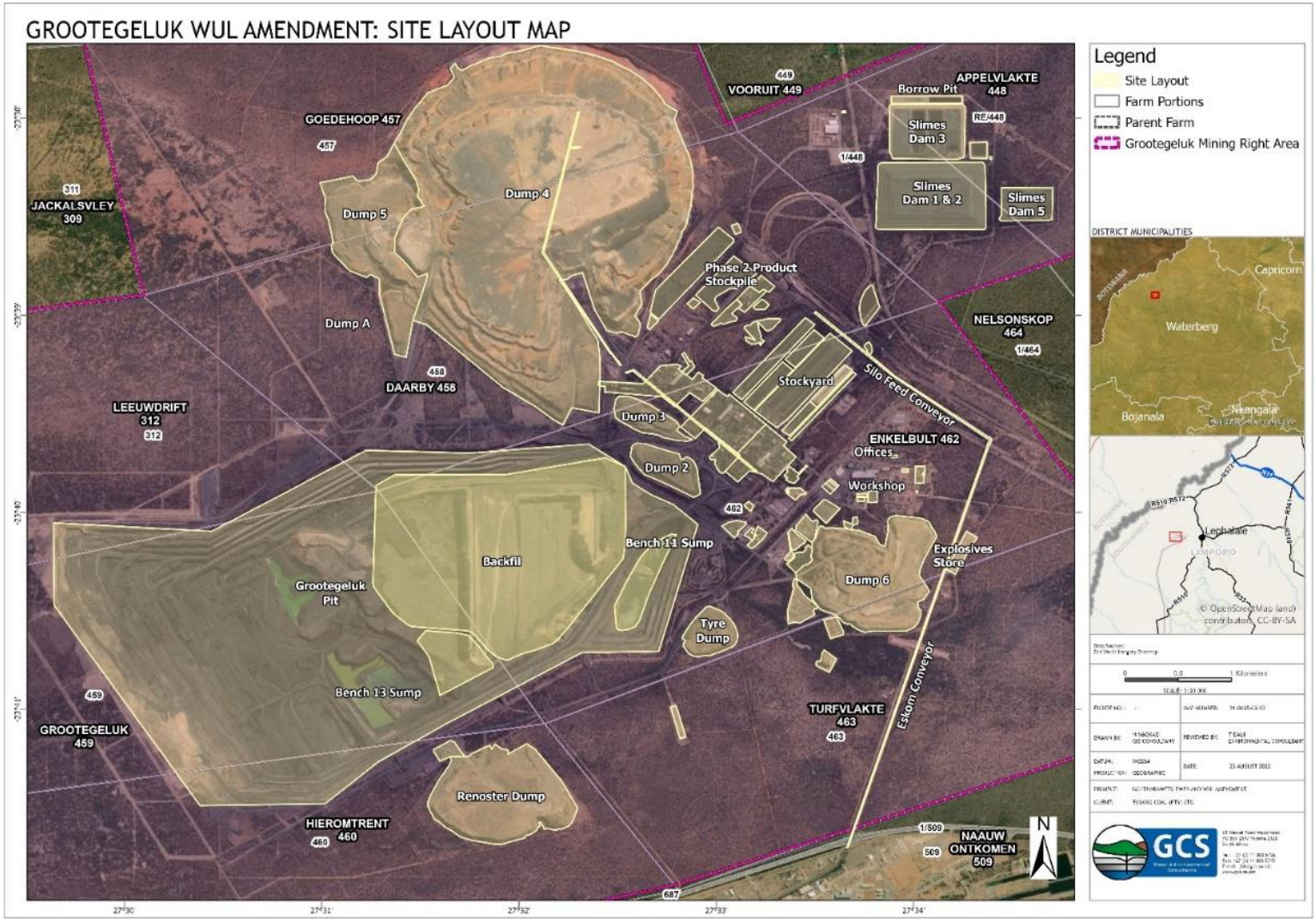

Figure 2.2 Infrastructure Layout

2.3 Key Activity Related Processes and Product

2.3.1 Mining Method

Mining at Grootegeluk is conducted by means of the conventional shovel and truck method. The pit is located to the west of the plant and is being developed in a south-westerly direction. Extraction of the Volksrust Formation and Vryheid Formation differs. The Volksrust coal horizons are mass mined whilst the Vryheid Formation zones are mined selectively. The primary loading equipment consists of both rope and hydraulic shovels. The rope shovels are used on the five upper benches and the hydraulic shovels for the selective mining of the benches 6 to 11. Topsoil is removed prior to mining new areas and either stockpiled or transported directly to areas at the mine requiring rehabilitation.

The fleet of haul trucks consists of 181, 200 and 250 ton rear dump trucks, which transport 54 million tons annually. The dump trucks are diesel-electrically driven and equipped with pantograph systems, making it possible to use electrical power when driving up the ramp and out of the pit. In this way diesel consumption is minimized, productivity is increased and noise and air pollution are reduced. Diesel driven rotational drills are used to drill the blast holes, before they are primed and blasted.

The overburden bench is approximately 16 m thick, and consists of weathered and blue shale. The topsoil and weathered material is stripped with the aid of a hydraulic shovel. The rest of the overburden is drilled with a 172mm rotary drill and blasted. This material, together with the blue shale, is loaded into haul trucks by a rope shovel and transported to the waste dumps.

Coal is either temporarily stored on stockpiles on Dump 1 next to the GG1 tipping bin or fed directly into the tipping bins for use in the coal processing plants. The coal is transported via conveyor from the tipping bin to the plants.

There are also various workshops across the plant and mining area where the various pieces of equipment are maintained and serviced according to a planned schedule.

As part of the Medupi Expansion project and the commissioning of the new processing plants (GG7 and GG8), the pit crushing and conveying systems were commissioned.

These large semi-mobile crushers are located on benches 5, 6 and 11, with several smaller units installed on benches 7, 9 and12. Power will be supplied by a 33 kV power line. Conveyors will be installed to carry coal from the crusher units to the plant tipping bins.

2.4 Activity Life Description

The mining activities represent typical open pit coal mining operations and have commenced some 28 years ago. During 2019 the Grootegeluk Reserve was reviewed and the new 30-year LOM plan was approved (2020 – 2064). The current approved Mining Authorisation covers the next 19 years.

2.5 Activity Infrastructure Description

Grootegeluk has the following basic infrastructure:

- Open cast pit;
- Processing plants (GG1, GG2/6 Expansion, GG 3,4&5 GG7&8 & GG10) and Stock yards;
- Reductants / Semi-coke plant;
- Old and new Coal product stockpiling areas;
- Discard dumps/ residue deposits;
- Water management dams and pipelines;
- Slimes dams and Cyclic Ponds (COCSPS);
- Haul roads and conveyors;
- Railway line and New Loadout station;
- Explosives magazine;
- Laboratory, change houses, offices and warehouses;
- Explosive storage site (Managed by Sasol Nitro);
- Diesel fuel depot (Managed by Total);
- Waste storage yard;
- Workshop areas;
- Oxidation ponds / Sewage Waste Water Treatment Plant;
- Eskom's coal silo and conveyor; and
- Return water dams.

Construction activities currently underway includes:

- Tank Expansion at the Total Depot

A facility has been selected as the unit activity on which the IWWMP was founded. The facilities were identified and delineated based on the following criteria:

- A facility within the overall complex must display a measure of homogeneity;
- In terms of its spatial extent a facility should be confined as far as possible to define a direct interaction/relationship with the receiving water environment and/or within the Grootegeluk Mine site;

- The sum of the facilities must represent the total activity of the mine which could affect the receiving water body; and
- Clear management responsibility must be assignable to a facility.

The performance of the individual facilities is governed by a site-wide management framework that comprises site-wide performance objectives, associated strategies, as well as management measures. Hence, site-wide management requirements are aligned with facility-level management requirements and vice versa.

Nine facilities have been identified to provide the basis for the characterisation of Grootegeluk for this IWWMP. The geographical extent of the facilities is indicated in Figure 2.3 below. The list of the facilities at Grootegeluk Mine is contained in Table 2.1 below.

Table 2.1 Facility characterisation of Grootegeluk Mine

No.	Name of Facility	Description
1	Pit	Pit area and associated control room, Green area, power distribution, Explosives Depot (Sasol Nitro), and Explosivesmagazines.
2	Discard Dumps	Dump 6, Tyre Dump, Renoster Dump, Dump 4 and 5 (active) and Dump 1, 2, and 3 which are inactive.
3	Administration	Administration buildings. Stores and the Diesel Depot. (Total)
4	Plant area	All coal processing plants including GG1 – GG8 and GG10 and product stockyards and relevant PCD's.
5	Slimes Dam Complex	Active Slimes dam 1 and 2, the inactive slimes dam 5, Mamba dam, cement dam, new cyclic slurry pond (Slimes Dam 3).
6	Reductants Plant	Reductants Plant and associated infrastructure and PCD.
7	Workshops	Pool Workshop, Central Workshop, Pit Workshop, Olifantskop Dam and oxidation ponds.
8	Remainder of the Grootegeluk Mine Area	Open veld areas covering the remainder of the mine area. Seasonal pans.

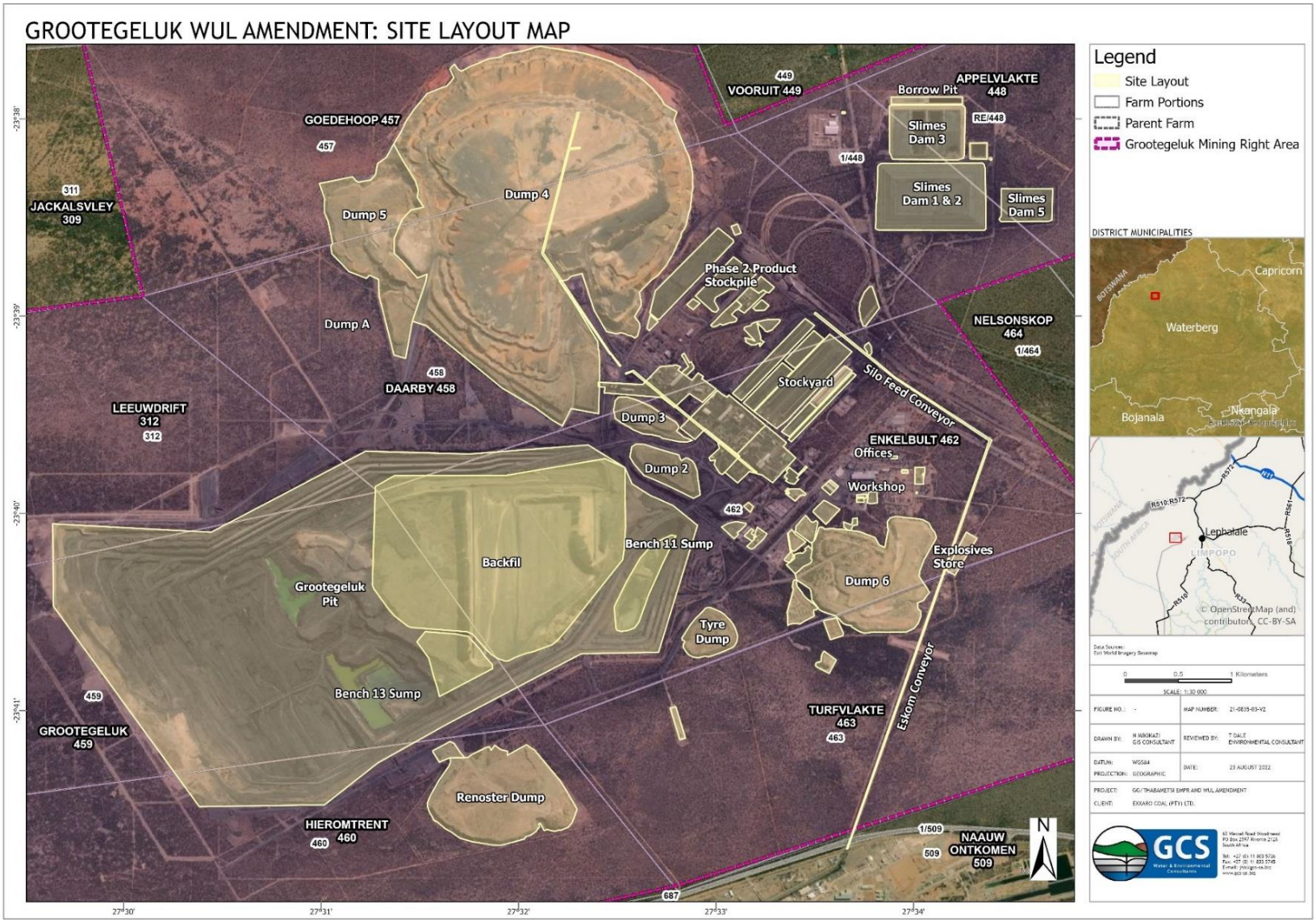

Figure 2.3 Grootegeluk delineation of facilities

2.5.1 Facility 1: Pit Area

Figure 2.4 Facility 1 – Pit Area Layout

2.5.1.1 Functions/operations

This facility comprises the following:

- Opencast mine pit area;
- Control room for the opencast pit;
- Green area adjacent to the pit;
- Power distribution point;
- Explosives Depot (Sasol Nitro Managed);
- Explosives magazines and
- In-pit backfilling.

The pit area is indicated in Figure 2.4. The management of the abovementioned functions falls under the mining section on Grootegeluk.

The green areas area safe areas adjacent to the Pit. The opencast Pit covers an area of approximately 1223,98 ha, the pit has 13 Benches and it is approximately 132 m deep.

The Explosives Depot managed by Explosives contractor, is utilised for matrix emulsion storage and also has an office, and a bunded diesel storage tank.

The Explosives Magazine area is utilised for storage of igniters and boosters in bunkers and the ammonium nitrate is stored in tanks.

The cores generated in the process of geological exploration drilling are housed in a dedicated store adjacent to the Explosives Depot.

The power distribution point has a dedicated lay-down area for the storage of electrical equipment within this area.

2.5.1.2 Storm Water

Rainfall falling in the pit area gravitates to the geographical low point, namely the in-pit sump on Bench 13 (Annexure O). From here it is treated with lime as part of the process water that filters through from Bench 11 into Bench 13 and is pumped back to the plant for reuse in the beneficiation process.

2.5.1.3 Process Water

Spilled and excess process water from the plant is channelled to the Bench 11 sump via the plant storm water channels and the channel to pit. Water from here gravitates through the backfill and accumulates in Bench 13 which is the lowest point. The water from Bench 13 is treated with lime and then pumped back to the plant where it is recovered as process water that is reused in the beneficiation of the coal.

2.5.1.4 Groundwater

The Pit is located within the Karoo sequence and it is associated with a broken rock aquifer where water movement takes place in bedding planes. The permeability in the Karoo is very low and it also has a very low transmissivity and storativity.

There is a trough of depression around the pit area. Very slow drainage of water takes place towards the Pit and it is evident from the limited ingress of groundwater that is visible in the Pit.

2.5.1.5 Waste

The Control Room and Green areas utilises domestic water for human consumption and generates domestic waste, this is collected by Engineering services and take to the Lephalale Municipal dump for disposal. Steel waste generated at the Power Distribution Centre is removed by the appointed reclamation contractor.

2.5.1.6 Pollution Potential

The materials balance for the Pit indicates that there will be a final void at mine closure due to a soil deficit. The backfill of the pit with discard has been addressed and the lower system is currently operational, the upper system has been constructed was commissioned in 2020, the methodology is implemented as per the approved EMPr. The interburden as well as discard is placed in the Pit and it is covered within eight weeks to prevent spontaneous

combustion.

2.5.2 Facility 2: Discard Dumps

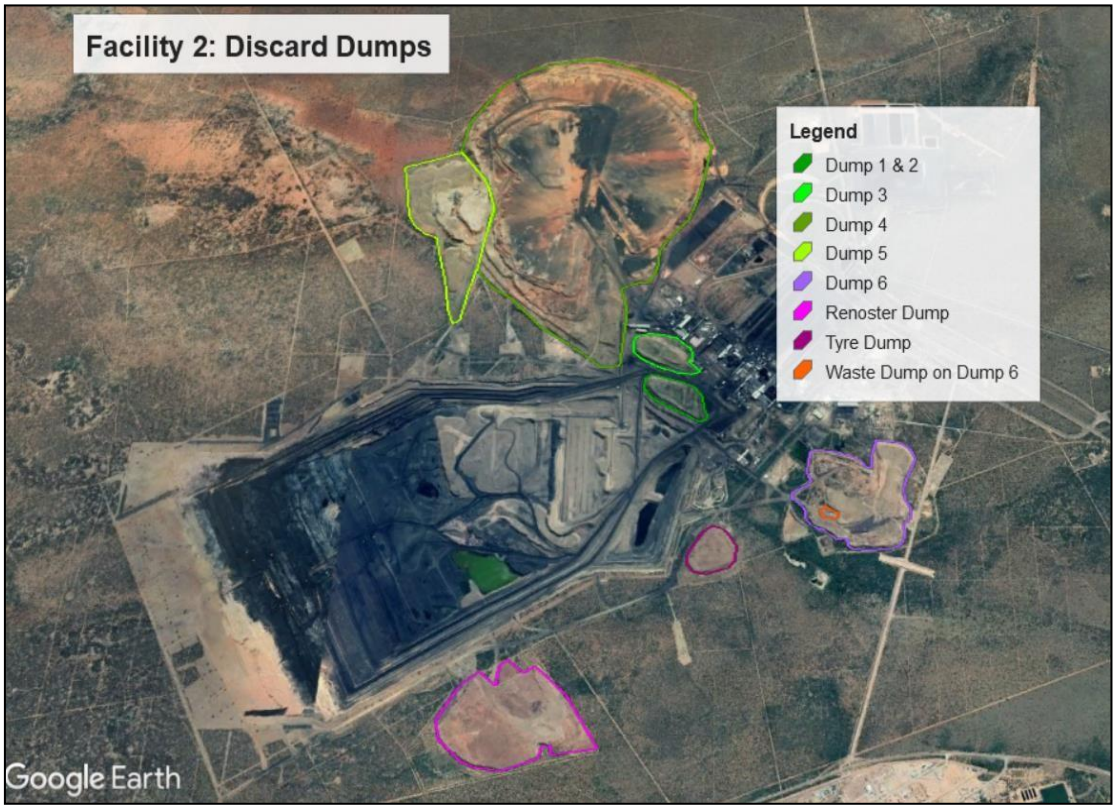

Figure 2.5 Facility 2 – Discard Dumps

2.5.2.1 Functions/operations

This facility comprises the following:

- Dump 6;
- Tyre Dump;
- Renoster Dump;
- Dump 4 and 5 (active); and
- Dump 1, 2 and 3 (inactive).

The layout of facility 2 is indicated in Figure 2.5. The management of this facility falls under the Mining Section at Grootegeluk.

Dump 4 and 5 is currently a backup for the in-pit coal discard system, the upper 1400 Spreader system was also decommissioned during 2023. Coal discard from the processing plants are transported to the dump via trucks and placed in the remaining demarcated areas.. The coal discard is also still covered with red sand or overburden form the front of the pit area to

prevent spontaneous combustion. The original placed coal discard was compacted by the moving of the Spreader over the placed material.
The final rehabilitation of Dump 4 and 5 is currently under investigation so as to design a performance based cover that is in line with the DWS closure Guidelines. The current side slopes of the dump are at a natural angle of repose and are prone to erosion the intent will be to cut and fill the slopes to achieve a 11-degree gradient.

The Renoster Dump consists of overburden material and topsoil. The footprint area will form part of the Pit Area in 40 years' time and the intent will be to recover the usable material and to use the remaining material as fill for the pit.

The Tyre Dump has been decommissioned and was utilised to perform trials to determine the slope angles required for effective rehabilitation. The dump has since been rehabilitated and the side slopes are 18°, 24° or 34° in different areas of the dump.

Dump 6 contains carbonaceous interburden material covered with overburden material there is also has a domestic dump site situated on this dump. Since 2008 the dump has only been used for the disposal of building rubble and will be capped as part of the final rehabilitation of this dump.

Dumps 1, 2 and 3 have been decommissioned. The Pit Control Room is located on top of Dump 1 and there is a road over the top surface of Dump 3. Dump 1 and 2 consist of overburden and Dump 3a and 3b consist of interburden covered with overburden.

2.5.2.2 Storm Water

Dump 4 and 5 has a flat surface on top and all the runoff, which collects on this upper surface area, drains via the haul roads to the Pit and the Plant Areas. The haul roads act as storm water drainage channels. The runoff, which drains towards the plant, reports to the GG7 and GG8 plants and subsequently also to the Plant storm water management system.

Dumps 1 and 2 have been provided with furrows to convey runoff from the top surface areas of these dumps to the plant storm water channels.

2.5.2.3 Process Water

Excess process water is collected in the storm water channels and taken to the Grootegeluk Pit from where it is recovered for re-use in the plants after being treated with lime. The plants are also striving to reuse as much process and recovered water as possible so as to minimize the water taken in to the system via the Mokolo dam abstraction (MCWAP-I IWUL).

2.5.2.4 Groundwater

The various dumps as well as discard dump 4&5 are not lined and there is no provision for any under-drainage. Rainfall reporting to the upper surface areas of the discard dumps can seep to the groundwater resource.

The current flow transport flow model indicates that the seepage plume is contained, and there is various monitoring borehole located north of the Daarby fault as well as other monitoring boreholes in the vicinity of Dump 4 and 5 which are part of the groundwater monitoring network.

Groundwater monitoring also takes place around the Renoster Dump, which is located on the Karoo sequence, and Dump 6, located on faulted areas in the cave sandstones.

2.5.2.5 Waste

The domestic waste site, located on top of Dump 6, was licensed in 1996 by the former Department of Water and Sanitation. Since 2008 this facility on Dump 6 has been used for the disposal of building rubble only. The waste site is fenced off and access and dumping is controlled via a permitting system.

2.5.2.6 Pollution Potential

The coal discard utilised for the construction of Dump 4 and 5 and the use of interburden in the construction of Dump 3 and 6 have the potential to impact on the seepage quality.

The lack of formal rehabilitation and the erosion of the haul roads and side slopes of all the discard dumps have the potential to impact on the receiving water quality. In 2019 the first Grootegeluk Erosion assessment took place as part of the erosion management program, the 2020 and 2021 assessment confirmed the areas that needs to be addressed. A capital project to address the erosion is currently underway.

2.5.3 Facility 3: Administration

Figure 2.6 Facility 3 - Administration

2.5.3.1 Functions/operations

This facility comprises the following:

- Administration buildings;
- New Warehouse, Old Stores, Reclamation Yard; and Fuel Depot (Managed by Total)
- New Temporary Hazardous Waste area

The layout of facility 3 is indicated in Figure 2.6. The facility falls under the responsibility of the Engineering Section of Grootegeluk, who is responsible for plant maintenance.

The Stores, Warehouse and Fuel Depot falls under the responsibility of Supply Chain Management, the area is currently contracted to Total and is also managed by them. The office facilities fall under the responsibility the relevant department, however services to these areas are supplied by the Engineering Section of Grootegeluk, who is responsible for outside services.

The Fuel Depot has above surface, bunded diesel storage tanks and underground petroleum storage tanks. The oils storage tanks are bunded. There is also an area demarcated for the

storage of waste oil, contained in drums. Any overflows or spillages are contained in a bunded area. The area behind the Fuel Depot is that was used for the temporary storage of hydrocarbonwaste from the mine has move to the new Temporary Hazardous waste storage area when it became operational in August 2018.

The new Temporary Hazardous waste area that was constructed across form the reclamation yard area is operational and all hazardous waste that needs to go for disposal is storage here until it is collected and disposed of by a licensed Hazardous Waste Company.

The Reclamation Yard is a dedicated, fenced off area utilised for the stripping of metal, cutting ofmetal, and storage of industrial waste that can be resold or needs to be disposed. All industrial waste is managed on the cemented areas and taken off site for disposal by a licensed disposal company.

The Warehouse to the west of Dump 4 & 5 is a building structure that houses goods used on themine. The small Sewage Treatment Plant (STP) was decommissioned in October 2016 and currently all sewage from here is taken to the newly commissioned Sewage water treatment planton site.

2.5.3.2 Storm Water

The runoff from the administration buildings is regarded as clean runoff and it is not collected or contained on site.

There is a sump located in the Reclamation Yard, which collects some of the runoff from the cutting slabs. The runoff collected in this sump either evaporates or alternatively it is pumped intothe mine's dirty storm water system where it is reused in the process. The storm water management system for the area was upgraded in 2015 to a formal system where all clean stormwater is captured and diverted to the veld and the dirty water is separated by a berm ensuring nocross contamination of clean water.

2.5.3.3 Process Water

Any contaminated water from these areas are captured and evaporated or pumped to the mineslines storm water areas where it is reused in the process. At the Fuel Depot the effluent water from the oil separators is pumped to a JoJo tank. The water is either disposed of by a HazardousWaste Contractor or alternatively it is discharged to the process water circuit after the quality hasbeen determined.

2.5.3.4 Groundwater

There is a groundwater monitoring borehole located at the Fuel Depot to monitor any impact on the groundwater regime.

2.5.3.5 Waste

All hydrocarbon contaminated waste from the mine is taken the new temporary Hazardous wastestorage area and put in to the designated skips. The skips are collected by the Hazardous WasteContractor when they are full. Drums with contaminated with old grease or oil are cleaned and reused for storage of oil rags in the various areas before they are brought to temporary Hazardouswaste storage area for removal and disposal to a licensed hazardous waste facility. The recoveredwaste oil is stored in an above ground tank in a bunded area in the Fuel Depot, when full it is collected by a contractor that recovers to oil for reuse

The Reclamation Yard on Grootegeluk is operated by an appointed contractor. The reclamation activities entail the cutting, stripping and storage of scrap metal.

All industrial waste is placed in designated skips on the cemented areas at the reclamation yard, from where it is disposed of at a licensed waste disposal facility or resold depending on the type of material.

2.5.3.6 Pollution Potential

There is a potential for groundwater contamination resulting from leakages from the hydrocarbonstorage associated with the Fuel Depot. Proper reconciliation of the volumes of diesel and petroleum is required to detect any structural failures and leakages. Leakage tests are also done on an annual basis for the underground tanks.

2.5.4 Facility 4: Plant Area

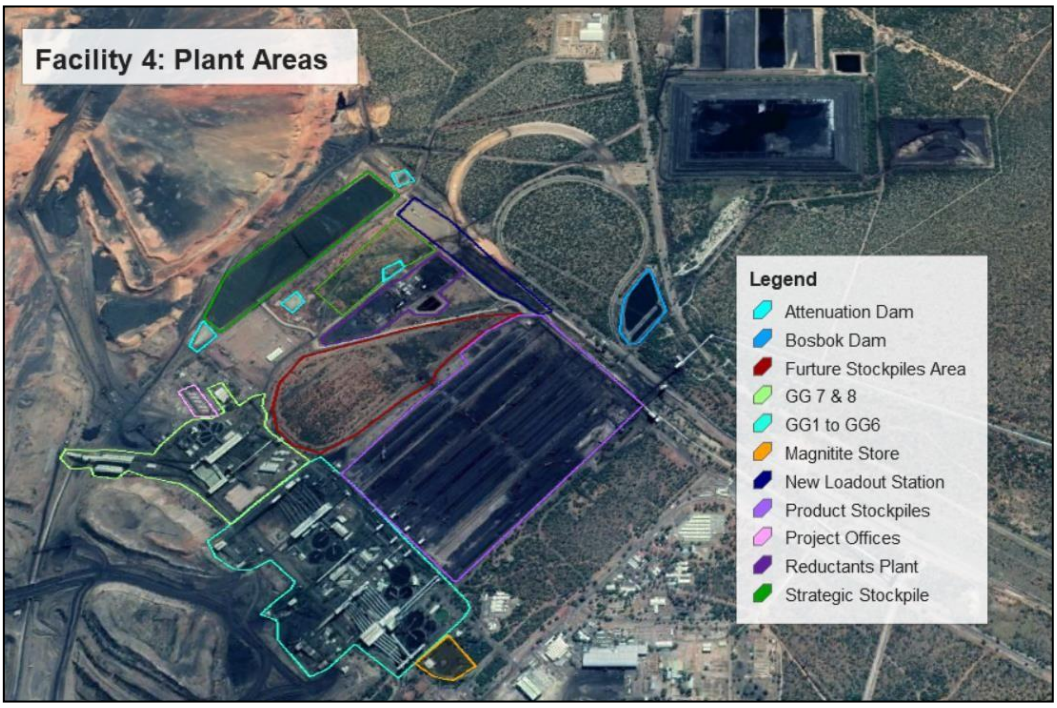

Figure 2.7 Facility 4 – Plant Area

2.5.4.1 Functions/operations

The facility 4 layout is indicated in Figure 2.7 all areas fall under the management responsibility ofthe Plant Beneficiation Section of Grootegeluk.

The plant area is split into the following areas:

- GG1 – GG6 and the surrounding stockpile areas;
- GG7, GG8 & GG10 areas;
- Loud-out Stations;
- Reductants plant;
- In-pit crushers;
- Product Stockpile bed;
- Bosbok Dam and;
- Bulk Magnetite storage (next to the GG1 Plant).

The GG1 Plant was built in 1980 and utilises coal from Benches 2, 3 and 4 in a process which entails secondary beneficiation of the coal to produce power station coal which is supplied to theEsko Medupi and Matimba power stations.

The GG2 Plant receives coal mined on Benches 5 and 6 of the Pit. GG2 is a single stage plant and no secondary beneficiation takes place in GG2. GG2 produces power station coal and the product from the GG2 plant is stockpiled with that from the GG1 plant.

The GG6 plant is coupled to the GG2 plant. GG6 receives coal mined from Benches 2, 3 and 4 in the pit and it produces power station or coking coal. The GG2 plant portion is currently being converted to a larger GG6 facility.

The GG3 plant produces only power station coal. The process in the plant only entails crushing, screening and no further beneficiation. The GG3 plant receives coal from Benches 6 and 9a in the pit. The product is stored on the Power Station Coal Stockpile Area or sent directly to Eskom.

The GG4 and GG5 plants utilise a separate tipping bin. The coal from Bench 9 is stored on the northern side of the Run of Mine(ROM) Stockpile and the coal from Bench 11 is the Reductants ROM which is stored on the southern side of the ROM Stockpile. The coal is fed to the GG5 plantand then to GG4 and which produces different sized coal and small nuts.

The GG7, 8 and GG10 plants are fed via the bunkers that are fed from the in-pit crusher system.The coal produced form these plants are stored on the GG7 & 8 stockpiles and taken to Medupi.

2.5.4.2 Storm Water

Currently all storm water runoff drains from the plant area via two main storm water drains, calledthe Northern (N1) and Southern Storm (S1) Water Drain. They connect at the channel to pit fromwhere the water is gravity fed to the pit from where it is later recovered for reuse.

The Northern Storm Water Drain starts at the Wet Screen House and runs between the plant andthe Power Station Coal Stockpile Area and reports to the pumping system at the foot of the cokingcoal stockpile.

There are a number of secondary storm water trenches in the plant which drains towards the mainstorm water drains. The secondary drains in the plant have been upgraded as part of the storm water management project to manage a 1:50 year flood. The storm water drains are then also continuously cleaned so as to prevent them from silting up and blocking.

All runoff from the Eastern and Western Power Station Coal Stockpile Areas is collected in seepage drains and collected and pumped back for reuse as part of the process water circuit. During high rainfall events the sump at the Eastern Power Station Coal Stockpile overflows to theBosbok Dam. This water is reused and recycled in the process water circuit.

Any siltation within the channels due to spillages from the plants is cleaned up via the cleaning contractor, thus blockages are prevented.

2.5.4.3 Process Water

Process water is re-used or recycled in the coal processing plants on Grootegeluk Mine.The following sequence is followed for the recovery and reuse of process water:

- Pit Water gets priority (Bench 11 & 13).
- Abstraction boreholes.
- Water form PCD's – Bosbok, Olifantskop.
- Water from Slimes Recovery system.

Raw water is abstracted from the Mokolo River for use on the mine and is primarily used for make-up water and the mixing of flocculent in the plants.

The Bosbok Dam is a lined process water dam with a large silt trap at the inlet to the dam. There is currently a program in place that is focused on the annual desilting of the Bosbok dam silt trap and the other PCD facilities where required.

The water from the plant Raw Water Dam (water stored here is primarily process water as indicated above) is utilised for the following:

- Fire hydrant system;
- Floor washing through the fire hydrant system;
- Relative density control for the magnetite system; and
- Use in the Reductants (Char) Plant.

The GG1 Plant has four thickeners, two of which are froth flotation (FF) thickeners. The overflowof the thickeners reports to the cement dirty water dam and from there it is re-used and recycledfor rinsing of screens in a closed process water circuit. The underflow from these thickeners is recycled back to the Spiral Plant in GG1. The Spiral Plant separates the power station coal and coking coal and from there it goes to the production conveyers.

The water from the Spiral Plant in GG1 is routed to the tailings thickeners (TT). The overflow of the TT is routed to the clarifiers and the underflow is sent to belt filters and from there it is pumpedto the Slimes Dam Complex. The process water from the belt filters building is re-circulated to thethickeners.

The return water from the Slimes Dam Complex is utilised in the FF thickener in GG1 or it is routed directly to the Bosbok Dam where it is also recovered for reuse in the plants.

- A pumping system is in place to pump any water which drains from the Eastern Power Station Coal Stockpile Area to the Clarifier Water Dam in GG1 for re-use and recycling in the process water circuit.

A pumping system is in place at the foot of the coking coal stockpile to pump any water which drains from the Western Power Station Coal Stockpile Area to the dirty water dam in GG1.

The GG2 plant has two thickeners and process water from GG2, GG3 and GG6 goes through both these thickeners. The underflow from these thickeners goes through a belt filter and the product is sent to the power station. The filtrate is recycled back to the thickeners or to the SlimesDam Complex. The overflow from these thickeners is routed to the Clarifier Dam and then via thestorm water drains to the In-Pit Channel. From here the water is routed to the Bench 11 Storagesump in the Pit. Under upset conditions water can also be pumped to the Slimes Dam.

The GG6 plant is coupled to the GG2 plant and the fines or excess water from GG6 is pumped tothe GG2 Plant thickeners. Note that GG2 & GG6 is currently in the process of being refurbished.

Spillages from the silt traps, sumps, transport bins and bunded areas have the potential to reportto the storm water drain from where it will be routed to the Channel to Pit and taken up in to the process. Currently GG 7 and 8 primarily uses raw water however a process water line was installed in 2019which makes it possible for these plants to also not make use of process water line for activities that do not require raw water. The dust suppression on the roads are done by means water trucksand the application of Dust-A-Side on unpaved road surfaces.

2.5.4.4 Groundwater

The Bosbok Dam and silt trap has been lined as it is located on a fault zone and historically resulted in groundwater pollution.

The plant area overlies a basalt aquifer and groundwater movement is restricted by the Daarby fault. The groundwater levels in this groundwater compartment underneath the plant have risen from 40 mbgl to 1 mbgl due to an historical artificial mound created by the plant activities over time.

Thus, to manage the water level so as not damage the foundations of the plants and ensure thatany contamination is contained inside the basalt aquifer, the authorized abstraction boreholes were positioned to create cone of depression across this area when they are pumped. During 2020, nine (9) of the abstraction boreholes were being pumped for 24

hours per day so as to ensure that the cone of depression in maintained, during good rainfall years more of the boreholesare put into operation. A volume of 80 000 – 150 000 $m^{3/}$month of groundwater is abstracted fromthese boreholes and directly re-used in the process water circuit.

2.5.4.5 Waste

Building rubble from the plant is disposed of on Dump 6 in the licensed waste disposal area, thisis regulated by internal permit system. The industrial waste generated in the plant is also removedby an appointed contractor to the licensed reclamation yard facility.

A skip system is implemented to separate the waste at source. Building rubble, wood and gardenrubble are disposed of in grey skips, steel and scrap metal in yellow skips and industrial waste ingreen skips. Drums (210ℓ) are utilised for the storage of hydrocarbon waste which is then removed from the plant site to the new hazardous waste storage area.

The domestic or general waste is disposed of onto the municipal landfill site after it is weighed atthe mine weighbridge.

The recyclable waste, such as paper and cardboard, are removed from site by the appointed contractor.

The coal discard generated in the beneficiation process is conveyed via conveyer belt to the Kidney Stockpile area and from there it is conveyed to Dump 4 and 5 upper system of in-pit backfill lower system for disposal.

2.5.4.6 Pollution Potential

The spillages from the various transfer stations are cleaned up and removed regularly. However,it has the potential to report to the plant storm water drains. All spillages from the plant conveyorsbuild-up and must be removed on a regular basis to maintain the system in proper working order.To mitigate this these is a contract in place for the continuous cleaning of the plant area.

The Bosbok Dam and its silt trap has a partial HDPE and clay lining, however there is still a risk of groundwater contamination should overflows occur, thus the PCD’s are closely monitored, andthe freeboard is maintained of 0.8 m. The attenuation dams linked to the Strategic Stockpiles (Annexure P of IWWMP) areoperated as empty and only has water after the rainy season. The captured water is then systematically pumped out to the Bosbok dam, where it is reused in the process water circuit.

The coking coal and power station coal stockpiles were constructed with drainage systems

when constructed 20 years ago. These systems are cautiously maintained and all new stockyards as with the GG 7 & 8 stockyard beds are suitably lined to prevent any pollution.

There is a potential for soil contamination resulting from hydrocarbon spillages as well as coal spills from the various plants which has the potential to report to the plant storm water drains if not immediately cleaned-up.

2.5.5 Facility 5: Slimes Dam Complex

Figure 2.8 Facility 5 – Slimes Dam Complex

2.5.5.1 Functions/operations

This facility comprises of the following:

- Slimes Dam 1 and 2 (active);
- Slimes Dam 5 (used for recovered slimes from cyclic ponds);
- Cycling ponds (COCSPS).
- Mamba Dam;
- Cement Dam (Return Water Dam); and
- Cyclic Ponds RWD1 and RWD II (for COCSPS).

The layout of facility 5 is indicated in Figure 2.8. The management responsibility for this facility lieswith the Plant Section of Grootegeluk.

Slimes Dams 1 and 2 are still operational and the amount of fine material that is sent to this areais strictly controlled. This is the ensure the stability of the system and the freeboard on top of thefacility. The bulk of the course fines are currently pumped to the cyclic ponds (COCSPS) where it is deposited and dried so that it can be reclaimed as product.

Slimes dam 5 has been decommissioned and partially recovered. The footprint is however being used for the storage of the wet reclaimed material from the COCSPS, form here it is recovered back to the Grootegeluk plant area where it is mixed in with the Coal product and sold to Eskom.

Water is reclaimed via the Slimes Dams 1& 2 Penstock as well as the Cyclic Ponds penstock system. The new Cyclic pond return water dams are also functional and water from here is pumped to the cement dam which is the weigh point for the collection of all the recovered water before the water is pumped back to the plant for reuse. Any overflow from the cement dam reports to the Mamba dam which is also a lined facility.

2.5.5.2 Storm Water

Slimes Dam 1 and 2 has a small collection trench around the dams, which drains into the CementDam. Any overflow from the Cement Dam reports to the lined Mamba Dam. The design capacityof the dirty water collection system around the slimes dam complex has been re-assessed as partof the storm water project.

Any seepage from this facility is either captured by the subsoil drain or by the drainage system under the Cyclic ponds, from where the water is recovered. Unfortunately, the subsoil drain does not extend the entire length of the Dam 5 footprint, which is currently managed as a dry dam andused for the draying and storage of course material recovered from the cyclic ponds.

The cyclic ponds (COCSPS) RWD I & II (return water dams) have been designed to improve storm water management of this area.

Clean storm water is diverted around the cyclic ponds by a diversion bund to the west of the facility. The storm water is also diverted to the receiving environment north of the cyclic ponds. The concrete filled geo- cell storm water cut-off bund was sized based on the catchment area tothe west of the facility and the 1:50 year 24-hour storm.

This storm water captured inside the ponds will be drained via the pond penstock systems and pumped to the plant. Allowance has been made to store and decant the 1:50 year 24-hour stormevent on the cyclic ponds and at the RWD. Any storm water greater than the 1:50 year 24-hour storm event will be diverted off the cyclic ponds or return water dam by means of spillways and discharged into the environment. The spillways have been designed for a 1:100-year storm event.

Storm water channels between Dams 1 and 2 will remain in place and convey dirty storm water emanating from this facility to the Mamba dam and cement dam. Storm water berms around the return water dam will prevent flow into the dams. All rain falling within the

basin has been accounted for in the capacity of the dams and in the water balance.

2.5.5.3 Process Water

Slimes Dams 1 and 2 has a penstock and drainage system. The seepage is water captured in this system is routed via the storm water trenches to the Cement Dam. There are two pumps in place at the Cement Dam to pump this process water back to the FF thickeners in the GG1 Plantor alternatively it is routed to the Bosbok Dam.

The cyclic pond RWD I & II is designed to have sufficient capacity for normal operating water volumes and to contain the 1:50 year flood on the cyclic pond and return water dam areas. A capacity allowance was made for any potential silt build-up. A composite and trafficable liner system was installed to prevent ingress of water into the environment.

To facilitate continued operation of the overall facility should silt need to be removed from the dams RWD, I &II is not both operational at the same time, thus always making sure that one damcan be cleaned whilst the other is in use. Each dam is designed to facilitate hydraulic de-silting and has a 1:10 access ramp to provide for mechanical access if necessary.

The Return Water Pump station is in the middle of the two new return water dams. Water from here is pumped into the Cement Dam and returned to the plant using the Dams 1 and 2 existingreturn water system.

All the water recovered from the slimes will re-used in the process.

2.5.5.4 Groundwater

The Slimes Dam Complex is located on a Holkrans Sandstone formation, which is impervious except for the weathering zone, which is from surface to approximately 8 mbgl.

The current Slimes Dams 1 and 2 are not lined and the seepage from these dams has historically contributed to the contamination of groundwater and an associated groundwater pollution plume in this area.

A 1.2 km long sub-surface geo-drain has been constructed down-slope of the Slimes Dam Complex to intercept the migration of contaminated groundwater. The contaminated seepage is pumped back to be re-used and recycled in the process water circuit.

The COCSPS and RWD I&II are lined, with a geo-synthetic clay liner which consists of bentoniteclay sandwiched between two geo-fabric layers, and therefore seepage of coal slurry water to groundwater from the new facility is not expected.

The RWD dam liner system is more robust that that for the COCSPS and includes an HDPE linersystem the dams are also fitted a leakage detection layer.

2.5.5.5 Waste

The Slimes Dams Complex on Grootegeluk is a dedicated mine residue disposal facility developed for the disposal and recovery of coal fines generated in the coal processing plants.

The recovered slimes are blended with beneficiation plant product and then sent to the Power Station for combustion.

The COCSPS has been designed to facilitate the recovery of course fines and will result in additional fines being sent to the Power Station.

The cyclic pond system will have certain benefits, for example, at closure the COCSPS can be completely removed at closure and the area rehabilitated. This is an improvement compared to atraditional slimes dam which, unless actively removed, will remain as a permanent feature on the landscape and result in seepage to groundwater for a considerable length of time.

2.5.5.6 Pollution Potential

No concurrent rehabilitation of Slimes Dams 1 and 2 are taking place and this has resulted in erosion of the side slopes of the dams, the reason for this is primarily that the material from this facility will also be reclaimed in future.

The limited capacity of the collection trench around Slimes Dams 1 and 2 results in overtopping and spillages which report to the clean area around the dams. As part of the storm water upgrade program these trenches have been fixed and cleaned of vegetation however the capacity of the trenches is still limited, and continuous cleaning is required.

2.5.6 Facility 6: Reductants Plant

Figure 2.9 Facility 6 – Reductants Plant

This facility comprises of the following:

- Coal feed system;
- Retort system;
- Gas & Liquors system
- Reductant PCD

The layout of facility 6 is indicated in Figure 2.9. The management responsibility for this facility lieswith the Plant Section of Grootegeluk.

The Reductants manufacturing process involves the conversion of lumpy coal blends to high quality carbon Reductants (char) through de-volatilisation. De-volatilisation involves releasing volatile compounds through heating the coal at approximately 950°C. The process takes place ina closed circuit and involves the re-application of gaseous heat in the absence of oxygen, which maximises the recovery of lumpy carbon – this reaction takes place in vertical retort. The Reductants production plant is designed to recycle and use the off-gas (waste gas) from the process.

It should be noted that due to a fire in March 2018 the plant has not been operational for the last 11 months. The Refurbishment of the facility has also been put on hold due to the current unreliability of the markets linked to semi-coke. The mine is currently investigating decommissioning alternatives.

2.5.6.1 Storm Water

The storm water runoff and process water are mixed in the Reductants Plant Pollution Control Dam (PCD). The Reductants Plant PCD is lined with an HDPE liner as specified in the IWUL. ThePCD has a dual silt trap system in place at the inlet to the PCD. Storm water runoff from the stockpile area drains towards the PCD via the drainage system, however this system is not alwaysadequate so during storm events some of the water do drain to the natural environment.

The Reductants product stockpile has a sump in place from where storm water is pumped to the PCD.

Hydrocarbon contaminated runoff and water generated in the scaffolding cleaning process is sentto the liquor destructor in the Reductants Plant.

2.5.6.2 Process Water

All process water is re-used or recycled within the Reductants closed water system. The Reductants Plant receives some of its process water from the Raw Water Dam in the GG2 Plantas well as the D8 tipping bin. Water from here is primarily used for quenching and cooling.

The Reductants Plant has a boiler house with 2 boilers, of which one is a stand-by boiler. The boilers where originally used to utilise raw water to generate steam to catch the off-gas howeverthey have been decommissioned. The cooling towers in the Reductants Plant also utilise raw water in their open and closed circuits. The cooling towers cool down the gas to 40°C and generate gas liquor in the process. This liquor is contained in tanks before it is incinerated.

The process water utilised for the quenching of char from the retort is recycled and re-used fromthe Reductants PCD. Evaporative losses occur from this process water circuit and make-up wateris obtained from the mine process water system.

The sewerage generated in the Reductants Plant is stored in a conservancy tank and pumped to the Grootegeluk sewage water Treatment facility that become operational in Oct 2015.

2.5.6.3 Groundwater

There is a groundwater monitoring borehole located downstream of the Reductants PCD to detectany groundwater pollution arising from this site. This groundwater monitoring forms part of the mine-wide groundwater monitoring system.

2.5.6.4 Waste

The waste streams generated by the Reductants Plant include the following:

- Tar;
- Scrap metal;
- Refractory from the retorts; and
- Waste coal.

The Reductants process generates tar as a by-product and tar slag separators are utilised to separate the tar and sludge. The tar is then further separated from the liquor and loaded into tanksfor sale and distribution.

The “waste coal” is a char and coal mix, which is screened and recycled back into the process.

The scrap metal and industrial waste generated during the maintenance of the plant is stored in skips and removed to the mines Reclamation Yard for processing, resale, and final disposal.

2.5.6.5 Pollution Potential

There is a road sweeper on site to sweep the fines from the road once or twice a month. All the spilled char is recycled back into the process.

Water quality monitoring is in place to detect any phenols and bacteriological contamination. Newleakage detection monitoring holes has also been put in place to ensure that no pollution takes place. During the period of operations there were no leakages detected.

2.5.7 Facility 7: Workshops

Figure 2.10 Facility 7 - Workshops

2.5.7.1 Functions/operations

This facility comprises the following:

- In-Pit Service Station;
- Diesel and HDV Workshop;
- Pool Workshop;
- Olifantskop Dam & Buffer Dam; and
- Dam North of Dump 6.
- Storage and Reclamation yard areas

The layout of facility 7 is indicated in Figure 2.10. The management of the facility falls under the responsibility of the Engineering Services Section on Grootegeluk. The Reclamation yard and storage areas are the responsibility of Supply Chain Management.

The Olifantskop Dam is an unlined process water dam which receives storm water from the surrounding environment as well as process water during a 1:50 year flood event. The facility was taken out of operation towards the end of 2021, to clear the footprint so that the facility can be lined. The intent is to start with the lining of the facility in August of 2022, this project forms part of the GGIWMS Strategy which includes the

investigation of an additional 285 000 m^3 buffer dam facility that will be constructed to act as an additional buffer storage in future.

The workshops and service stations are utilized for the maintenance of the mine equipment and the Pool and HDV wash bay areas are the designated washing areas on the mine.

2.5.7.2 Storm Water

All workshops fall within the mines designated dirty water areas, thus all storm water which falls in these areas are seen a being dirty and is included in the mines process water system. The workshop areas have small storm water drainage channels which are primary used for capturing dirty water and directing it to the dirty water channels where the water can be captured and re- used in the process.

At the Diesel, HDV and Pool Workshop, the water drains towards the oil separator where the water is separated from any contaminates and then pumped to the plant dirty storm water channels for re-use. The water recovered from the washing areas are then reused in the washing process where possible, but the excess is pumped to the plants for reuse. At the Diesel workshop area any water that falls on the roads is accumulated in the licensed low-lying area to the north of Dump 6 where it can evaporate. At the Pit Service station, the water also drains to the separator unit from where the water is pumped to the in-pit channel and reused in the process.

At the Reclamation yard the storm water is captured and the cutting slab and drained to the separator. Clean water form here is collected and taken to the plant dirty water channels.

2.5.7.3 Process Water

In the current workshops raw water is utilised for the washing of vehicles due to the corrosive nature of the process water. The wash water used is however captured in the oil separator systems and the “clean” water is reused as process water. At the HDV wash bay this water is however also recirculated as wash water and used for the washing of the workshop floors.

At the Diesel Workshop the water drains towards the oil separator where the water is separated from any contaminates this water is also captured and recirculated as wash water at the HDV Wash bay. At the Pit Service station, the water also drains to the separator unit from where the water is recovered for the washing of floors and excess will report to the pit via the channel to pit.

At the Pool Workshop the wash water is also channelled to the separator and the “clean” water is once again captured and reused in the washing process.

2.5.7.4 Groundwater

Water is pumped from one of the abstraction boreholes at the Pit service station where the water is used to ensure circulation of the water drains, from here the water is captured and once again used in the process.

2.5.7.5 Waste

The workshops also have a bin and skip system, which is implemented to separate the waste at source. The skips are removed by the appointed contractor. Steel and Industrial waste are all taken to the Reclamation Yard where it is reclaimed and sold.

Hydrocarbon waste, such as contaminated oily rags, gloves and overalls are removed from the workshops and stored in skips at the new Temporary Hazardous Waste storage area before removal and final disposal.

The waste oil is recovered and pumped back to the used oil Tank at the Total depot which is in a bunded area. The Pool workshop also has a used oil tank which is bunded and empties on a regular basis. These drums are cleaned and re-used for storage of oily rags.

2.5.7.6 Pollution Potential

There is evidence of hydrocarbon contaminated soil resulting from spillages at the workshops these spills are cleaned continuously, and the contaminated material is disposed as hazardous waste.

The new separator systems as the central workshop, pool workshop and pit service station were commissioned in 2014 and the old systems decommissioned, and historically contaminated areas cleaned.

2.6 Key Water Uses and Waste Streams

The key site-wide water uses at Grootegeluk include the following:

- Section 21(a): Taking water from a water resource;
- Section 21(b): Storage of water (Wildlife Watering);
- Section 21(c): Impeding or diverting the flow of water in a watercourse.
- Section 21(g): Disposing of waste in a manner which may detrimentally impact on a water resource;
- Section 21 (i): Altering the bed, banks course or characteristics of a watercourse; and
- Section 21(j): Removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people.

The key site wide Waste Streams for Grootegeluk in General and Hazardous waste. Table 2.2 summarises the main General Waste Streams and Table 2.3 summarises that Hazardous Waste Streams produced on site.

Table 2.2 General Waste Streams

Waste Type	Description	Management and/orDisposal
Paper	Recyclables	Recycling company
Cans	Recyclables	Recycling company
Cardboard boxes	Recyclables	Recycling company
Towel rollers	Recyclables	Recycling company
Plastic bottles	Domestic waste/ Recyclables	Town landfill
Glass	Domestic waste/ Recyclables	Town landfill
Food residues	Domestic waste	Town landfill
Food wrapping	Domestic waste	Town landfill
Clothing (Un-contaminated)	Domestic waste	Town landfill
Polystyrene	Domestic waste	Town landfill
Garden waste	General waste	Mine discard dump, Dump 6
Building rubble	General waste	Mine discard dump, Dump 6
Fibreglass panels	General waste	Mine discard dump, Dump 6
Wood / Wooden Pallets	General waste	Mine discard dump, Dump 6
Scrap metal	Industrial waste	Reclamation yard for resale
Scrap rubber, pipes, and	Industrial waste	Reclamation yard for resale

Waste Type	Description	Management and/orDisposal
uncontaminated hydraulic hoses		
Tyres	Industrial waste	Stored at designated tyre storage area & Removed toRegistered tyre disposal company.
Conveyor belts	Industrial waste	Returned to supplier or sold
Air filters	Industrial waste	Reclamation yard for resaleor disposal
Hard Hats	Industrial waste	Reclamation yard for resaleor disposal

Table 2.3 Hazardous Waste Streams

Waste Type	Management and/or Disposal
Electrical components and cables	Reclamation yard for re-sale
Sandblasting waste	Stored on site until disposal method identified
Scrapped electronic equipment	Reclamation yard for re-sale
Acid, chemicals and containers	Removed by permitted waste disposal contractor for treatment and disposal at licensed hazardous waste disposal site
Herbicides and pesticides	Removed by permitted waste disposal contractor for treatment and disposal at licensed hazardous waste disposal site or incineration
Paint, thinners, turpentine	Removed by permitted waste disposal contractor for treatment and disposal at licensed hazardous waste disposal site or incineration
Cooking oil	Removed by permitted waste disposal contractor for treatment and disposal at licensed hazardous waste disposal site
Asbestos	Removed according to the Asbestos Regulations by permitted waste disposal contractor for disposal at licensed hazardous waste disposal site
Batteries	Removed by permitted waste disposal contractor for recycling or treatment and disposal at licensed hazardous waste disposal site
Plant chemicals that includes biocides, magnetite, flocculants and zinc chloride	Removed by permitted waste disposal contractor for treatment and disposal at licensed hazardous waste disposal site

Waste Type	Management and/or Disposal
Lead	Removed by permitted waste disposal contractor for recycling
Fluorescent tubes	Crushed with a tube crusher and removed by permitted waste disposal contractor for treatment and disposal at a licensed hazardous waste disposal site
Hydrocarbon waste including oils, oily rags, oil filters, contaminated soils	Stored at the total depot for recycling or removal by permitted waste disposal contractor for disposal at licensed hazardous waste disposal site
Polychlorinated Biphenyls	Removed by permitted waste disposal contractor for disposal at licensed hazardous waste disposal site or incineration
Empty gas cylinders	Valves removed prior to removal by permitted waste disposal contractor for disposal at licensed hazardous waste disposal site
Aerosols	Punctured, flattened and removed by permitted waste disposal contractor for disposal at licensed hazardous waste disposal site
Petri dishes	Removed by permitted waste disposal contractor for disposal at licensed hazardous waste disposal site or incineration
Radioactive waste	Removed by permitted waste disposal contractor in accordance with the requirements of the Nuclear Energy Act, 1999 (Act 46 of 1999)
Health Care Risk Waste	Stored in designated area in legally compliant containers prior to removal by permitted waste disposal contractor for incineration or appropriate treatment
Explosives	Handled in accordance with the Explosives Act, 1956, (Act 26 of 1956) and Mines and Works and Explosives Amendment Act, 1964 (Act 46 of 1964)
Contaminated PPE	Removed by permitted waste disposal contractor for treatment and disposal at licensed hazardous waste disposal site
Reductants Plant, Tar	Sold as Bi-Product. Any spilled material is removed by permitted waste disposal contractor for treatment and disposal at licensed hazardous waste disposal site
Reductants Plant, Liquor	Put through Liquor destructors. Any spilled material is removedby permitted waste disposal contractor for treatment and disposal at licensed hazardous waste disposal site
Coal fines, spilled material and contaminated refractory	Disposed with Plant Discard in side pit or on Active Discard dump.

2.7 Organisational Structure of the Activity

The Grootegeluk Organizational structure is shown in Figure 2.11 and gives a detailed breakdown of the Environmental Section which lies within the Exxaro Grootegeluk Sustainability Department.

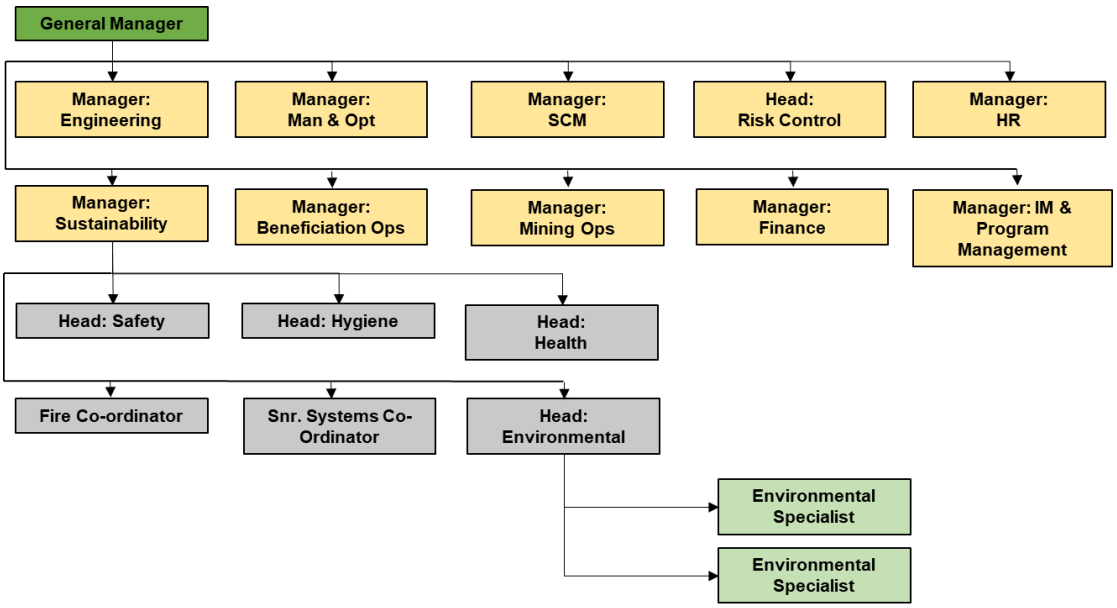

Figure 2.11: Organisational Structure of Grootegeluk with a detailed description of the Environmental Section

2.8 Business and Corporate Policies

Refer to **Annexure B** for the Management Standard: Exxaro Policy, Leadership and Commitment Standard.

2.8.1 Sustainability Policy

Management shall demonstrate leadership and commitment to SHEC in line with Exxaro's Vision of Zero Harm. This shall include the development and maintenance of the Exxaro Sustainability Policy, which shall be fully aligned with Exxaro's vision and principles.

Exxaro shall maintain a Sustainability Policy that is appropriate to the nature and scale of its activities. The Exxaro Board shall endorse that Sustainability policy and will review it regularly to ensure it remains current and relevant.
Senior Management at each Exxaro operation shall be accountable for establishing and maintaining the operation's Sustainability policy and a SHEC (Safety, Health, Environment and Community) management system that, as a minimum, shall reflect the Exxaro Vision and Principles. The policy and SHEC management system shall be consistent with the requirements of internationally recognised SHEC management system standards such as ISO 45001 and ISO 14001:2004.

Exxaro Resources actively cares for the health and safety of its people, the environment, surrounding communities and our resources by ensuring sustainable development1 in all our activities. Exxaro Resources is active in mining and mineral-related operations, as well as energy generation, and is committed to:

- Consultation with employees, representatives and other stakeholders in appropriate forums to develop, communicate, and review responsible and innovative policies, programmes and guidelines that safeguard the community, employees, contractors, stakeholders and the environment, while providing flexibility to meet the needs of our businesses.

- Achieving high standards of environmental care and providing a safe and healthy workplace for employees, contractors, and other relevant stakeholders.

[1] *Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs (from: World Commission on Environment and Development (WCED). Our common future. Oxford: Oxford University Press, 1987 p. 43).*

- Ensuring an appropriate organizational structure and adequate resources to manage sustainable development, including safety, health and environmental matters and compliance with legislation.

- Implementing internationally accepted and appropriate standards for safety, occupational health and hygiene, environment, and stakeholder engagement management systems.

- Complying with all applicable Sustainability legislation and international obligations as a minimum requirement and implementing effective company standards, programmes, and processes to manage risks.

- Maintaining continuous hazard and aspect identification and risk assessment regarding safety, occupational health, and sustainable development.

- Maintaining competence and awareness regarding relevant safety and sustainable development matters through training, mentoring and communication to employees and contractors.

- Conserving natural resources and reducing the environmental burden of waste generation and emissions to the air, water, and land through strategies focusing on reducing, reusing, recycling and responsible disposal of waste.

- Prevention of injury, ill health, pollution and continual improvement in SSD management and performance.

- Establishing objectives, targets and continuously improve operations regarding safety and sustainable development performance and management systems.

- Ensuring that all incidents leading to fatality, environmental impact, injury, occupational diseases, damage to property, process losses, compliance notices, regulatory fines and penalties are reported and investigated thoroughly to determine all contributing factors and promptly implement corrective and preventive actions.

- Establishing and maintaining appropriate controls, including periodic audits and review, to ensure that this policy is effectively implemented, updated and available to interested and affected parties; and

- Maintaining a high level of emergency preparedness and response to manage any potential emergency.

Our SSD policy informs the entire SSD function as Exxaro aspires to be a responsible corporate citizen that contributes to mitigating sustainable development challenges facing the environments in which our operations are located, as well as international treaties that South Africa is signatory to.

2.8.2 Health and Safety

Safety, occupational health and hygiene remain top priorities for the Exxaro group and its board of directors. Exxaro is committed to enforcing compliance with the requirements of the relevant safety, occupational health and hygiene regulations. Suppliers are obliged to ensure adequate compliance with safety, health and hygiene legislation and implement best practices to protect the safety, health and hygiene of their workforce and stakeholders. Suppliers are obliged to:

- Have an effective policy to enforce compliance with all applicable safety, occupational health and hygiene legislation and programmes for the protection of its workforce from unsafe practices and threat of occupational diseases;
- Maintain controls and innovative methods to ensure that they comply with the regulated occupational exposure limits or legislated targets and guidelines on noise and dust when providing services or supplying goods to Exxaro;
- Enforce and manage a zero tolerance approach to behaviour and practices that may harm the workforce; and
- Maintain a high level of emergency preparedness to manage any potential safety, health or environmental emergencies.

3 REGULATORY WATER AND WASTE MANAGEMENT FRAMEWORK

3.1 Summary of all Water Uses

All the water uses authorised under Licence no. 01/A42J/GB/6418 (dated 5 July 2018) are summarised in Table 3.1, Table 3.2, and Table 3.3. The water uses authorised under Licence no. 07/A42J/CICI/6418 (dated 18 October 2019) are summarised in Table 3.4.

Table 3.1 Summary of all section 21(a) water uses authorised for Grootegeluk

Name of water use	Total Quantities	Farm Portion	Coordinates
Abstraction of groundwater from BoreholeWB33 for process water	2 400 000 m^3/a	Daarby 458 LQ, Portion 0	S23°·39' 25.40359" E27° 32' 55.20116"
Abstraction of groundwater from BoreholeWB35 for process water		Daarby 458 LQ, Portion 0	S23°·39' 19.08297" E27° 32' 40.96954"
Abstraction of groundwater from BoreholeWB36A for process water		Daarby 458 LQ, Portion 0	S23° 39' 29.132" E 27° 32' 25.893"
Abstraction of groundwater from BoreholeWB38 for process water		Enkelbult 462 LQ Portion 0	S23°·39' 50.86969" E27° 32' 43.82564"
Abstraction of groundwater from BoreholeWB39A for process water		Enkelbult 462 LQ Portion 0	S 23° 40' 3.403" E 27° 33' 22.779"
Abstraction of groundwater from BoreholeWB41 for process water		Enkelbult 462 LQ Portion 0	S23°·40' 03.54058" E27° 33' 36.07525"
Abstraction of groundwater from BoreholeWB42 for process water		Enkelbult 462 LQ Portion 0	S23°·40' 11.15419" E27° 33' 17.72228"
Abstraction of groundwater from BoreholeWB43 for process water		Enkelbult 462 LQ Portion 0	S23°·39' 55.10471" E27° 33' 30.23365"
Abstraction of groundwater from BoreholeWB45 for process water		Enkelbult 462 LQ Portion 0	S23°·39' 53.57424" E27° 33' 51.84923"
Abstraction of groundwater from Borehole WB46 for process water		Enkelbult 462 LQ Portion 0	S23°·40' 06.31107" E27° 33' 51.61343"

Name of water use	Total Quantities	Farm Portion	Coordinates
Abstraction of groundwater from Borehole WB49 for process water		Enkelbult 462 LQ Portion 0	S23°·39' 28.59048" E27° 33' 37.81549"
Abstraction of groundwater from Borehole WB50 for process water		Enkelbult 462 LQ Portion 0	S23°·39' 02.87241" E27° 33' 47.89301"
Abstraction of groundwater from Borehole WB51 for process water		Enkelbult 462 LQ Portion 0	S23°·39' 38.09110" E27° 33' 41.04121"
Abstraction of groundwater from Borehole WB52 for process water		Enkelbult 462 LQ Portion 0	S23°·40' 05.03633" E27° 33' 05.87707"
Abstraction of groundwater from Borehole WB53 for process water		Enkelbult 462 LQ Portion 0	S23°·39' 52.50427" E27° 33' 18.19635"
Abstraction of groundwater from Borehole WB54 for process water		Enkelbult 462 LQ Portion 0	S23°·40' 04.11537" E27° 33' 35.96607"
Abstraction of groundwater from Borehole WB55 for process water		Enkelbult 462 LQ Portion 0	S23°·39' 40.81340" E27° 33' 55.54022"
Abstraction of groundwater from Borehole WB56 for process water		Enkelbult 462 LQ Portion 0	S23°·39' 35.91699" E27° 33' 00.53742"
Abstraction of groundwater from Borehole WB57 for process water		Enkelbult 462 LQ Portion 0	S23°·39' 08.86556" E27° 32' 59.37305"
Abstraction of groundwater from Borehole WB59 for process water		Enkelbult 462 LQ Portion 0	S23°·39' 31.03196" E27° 33' 18.60954"
			S23° 40' 40.55" E27° 32' 40.74" S23° 42' 13.11"

Name of water use	Total Quantities	Farm Portion	Coordinates
Abstraction from the Grootegeluk In-pit sumps		Enkelbult 462 LQ portion 0	E27° 29' 34.05" S23° 40' 32.02" E27° 28' 27.82" S23° 39' 41.21" E27° 31' 12.10" S23° 39' 57.87" E27° 32' 50.22"

Table 3.2 Summary of all section 21(g) water uses authorised for Grootegeluk (*Uses addressed in IWUL Amendment received Dec 2018)

No	Name of water use	Properties	Farm Portion	Coordinates
1.	Stockpiling of coal at the GG6/2 Stockyard.	Current Capacity = 231 100 m^3 Current Annual disposal quantity =8 385 000 tons	Enkelbult 462 LQ, portion 0	S 23°39'36.72" E 27°33'24.19"
2.	Stockpiling of coal at theGG4 and GG5 Stockyards	Current Capacity = 20 000 m^3 Current Annual disposal quantity =2 000 000 tons	Daarby 458 LQ. portion 0 Enkelbult 462 LQ, portion 0	S 23°39'10.63" E 27°33'26.19"
3.	Stockpiling of coal at the GG10 Stockyard A (next to Discard Dump)	Current Capacity = 400 000 tons Current Annual disposal quantity = 4 500 000 tons	Daarby 458 LQ, portion 0	S 23°38'33.23" E 27°33'00.57"
4.	Stockpiling of coal at the GG10 Stockyard B (D8 Loop Footprint)	Current Capacity = 400 000 tons Current Annual disposal quantity = 4 500 000 tons	Daarby 458 LQ, portion 0 Enkelbult 462 LQ, portion 0	S 23°39'21.85" E 27°33'03.33"

No	Name of water use	Properties	Farm Portion	Coordinates
5.	Stockpiling of coal at the Multiproduct Overflow Stockyard.	Current Capacity = 140 000 tons Current Annual disposal quantity = 3 000 000 tons	Daarby 458 LQ, portion 0	S 23°39'04.55" E 27°33'21.31"
6.	Stockpiling of coal at the Buffer Stockpile as part of the fines recovery.	Current Capacity = 60 000 Current Annual disposal quantity = 700 000 tons	Daarby 458 LQ, portion 0	S 23°38'52.92" E 27°33'55.31"
7.	Stockpiling of coal at the Conical Stockpile as part of the fines recovery	Current Capacity = 10 000 tons (5 000 tons per stockpile) Current Annual disposal quantity = 2 000 000 tons	Daarby 458 LQ, portion 0	23°39'55.25" E 27°32'51.56"
8.	Reductants feed stockpile (Extension)	Current Capacity = 735 840 m3 Current Annual disposal quantity = 735 840 m3	Farm Daarby 458 portion 0	S23 38’50.57” E27 33’13.62”
9.	Reductants product Stockpile	Current Capacity = 20 945 m3 or 15500 ton/a Current Annual disposal quantity = 135000 m3	Farm Daarby 458, LQ portion 0	S23 38’57.58.92” E27 33’05.46”
10.	Reductants product Stockpile (extension)	Current Capacity = 6 081 m3 or 4500 ton/a Current Annual disposal quantity = 61000 m3/a	Farm Daarby 458, LQ portion 0	S 23°38'57.50" E 27°33'06.82"
11.	Reductants feed stockpile	Current Capacity = 199 416 m3 Current Annual disposal quantity = 407	Farm Daarby 458 LQ portion 0	S 23°38'52.10" E 27°33'15.82"

No	Name of water use	Properties	Farm Portion	Coordinates
	(Kidney Stockpile)	592 tons		
12.	Existing GG1 Stockyard SSCC	Capacity = 180 000 m3 Volume = 1.5 mil ton	Daarby 458 LQ, portion 0	S23 39'28.80" E27 33'31.35"
13.	Existing GG1-6 Stockyard PSC	Capacity = 613 654 m3 Volume = 9.7 mil ton	Daarby 458 LQ, portion 0	S23 39'19.52" E27 33'26.84"
14.	Existing GG4 & 5 Met	Capacity = 131 265 m3 Volume = 1.6 mil ton	Daarby 458 LQ, RE portion 0	S23 39'21.86" E27 33'14.63"
15.	Existing GG7&8 Stockyard PSC	Capacity = 310 355 m3 Volume = 10.1 mil ton	Daarby 458 LQ, portion 0	S23 39'12.61" E27 33'18.20"
16.	Existing GG6 Stockyard Export	Capacity = 86 000 m3 Volume = 817 000 ton	Daarby 458 LQ, portion 0	S23 39'21.43" E27 33'33.69"
17.	Short term – Laydown Area Stockpile	Capacity = 1282 000 m3 Annual disposal quantity = 1 666 600 tons/a	Enkelbult 462 LQ portion 0	S23 39'09.9" E27 32'48.0"
18.	Short term – GG 10B Stockpile and Expansion Area	Capacity = 1265 500 m3 Annual disposal quantity = 1 645 150 tons/a (max storage capacity)	Daarby 458 LQ portion 0 Enkelbult 462 LQ portion 0	S23 39'01.7" E27 33'13.9"
19.	Short term – Multiproduct Stockpile	Capacity = 140 000 tons Annual disposal quantity = 3 000 000 tons/a	Daarby 458 LQ portion 0	S23 39'04.55" E27 33'21.31"
20.	Dumps 4 & 5	Current Capacity = 284966875 m3 Surface Area 709 ha. Current Annual disposal quantity = 18.5 million tons per	Goedehoop 457 LQ portion 0 Daarby 458 LQ portion 0	S23 38'32.10" E27 32'01.46"

No	Name of water use	Properties	Farm Portion	Coordinates
		annum		
21.	Dust Suppression of the mine roads with process water from water reticulation system and PCD's	*Current Annual disposal quantity = 1,600,000 m3/a	Enkelbult 462 LQ, Portion 0, Daarby 458 LQ, portion 0 Turfvlakte 463 LQ, portion 0 Hieromtrent 460 LQ, portion 0 Grootegeluk 459 LQ, portion 0	Haul Road
22.	Return Water Dam A for water from the Cyclic ponds	Current Capacity = 49 500 m3 Current Annual disposal quantity = 1 257 094 m3/a	Appelvlakte 448 LQ, portion 0	S 23°37'54.32" E 27°33'58.12"
23.	Return Water Dam B for water from the Cyclic ponds	Current Capacity = 49 500 m3 Current Annual disposal quantity = 1 257 094 m3/a	Farm Appelvlakte 448, portion 0	S23 37'54.24" E27 34'09.15"
24.	Slimes Return Water Dam (Cement dam)	Current Capacity = 1 782 m3 Current Annual disposal quantity = 890 000 m3	Appelvlakte 448 LQ, portion 0	S 23°38'12.06" E 27°34'23.44"
25.	Cyclic Operated Coal Slurry Pond System (COCSP S1-4)	Current Capacity = 1 440 000 m3 Current Annual disposal quantity = 6 851 772 m3/a	Appelvlakte 448 LQ, portion 0 Appelvlakte 448 LQ, portion 1	S 23°38'04.14" E 27°33'56.18" S 23°38'04.17"

No	Name of water use	Properties	Farm Portion	Coordinates
				E 27°34'01.52" S 23°38'04.06" E 27°34'06.85" S 23°38'04.47" E 27°34'11.66"
26.	Slimes Dam 5	Current Capacity = 199 416 m3 Current Annual disposal quantity = 407 592 m3/a	Appelvlakte 448 LQ, portion 0	S 23°38'27.96" E 27°34'34.56"
27.	Slimes dams (active dams 1 and 2)	Current Capacity = 16 639 453 m3 Current Annual disposal quantity = 750 000 tons per annum	Appelvlakte 448 LQ, portion 0 Appelvlakte 448 LQ, portion 1	S23° 38' 26.39" E27° 34' 04.75"
28.	Catchment sump at N1 overflow to Olifantskop dam	Current Annual disposal quantity = 1 000 000 m3	Enkelbult 462 LQ portion 0	S23 39'52.22" E27 33'17.35"
29.	Storm water dam north of dump 6	Current Capacity = 50 520 m3 Total volumes waste water discharged = 26 065 m3/annum	Enkelbult 462 LQ portion 0	S23 40'04.60" E27 33'40.58"
		Disposal volume = 33 069 m3/annum		
30.	Reductants Plant Pollution Control Dam	Current Capacity = 12 828 m3 Current Annual disposal quantity = 232 032	Daarby 458 LQ portion 0	S23° 38' 56.77" E27° 33' 13.67"

No	Name of water use	Properties	Farm Portion	Coordinates
31.	Medupi Sump 1: Southern Sump	Current Capacity = 47 748 m3 Current Annual disposal quantity = 20 400	Daarby 458 LQ portion 0	23° 38' 33.710" S 27° 33' 06.518" E
32.	Medupi Sump 2: Northern Sump	Current Capacity = 23 520 m3 Current Annual disposal quantity = 10 049	Daarby 458 LQ portion 0	S23° 38' 56.457" E27° 32' 53.043"
33.	Medupi Sump 3	Current Capacity = 59 604 m3 Current Annual disposal quantity = 25 440	Daarby 458 LQ portion 0	23° 39' 01.454" S 27° 32' 40.177" E
34.	Olifantskop dam	Current Capacity = 114600m3 Current Annual disposal quantity = 900000 m3	Enkelbult 462 LQ portion 0	S23 40’04.3” E27 33’27.75”
35.	Buffer dam	Current Capacity = 94500 m3 Current Annual disposal quantity = 0	Enkelbult 462 LQ portion 0	S23 39’59.00” E27 33’33.00”
36.	Bosbok Dam and silt trap	Bosbok dam Current Capacity = 114450 m3 Silt Trap =18 500m3 Annual disposal quantity = 940000 m3	Daarby 458 LQ portion 0	S23 38’56.82” E27 33’45.72” S23° 39’ 00.0” E27° 33’ 47.11”
37.	Mamba dam	Current Capacity = 73 000 m3 Current Annual disposal quantity = 280 000 m3	Appelvlakte 448 LQ portion 0	S23 38’10.11” E27 34’19.62”
38.	Bench 11 open pit storage dam	Current Capacity = 188 000 m3 Current Annual disposal quantity = 2 000 000 m3	Enkelbult 462 LQ portion 0	S23 40’19.30” E27 32’38.48”
39.	Movable Bench 13 in-pit sump	Total volumes waste water discharged = 596	Enkelbult 462 LQ	S23° 38' 50.044"

No	Name of water use	Properties	Farm Portion	Coordinates
		808 m3/annum Maximum disposal volume = 69 190 m3/month	portion 0 Grootegeluk 494 LQ portion 0	E27° 31' 2.061" S23° 41' 4.447" E27° 34' 3.258" S23° 41' 56.080" E27° 32' 26.050" S23° 42' 34.598" E27° 29' 46.621" S23° 41' 36.306" E27° 29' 11.797" S23° 40' 37.010" E27° 28' 31.189" S23° 40' 3.769" E27° 28' 16.199" S23° 39' 7.789" E27° 30' 1.683"
40	Reductants concrete lined tank	Surface area 138 m2, a wall height of 2.83 m and capacity to hold 112 m3	Daarby 458 LQ portion 0	S23° 38’ 55.59” E27° 33’ 12.57”
41.	Expansion of the Reductants PCD Silt trap	Silt trap of height 1.3 m, surface area of 122 m3 and capacity of 242 m3	Daarby 458 LQ portion 0	S23° 38’ 55.54” E27° 33’ 13.46”
42*	Oxidation ponds	Design capacity = 14 747 m3 Large pond (compartments 1 and 2) = 7 600 – 15 200 m3;	Turfvlakte 463 LQ, portion 0	S23° 40’ 34.24” E27° 33’ 35.60”

No	Name of water use	Properties	Farm Portion	Coordinates
		Small pond (compartments 3 and 4 combined) = 2 400 m3 Disposal capacity = 0 / Emergencies		
43*	Attenuation dam A at Phase 2 Stockpile area	Design Volume = 15 850 m3 Active storage = 13 095 m3 Annual disposal = 157 140 m3/a	Daarby 458 LQ portion 0	S23° 39' 00.26" E27° 32' 59.69" S23° 38' 58.86" E27° 32' 58.45" S23° 38' 53.47" E27° 33' 04.22"
44*	Attenuation dam B at Phase 2 Stockpile area	Design Volume = 18 900 m3 Active storage = 13 000 m3 Annual disposal = 156 000 m3/a	Daarby 458 LQ portion 0	S23° 39' 02.14" E27° 33' 13.11" S23° 39' 05.23" E27° 33' 16.52" S23° 39' 07.25" E27° 33' 13.92" S23° 39' 03.66" E27° 33' 10.04"
45	In-pit backfilling / disposal	Current Capacity = 51 769 000 m3 Current Annual disposal quantity = 12 million tons/a	Grootegeluk 459 LQ portion 0 Leeuwdrift 312 LQ portion 0 Hieromtrent 460 LQ portion 0	S23° 38' 50.044" E27° 31' 2.061" S23° 41' 4.447" E27° 34' 3.258" S23° 41' 56.080"

No	Name of water use	Properties	Farm Portion	Coordinates
			Turfvlakte 463 LQ portion 0 Enkelbult 462 LQ portion 0 Daarby 458 LQ portion 0	E27° 32' 26.050" S23° 42' 34.598" E27° 29' 46.621" S23° 41' 36.306" E27° 29' 11.797" S23° 40' 37.010" E27° 28' 31.189" S23° 40' 3.769" E27° 28' 16.199" S23° 39' 7.789" E27° 30' 1.683"

Table 3.3 Summary of all section 21(j) water uses authorised for Grootegeluk

No	Name of water use	Quantity	Farm Portion	Coordinates
1.	Abstraction from the Grootegeluk Pit & In-Pit sumps	954 072 m^3/annum (average) and maximum of 1 606 689 m^3/annum	Enkelbult 462 LQ portion 0 Hieromtrent 460 LQ portion 0 Grootegeluk 459 LQ, portion 0	S23° 40’ 40.55” E27° 32’ 40.74” S23° 42’ 13.11” E27° 29’ 34.05” S23° 40’ 32.02” E27° 28’ 27.82” S23° 39’ 41.21” E27° 31’ 12.10” S23° 39’ 57.87” E27° 32’ 50.22”

Table 3.4 Water use 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

WU name	PES	Activity	Purpose and Description	FARM_NAME	Length (m)	Width (m)	Coordinates S	Coordinates E
Seasonal Pan 1	B Category	Coal Mining	Altering the bed and character of the non-perennial pan (removal ofpans)	DAARBY 458	94.3	68	23° 39' 14.223" S	27° 31' 36.476" E
Seasonal Pan 2	D Category	1.0049	Altering the bed and character of the non-perennial pan (removal ofpans)	DAARBY 458	160	85.6	23° 39' 14.963" S	27° 30' 57.750" E
Seasonal Pan 3	B Category	0.0512	Altering the bed and character of the non-perennial pan (removal ofpans)	LEEUWDRIFT 312	34.2	19.4	23° 39' 9.463" S	27° 30' 14.532" E
Seasonal Pan 4	B Category	0.1414	Altering the bed and character of the non-perennial pan (removal ofpans)	LEEUWDRIFT 312	76.7	36.2	23° 39' 14.278" S	27° 29' 46.118" E
Seasonal Pan 5	B Category	0.4498	Altering the bed and character of the non-perennial pan (removal ofpans)	LEEUWDRIFT 312	106.2	54.6	23° 39' 28.115" S	27° 30' 5.315" E
Artificial pan 6	Artificial	0.1385	Altering the bed and character of the non-perennial pan	LEEUWDRIFT 312	43.7	38.3	23° 39' 46.637" S	27° 30' 6.173" E

WU name	PES	Activity	Purpose and Description	FARM_NAME	Length (m)	Width (m)	Coordinates S	Coordinates E
			(removal ofpans)					
Seasonal Pan 7	B Category	0.257	Altering the bed and character of the non-perennial pan (removal ofpans)	LEEUWDRIFT 312	98.8	53.8	23° 39' 14.937" S	27° 29' 27.234" E
Seasonal Pan 8	B Category	2.3596	Altering the bed and character of the non-perennial pan (removal ofpans)	LEEUWDRIFT 312	214.6	150.4	23° 39' 35.538" S	27° 29' 10.722" E
Seasonal Pan 9	B Category	0.0138	Altering the bed and character of the non-perennial pan (removal ofpans)	LEEUWDRIFT 312	19	10	23° 39' 41.450" S	27° 29' 7.742" E
Seasonal Pan 10	B Category	0.0854	Altering the bed and character of the non-perennial pan (removal ofpans)	LEEUWDRIFT 312	53.5	33.2	23° 39' 40.964" S	27° 29' 9.690" E
Seasonal Pan 11	B Category	0.0078	Altering the bed and character of the non-perennial pan (removal ofpans)	LEEUWDRIFT 312	14	7.2	23° 39' 42.922" S	27° 29' 9.259" E
Seasonal Pan 12	B Category	0.008	Altering the bed and character of the non-perennial pan	LEEUWDRIFT 312	13.6	7.7	23° 39' 50.948" S	27° 28' 58.813" E

WU name	PES	Activity	Purpose and Description	FARM_NAME	Length (m)	Width (m)	Coordinates S	Coordinates E
			(removal ofpans)					
Seasonal Pan 13	B Category	0.2666	Altering the bed and character of the non-perennial pan (removal ofpans)	LEEUWDRIFT 312	100.6	67.1	23° 39' 54.424" S	27° 29' 17.005" E
Seasonal Pan 14	B Category	0.0052	Altering the bed and character of the non-perennial pan (removal ofpans)	LEEUWDRIFT 312	9.5	6.7	23° 39' 53.876" S	27° 29' 18.922" E
Seasonal Pan 15	B Category	0.1159	Altering the bed and character of the non-perennial pan (removal ofpans)	LEEUWDRIFT 312	54	42.9	23° 39' 29.055" S	27° 28' 50.847" E
Seasonal Pan 16	B Category	0.0511	Altering the bed and character of the non-perennial pan (removal ofpans)	LEEUWDRIFT 312	51.4	24	23° 39' 30.617" S	27° 28' 52.857" E
Seasonal Pan 17	B Category	0.0997	Altering the bed and character of the non-perennial pan (removal of pans)	LEEUWDRIFT 312	69.9	42.2	23° 40' 8.181" S	27° 29' 1.732" E
Seasonal Pan 18	B Category	0.2874	Altering the bed and character of the non-perennial pan	LEEUWDRIFT 312	87.2	67.3	23° 40' 9.321" S	27° 29' 21.042" E

WU name	PES	Activity	Purpose and Description	FARM_NAME	Length (m)	Width (m)	Coordinates S	Coordinates E
			(removal of pans)					
Seasonal Pan 19	B Category	0.0023	Altering the bed and character of the non-perennial pan (removal of pans)	LEEUWDRIFT 312	8.3	4.1	23° 40' 8.008" S	27° 29' 24.006" E
Seasonal Pan 20	B Category	0.0114	Altering the bed and character of the non-perennial pan (removal of pans)	LEEUWDRIFT 312	19.9	8	23° 40' 8.873" S	27° 29' 24.737" E
Seasonal Pan 21	B Category	0.0214	Altering the bed and character of the non-perennial pan (removal of pans)	LEEUWDRIFT 312	23.8	15	23° 40' 9.838" S	27° 29' 25.401" E
Seasonal Pan 22	B Category	0.0801	Altering the bed and character of the non-perennial pan (removal of pans)	GROOTEGEL UK 459	51.2	26.6	23° 40' 28.403" S	27° 28' 36.622" E
Seasonal Pan 23	B Category	0.0012	Altering the bed and character of the non-perennial pan (removal of pans)	GROOTEGEL UK 459	4.7	3.2	23° 40' 47.003" S	27° 28' 46.150" E
Seasonal Pan 24	B Category	0.0206	Altering the bed and character of the non-perennial pan	GROOTEGEL UK 459	48.9	11.1	23° 40' 44.051" S	27° 28' 46.868" E

WU name	PES	Activity	Purpose and Description	FARM_NAME	Length (m)	Width (m)	Coordinates S	Coordinates E
			(removal of pans)					
Seasonal Pan 25	B Category	0.0051	Altering the bed and character of the non-perennial pan (removal of pans)	GROOTEGEL UK 459	17.1	5	23° 40' 42.467" S	27° 28' 48.302" E
Seasonal Pan 26	B Category	0.0212	Altering the bed and character of the non-perennial pan (removal of pans)	GROOTEGEL UK 459	38.7	13.5	23° 40' 38.386" S	27° 28' 51.028" E
Seasonal Pan 27	B Category	0.0877	Altering the bed and character of the non-perennial pan (removal of pans)	GROOTEGEL UK 459	85.5	46	23° 40' 36.060" S	27° 28' 51.620" E
Seasonal Pan 28	B Category	0.0155	Altering the bed and character of the non-perennial pan (removal of pans)	GROOTEGEL UK 459	14.8	13.5	23° 40' 34.195" S	27° 29' 2.418" E
Seasonal Pan 29	B Category	0.0026	Altering the bed and character of the non-perennial pan (removal of pans)	GROOTEGEL UK 459	8.9	3.9	23° 40' 35.078" S	27° 29' 7.978" E
Seasonal Pan 30	B Category	0.0263	Altering the bed and character of the non-perennial pan	GROOTEGEL UK 459	37.9	15.8	23° 40' 34.885" S	27° 29' 9.204" E

WU name	PES	Activity	Purpose and Description	FARM_NAME	Length (m)	Width (m)	Coordinates S	Coordinates E
			(removal of pans)					
Seasonal Pan 31	B Category	0.0599	Altering the bed and character of the non-perennial pan (removal of pans)	GROOTEGEL UK 459	40.3	22.4	23° 40' 31.945" S	27° 29' 14.113" E
Seasonal Pan 32	B Category	0.0341	Altering the bed and character of the non-perennial pan (removal of pans)	GROOTEGEL UK 459	34.8	16	23° 40' 30.051" S	27° 29' 18.203" E
Artificial pan 33	Artificial	0.3493	Altering the bed and character of the non-perennial pan (removal of pans)	GROOTEGEL UK 459	67.6	65.9	23° 40' 51.219" S	27° 29' 29.872" E
Seasonal Pan 34	B Category	0.0244	Altering the bed and character of the non-perennial pan (removal of pans)	GROOTEGEL UK 459	49.9	27	23° 41' 4.462" S	27° 29' 21.684" E
Seasonal Pan 35	B Category	0.0047	Altering the bed and character of the non-perennial pan (removal of pans)	GROOTEGEL UK 459	13.9	4.3	23° 41' 2.662" S	27° 29' 33.022" E
Seasonal Pan 36	B Category	0.0094	Altering the bed and character of the non-perennial pan	GROOTEGEL UK 459	13.7	10.7	23° 41' 2.839" S	27° 29' 35.054" E

WU name	PES	Activity	Purpose and Description	FARM_NAME	Length (m)	Width (m)	Coordinates S	Coordinates E
			(removal of pans)					
Seasonal Pan 37	B Category	0.0067	Altering the bed and character of the non-perennial pan (removal of pans)	GROOTEGEL UK 459	13.9	10.7	23° 41' 7.155" S	27° 29' 33.409" E
Seasonal Pan 38	B Category	0.0087	Altering the bed and character of the non-perennial pan (removal of pans)	GROOTEGEL UK 459	23.8	8.7	23° 41' 7.721" S	27° 29' 34.257" E
Seasonal Pan 39	B Category	0.0655	Altering the bed and character of the non-perennial pan (removal of pans)	GROOTEGEL UK 459	42.4	28.4	23° 41' 6.345" S	27° 29' 44.676" E
Seasonal Pan 40	B Category	0.0496	Altering the bed and character of the non-perennial pan (removal of pans)	GROOTEGEL UK 459	36	19.6	23° 41' 10.752" S	27° 29' 48.402" E
Seasonal Pan 41	B Category	0.0678	Altering the bed and character of the non-perennial pan (removal of pans)	HIEROMTREN T 460	43.2	25.3	23° 41' 32.276" S	27° 29' 52.695" E
Seasonal Pan 42	B Category	0.0112	Altering the bed and character of the non-perennial pan	HIEROMTREN T 460	19.4	10.5	23° 41' 34.637" S	27° 29' 56.587" E

WU name	PES	Activity	Purpose and Description	FARM_NAME	Length (m)	Width (m)	Coordinates S	Coordinates E
			(removal of pans)					
Seasonal Pan 43	B Category	0.0019	Altering the bed and character of the non-perennial pan (removal of pans)	HIEROMTREN T 460	5.8	4	23° 41' 34.055" S	27° 29' 57.607" E
Seasonal Pan 44	B Category	0.335	Altering the bed and character of the non-perennial pan (removal of pans)	HIEROMTREN T 460	89.7	73.3	23° 41' 25.171" S	27° 29' 56.744" E
Seasonal Pan 45	B Category	0.0126	Altering the bed and character of the non-perennial pan (removal of pans)	HIEROMTREN T 460	20.4	8.1	23° 41' 37.782" S	27° 30' 11.782" E
Seasonal Pan 46	B Category	0.0141	Altering the bed and character of the non-perennial pan (removal of pans)	HIEROMTREN T 460	16.3	12.6	23° 41' 42.406" S	27° 30' 14.441" E
Seasonal Pan 47	B Category	0.0651	Altering the bed and character of the non-perennial pan (removal of pans)	HIEROMTREN T 460	51.9	26.4	23° 41' 44.503" S	27° 29' 56.970" E
Seasonal Pan 48	B Category	0.0022	Altering the bed and character of the non-perennial pan	HIEROMTREN T 460	5.5	5	23° 41' 39.246" S	27° 29' 28.764" E

WU name	PES	Activity	Purpose and Description	FARM_NAME	Length (m)	Width (m)	Coordinates S	Coordinates E
			(removal of pans)					
Seasonal Pan 49	B Category	0.0873	Altering the bed and character of the non-perennial pan (removal of pans)	HIEROMTREN T 460	71	25.9	23° 41' 43.190" S	27° 29' 30.334" E
Seasonal Pan 50	B Category	0.0174	Altering the bed and character of the non-perennial pan (removal of pans)	HIEROMTREN T 460	18.1	12.8	23° 41' 48.109" S	27° 29' 38.823" E
Seasonal Pan 51	B Category	0.0132	Altering the bed and character of the non-perennial pan (removal of pans)	HIEROMTREN T 460	14	12	23° 41' 50.922" S	27° 30' 19.253" E
Seasonal Pan 52	B Category	0.0203	Altering the bed and character of the non-perennial pan (removal of pans)	HIEROMTREN T 460	16.8	16.3	23° 41' 55.242" S	27° 30' 17.107" E
Seasonal Pan 53	B Category	0.0485	Altering the bed and character of the non-perennial pan (removal of pans)	HIEROMTREN T 460	31.8	21.1	23° 42' 20.858" S	27° 30' 33.759" E
Seasonal Pan 54	B Category	0.0101	Altering the bed and character of the non-perennial pan	HIEROMTREN T 460	23.8	7.3	23° 42' 10.583" S	27° 30' 42.978" E

WU name	PES	Activity	Purpose and Description	FARM_NAME	Length (m)	Width (m)	Coordinates S	Coordinates E
			(removal of pans)					
Seasonal Pan 55	B Category	0.0145	Altering the bed and character of the non-perennial pan (removal of pans)	HIEROMTREN T 460	22.8	8.7	23° 42' 8.861" S	27° 30' 43.647" E
Seasonal Pan 56	B Category	0.0051	Altering the bed and character of the non-perennial pan (removal of pans)	HIEROMTREN T 460	8.7	7.6	23° 42' 5.881" S	27° 30' 44.249" E
Seasonal Pan 57	B Category	0.0219	Altering the bed and character of the non-perennial pan (removal of pans)	HIEROMTREN T 460	20.6	13.2	23° 42' 15.544" S	27° 30' 56.415" E
Seasonal Pan 58	B Category	0.0046	Altering the bed and character of the non-perennial pan (removal of pans)	HIEROMTREN T 460	11.5	4.9	23° 42' 13.153" S	27° 30' 57.613" E
Artificial pan 59	Artificial	0.1275	Altering the bed and character of the non-perennial pan (removal of pans)	HIEROMTREN T 460	47.8	32.8	23° 41' 58.045" S	27° 31' 1.087" E
Seasonal Pan 60	B Category	0.0279	Altering the bed and character of the non-perennial pan	HIEROMTREN T 460	21.8	16.8	23° 42' 10.145" S	27° 31' 26.968" E

WU name	PES	Activity	Purpose and Description	FARM_NAME	Length (m)	Width (m)	Coordinates S	Coordinates E
			(removal of pans)					
Seasonal Pan 61	B Category	0.0363	Altering the bed and character of the non-perennial pan (removal of pans)	HIEROMTREN T 460	21.9	20.2	23° 41' 58.326" S	27° 32' 10.084" E
Seasonal Pan 62	B Category	0.0028	Altering the bed and character of the non-perennial pan (removal of pans)	HIEROMTREN T 460	5.9	5.7	23° 41' 54.673" S	27° 32' 29.587" E
Seasonal Pan 63	D Category	0.08	Altering the bed and character of the non-perennial pan (removal of pans)	HIEROMTREN T 460	67.3	43.1	23° 41' 17.457" S	27° 32' 18.262" E

3.2 Existing Lawful Water Uses

According to the NWA, an existing lawful water use is any use of water that started two years prior to the promulgation of the NWA and was considered a lawful water use under any previous legislation

The only existing ELWU is linked to the old Grootegeluk Oxidation ponds which are currently only being used for emergency use should the new Sewage Waste Water Treatment plant malfunction. This water use was, however, incorporated in to the 2018 license (Amendment to License issued 30 November 2018).

3.3 Relevant Exemptions

The Minister of the Department of Water and Sanitation (DWS) is responsible for the protection, use, development, conservation, management and control of the water resources of South Africa on a sustainable basis. The requirements prescribed in terms of the regulations must be seen as minimum requirements to fulfil this goal.

The Minister of Water and Sanitation is responsible for the protection, use, development, conservation, management and control of the water resources of South Africa on a sustainable basis. The requirements prescribed in terms of the regulations must be minimum requirements to fulfil this goal. Refer to **Annexure C** for the most recent GN704 Audit Report.

Note that as part of this amendment the mine also request exemption under section 3 of the GN704, linking to the use of residue or substance which causes or is likely to cause pollution of a water resource for the construction of infrastructure like roads and embankments, which is addressed under sections 5 of the regulations. **Annexure D** sets out the risk assessment and recommendations linked to the use of Bench 1A and 1B material on the mine.

3.4 Generally, Authorised Water Uses

Grootegeluk mine is a coal mining operation. In terms of the General Authorisations (GA), Grootegeluk is classified as a Category A mine which excluded the mine from applying for water uses in terms of the GA. All water uses triggered by the mine are therefore being applied for as a WUL.

3.5 New Water Uses to be Licensed

Additional water uses have been identified that require authorisation in terms of Section 21 of the NWA. The following additional water uses are required to be licenced for the Grootegeluk Coal Mine Complex:

- Section 21(a) – Taking of water from a water resource;
- Section 21(g) – Disposing of waste in a manner which may detrimentally impact on a water resource; and
- Section 21(j) – Removing, discharging or disposing of water found underground.

Abstraction Boreholes & Pit Dewatering (S21a) and Pit Dewatering (S21j)

Abstraction from the Grootegeluk abstraction boreholes and Pit.
The volumes need to be updated to reflect the current and future increases linked the Grootegeluk Integrated Water Management Strategy, supporting Water Balance and updated Groundwater Report (2023).

Bench 11 and 13 In Pit Sumps (S21g)

The quantities and capacities for these existing facilities needs to be updated to reflect the current and future increases linked the Grootegeluk Integrated Water Management Strategy and supporting Water Balance.
Over time Bench 11, has also become a temporary sump to which the water from the plant reports to via the channel to pit, before the water seeps through the backfill to Bench 13 where it is then recovered to the plant.
The new uses are then linked to adjusting the capacities an annual trough put to reflect these changes. The co-ordinates of the Movable Bench 13 in-pit multiple sump complex also needs to be amended to consider the 2019 30 year - Life of Mine (LoM) plan / pit layout.

Dust Suppression (S21g)

The existing 1.6 million cubes that is used for dust suppression of Grootegeluk needs to be increased to 3.5 million cubes so as to consider the expansion of the pit and plant area over time.

Backfill Quantities:

The 30 year - Life of Mine for Grootegeluk was revised in 2019 so as to ensure that the coal extraction in optimized. This lead to the updating of the planned backfilling strategy and quantities and layout of the pit inside the approved Mining Right Area.
The intent of the amended is to update the backfill quantities to reflect the 30-year LoM plan and to also amended the co-ordinates of the final pit in line with the LoM change.

Phase 2 Short Term Stockpile:

The Phase 2 short term stockpile was first licensed as a short term facility, however the final designs considered a long term facility with an C-Class liner.

The Grootegeluk IWUL make provision for the retention of short term facilities should the liner system comply with the DWS requirements. The application for retaining this facility was submitted and DWS indicated that there are no objection and that the change needs to be actioned via an amendment. The intent of the amendment is thus to move this facility to the permanent stockpile section in Table 3 of the existing WUL.

The details of the new water uses to be licensed are presented in Table 3.5 and can be seen in Figure 3.1.

In addition to the further water uses identified, an audit was undertaken by Golder Associates Africa (Pty) Ltd (Golder) in 2021. The following recommendations were made by Golder:

- The requirement for the metering of the outflow at the Voëltjie dam must be amended. Grootegeluk should ensure that the correct area and capacity for the Voëltjie dam is listed within the IWUL;
- Amendment or removal of the conditions which refer to “streams” and “watercourses” since no steams are located within the Grootegeluk mining area;
- The change from temporary stockpile area to permanent stockpile areas should be submitted to the Provincial Head; and
- Correct the references within the WUL (Condition 3.19 under Appendix III, condition 13.13.1) refers to a condition in the previous WUL which was amended. It is recommended that this reference be removed accordingly.

Slimes Dam 5:

The description of Slimes dam 5 indicates that this facility is an inactive dam footprint area that may be recovered. However, the area is also being used to place recovered material from the Cyclic Ponds Facility, so that it can dry before it is recovered as product. The intent is thus to amend the description of this facility to consider the activity currently taking place with the intent of long-term recovery of the entire footprint.

The details of the water uses to be amended are presented in Table 3.6.

Table 3.5 New Section 21 Water Uses

Water Use No.	Site Name	Description	*Original WUL Clause*	Co-ordinates	Property	New Volume (m³/a)
21(g) Disposing of waste in a manner which may detrimentally impact on a water resource						
1	Bench 11 open pit storage dam	In-pit storage of contaminated runoff and process water which seeps into Bench 13 and recovered.	Current Capacity = 188 000 m3 Current annual disposal quantity = 2 000 000 m³/a	S23° 40' 19.30" E27° 32' 38.48"	Enkelbult 462 LQ portion 0	New Annual disposal - 4 935 140 m³/a 3 150 000 m³/a (2023 Water Balance)
2	Dust Suppression	Dust Suppression of the mine roads with process water from water reticulation system and PCDs	Current Annual disposal quantity = 1,600,000 m³/a	E 27.52722324 – S 23.65896772	Enkelbult 462 LQ portion 0 Goedehoop 457 LQ portion 0 Daarby 458 LQ portion 0 Turfvlakte 463 LQ portion 0 Hieromtrent 460 LQ portion 0 Grootegeluk 456 LQ Portion 0 Leeuwdrift 312 LQ portion 0 Appelvlakte 448, Portion 1 and 0	2,600,000 m³/a (Need to further increase to 3,500,000 m3/a in 5 years)
3	Movable Bench 13 in-pit multiple sump complex	In-pit collection and storage of contaminated storm water runoff and process water for re-use in the Beneficiation Plants	Total volumes waste water discharged = 596 808 m³/annum Maximum disposal volume = 69190 m³/month	S23° 38' 50.044" E27° 31' 2.061" S23° 41' 4.447" E27° 34' 3.258" S23° 41' 56.080" E27° 32'26.050" S23° 42' 34.598" E27° 29'46.621" S23° 41' 36.306" E27° 29'11.797"	Enkelbult 462 LQ portion 0 Grootegeluk 456 LQ Portion 0	In Pit Storage Capacity = 4,000,000 mil m³ New Annual disposal - 4 935 140 m³/a (Water from Bench 11)

Water Use No.	Site Name	Description	*Original WUL Clause*	Co-ordinates	Property	New Volume (m³/a)
				S23° 40' 37.010" E27° 28'31.189" S23° 40' 3.769" E27° 28' 16.1999" S23° 39' 7.789" E27° 30' 1.683"		
4	In-pit backfilling / disposal	Backfilling with inter and overburden as well as discard material	Current Annual disposal quantity = 12 million tons/a	S23° 38' 50.044" E27° 31' 2.061" S23° 41' 4.447" E27° 34' 3.258" S23° 41' 56.080" E27° 32'26.050" S23° 42' 34.598" E27° 29'46.621" S23° 41' 36.306" E27° 29'11.797" S23° 40' 37.010" E27° 28'31.189" S23° 40' 3.769" E27° 28' 16.1999" S23° 39' 7.789" E27° 30' 1.683"	Enkelbult 462 LQ portion 0 Daarby 458 LQ portion 0 Turfvlakte 463 LQ portion 0 Hieromtrent 460 LQ portion 0 Grootegeluk 456 LQ Portion 0 Leeudrift 312 LQ portion 0	Current LOM Volume - 1,905,663,882m³ Annual Disposal = 52,935,108 m³
5	Short term Laydown area stockpile (Phase 2 High Value Stockpile)	Permanent Stockpiling of compacted high value coal	Annual disposal quantity = 1 666 600 tons/a Capacity = 1 282 000m³	23°38'48.17"S 27°33'2.75"E	Daarby 458 LQ portion 0	This use needs to move to the permanent facilities in Table 3 of the GG WUL
21(a) Taking of water resource						

Water Use No.	Site Name	Description	*Original WUL Clause*	Co-ordinates	Property	New Volume (m³/a)
6	Abstraction Boreholes & Pit Dewatering	Abstraction from the Grootegeluk abstraction boreholes and Pit	Total abstraction= 2 400 000 m³/a	E27° 29' 34.05" S23° 40' 32.02" E27° 28' 27.82" S23° 39' 41.21" E27° 31' 12.10" S23° 39' 57.87" E27° 32' 50.22"	Enkelbult 462 LQ portion 0	(1.4M from boreholes and 2.15M from dewatering) = 3 500 000 m³/a
21(j) Removing, discharging or disposing of water found underground if it is necessary to the efficiency continuation of an activity						
7	Pit Dewatering	Abstraction from the Grootegeluk Pit	954 072 m³/a (average) and maximum of 1 606 689 000 m³/a	E27° 29' 34.05" S23° 40' 32.02" E27° 28' 27.82" S23° 39' 41.21" E27° 31' 12.10" S23° 39' 57.87" E27° 32' 50.22"	Enkelbult 462 LQ portion 0	2 150 000 m³/a

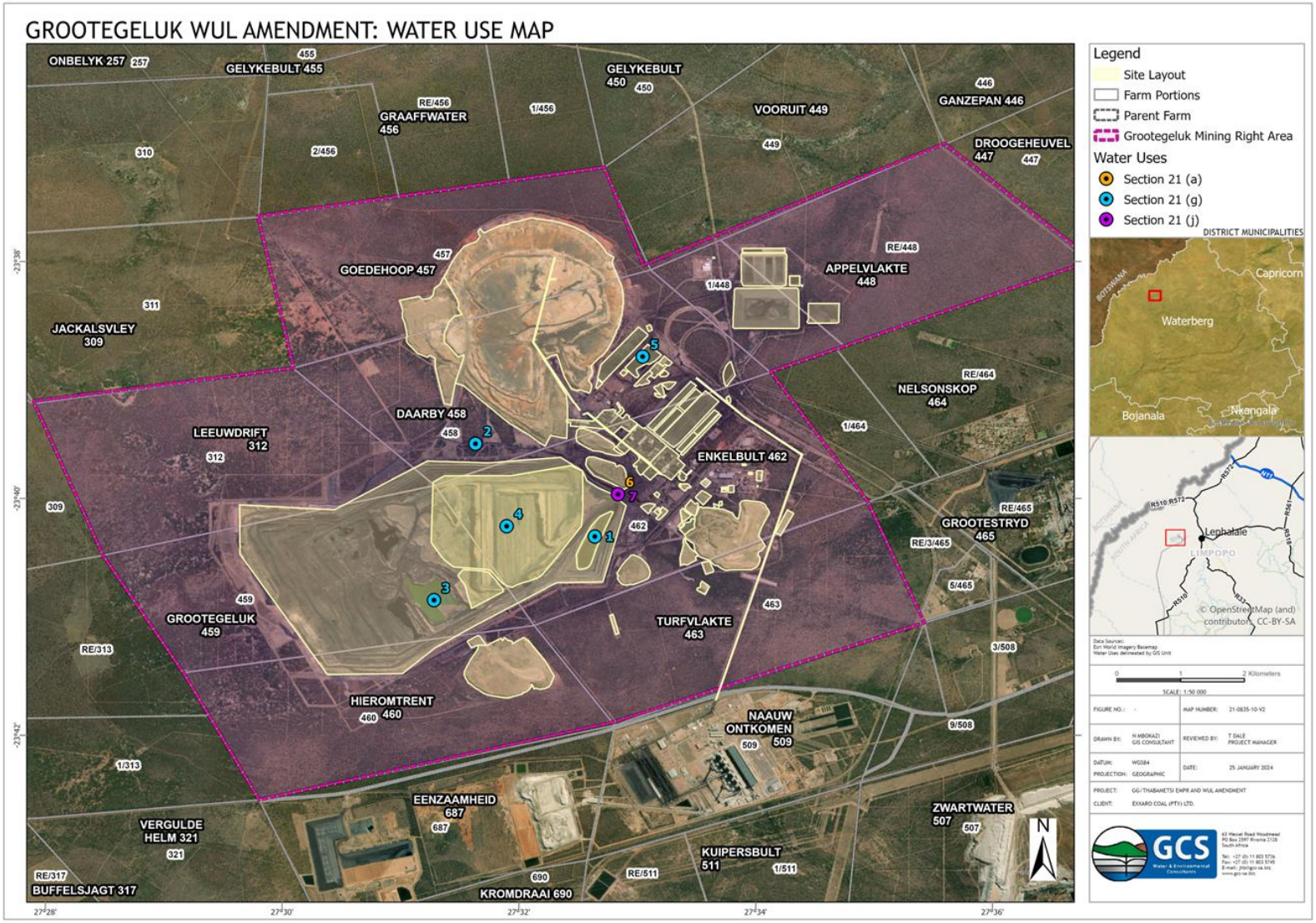

Figure 3.1 Water Use Map

Table 3.6 Water uses requiring amendment

Appendix	Condition	Title	Original Clause	Amendment Proposed	Comments/Justification
Appendix III: Section 21 (b) of the Act: Storing Water					
III	1.1	Storing of Water	The licence authorises storage of twenty one thousand four hundred and seventy two cubic metres (21 472 m3) volume of raw water at Voëltjie Dam, for the purpose of game watering. The geographical location of the activity is at the coordinates S23° 40' 45.74" and E27° 33' 31.83" on portion 0 of the Farm Turfvlakte 463 LQ in the Limpopo Water Management Area.	The licence authorises the storage of twenty one thousand four hundred and seventy two cubic metres (21 472 m3) volume of raw water at Voëltjie Dam, **which has a capacity of 51536.49 m3, for the purpose of game watering**. The geographical location of the activity is at the coordinates S23° 40' 45.74" and E27° 33' 31.83" on portion 0 of the Farm Turfvlakte 463 LQ in the Limpopo Water Management Area.	It is recommended that this condition be amended to indicate the actual capacity however still limiting the user to the storage volume of (21 472 m3).
III	2.1	Monitoring Requirements	Suitable measuring structures must be constructed upstream and downstream of the dams to measure the flow entering and leaving the dam and this information must be available on request.	Suitable measuring structures must put in place so as to measure the flow entering the dam and this information must be available on request.	It is recommended that this condition be amended as this dam is an old borrow-pit and has no natural in and out flow / up and down stream).
III	2.3	Monitoring Requirements	*The quantity of water stored shall be recorded at the last day of each month.*	The quantity of water stored shall be recorded **on a monthly** basis **to ensure that the volume licensed is not exceeded.**	At the time of the audit, it was found that the quantity of water stored is recorded through the survey which is conducted on a monthly basis. This recording does however not take place at the end of each month but on a monthly basis. It is recommended that the wording of this condition be amended to reflect that the monthly recording of quantity of water at Voëltjie Dam should be recorded and made available. It should be noted that this condition is not practical if the last day of the month is over a weekend.
Appendix V: Section 21 (g) of the Act: disposing of waste in a manner which may detrimentally impact on a water resource.					

Appendix	Condition	Title	Original Clause	Amendment Proposed	Comments/Justification
IV	2.1 (Table 3) Use 26.	Change in Description	*Slimes Dam 5, an inactive dam footprint area that may be recovered.*	The Footprint of Dam 5 is used to dry recovered material from the Cyclic Ponds after which it is reclaimed to the plant as product. Long term recovery of the footprint will take place.	The currently practice of recovery is not considered in the description of the facility and the induction that the facility is "inactive" needs to be corrected.
IV	3.1	Quality of Waste Water to be disposed	*The quality of wastewater effluent disposed of into the surrounding environment must not exceed the following limits as indicated in Table 4 and shall form part of the Monitoring plan for Grootegeluk.* *Heading of Table 4 refers to Quality Limits linked to the Wastewater Facilities.*	The quality of wastewater effluent disposed of into the **dirty water storage facilitie**s must not exceed the following limits as indicated in Table 4 and shall form part of the Monitoring plan for Grootegeluk. Heading of Table 4 refers to Quality Limits linked to the Wastewater Facilities.	It is recommended that this condition be amended to "The quality of waste water effluent disposed of into the dirty storage facilities. Since this water should not be released into the environment as currently suggested in 3.1
IV	6.1	Water Resource Protection	*The impact of the activities of the mine on groundwater shall not exceed the water quality limits as indicated in Table 5 and will form part of the updated monitoring plan for Grootegeluk*	The impact of the activities of the mine on groundwater shall not exceed the water quality limits as indicated in **Table 5 for the compliance monitoring boreholes** as indicted in the monitoring program for Grootegeluk**.**	It is recommended that the Table definition is corrected.
IV	8.2	Stormwater Management	*Increase runoff due to vegetation clearance and/or soil compaction must be managed, and steps must be taken to ensure that storm water does not lead to bank instability and excessive levels of silt entering the stream.*	Removal of condition	At the time of the audit, it was found that vegetation clearance occurs in front of pit areas however this does not lead to any bank instability where storm water enters any stream. No excessive silt enters any streams on the Grootegeluk mining area. It is recommended that this condition be amended since no streams occur on the Grootegeluk mining area.
IV	8.4	Stormwater Management	Where necessary works must be constructed to attenuate the velocity of any storm-water discharge and to protect the banks of the affected watercourses.	Removal of condition	This condition was noted since no affected watercourse exists on Grootegeluk. No formalised storm water discharge occurs and there was no need for the construction of structures to attenuate the velocity of storm water discharge

Appendix	Condition	Title	Original Clause	Amendment Proposed	Comments/Justification
					within the mining area. It is recommended that this condition be amended since no affected watercourses occur on the Grootegeluk mining area.
IV	13.13	Site specific conditions	*Should the pollution be detected in the existing stockyards, the Licensee shall re-line the existing stockyard and conduct monitoring as indicated in condition 13.19.*	Should a significant increase in the pollution in the basalts be detected the mine shall investigate and assess the drainage systems of the exiting stockyards as well as operational practices and put mitigation measures in place to address the seepages from these facilities as well as contributing sources.	At the time of the audit, it was found that the groundwater reports monitor any possible pollution, and a pollution source determination study was conducted and in the process of being updated. It is noted that no condition 13.19 exists within this WUL. This condition is noted. It is recommended to update the condition reference with an amendment process.Re-lining of the stock yards is not an option since this will cause the total stoppage of the mining activities and make it impossible to GG to supply the required product to our clients.

3.6 Waste Management Activities and Waste Related Authorisations

3.6.1 General Waste

General waste is defined as any waste that does not pose an immediate threat to man or the environment. The general waste at the site is divided into three classes:

3.6.2 Domestic Waste

Domestic waste includes: glass, food wrapping (foil, paper and plastic), food residue, clothing, polystyrene and flocculent bags. All domestic waste is black plastic bags and collected routinely from various locations around the site. Domestic waste bags are stored in animal proof cages where possible. The domestic waste bags are disposed of in the Lephalale local municipality's waste disposal site on Groothoek Farm.

3.6.3 Recyclables

Recyclables from the site include paper, cold drink cans, cardboard boxes and towel rollers. Where possible recyclables are stored separately within the domestic waste cages or stacked separately alongside the domestic waste bags.

3.6.4 Other General Waste

Other general waste on site includes garden waste, wood from packaging material, wooden crates, wooden cable wheels, wooden pallets, and building rubble. The wooden pallets are taken to the Reclamation Yard for disposal or donation. The Building rubble is stored at various dedicated locations around the site and disposed of at the general waste dump on Dump 6.

3.6.5 Scrap metal

The scrap metal at the site includes ferrous metals, non-ferrous metals, metal shavings and drill bits. Sources of scrap metal include clean oil drums, safety guards, vehicle wheel rims, roof bolts, nuts and bolts, pump housing, impellers, handrails, dragline/shovel ropes, copper wire, boilermaker cut offs, engine/ engine parts and welding rods.

All scrap metal is separated at source and placed in yellow skips at various locations around the site. Skips are transported routinely to the reclamation yard. If metal parts are too large to be handled manually they are removed by truck to the reclamation yard.

Scrap metal is sorted for recycling. Scrap metal that is not recycled is disposed of by an approved contractor at an approved facility

3.6.6 Industrial waste

Industrial waste at the site is defined as any non-hazardous solid waste at the site generated from use of industrial equipment. This waste includes any uncontaminated rubber products, tyres, plastic and rubber pipes, conveyor belts, V-belts, screen panels, plastic containers, hydraulic hoses, electrical components, scrap electrical cable, air filters, sand blasting waste, magnetite bags, fibreglass plates, or other waste item containing both steel and rubber.

All industrial waste is removed from site by approved contractors and disposed of in registered facilities. Building rubble that is uncontaminated is disposed of at the Dump 6 waste disposal facility

3.6.7 Hazardous Waste

Hazardous waste at the site is defined as any waste that has potential, even at low concentration, to have significant adverse effect on public health and/or the environment.

Hazardous waste is separated at sources and then taken to the applicable hazardous waste storage area. Currently there are two temporary hazardous waste areas on Grootegeluk. The temporary storage site at the back of the Total Depot is primarily used for hydrocarbon contaminated waste. The temporary storage site at the Reclamation Yard is used for the storage of all other identified hazardous waste. In the various areas where hazardous waste is produced the waste is stored in red 210 L drums. These bins are stored in covered bunded areas. If the area is not covered lids are used.

The process hazardous waste sludge removed from the Reductants plant equipment will be transferred to a mixing station where it will be mixed with char product fines to form a dry consistency. The sludge/char fines mix will then be transferred to the nearby Eskom Matimba Power Station as part of the coal feed for power generation.

Tar generated during the char production process is collected in a tar tank near the bottom of each retort. The tar is sold as a by-product of the process. When customers come to collect the tar at the loading facility it will be transferred to the customers tar tanks for transport. The tar storage area is bunded to prevent spillage.

Water condensate (liquor) from the cooling systems and gas booster fans are collected in tanks at the liquor destructors. The liquor is destroyed by oxidation (burning) at high temperature. Bunds are provided to prevent spillage of liquor.

3.6.8 Waste Management Activities (NEM:WA)

The National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) (NEM:WA) fundamentally reformed the law regulating waste management, and for the first time provides a coherent and integrated legislative framework addressing all the steps in the waste management hierarchy. The objectives of the NEM:WA are to protect health, well-being and the environment by providing reasonable measures for, inter alia, remediating land where contamination presents, or may present, a significant risk of harm to health or the environment. The objectives of the NEM: WA are structured around the steps in the waste management hierarchy, which is the overall approach that informs waste management in South Africa. The waste management hierarchy consists of options for waste management during the lifecycle of waste, arranged in descending order of priority; i.e. waste avoidance, reduction, re-use, recycling, recovery, treatment, and safe disposal as a last resort.

NEMA, as previously mentioned, introduced a number of additional guiding principles into South African environmental legislation, including the life-cycle approach to waste management, producer responsibility, the precautionary principle and the polluter pays principle (i.e. the sustainability principles as contained in Section 2 of NEMA). Section 5(2) of the NEM: WA stipulates that the Act should be interpreted and guided in accordance with these sustainability principles. The NEM: WA, furthermore, echoes the duty of care provision, in terms of Section 28 of NEMA, by obliging holders of waste to take reasonable measures to implement the waste management hierarchy. Section 16(1) of the NEM: WA provides that:
"A holder of waste must, within the holder's power, take all reasonable measures to –

a) Avoid the generation of waste and where such generation cannot be avoided, to minimise the toxicity and amounts of waste that are generated;
b) Reduce, re-use, recycle and recover waste;
c) Where waste must be disposed of, ensure that the waste is treated and disposed of in an environmentally sound manner;
d) Manage the waste in such a manner that it does not endanger health or the environment or cause a nuisance through noise, odour or visual impacts;
e) Prevent any employee or any person under his or her supervision from contravening this Act; and
f) Prevent the waste from being used for an unauthorised purpose."

While the NEM: WA creates a comprehensive legal framework for waste management, its provisions will be meaningless without measures to monitor and, where necessary, enforce compliance. Compliance monitoring is supported by a range of reporting provisions contained in the NEM:WA. In addition to compliance reports for waste management licences and norms and standards, the NEM: WA has provisions for annual performance reports on the implementation of provincial and local Integrated Waste Management Plans. Industry Waste Management Plans are subject to review at intervals to be determined by the authority that mandated the plan. Furthermore, Environmental Management Inspectors and Waste Management Officers can request a Waste Impact Report where they suspect a contravention of the Act, licence conditions or exemption conditions.

The NEM: WA provides for a licensing regime specific to waste management activities. It replaces the historical system of permits issued in terms of the repealed Section 20 of the ECA. Transitional arrangements allow existing permits granted in terms of ECA to be regarded as licences in terms of the NEM: WA until the Minister requires a licence application as per the NEM: WA category of the waste management activity (i.e. category A or B). The NEM: WA waste management categories determine the environmental assessment procedure (which is the equivalent of the NEMA EIA regulations' requirements) required to obtain a licence.

Category A activities require a BA process to be undertaken, whilst Category B activities require a S&EIR process to be undertaken.

The recently amended legislation concerning EIAs makes reference to the development of norms and standards which may guide EIA applications and Environmental Authorisations in the future. The production of appropriate norms and standards for specific forms of developments is ongoing and it is anticipated that this will eventually provide the opportunity to further streamline the EIA procedures in relation to particular forms of developments. Depending on the location of developments, it is important to note that applicable Norms and Standards are no different from regulations in law in that they are both equally binding.

Government Notice 921, which commenced on 29 November 2013, lists the waste management activities that require licensing in terms of the NEM:WA. Licence applications for activities involving hazardous waste must be submitted to the national authority, the Department of Environmental Affairs (DEA) and those for general waste to the provincial authority, in this case the Limpopo Department of Economic Development, Environment and Tourism (LDEDET).

One of the major amendments effected by the National Environmental Management Waste Amendment Act 2014 is the insertion of section 24(5), as a result of which the NEM:WA is now also applicable to mining residue deposits and residue stockpiles, as follows:
‘‘Management of residue stockpiles and residue deposits”
24(5) Residue stockpiles and residue deposits must be deposited and managed in accordance with the provisions of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008), on any site demarcated for that purpose in the environmental management plan or environmental management programme in question.’’

In terms section 18, Schedule 3 of the National Environmental Management: Waste Amendment Act, 2014 (Act No. 26 of 2014) (NEM:WAA), which commenced on 2 June 2014, mining residues must also be managed in terms of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) (NEMWA). The applicable regulations are GN R.634 to 636.

Grootegeluk has a standard procedure in place to ensure correct identification, classification, storage and disposal of hazardous and non-hazardous waste generated at Grootegeluk.

3.6.9 Waste Related Authorisations

During the commencement of Grootegeluk Coal Mine, the definition of a “residue stockpile” or “residue deposit”, was not regulated in terms of the National Environmental Management WasteAct, 2008 (Act No. 59 of 2008) (NEM: WA), but rather fell under the Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002) (MPRDA) and were thus, subject to the provisions of the NWA (Section 68 of GN R. 527 of 23 April 2004) and the provisions of any rightor permit in terms of the MPRDA.

Existing waste facilities that are permitted in terms of Sec 20 of the National Conservation Act of1989 are considered valid until otherwise requested by the Minister and thus do not require a waste licence according to the NEM: WA at this time. Majority of the waste activities atGrootegeluk Coal Mine fell within the MPRDA definition of “residue stockpiles” (Exxaro Services,2013), with the exception of the following:

- General Waste Facility on Waste Dump 6. B33/2/140/1/S
- The following waste licenses have then also been issued under NEM:WA:
- Warehouse Sewage WWTP: Licence No. 12/9/11/L652/5;
- Reductants Hazardous Waste Facility: Licence No. 12/9/11/L783/5; and
- Reclamation Yard: Licence No. 12/4/10/8-A/2/W2.

- In addition, the following have been registered as a Category C facility according to the NEM:WA:
- Storage of waste tyres: DEA Reference No. 12/9/11/STO7/5; and
- Temporary storage of hazardous waste: DEA Reference No. 12/9/11/STO6/5.

3.7 Other Authorisations and Regulations

The Grootegeluk Coal mine currently holds the following approved authorisations for the site (Table 3.7):

Table 3.7 Environmental Authorisations

EMPr			
Description	**Reference**	**Status**	**Grant Date**
EMPR Amendment (Consolidation of all existing EMPs and their associated amendments)	12/1/9/CR-W252	Granted	Approved 2023
EMPR Consolidation of all prior EMPr (1985-2013)	LP30/5/1/3/2/1(46) EM	Granted	Approved 2014
EMPR Addenda for New Gate and Cyclic PondFacility	LP30/5/1/3/2/1(46) EM	Granted	Approved 2013
EMPR Addenda for GG Infrastructure Projects	LP30/5/1/3/2/1(46) EM	Granted	Approved 2015
EMPR Addenda for GG Infrastructure Projects (Amendment - Phase 2 Stockpile)	LP30/5/1/3/2/1(46) EM	Granted	Approved 8 May 2017
EA/ROD			
Description	**Reference**	**Status**	**Grant Date**
New Laboratory	12/1/9-6/16b-W36	Granted	Approved 2010
Relocation of the Explosives Magazine	12/1/9-6/16b-W40	Granted	Approved 2010
Zeeland Water Treatment Plant (Amendment)	12/1/9-7/1(e)-W2	Granted	Approved 2 Sep 2015
New Waste Water Treatment Plant	12/1/9-7/1(o)-W1)	Granted	Approved

			2011
New Warehouse	12/1/9/1-W2	Granted	Approved 24 Feb 2012
New Access Gate	12/1/9/1-W40	Granted	Approved 29 Aug 2012
GG Infrastructure Projects	12/1/9/1-W89	Granted	Approved 29 Oct 2014
EA Amendment to for GG Infrastructure Projects addenda	12/1/9/1-W89	Granted	Approved 2016

3.8 Legal Assessment

One of the main and ever-continuing concerns in South Africa is the sustainability of water provision, and the costs associated with the prevention and remediation of pollution in a country with an average rainfall below international standards. The NWA is one of the Government's answers to some of these challenges and is based on the constitutional right to access to sufficient water (Section 27 of the Constitution), and furthermore functions as sectoral legislation within the framework of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA).

Water management at mines is primarily controlled by the following legislation:

- The NWA;
- The MPRDA and
- The NEMA.

3.8.1 The Constitution of South Africa, 1996 (Act No.108 of 1996)

The Constitution reigns supreme and the advancement of human rights is one of the foundations of South Africa's democracy. Furthermore, the Bill of Rights plays a central role in the democratic regime because it embodies a set of fundamental values which should be promoted at all times. One of the fundamental values is contained in Section 24 and is, arguably, the cornerstone for environmental governance in South Africa which includes the mining industry. Section 24 of the constitution provides:

Everyone has the right:

a) to an environment that is not harmful to their health or well-being;
b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that
    i. prevent pollution and ecological degradation;
    ii. promote conservation; and
    iii. secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

Mining companies are thus duty-bound to constitutional, legislative, and other measures to prevent pollution and ecological degradation, promote conservation and to develop in a sustainable manner.

The constitutional environmental right elevates the importance of environmental protection and conservation and emphasises the significance that South Africans attach to a sound and healthy environment. In addition, the environmental right applies horizontally and this implies that the mining industry has to exercise a duty of care if liability, on the basis of the constitutional environmental right, is to be avoided. The constitutional environmental right is given effect to by means of detailed statutory provisions ranging from framework to sectoral legislation which relate to mining.

3.8.2 The National Environmental Management Act, 1998 (Act No.107 of 1998)

The National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) is South Africa's overarching framework for environmental legislation. The NEMA sets out the principles of Integrated Environmental Management (IEM). The NEMA aims to promote sustainable development, with wide-ranging implications for national, provincial, and local government. Included amongst the key principles is that all development must be environmentally, economically and socially sustainable and that environmental management must place people and their needs at the forefront, and equitably serve their physical, developmental, psychological, cultural and social interest.

The NEMA is the environmental framework legislation promulgated to replace the Environmental Conservation Act, 1989 (Act No. 73 of 1989), and ensure that the environmental rights contemplated in Section 24 of the Constitution are realised. NEMA sets out:

- the fundamental principles that need to be incorporated in the environmental decision making process;

- the principles that are necessary to achieve sustainable development;
- provides for duty of care to prevent, control and rehabilitate the effect of significant pollution and environmental degradation; and
- it allows for the prosecution of environmental crimes.

The NEMA provides for the identification of activities which will impact the environment. These activities were promulgated in terms of Regulations 982, 983, 984 and 985, published 4 December 2014 and require environmental authorisation.

The impacts of the listed activities must be investigated, assessed and reported to the competent authority before authorisation to commence with such listed activities can be granted.

3.8.3 The Mineral and Petroleum Resources Development Act, 2002 (Act No.48 of 2002)

This Act makes provision for the equitable access to and sustainable development of South Africa's mineral and petroleum resources. Regulations under the Act ensure that activities relating to the mining of minerals are undertaken in a manner that is sustainable and that is equitable to all.

In terms of Section 38 of the MPRDA, mining companies are required to familiarize themselves of potential environmental impacts; manage any environmental impacts; and rehabilitate the environment in so far as is reasonably possible. Furthermore, Section 38(1)(e) states that such holders, whose mining causes or results in ecological degradation, pollution, or environmental damage that may be harmful to the health or well-being of anyone:

"…is responsible for any environmental damage, pollution or ecological degradation as a result of his or her operations and which may occur inside and outside the boundaries of the area to which such right, permit or permission relates."

These holders will ***"…remain responsible for any environmental liability, pollution or ecological degradation and the management thereof until a closure certificate has been issued"***.

Section 39 provides that a mine must indicate how it will contain or remedy the cause of pollution or degradation and migration of pollutants and comply with any prescribed waste standards or management practice.

Granting of permission to mine or prospect, among others, is conditional on an environmental management programme and plan being submitted and accepted by the relevant government authority. Section 43 is one of the most important provisions as it deals with the responsibility for any environmental liability, pollution or ecological degradation until the issue of the closure certificate. It is important to note that environmental liability will not necessarily cease or fall away by the issuing of a closure certificate. In addition to the broader liability provisions above, Section 45 provides that the relevant authority may direct a mine to undertake remedial measures where:

"...any prospecting, mining, reconnaissance or production operations cause or results in ecological degradation, pollution or environmental damage which may be harmful to the health or well-being of anyone and requires urgent remedial measures."

Where the mine fails to take these measures, the relevant authority will act on its behalf and then recover costs incurred from the mine. If the mine fails to compensate the authority, the latter is empowered to seize and sell the mine's property to recover the costs. The mine will thus remain financially liable for the rehabilitation, even if it chooses to ignore the government directive.

3.8.4 The National Water Act, 1998 (Act No.36 of 1998)

Section 19 of the NWA mirrors the provision of Section 28 of NEMA and addresses the prevention and remediation of the effects of pollution. The NWA provides a wide duty of care in that:

"(1) an owner of land, a person in control of land or a person who occupies or uses the land on which-

(a) any activity or process is or was performed or undertaken; or

(b) any other situation exists, which causes, has caused or is likely to cause pollution of a water resource must take all reasonable measures to prevent any such pollution from occurring, continuing or recurring."

The words "likely to cause pollution" broadens the scope of the duty, which enables an activity, or situation that is land-based, to trigger the application of the duty. The "reasonable measures" are not prescribed, but may include measures intended to:

"cease, modify or control any act or process causing the pollution; comply with any prescribed waste standard or management practice; contain or prevent the movement

of pollutants; eliminate any source of pollution; remedy the effects of pollution; and remedy the effects of any disturbance to the bed and banks of a watercourse."

The NWA, furthermore, provides for water use authorisations which a mine will have to apply for, before commencing with its primary activity of mining. Various conditions may be attached to these licenses and a breach thereof will result in criminal and civil liability. The conditions attached to water use authorisations will function alongside the additional protective measures, duty of care and statutory liability provisions provided by the NWA and other legislation to regulate a whole array of water issues.

The detrimental impact of mining on water resources is further regulated by the NWA in a comprehensive set of regulations titled: *"Regulations on the Use of Water for Mining and Related Activities Aimed at the Protection of Water Resources"* (GN R704 of 4 June 1999) (hereinafter referred to as the "*NWA: Mining Water Regulations*"). In terms of these regulations:

"No person in control of a mine or [mining] activity may 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."

Regulation 7 provides for a whole array of provisions which specifically aim to protect water resources from mining. These provisions state that every person in control of a mine or mining activity must take all reasonable measures to, inter alia: prevent water containing waste or any substance which causes or is likely to cause pollution from entering any water resource; design, modify, locate, construct and maintain all water systems including residue deposits, to prevent the pollution of any water resource through the operation or use thereof; 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; prevent the erosion or leaching of materials from any residue deposit or stockpile from any area; and ensure that water used in any process at a mine or activity is recycled as far as practicable. These provisions specifically relate to the protection of water resources and they clearly set out further additional liabilities for mines as far as their water resource protection activities are concerned.

Activities which have the potential to impact on a water resource require a water use licence (WUL) issued by the DHSWS, under the NWA. Section 21 of the NWA identifies certain water uses which have to be authorised.

Furthermore, Section 27 of the NWA specifies that the following factors, regarding water use authorization, must be taken into consideration:

- The efficient and beneficial use of water in the public interest;
- The socio-economic impact of the decision whether or not to issue a license;
- Alignment with the catchment management strategy;
- The impact of the water use and possible resource directed measures; and
- Investments made by the applicant in respect of the water use in question.

Section 27 considerations is included in the as an annexure (Annexure A) to this report. This will assist the mine in ensuring that the water uses applied for, are undertaken in a manner that does not negatively impact on the public, water resources, or downstream water users or compromise any of the country's international obligations with regards to shared water resources.

4 PRESENT ENVIRONMENTAL SITUATION

4.1 Climate

4.1.1 Regional Climate

Grootegeluk lies within the subtropical high-pressure belt in the Waterberg region of South Africa.The region has warm summers and moderate, dry winters and experiences summer rainfall.

Lowest rainfall levels are typically experienced in the month of June, with the highest levels experienced during January. Rainfall typically occurs in the form of short duration, intense convection thunderstorms. Droughts are endemic to the more semi-arid and arid regions and occasional flooding may occur during the summer months due to the convection thunderstorms and tropical disturbances (Limpopo SOE, 2004). The Mean Annual Evaporation (MAE) is more than three (3) times that of the MAP, with evaporation varying between 1 800 mm per annum and2 000 mm per annum (Exxaro Services, 2013).

The highest temperatures for the region are experienced during the summer months of December, January and February, with the lowest temperatures during the winter months

of June,July and August. The average summer and winter minimum and maximum temperatures are indicated in Table 4.1.

Table 4.1 Average summer and winter minimum and maximum temperatures Just (Golder, 2013)

Season	Minimum (°C)	Maximum (°C)
Summer	11	40
Winter	0	28

4.1.2 Rainfall

Grootegeluk Coal Mine is located within the summer rainfall region of South Africa and most of the rainfall occurs between November and April although inter-annual rainfall variability is known to occur (Golder Associates Africa (Pty) Ltd., 2013). Rainfall is typically experienced in the form of short duration intense convection thunderstorms leading to occasional flooding while droughts occur periodically.

Five climate stations operated by the South African Weather Services (SAWS) were considered when determining the Mean Annual Precipitation (MAP) and the rainfall depths for different recurrence intervals. The information for these stations can be seen in Table 4.2.

Table 4.2 Climate stations in the Lephalale region

Number	Name	Latitude	Longitude	Distance to site (km)	Patched (%)	No. of years	Estimated MAP (mm)
0673636 W	Tambootivlei	23°36'	27°21'	19.5	55.6	90	379
0673645 W	Zyferbult	23°45'	27°22'	20.3	58.9	95	439
0674400 W	Ellisras(POL)	23°41'	27°44'	20.7	66.2	96	534
0718327 W	Oranjefontein	23°27'	27°41'	26.9	72.9	96	421
0674207 W	Sterkfontein	23°57'	27°38'	34.8	38.7	96	490

The average rainfall is indicated in Figure 4.1. It can be seen that the highest rainfall occurs in January and the lowest rainfall occurs in July and August.

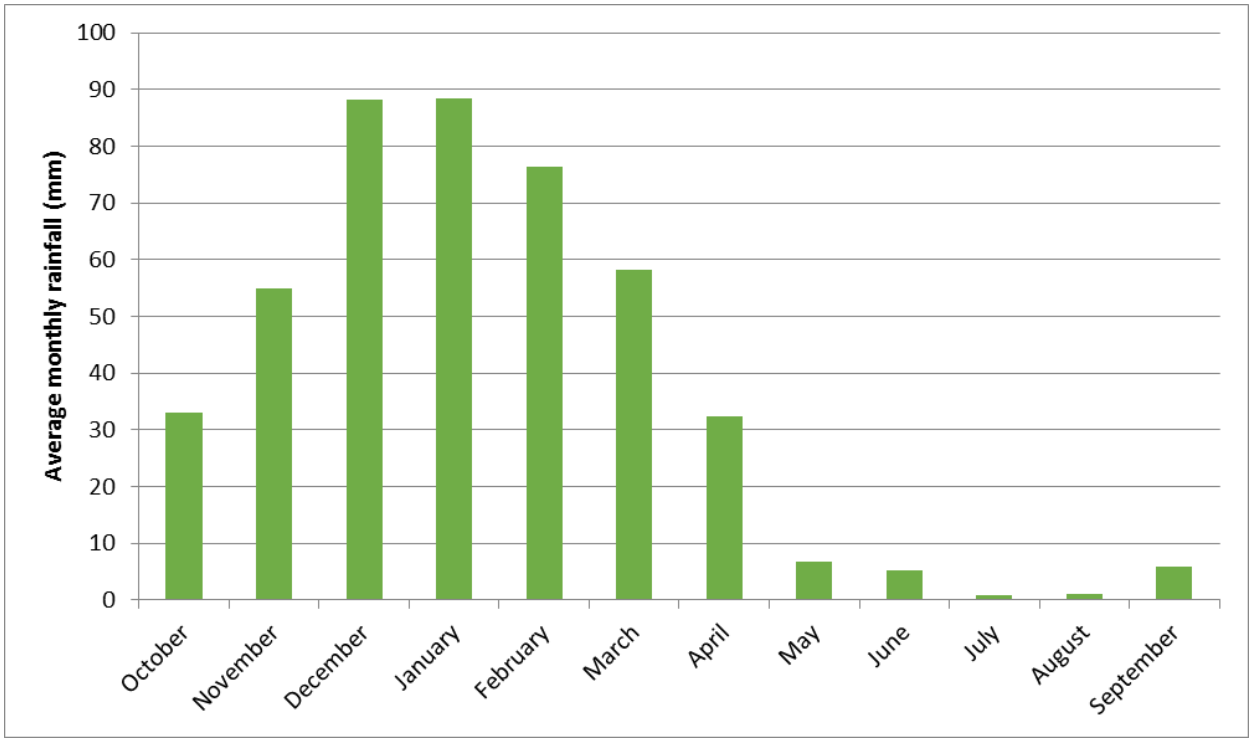

Figure 4.1 ***Grootegeluk Average Monthly Rainfall***

4.1.3 Evaporation

The Mean Annual Precipitation (MAP) for A41E is 439.4mm and Potential Evapotranspiration (PET) is 2 407mm (Schulze 2007). The MAP for A42J is 428.6mm and PET is 2 444mm (Schulze 2007) (GroundTruth, 2018).

4.2 Surface Water

4.2.1 Water Management Area

The mine is located within the A42J quaternary catchment of the Limpopo Water Management Area (WMA). (Figure 4.2).

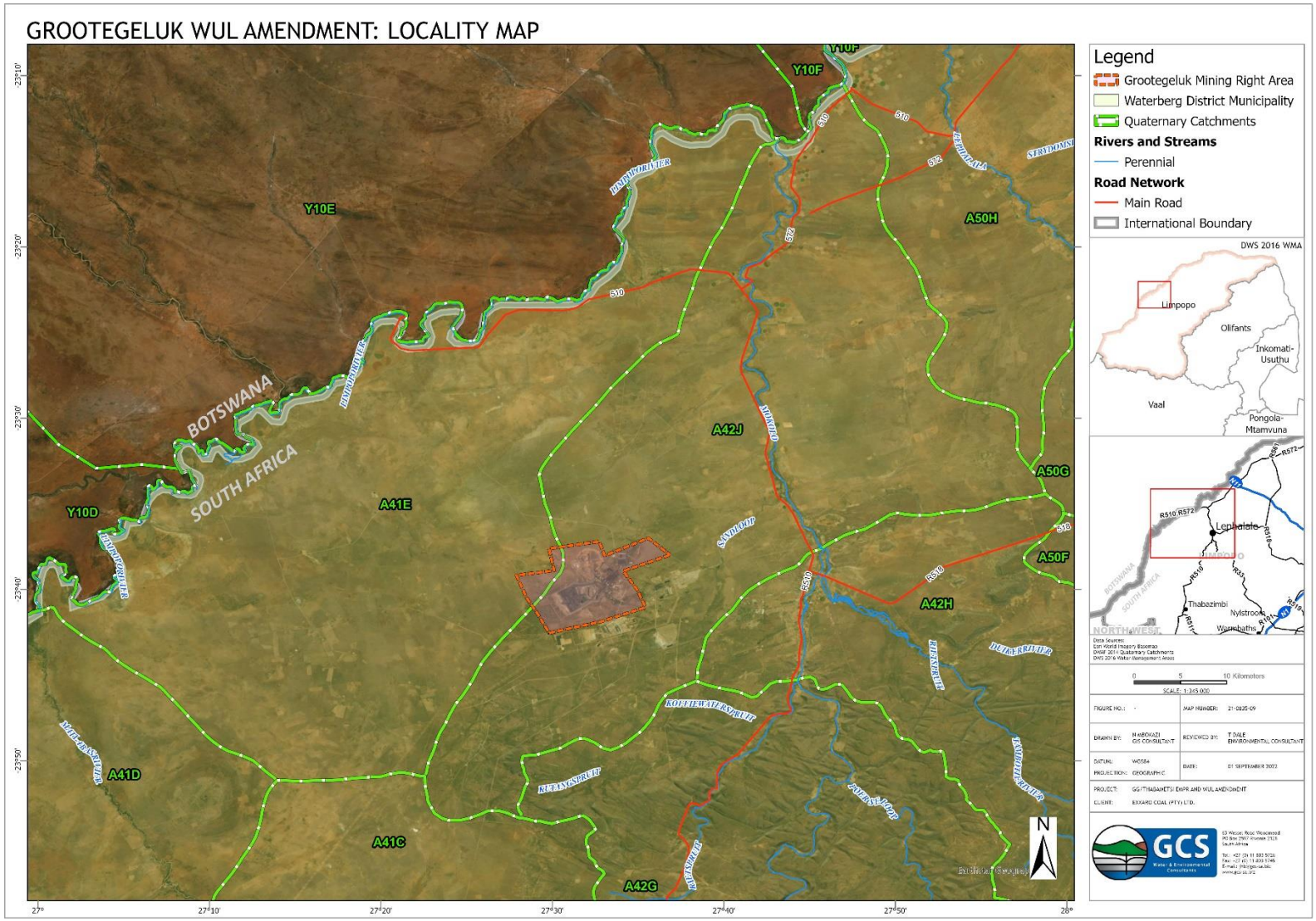

Figure 4.2 Water Management Area of Grootegeluk

4.2.2 Surface Water Hydrology

Grootegeluk is situated approximately 900 m above meters above mean sea level (mamsl) and drains north eastwards towards the Mokolo River which is approximately 810 mamsl. This results in an almost negligible gradient of 0.0043% (Bohlweki Environmental, 2006) and, thus, there is no fast-flowing water and drainage is slow. Grootegeluk Coal Mine drains via an unnamed ephemeral tributary, which drains eastwards, and discharges initially into the ephemeral Sandsloop Stream which is the closest river and then into the Mokolo River approximately 20 km to the east. The Mokolo River's source is in the south east in the Waterberg mountains. The source exists in the mountainous region south of Lephalale and drains across the flat plain between the Lephalale and the Limpopo River, discharging into the Limpopo River 50 km north of Grootegeluk Coal Mine (Jones and Wagener, 2012).

Surface water within the mine is found primarily after rainfall events and, due to the relatively flattopography and sandy soil cover, most of the rainwater seeps into the groundwater aquifer. The small seasonal pans or wetlands occurring in front of the pit area are formed due to runoff and rainfall that is temporarily collect during the rainy season. The nearest large dam is the Mokolo Dam which is located 41 km to the south east of the site.

The Sandloop Spruit is an ephemeral stream with only intermittent flows during the wet season. Seasonal pans are known to occur to the west of the open pit, but they are located a considerable distance from the project areas. Due to the flat topography, highly permeable sands and the absence of any surface water drainage courses, the mine has no direct impact on the surface hydrology of the Mokolo catchment, as most of the rainwater seeps into the groundwater aquifers.(Grootegeluk, 2010).

4.2.3 Surface Water Quality

Refer to Section 5.4.1 for details on the surface water monitoring.

4.2.4 Mean Annual Runoff

The Mean Annual Runoff (MAR) for Grootegeluk is approximately 4.1mm per year (AGIS, 2004). The expected MARs for the Sandloop Stream, which is the tributary to the Mokolo River, as well as the Mokolo River, are depicted in Table 4.3.

Table 4.3 Mean Annual Runoff for catchments of Grootegeluk Coal Mine

Description	Catchment area of River(km^2)	MAR (m^3 x 106)	MAR at receivingwater body (%)
Sandloop Stream at confluence withMokolo River	70.7	0.5	0.2
Mokolo River at confluence withLimpopo River	8 395	312.3	100

4.2.5 Resource Class and River Health

The nearest surface water resource, the Mokolo River, is situated approximately 20km away from Grootegeluk and therefore, mining activities taking place at Grootegeluk are not expected to have any direct impact on surface water quality of the resource.

The State of the Rivers Report (DWS 2006) for the Mokolo River classifies the Lower Mokolo Region in the vicinity of Lephalale as River Health Category fair and the Ecological Importance and Sensitivity (EIS) in the category of moderate.

The EIS is used to determine whether a river should receive a high level of protection or not. The River Health Category describes the ecological and management perspectives in terms of loss of sensitive species, abundance of tolerant species, disturbances associated with socio-economic development and habitat modification.

4.2.5.1 Receiving Water Quality Objectives

The DWS has set RQO standards for the Mokolo River catchment. The Grootegeluk operations falls within resource unit 16_4 under Sandloop spruit the water quality objectives for this area are primarily based and linked to groundwater

4.2.6 Surface Water User Survey

The DWS require that stakeholders be considered when applying for a WUL. These stakeholders include water users in the vicinity of the mine as well as all water users downstream that could be impacted.

The Mokolo River is the receiving surface water receptor identified within the vicinity of Grootegeluk Catchment and is dominated by agriculture and game farming.

The vegetation of the study area is in a largely natural state and less than 1% of the area shows signs of clearing for agricultural production indicating a low agricultural land use in the area. The farms surveyed in the west are currently being grazed by cattle and have a moderate to heavy grazing intensity. Thus, the expected impact on agriculture is expected to be minimal.

A large area is under free-range wildlife management and it is expected that the major surface water usage in the vicinity of Grootegeluk is for wildlife watering. (Natural Scientific Services, June 2009).

4.2.7 Sensitive Areas (Wetlands)

The following information has been obtained out of the GroundTruth, Wetland Study for Exxaro Grootegeluk Complex, reference GTW726/301018/01 dated 2018.

The Grootegeluk mining area is located within a more arid portion of South Africa, with limited large interconnected freshwater ecosystems within the landscape. The area does not contain any perennial streams and fringe habitat wetlands within its boundaries but rather an expansive number of pans varying in size from 0.004 ha to 2.3 ha. Most of the systems are under 0.1 ha in extent, and in some instances, are interlinked by a dendritic drainage network. However, these dendritic drainage networks are only preferential flows paths within the landscape and not actual streams (i.e. are not characterised by the presence of alluvial material and vegetation distinctly different from adjacent terrestrial vegetation).

Interestingly, the wetland delineation findings and the results from the invertebrate analysis concluded that all of the identified wetlands regardless of how temporary in nature the systems were, contained invertebrates, thus providing an additional level of evidence to the presence of wetland conditions resulting in a biotic response.

Some of the artificial systems were also noted to contain some degree of invertebrates, but the numbers and diversity of the species was often limited. The limitation in the invertebrate numbers can be explained by the fact that in many instances the substrate of the artificial systems was rock versus the mud within the natural wetland systems. Therefore, the invertebrates were generally opportunistic species, such as dragonflies, who are not reliant on mud-dominated substrates for hatching purposes. Whereas, the wetland systems generally contained invertebrate species that are reliant on muddy substrates for hatching purposes.
Due to the location of the pans/depressions within the Manketti Game Reserve, the sixty (60) identified natural wetlands are considered to be predominantly in good condition, i.e. ‘B’

category systems and cover an area of 7.14 ha. Based on the integrity assessment (Macfarlane et al 2018), the wetlands are considered equivalent to 5.99 hectares of functional wetland habitat.

Of the sixty-three (63) systems that have been identified within the mines impact area, 3 are considered artificial. These artificial systems within the LOM footprint area, were excluded from any assessments due to their artificial nature, and therefore, do not contribute to the offset mitigation requirements. Based on the loss of 5.6-hectare equivalents, the SANBI Offset Guidelines were used to calculate the offset requirements of the mine. In terms of the offset targets that would be applicable, the following would need to be considered for the impacts on the wetland systems:

- Wetland functionality target – 5.6-hectare equivalents; and
- Ecosystem conservation target – 1.2-hectare equivalents.

License 07/A42J/CICI/6418, which authorizes the loss of these systems to mining activities was approved on 18 October 2019 and the amendment to the licence was approved 16 February 2022 which licenses the mining on these identified seasonal pan areas. It also states the conditions and requirements that needs to be met to continue with this authorized activity.

It should be noted that the 30-year LOM for Exxaro Grootegeluk was updated in 2020, this thus impacts the number of pans that will be lost through mining, as well as the time frames as to when these pans will be impacted. Based on the new LOM-plan only 34 of the 60 natural wetlands /pans will be lost to mining activities in the next 30 years the remainder will be impacted by mining in that they are predominantly within 500m of the mining activities that will be taking place. Figure 4.3 indicate the position of these seasonal pans that forms part of the Grootegeluk IWUL.

During 2021 the mine also kicked off the Pan Creation proof of concepts study, which is aimed at testing the feasibility and determining the success of creating similar seasonal pans as part of the proposed offset or final rehabilitation plan in future. The implementation of this study formed part of the recommendations of the Wetland Report as well as commitments made to the Department as part of the WUL approval discussions.

The pan where created as per the Pan Creation Method Statement that was submitted to the Department in April 2020, as required by the WUL. The construction activities kicked off early in June 2021 and was completed in August 2021. The Baseline Assessment of the Donor Pans as well as the Construction Close-out Report was submitted to the Department in 2021.

The next steps will be the monitoring of these systems over a 5-year period to assess the success rate of the translocation and recreation process undertaken which will commence early in 2022. The outcome of the monitoring will indicate the success of the pan creation process and will guide the mine regarding future rehabilitation and offset options.

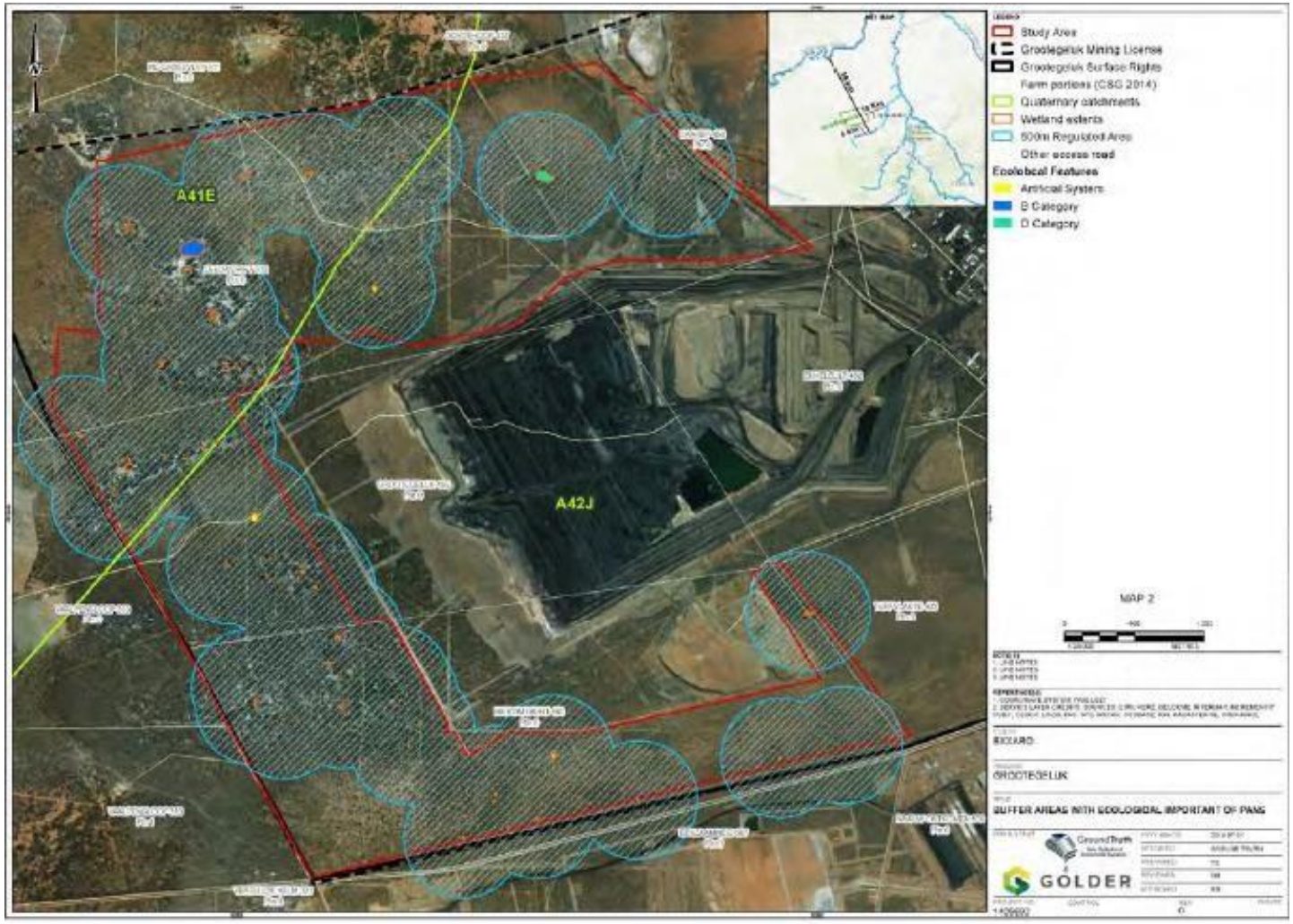

Figure 4.3 Seasonal Pan Layout with 500m buffer

4.3 Groundwater

4.3.1 Aquifer Characterisation

Extracted from Grootegeluk Groundwater Strategy (2022) (Annexure E).

The aquifers of the Karoo Supergroup display characteristics of intergranular and fractured rock.

The Karoo Supergroup is not known for the development of major aquifers, but occasional high-yielding boreholes may be present. The aquifers that occur in the area can therefore be classified as minor aquifers (low yielding), but of high importance (Parsons, 1995).

The Eenzaamheid fault acts as a watershed for groundwater flow in the study area, dividing the study area into two distinct groundwater compartments with very little (if any) flow across the fault boundary (Vermeulen et al., 2011). The faults serve as preferred pathways for the flow of water, having higher transmissivities than the surrounding rock, with boreholes (in most cases) drilled near the faults showing higher yields than boreholes drilled further away from the faults (Vermeulen et al., 2011).

4.3.1.1 Shallow Weathered Aquifer

The upper aquifer is associated with the weathered horizon ranging from 5 – 30 metres below ground level (mbgl). These aquifers are recharged by rainfall. Rainfall infiltrates into the weathered zone until it reaches the impermeable layers of solid rock, and the lateral flow of the water will emulate the surface topography until it later emerges as springs where the surface topography intercepts the groundwater level. The weathered zone is generally low-yielding, but yields may be higher in the Letaba Formation basalt and along faulting. The quality of the water in this aquifer is normally excellent and can be attributed to many years of dynamic groundwater flow through the weathered sediments (Vermeulen et al., 2011).

4.3.1.2 Fractured Rock Aquifer

The bedrock in the area does not allow for significant groundwater movement. Most of the groundwater flow will occur along fractures, faults, cracks and joints present within the rocks. The contact between the basalt and underlying Clarens sandstone is an erosional surface with considerable hydrogeological significance (Johnstone, 1989). The fractured rock aquifer associated with the Ecca Group, Beaufort Group, Clarens, Elliot and Molteno Formations appears to be lower yielding when compared to the the Letaba Formation basalt (and the contact zone with the Clarens Formation sandstone) fractured aquifer east of the Daarby fault. Increased borehole yields and transmissivity is also associated with the faults in the Letaba Formation basalt.

In the areas where other faults intersect the Daarby fault, certain transmissive zones may also be found and thus compromise the reported flow barrier. The dewatering of the Grootgeluk Mine located west of the Daarby fault is unlikely to impact significantly on the potential contaminant plume emanating from the plant/infrastructure area as the groundwater flow direction is towards the northeast. The faults could compartmentalize the aquifer and limit flow towards the northeast. The aquifer below the waste facilities and plant has already been impacted on by contaminated seepage.

4.3.1.3 Groundwater levels

Groundwater levels in 2016 and 2017 from the Mine WISH monitoring database, range between 4.2 (WB41) to 75.62 (WBR41) mbgl with an average level of 30.16 mbgl across the Grootegeluk area. The deeper groundwater levels occur to the west of the Daarby fault around the open pit, where dewatering of the aquifers has occurred.

The groundwater levels measured by Golder in 2014 north east of the mine in the Clarens/Elliot/Molteno Formation sandstone aquifer is shallower and ranged from 3.82 to 33.48 mbgl, averaging at 18.64 mbgl.

The groundwater levels in the plant area appear to be cyclic in nature. This variation can possibly be attributed to periods of groundwater abstraction from the basalt aquifer as well as periods of high rainfall that recharge the basalt aquifer. The groundwater levels in the plant area range from 0.78 to 22 mbgl with an average level of 7.12 mbgl. The groundwater levels in the basalt aquifer are thus shallower when compared to the other aquifers, partly due to artificial mounding in the plant areas caused by process related seepage.

Based on data from the 2016 WISH database, the average water level in the boreholes in close vicinity to Dump 4 and 5 waste facility was 24.74 mbgl, and ranged between 11.7 and 41.3 mbgl for measurements in 2014 and 2016.

4.3.1.4 Groundwater Quality

Refer to Section 6.7.1.2 for details on the groundwater monitoring.

4.3.2 Hydrocensus

A hydro-census was conducted at 10 selected boreholes at the Grootegeluk mining area and are listed in Table 16 and indicated on Figure 19 The objective of the hydro-census was to determine existing groundwater quality status at these sample points and to serve as a quality reference of laboratories previously used for monitoring purposes.

These samples were collected as per Golder's standard sampling procedures and submitted to Jones Environmental Laboratory in Deeside, UK an accredited laboratory. Two duplicate samples were collected and analysed (Highlighted in blue – Table 4.4)

Table 4.4 Hydrocensus Boreholes

Borehole number	Alternative	Latitude	Longitude	Farm	Comment
WB-33 / WB-100	Hy-01	-23.65733	27.54875	Grootegeluk	Sampled
WB-56	Hy-02	-23.65996	27.55017	Grootegeluk	Sampled
WB-39	Hy-03	-23.66767	27.55639	Grootegeluk	Sampled
Hy-04	Zdw-01	-23.58929	27.64220	Zonderwater	Sampled
TE-94	Hy-05	-23.67910	27.57662	Turfvlakte	Sampled
JV-01/ GG-75	Hy-06	-23.64985	27.43916	Jakkalsvlei	Sampled
VP7	Hy-07	-23.70898	27.48130	Vaalpensloop	Sampled
VDWP-01	Hy-08	-23.61743	27.48106	Vanderwaltspan	Sampled
MYS50	HY-09	-23.63895	27.49084	MC Cabesvley	Sampled
AV01	Hy-10	-23.62569	27.58169	Appelsvlakte	Sampled

A dataset was taken in 1975 and 1976 before mining commenced within the Grootegeluk area. These boreholes were spread across the mining area and included the various lithofacies characteristic for the mining area. However, the early dataset lacks certain major parameters used for characterising water types (Ca, Mg, and bicarbonate). The trace metal data was also limited and there is a high degree of uncertainty about the trace metal results.

In addition to the 1970's data set, several other monitoring points with long term data have been evaluated. These sets are from areas to the west and east of the mining areas and are not expected to be influenced by mining activities, thus representing un-impacted conditions. Table 17 shows the date of the 2015 Hydro-census compares to earlier qualities sampled in the same boreholes The existing numerical groundwater flow and mass transport model for Grootegeluk was updated in 2018 to reflect the potential effects on the local groundwater from all the identifiable contamination sources within the overall mine site, particularly related to the mining residue deposits as well as the processing plants and associated infrastructure areas. The model was required to predict with the necessary resolution and accuracy the effect from the contamination sources on key predetermined groundwater

receptors. This information was used to update the Grootegeluk Groundwater Strategy that will be implemented so as to improve the long-term groundwater management on site.

Exxaro Coal (Pty) Ltd (Exxaro) contracted Groundwater Consulting Services (GCS) to update the groundwater flow and mass transport model, and Golder Associates (Pty) Ltd (Golder) was to undertake pollution source term characterisation to support the groundwater mass transport model. The same information was used to up-date the mass transport model in 2020.

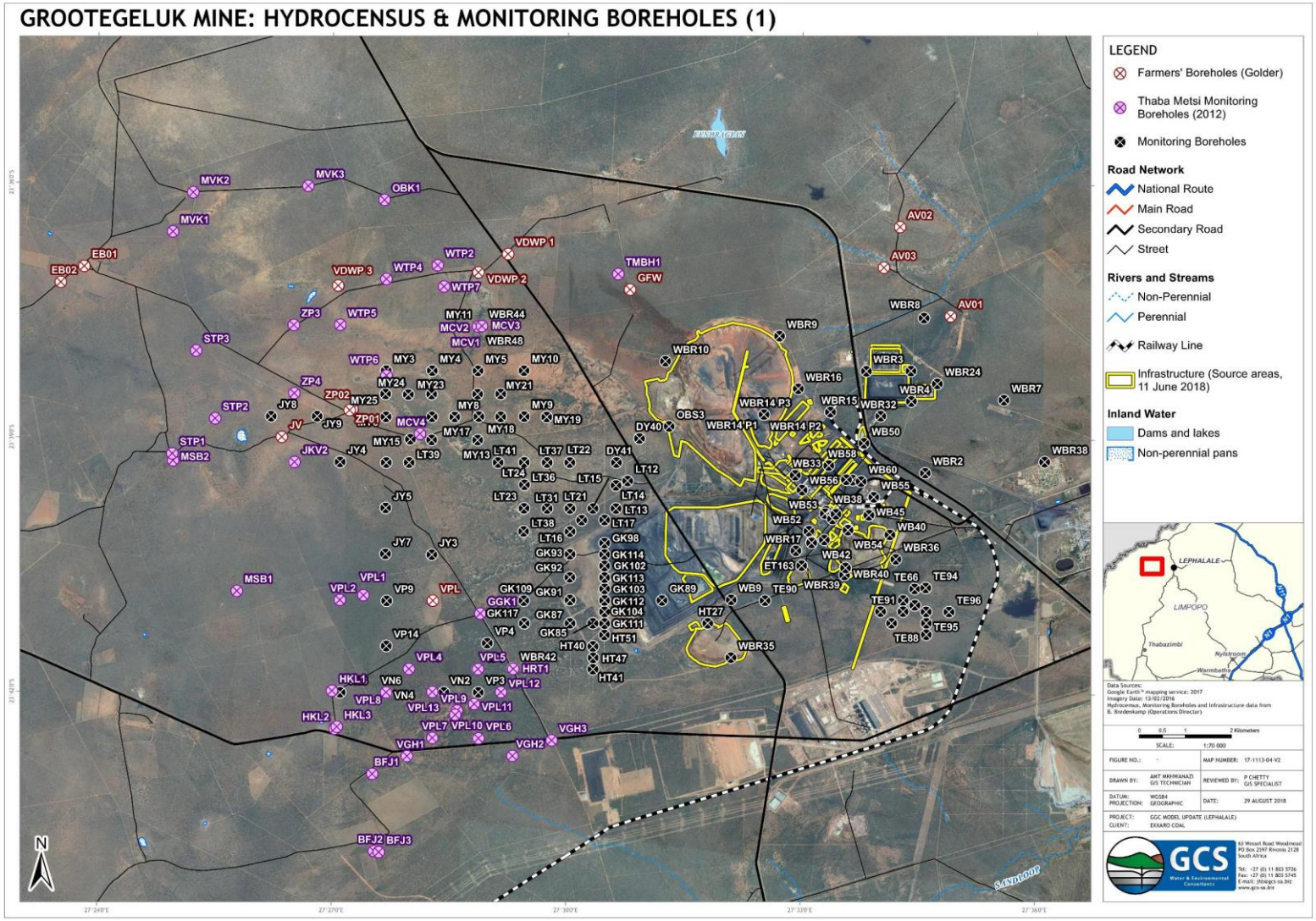

Figure 4.4 Hydrocensus and Monitoring Boreholes

4.3.3 Potential Pollution Source Identification

As part of the study the following sources were identified as shown in Figure 20 once identified sources where evaluated all available information regarding characterization was used to determine the source term results as indicated in Table 4.10. This information was then built into the Grootegeluk flow transport model so at model the impact of the potential sources of the receipting area.

4.3.4 Analytical Groundwater Model

The calibrated groundwater flow model was used as a basis for developing the contaminant transport model. Sulphate (SO4) was allocated as an input contaminant in the transport model. The model was based on the following assumptions:

- Contaminant movement will mostly take place as a result of advection. This assumption was based on the calculation of the Peclet number (Pe) for the aquifer which indicated that advection is the main flow mechanism.
- Chemical reaction between rock and dissolved species were not taken into consideration during simulations. Therefore, a worst-case scenario was assumed.

Movement of contaminant particles takes advection, dispersion and also flux sources into account. Longitudinal dispersion was taken as 100 metres. The existing GCS model was updated by assigning a varying recharge rate over the footprint of the Dump 4 and 5. The entire footprint of the Dump 4 and 5 was modelled from the beginning of the operational phase i.e. 1981. It was assumed that the use of Dump 4 and 5 would cease in 2020. During the simulations the footprint remained a constant size while only the seepage rates and concentrations varied. For modelling purposes, it was assumed that the soil cover would be installed and completed in 2021. (Dates are dependent on the start of the rehabilitation process once authorization is attained form the DMR).

These seepage rates and concentrations were used as input into the numerical flow and contaminant transport model. The model outputs were for the current situation (2018) and 50, 100 and 200 years post closure.

Due to the assumptions made and limited calibration data available, the results from the contaminant transport model were considered to represent a first approximation of the impact on groundwater quality. Due to the nature of the simulations, the estimated concentrations will reflect expected conditions within an order of magnitude. Below is a summary of the input values used for each scenario. For each scenario the sources which are found within the 2051 LOM Grootegeluk pit area have been excluded from the simulations as they are deemed to be mined out. In addition, the partially backfilled Grootegeluk pit was

not included as a post closure source as it is likely to act as a contaminant sink post closure (i.e. contaminants could migrate toward pit post closure).

The following scenarios were tested.
Scenario 1: Constant source during the operational and post closure phases for the Dump 4 and 5 waste facility as well as the all other sources at Grootegeluk;
Scenario 2: Covering of the 4 and 5 waste dump with a 70 cm cover with poor vegetation vigour/condition, while the other sources are unmitigated (i.e. constant source during operational and post closure);
Scenario 3: Covering of the 4 and 5 waste dump with a 70 cm cover with poor vegetation vigour/condition, while the other sources are mitigated with increased post closure seepage rates and contaminant concentrations (source removal/contaminant load reduction, capping etc.) – poorly mitigated case; and
Scenario 4: Covering of the 4 and 5 waste dump with a 70 cm cover with poor vegetation vigour/condition, while the other sources are mitigated post closure (source removal/contaminant load reduction, capping etc.) – likely mitigation case.
Based on these scenarios the following conclusions were made:

4.3.4.1 2018/2019 current SO4 contaminant plumes

- The SO4 contaminant plume for all 4 scenarios are similar, as all the proposed mitigation options (scenario 2 to scenario 4) only manifest after 2019 (Figure 4.5). The 2019 current SO4 contaminant plume is generally confined to the Grootegeluk mining complex. The Letaba Formation basalt aquifer is generally impacted on by mining related contaminants emanating the plant infrastructure and waste facilities/dumps. The Largest contaminant source at the mine is Dump 4 and 5. Other sources that show an impact that could require further management is the Plant and Stockpiles areas and the Tailings Dam Facility. The abstraction boreholes are active and change the contaminant migration direction in the plant and stockpile area.
- Plume migration in the Clarens Formation sandstone aquifer is slow given the lower transmissivity and higher effective porosity.
- No third-party groundwater users were likely to be impacted on.

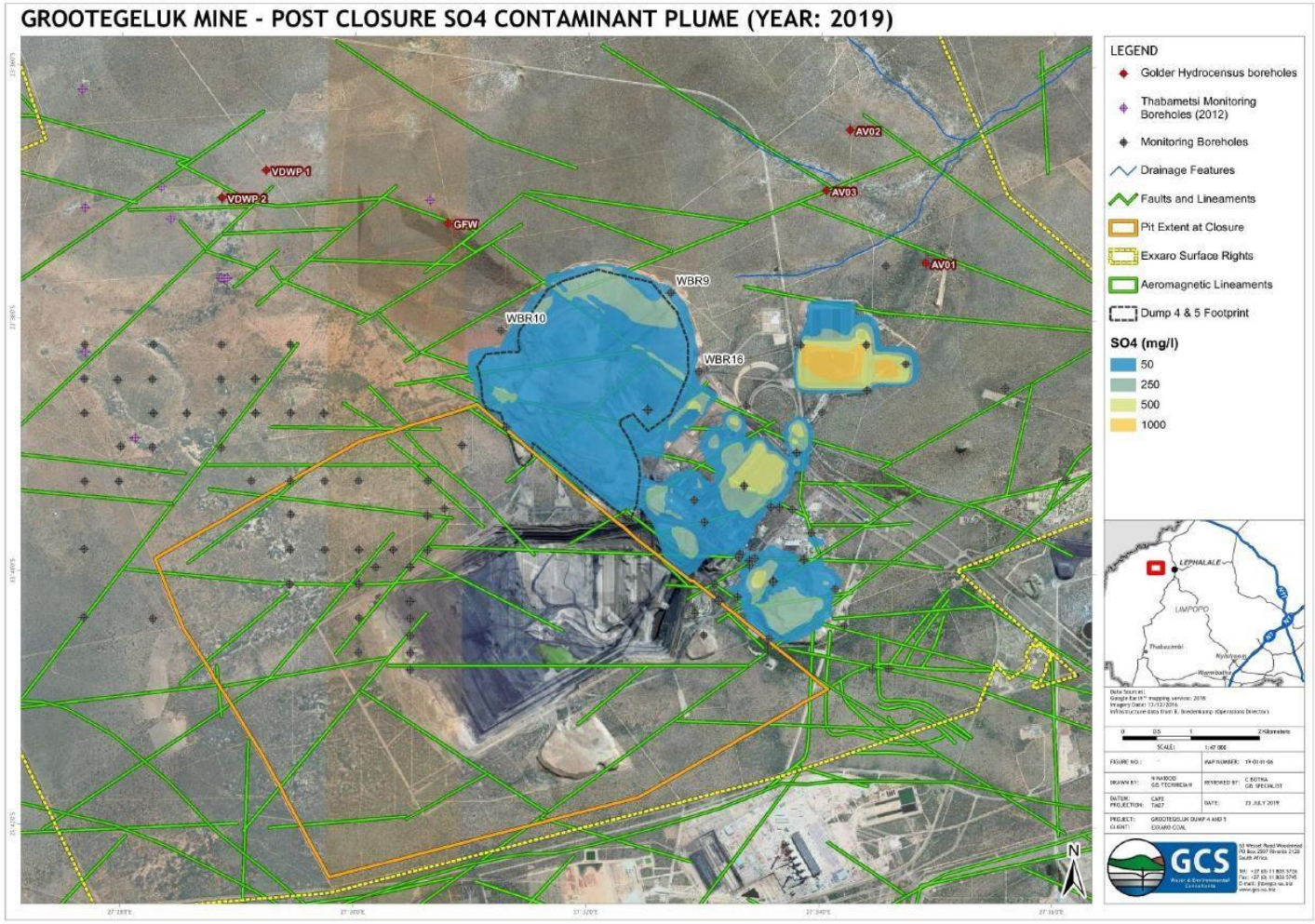

Figure 4.5 Current SO4 contamination plume

4.3.4.2 At closure SO4 contaminant plumes (year 2051)

- At mine closure, the SO4 contaminant plume extent still remains generally confined to the Grootegeluk mining surface rights (Figure 4.6). In scenario 1 where no mitigated of any sources were assumed, it is evident that Dump 4 and 5 as well as the slimes dam area are the most prominent contaminant source areas.
- In Scenario 2, where only Dump 4 and 5 is mitigated (covered with 70cm soil cover with poor vegetation cover), the groundwater contaminant concentrations below the Dump 4 and 5 are lower when compared to the unmitigated scenario 1, while the extent of the plume round the Dump 4 and 5 is also slightly smaller.
- Scenario 3, which represents a fully mitigated Dump 4 and 5 and other partially mitigated sources has a similar footprint to the plumes in scenario 2, but with slightly higher groundwater contaminant concentrations below the sources due to the assumed higher seepage rates of certain sources.
- The likely scenario 4, appears similar to scenario 2 as the mitigation measures for the all the sources at the mine (excluding Dump 4 and 5) will only be implemented after closure.
- The SO4 concentrations below the Dump 4 and 5 are highest for the unmitigated scenario and lowest for the 70 cm soil cover.
- The contaminant plumes in the basalt aquifer are still generally confined to the aquifer.
- The fault between the basalt and sandstone may also act as a flow barrier across the fault and flow conduit along the fault. Similarly, the Daarby fault generally retards any plume migration across the
- fault into the backfilled open pit. The hydrogeological characteristics of these faults should be further investigated as it will control the migration of contaminants.
- The contaminant plume generally migrates in all directions away from the 4 and 5 dump. This can generally be attributed to the high seepage rate below the dump when compared to natural recharge.
- No third-party groundwater users are likely to be impacted in both the unmitigated and the mitigated case.

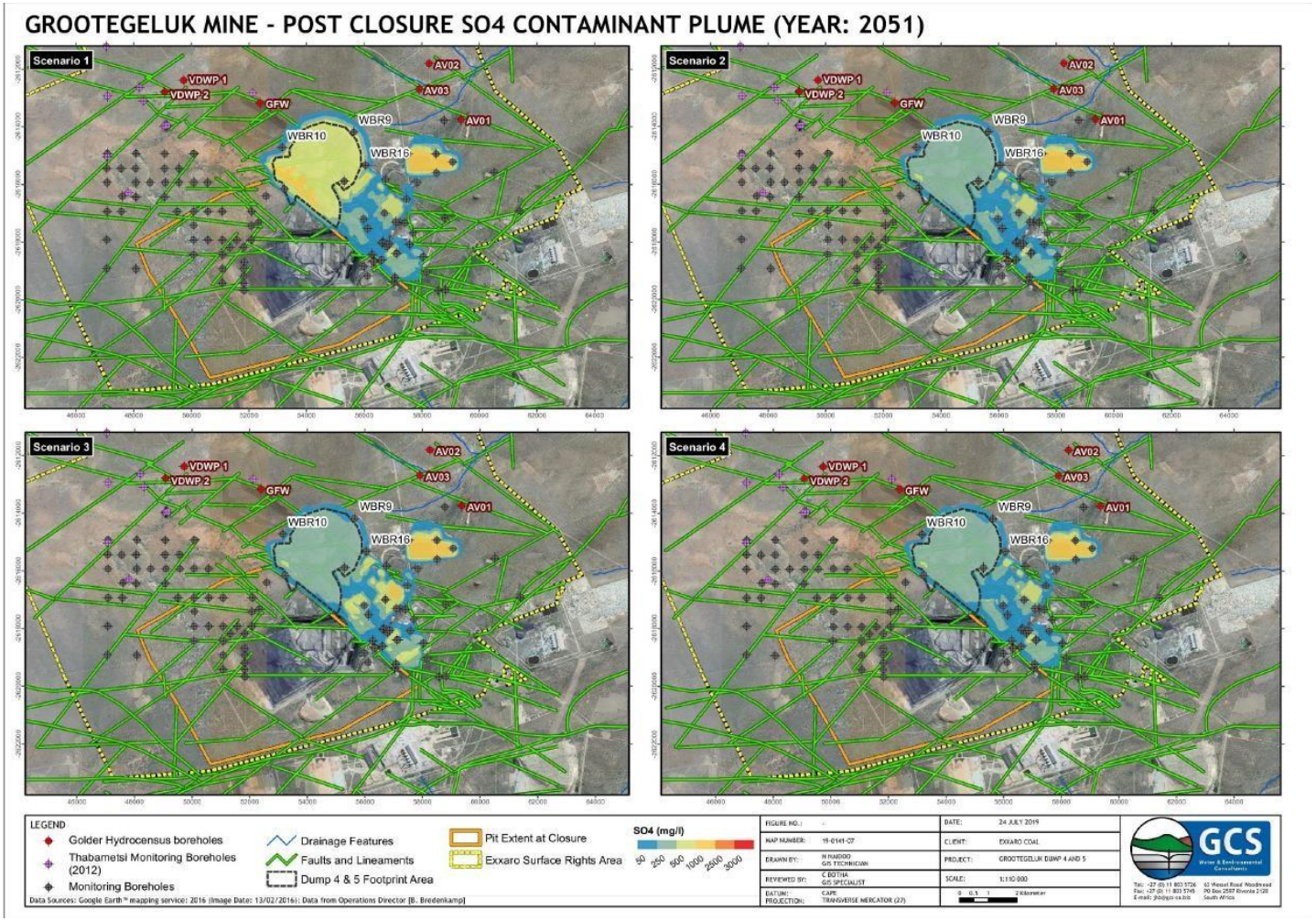

Figure 4.6 Closure SO4 contamination plume (2051)

4.3.4.3 100-year post closure SO4 contaminant plumes

- In the 100-year SO4 contaminant plumes clearly show the soil cover for Dump 4 and 5 as an effective mitigation measure. The Dump 4 and 5 however still remains the largest single source of contamination at the mine.
- For scenario 1 (no mitigation), the SO4 plume extends ~900m to the north-east of Dump 4 and 5. The plume could migrate almost 1400 m along the basalt/sandstone contact fault in a north westerly direction. The Daarby fault also acts as a barrier to the migration of contaminants to the south west. The contaminant plume also migrates in a south westerly direction towards the rehabilitated open pit. A flow gradient exists towards the Grootegeluk pit after closure due to the rehabilitated pit acting as a sink. The SO4 plume extends ~900m to the north-east of the slimes dams (with no mitigation). The SO4 plume near the plant area and unrehabilitated stockyards is generally confined to Letaba Formation basalt, but also migrates towards the east along the faults.
- In Scenarios 2, 3 and 4 (where Dump 4 and 5 is covered with 70cm cover), the plume extents of Dump 4 and 5 is similar. For these three mitigation scenarios, the SO4 plume extends only ~600 m to the north-east and ~800 m along the basalt/sandstone contact fault in a north westerly direction from Dump 4 and 5.
- Regarding the SO4 plume at the plant area and stockyards, the implementation of mitigations (source removal, soil covers, etc.) as seen in Scenario 4 are effective in decreasing the impacts from these areas post closure. The groundwater contaminant plume concentrations were also likely to be lower when the sources are mitigated (when comparing scenario 1 and 2 with scenario 3 and 4). The SO4 plume is however generally confined to Letaba Formation basalt, with limited migration of contaminants out of the Letaba Formation basalt aquifer along the faulting.
- The characterisation of faults is important to assess in future to what extent contaminants could migrate or be retarded along the faults.
- No third-party groundwater users are likely to be impacted 100 years post closure for both unmitigated and mitigated scenarios. The contaminant plumes are further confined to the Exxaro Surface Right area.

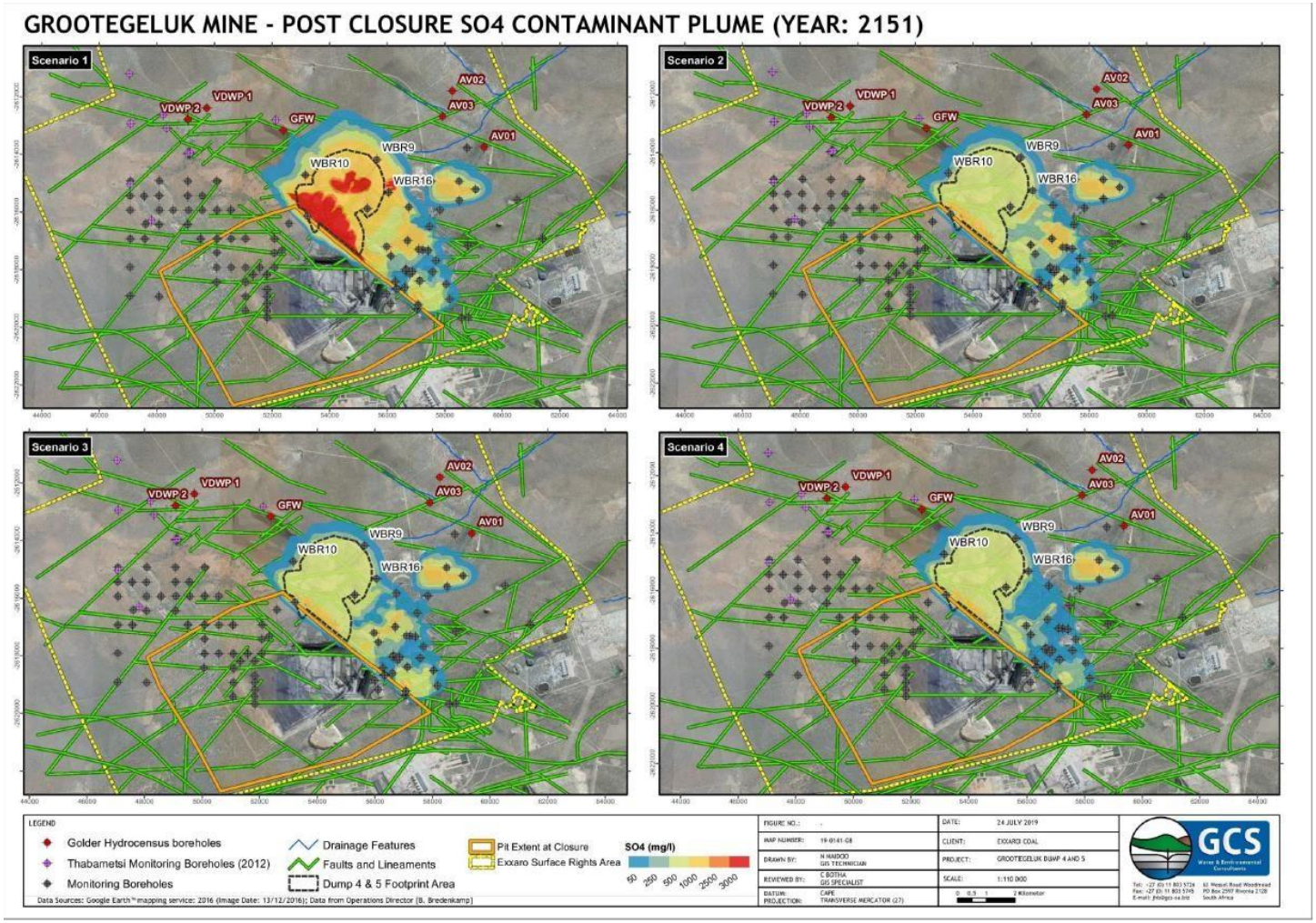

Figure 4.7 100 year post closure SO4 contamination plume

4.3.4.4 200 year post closure SO4 contaminant plumes

- The 200 year SO4 contaminant plumes extends along the lineaments to the north-west, north east and south east. In addition, the mitigations proposed for the other sources at Grootegeluk are likely to be effective when comparing scenario 1 (no mitigation) to scenario 4 (likely case mitigation) (Figure 4.19).
- The SO4 plume for the unmitigated scenario extends ~1.7 km to the north-west of Dump 4 and 5 along a lineament. The plume could migrate almost 3 km along the basalt/sandstone contact fault in a north westerly direction. The Daarby fault also acts as a barrier to the migration of contaminants to the south west towards the rehabilitated open pit. Seepage from Dump 4 and 5 could migrate across the Daarby fault and into the rehabilitated open pit. The contaminant plume concentrations are also higher below the contaminant sources in the unmitigated scenario 1, when compared to the scenarios with mitigations (scenario 2,3 and 4). In the plant and stockpile areas, the plume migration is generally towards the east and is associated with faulting in the Letaba Formation basalt aquifer. The contaminant plume could extend 800m east of these sources along the faults.
- The effectiveness of the mitigation measures (scenario 2,3 and 4) is evident from the modelling. The 70 cm soil cover with poor vegetation results in smaller contaminant plume with lower contaminant
- concentrations when compared to the unmitigated scenario 1. Similarly, the likely mitigation measures for the other sources at the mine also prove to be effective in reducing the extent and the contaminant concentrations in the groundwater contaminant plumes.
- At Dump 4 and 5 in the mitigation scenarios (scenario 2, 3 and 4) the SO4 plume extends only ~700 m to the north-east and ~1400 m along the basalt/sandstone contact fault in a north westerly direction.
- In the plant and stockpile areas, plume migration is generally towards the east and is associated with faulting in the Letaba Formation basalt aquifer. The contaminant plume is generally confined to the Letaba Formation basalt aquifer in scenario 4, the likely case. The contaminant plume could extend ~1000m east of these sources along the faults, with mitigation, although at low concentrations.
- Based on the result of the simulation no other third party boreholes (outside of Exxaro Surface Rights area) were likely to be impacted by the contaminant plume emanating from the simulated Grootegeluk sources. It is also unlikely (based on the model results and assumptions) that the potential contaminant plumes migrate off Exxaro property (outside the Exxaro surface rights).

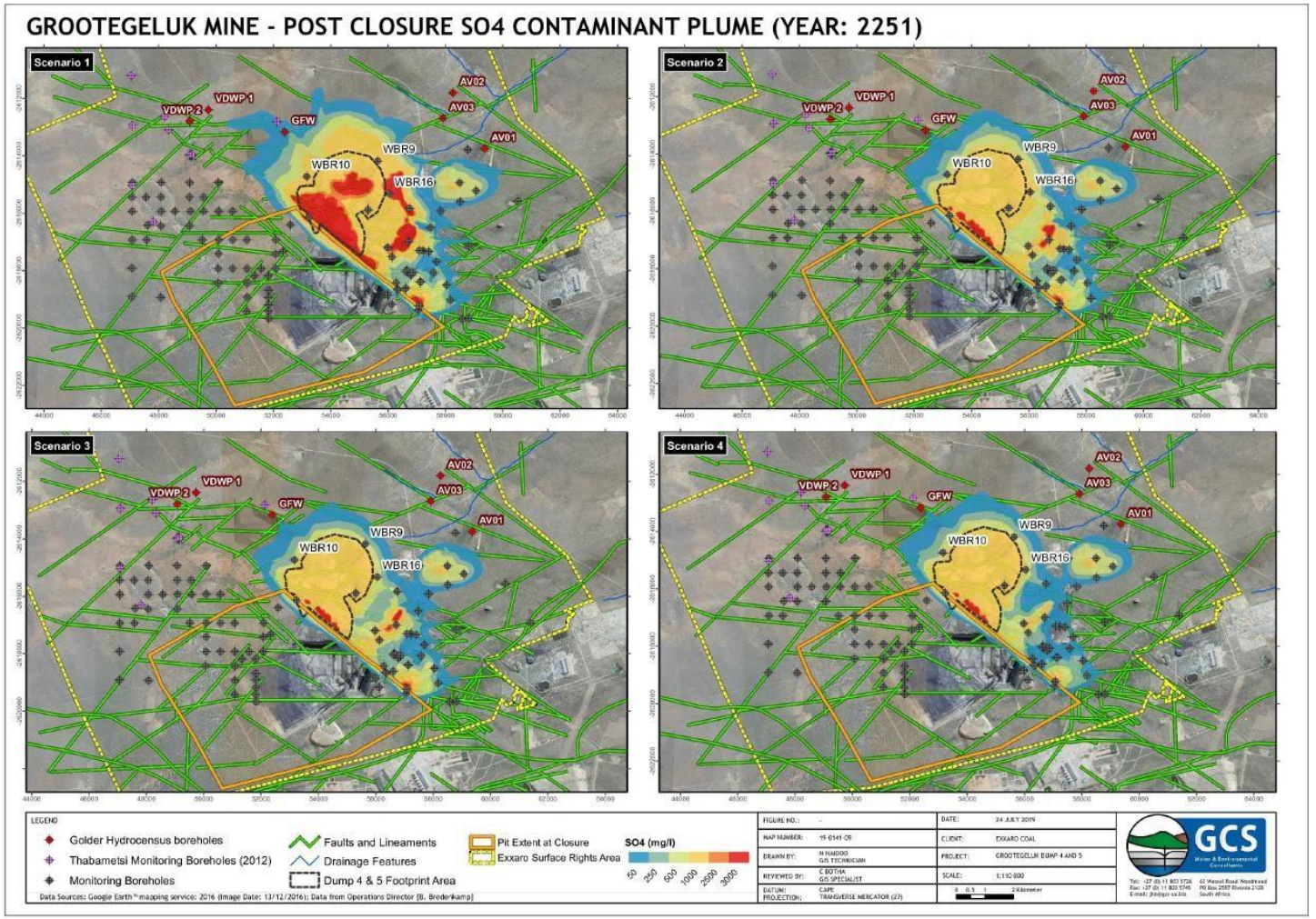

Figure 4.8 200 year post closure SO4 contamination plume

4.3.5 Acid Mine Drainage Plan

Refer to **Annexure F** for the Grootegeluk AMD plan.

4.4 Socio-Economic Environment

The Grootegeluk Coal Mine laid the basis for the economic development of the surrounding and the establishment of the town of Lephalale. When the mine was founded, Lephalale had a population of approximately 500 people who were predominantly serving the surrounding farms.

The town has grown into a community of approximately 20 000 people with sophisticated transport, electricity and water infrastructure. This remarkable growth was essentially the product of the simultaneous development of the mine in 1980 and the commissioning of the Matimba Power Station in 1987. Matimba Power Station is solely dependent on Grootegeluk Coal Mine to supply its required coal stocks for the functioning of the Power Station; 80% of Grootegeluk Coal Mine's coal production is supplied to Matimba Power Station. It is estimated that the Matimba Power Station produces 12% of the country's current power supply, supplying electricity to all mining activities between Rustenburg and Polokwane. Matimba Power Station is one of the country's lowest cost producers of electricity.

Coal mining and power generation have laid the foundations for economic development in the area. Although mining only accounts for 4% of the LLM's GGP, the multiplier effect of downstream economic activity accounts for approximately 70% of the area's GGP. In addition, Matimba Power Station accounts for 800 local jobs.

4.4.1 Regional Context

4.4.1.1 The Limpopo Province

Lephalale Local Municipality (LLM) is in the Northwestern part of Waterberg District of Limpopo Province of the Republic of South Africa. It borders with four Local Municipalities (Blouberg, Modimolle-Mookgophong, Mogalakwena and Thabazimbi). Its North-Western border is also part of the International 54 Border between South Africa and Botswana. The Lephalale Municipality is the biggest Municipality in the Limpopo Province (covering 14 000km^2). The town of Lephalale is located a mere 280km from Tshwane and a recognized gateway to Botswana and other Southern African Countries. The town Lephalale (Ellisras/Onverwacht/Marapong) is located approximately 40km from the border of Botswana. It is situated between 23˚30' and 24˚00' south latitude 27˚30' and 28˚00' east longitude.

Lephalale Local Municipality has been revised through the Provincial Spatial Framework as a centre for unlocking the Waterberg Mineral belt and has attained the status of Regional

Development Node. The coal fields which boast more than 40% of the total coal reserve of South Africa are in Lephalale.

The Waterberg Coal Field is estimated to contain a resource base of 50 billion tons; of which 12.5 billion tons can be mined by opencast method (coal is sufficiently close to surface that it does not require the sinking of a shaft). It is against this background that Lephalale has crafted its vision to become one of the vibrant cities within the Limpopo Province. Hence, we define a city as a relatively large and permanent settlement with complex systems for sanitation, utilities, land usage, housing, and transportation. The concentration of development greatly facilitates interaction between people and businesses, benefiting both parties in the process and improving the quality of lives of the people of Waterberg Region. (LLM IDP, 2022 – 2027)

4.4.1.2 The Waterberg District Municipality

The Waterberg District Municipality (WDM) covers an area of about 4.95 million hectares (ha) and consists of the five local municipalities Bela-Bela, Lephalale, Mogalakwena and Modimolle-Mookgophong and Thabazimbi.

The WDM is a Category C municipality located in the South-Western part of Limpopo Province, which is South Africa's most Northern Province. The district was formed in 2000 and is one of the five District Municipalities in the Limpopo Province. The district is strategically located in sharing its borders with Capricorn District Municipality in the north and Sekhukhune District Municipality in the east. The south-western boundary abuts the Northwest, while the Gauteng Province lies on the south-eastern side. The municipality is the biggest district in the province, making up just more than a third of its geographical area. It shares its five-border control points with Botswana, namely Groblersbrug, Stockpoort, Derdepoort, Zanzibar and Platjan. The largely rural district is made-up of five local municipalities, namely; Bela-Bela LM, Lephalale LM, Modimolle-Mookgopong LM, Mogalakwena LM, and Thabazimbi LM. The WDM is also made-up of 80 wards, 6 towns, 11 townships, 216 villages, and 30 informal settlements.

In addition, the district has 11 Traditional Councils with about 47% of the district's population living in traditional authority areas making up about 7.3% of the landmass of the district. The WDM is home to 757 000 people which is 1.3% of South Africa's total population. Between 2008 and 2018, the population growth averaged 1.27% per annum, which was just below the growth rate of the province and South Africa at 1.3% and 1.57%, respectively. Lephalale LM experienced the largest increase in population in the district, with an average annual growth rate of 2.87% between 2008 and 2018, while Modimolle/Mookgopong LM experienced an average annual decline of 0.38% in the same period. The high population growth rates in

Lephalale can be attributed to the growth of the mining and energy sectors, whereas decline in the Modimolle-Mookgopong can be attributed to the dearth in opportunities as result of lesser traffic on the R101.

The WDM contains most of the Waterberg Biosphere which falls under UNESCO (United Nations Educational, Scientific and Cultural Organisation), designated as a Biosphere Reserve with the area of 654,033 ha. The district is one of the first regions in the north to host a Biosphere Reserve by UNESCO Its ecosystem may be characterised as a dry deciduous forest or Bushveld Main Economic Sectors: Mining, agriculture, tourism. greatest contributor to Waterberg's Gross Value Add (GVA) to the district being 56%. Other contributing sectors include community services (12%); finance (8%); trade (8%); transport (4%); manufacturing (3%); electricity (3%); agriculture (3%); and construction (2%). (WDM 2022-2023 IDP).

4.4.1.3 Economic Activities

Lephalale is the fastest growing town in the Waterberg district, which has natural resources with potential for entrepreneurship and economic development. The economy is dominated by mining (platinum, iron ore, coal, and diamonds), tourism and agriculture. The Waterberg District Municipality is the largest platinum producing area in the Limpopo Province. The growing energy demand drives the development of coal and petroleum production in the Lephalale area. The coal resource in the Waterberg field is estimated at 76 billion tons, which is more than 40% of the national coal reserve. Mining is the highest GDP contributor in the district at 47.4% (Waterberg DM IDP, 2014/15). The renowned Biosphere Reserve is found in the District, and the agricultural potential of the sector has not yet been reached.

The local economy is currently dominated by Exxaro's Grootegeluk Coal Mine and Eskom's Matimba power station. The contribution of mining to the LLM's GDP is major at 59.21%. Tourism, game farming, commercial hunting, red meat production and manufacturing also contribute significantly to the local economy. Lephalale is currently in the second stage of considerable public-sector investment, estimated at R140 billion over six years, for the construction of Medupi power station. Lephalale is the fastest growing town in the Waterberg district. The Gross Value Added (GVA) per sector of the economy within the LLM is shown in Table 4.11 and the overall percentages of contributions from each sector for 2010 is depicted in Figure 26 (Lephalale local Municipality – IDP, 2016 – 2021). Relative sectorial contributions to the regional Gross Value Added (GVA) for 2010 are shown in Table 4.12 (Lephalale local Municipality – IDP, 2016 – 2021).

5 ANALYSES AND CHARACTERISATION OF ACTIVITY

5.1 Site Delineation for Characterisation

Refer to Figure 2.2 for the property boundaries of the study area. No mining or mining related activities will take place outside of this area.

5.2 Water and Waste Management

The water and salt balance for Grootegeluk is updated on an annual basis. The results of the 2023 water balance are presented in

Figure 5.1 and

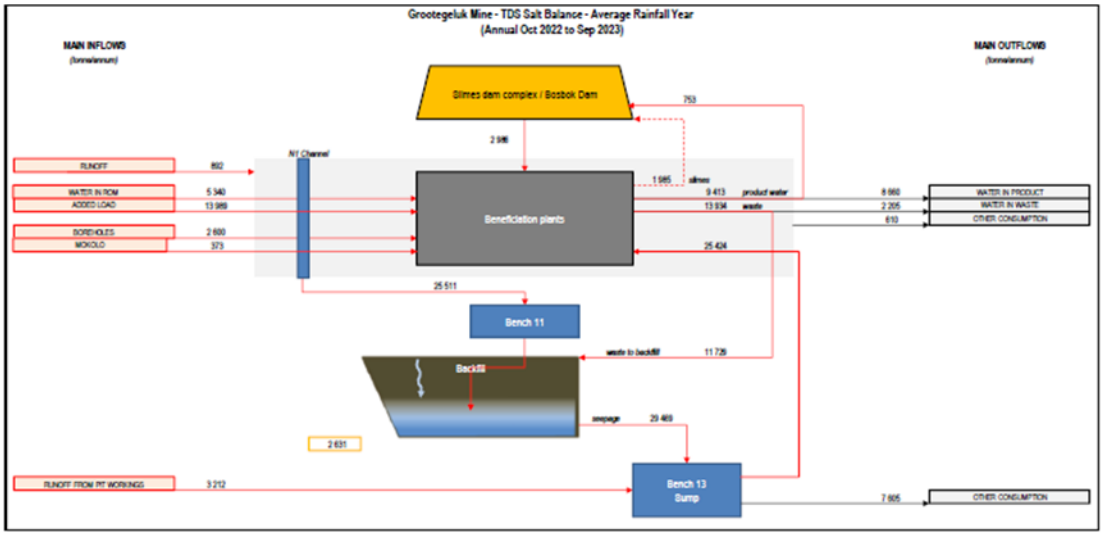

Figure 5.2 (**Annexure G**).

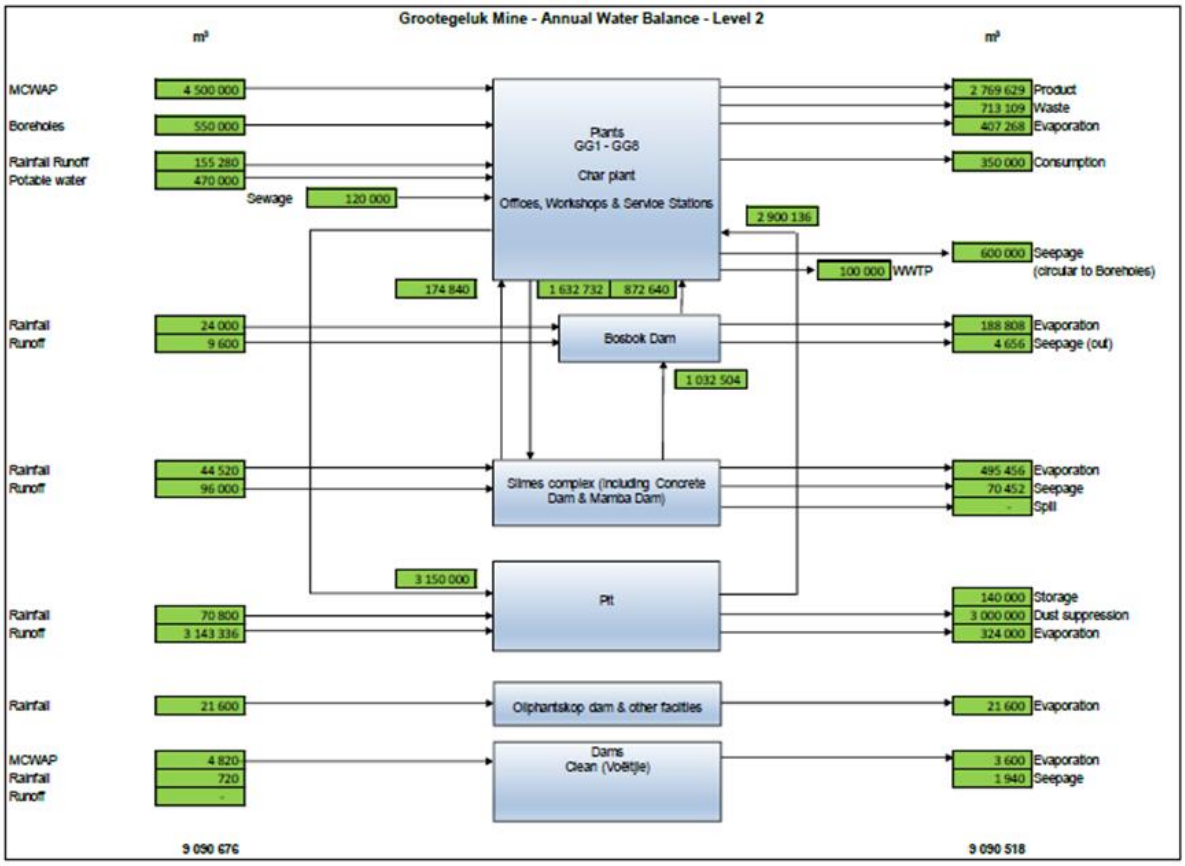

Figure 5.1 Annual Water Balance: Oct 2022 – Sep 2023

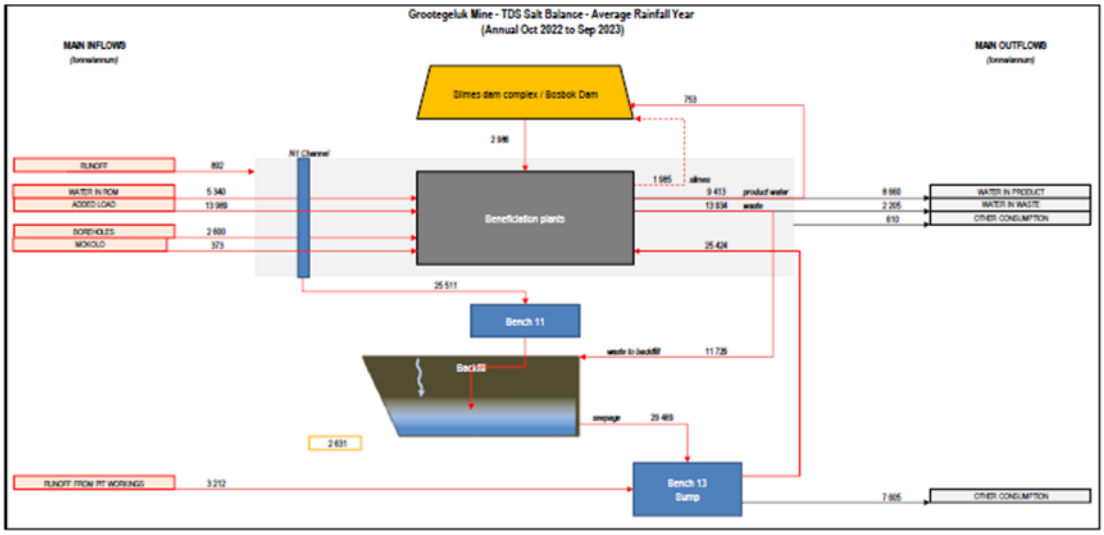

Figure 5.2 Annual Salt Balance: Oct 2022 – Sep 2023

5.2.1 Process Water

Grootegeluk has one closed process water system which ensures the effective reuse of water. To ensure effective use the following methodology is used to recover water from the system. The process water recovery and intake protocol are implemented according to the following priority (from highest to lowest intake priority):

- Slimes dams complex including the Mamba Dam;
- Pollution control dams;
- Pit sumps (water accumulated in the pit);
- Boreholes (dewatering of artificial underground water); and
- Mokolo dam (DWS supply). The priority will be influenced by:
- Groundwater levels;
- Availability of water due to rainfall accumulation;
- Maintenance on pipelines;
- Corrosive and scaling due to water quality properties;
- Mokolo dam yield.

The priority of supply is maintained by considering the controlled and uncontrolled influences as stated above.

All process water is recovered via the return water and pollution control dams, the slimes dams and the mining pit area re-used as plant process water or for dust suppression on haul roads. All spilled water that is reclaimed from beneficiation plant via the storm water channels and sumps is also returned to the water distribution system.

Refer to the Integrated Water Management Study undertaken by Aurecon dated 2020 as well as the updated Water Balance dated November 2023, Exxaro (**Annexure G**).

5.2.2 Storm Water

Government Notice No. 704, published in terms of the National Water Act (Act No. 36 of 1998) requires the following, which will be adhered to:

- All clean water systems must be designed and operated in such a manner that they are at all times capable of handling the 1:50 year flood event on top of their mean operation level without spilling;
- Any water arising from an area, which causes, has caused or is likely to cause pollution of a water resource, including polluted storm water, must be contained within a dirty water system. In order to reduce the volume of polluted water, contaminated areas should be minimised. While clean water should be diverted to natural water courses, polluted water should be re-used wherever possible, thereby reducing the use of clean water; and

- Design, construct, maintain and operate any dam or tailings facility that forms part of a dirty water system to have a minimum freeboard of 0.8m above full supply level.

5.2.2.1 Current Storm Water Management Infrastructure

A storm water management plan for Grootegeluk mine was compiled by Golder in August 2012. This suggested a storm water management system for both the clean and dirty water associated with the site. In 2015 Delta Built Environment Consultants (Delta BEC) supplied Exxaro with an update of their current stormwater management plan that includes the consideration of new infrastructure and site layout (Delta Built Environment Consultants, 2015). (**Annexure H**)

5.2.3 Groundwater

Groundwater has been identified as the major environmental component affected by the Grootegeluk mining operation. Effective process water management and pro-active prevention practices of groundwater pollution have not been in place since the start of mining at Grootegeluk. Groundwater monitoring results have shown areas of water level mounding and pollution plume migration and some measures have been taken to address specific problems.

The overall groundwater strategy was updated in 2023 (**Annexure E**) and Grootegeluk is currently in the process of implementing the work program that was committed to so to improve Groundwater management with in the mines impact area.

- Groundwater monitoring will be conducted as per approved Monitoring program;
- Facility specific monitoring networks will be implemented, where required, to verify success of mitigation/closure measures (in place for certain facilities i.e. cyclic ponds);
- Interpretation and reporting of monitoring data must take place annually with emphasis around areas of concern;
- Continuous refinement of conceptual groundwater model with new information should be conducted annually;
- Delineation of all potential sources of groundwater contamination (complete);
- Source characterisation to determine contaminants of concern (complete);
- The faults underlying contaminant sources should be further characterised to determine their hydrogeological characteristics (potential flow barriers/preferential flow paths). This includes the Eenzaamheid and Daarby faults;
- Update of current groundwater flow and transport model with source information has been completed;

- The calibrated flow and transport model must be used to assess (with aim to improve) current management practice of dewatering the basalt aquifer;
- Regular (annually) re-calibration of groundwater model to assess relevance of monitoring network should be conducted;
- Utilisation of calibrated flow and transport model to assess closure scenarios on an annual basis;
- Regular updates (annually) of the macro water balance to confirm relevance of closure scenarios;
- Included all mining activities in the flow model to provide the groundwater balances for the complex in future;
- The model will be used as a management tool to simulate potential future impacts and to scope additional intrusive work or data collection;
- Run What-if scenarios to design BAT (best available technology) mitigation options for areas of concern;
- Report on the above in annual update of the IWWMP;
- Delineation of the proposed Tier zones in new RQOs will be done with the calibrated flow and transport model.

5.2.4 Waste

The sewage from the site is treated at the Sewage Waste Water Treatment Plant, which started operation in October 2015. The old oxidation pond system located south of Dump 6 is currently used for a back-up system and has been left to dry so that it can be rehabilitated and decommissioned in future. DWS confirmed in writing that the new site will not require a WUL since none of the purified sewage water will be stored but rather canalled to the plan for reuse in the process. The facility itself runs on an anaerobic and aerobic system where the sludge is fully broken down. The effluent water is then dosed with Cl and taken back into the process water system.

The waste management at the site is described in the sites Standard Practice Instruction (SPI/GG/H03.005, Exxaro, 2016). The integrated waste management at the site follows the following steps:

- Avoidance and prevention of waste generation;
- Reduction and re-use of wastes;
- Recycling and recovery of wastes; and
- Appropriate disposal.
- The wastes on site are segregated into:
- General waste;

- Scrap metal;
- Industrial waste; and
- Hazardous waste.

5.3 Operational Management

Management structure, commitment and responsibility, are focused on the basic principles of management at all functions and levels within the organisation and are aimed at meeting internal and external customer's needs, while serving the Company's interests. The system is thus structured in a way that will ensure proper utilization, application and control of all technical, operational, administrative and human resources within the limits and constraints of the approved budget.

5.3.1 Organisational Structure

An overview of the organisational structure is shown in Figure 2.11.

5.3.2 Resources and Competence

Grootegeluk Management ensures that:

- Resources essential for the implementation of SHEQ management systems are provided;
- Necessary competency is available for the effective and efficient operation of the organisation;
- Infrastructure necessary for the realisation of the product taking into consideration the needs and expectations of interested parties is defined, and
- Creates a suitable working environment for employees and contractors to enhance the performance of the organisation.

5.3.3 Education and Training

All personnel appointed will be suitably qualified and trained to ensure competence within their position.

Employees are mentored by their line managers through the Individual Development Plans (IDP), which record training needs and career aspirations. The employee and his or her mentor annually review the IDP, decide on the training needs for the coming year and mutually agree on an implementation plan. Growth in leadership and managerial skill is the focus for employees at

supervisor levels and above. Below supervisor levels the main focus is on the employee achieving excellence in her or his job.

The Environmental Awareness Plan, forms part of the mine's safety, health and environmental (SHE) training. All personnel will as a minimum undergo general SHE induction and awareness training. The managers responsible for environmental management will identify the SHE training requirements for all Exxaro personnel and contractors. The training requirements will be recorded in a training needs matrix indicating the particular training that must be undertaken by identified personnel and contractors and at what intervals.
The Training Programme will consist of the following components of modules:

5.3.3.1 General Awareness Training:

- A general environmental awareness training module will be developed and integrated into the general induction programme. The general awareness training must include the Exxaro Environmental Policy, a description of the environmental impacts and aspects and the importance of conformance to requirements, general responsibilities of mine personnel about the environmental requirements and a review of the emergency and corrective action processes; and
- A Training Practitioner will conduct the general awareness training. The Training Practitioner will keep a record of the details of all persons attending general awareness training. Such attendance registers shall indicate the names of attendees and their organisations, the date and the type of training received.

5.3.3.2 Specific Environmental Training:

Specific environmental training will be in line with the requirements identified in the training matrix and frequencies; and

Personnel whose work tasks can impact on the environment will be made aware of the requirements of appropriate procedures/work instructions. The responsible Manager will communicate training
requirements to responsible supervisors to ensure that personnel and contractors are trained accordingly.

5.3.3.3 Training Evaluation and Re-training:

- Effectiveness of the environmental training will be reflected by the degree of conformance to EMPR requirements, the result of annual internal audits and the general environmental performance achieved for the project;

- Incidents and non-conformances raised against the EMPR will be assessed through the Internal Incident Investigation and Reporting System to determine the root cause, including the possible lack of awareness/training;
- Should it be evident that re-training is required, the Environmental Manager(s) will inform the Exxaro management team of the need and take the appropriate actions;
- General awareness training of all personnel shall be repeated every two years; and
- The re-induction shall take into consideration changes made in the EMPR, changes in legislation, Exxaro's current levels of environmental performance, and areas of improvement.

The roles of the Environmental Specialists in terms of the mining operation and it associated projects shall include, amongst others, the following tasks:

- To support the successful implementation of the EMPR;
- Investigating and reporting on major environmental incidents;
- Maintaining and managing the monitoring programme;
- Providing liaison on environmental issues between all other parties, i.e. all contractors, the mine General Manager, engineers, adjacent landowners and authorities;
- Ensuring that all contractors/sub-contractors/employees are fully aware of their environmental responsibilities. This will take the form of an initial environmental awareness training or induction program in which the requirements of this document will be explained, as well as follow-up or additional training sessions as required; and
- Acting as the primary contact with I&AP's and adjacent landowners. It will be the responsibility of the Environmental Manager (or his appointed representative/s) to keep I&AP's updated and informed of all activities and decisions relating to project that may affect them and shall ensure that relevant contact details of relevant liaison parties are available for I & APs to make contact if required.

5.3.3.4 Human Resources

Management will ensure that personnel or person(s) performing tasks or work on its behalf affecting its activities, products and services that have the potential to cause an impact or risk shall be competent since appropriate education, training, skills and experience and shall retain associated records.

Human resource development within Grootegeluk is based on a combination of individual self- development (Individual Develop Plans or Programs (IDP) and formal/informal merit appraisals, promotion transfers, on-the-job training and discussions between individuals and Managers/Supervisors for the purpose of:

- Enabling the enterprise to achieve its business goals and objectives;

- Enabling individuals to perform at maximum level;
- Ensuring that competent personnel are used and are available when needed;
- Securing flexibility and expertise within the company;
- Allowing everyone, the opportunity to live up to his/her needs and aspirations, as well as to those of their colleagues; and
- To foster a culture of "doing things right first time" in a safe and cost-effective way.

5.3.4 Internal and External Communication

Communication is practiced at all functions and levels and is in the form of electronic media (e- mails), audio visual (tapes/videos) and/or traditional correspondence (caucuses, memos, notes, newsletters, periodicals, pamphlets, posters, slogans etc.).

5.3.4.1 Internal Communications

Internal communications regarding SHEQ aspects and the IMS takes place during: forum meetings, caucus, green area meetings, electronic mail, newsletter, information sessions, SHEQ meetings, road shows, GG Web, as well as Departmental Management Meetings by management representatives. The effectiveness of the IMS is communicated to all employees. Consultation with employees in regard to feedback on standards, procedures and SHEQ related programs is also done through the various SHEQ Forums and SHEQ Participative Structure meetings.

5.3.4.2 External Communications

External complaints and relevant correspondence on environmental, health, safety and quality matters shall be logged by the relevant SHEQ System Coordinator as a corrective request on the relevant Incident Management system. The correction request will then be directed to the responsible person to take corrective actions for answering the external parties according to the Grootegeluk Communication Strategy. Acknowledgement or receipt to the registered correction request shall be communicated via telephone or in writing, within ten (10) working days of receipt. Copies of such correspondence shall be maintained in accordance with the communication record.

All communication documents received from external parties including the Authorities must be handed over to the SHEQ secretary for record keeping.
All communications received from the Authorities (e.g. DWS, DEA, DMR) or I&AP will be officially answered on a Grootegeluk Coal Mine letterhead approved and signed by the General Manager of the Mine.

Both hard and electronic copies of all communications with external parties shall be filed in the Interested & Affected Parties (I & APs) folder/files managed by the SHEQ Systems Coordinator.

Information regarding significant environmental aspects as well as safety hazards shall be communicated to external parties on request as per the decision reached in the management review meeting.

The communication in regard to emergency issues that have the potential to impact on the surrounding communities will also be discussed as part of the management review, where management will make the decision on how these issues will be communicated.

The mine will have an annual information session with the I&APs where information affecting them will be communicated openly in regard to the environmental issues addressed by the mine as well as to give feedback on the steps taken to address any complaints received during the year. During this meeting the safety and health issues that relate to the community will also be discussed.

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5.3.5 Awareness Raising

Section 39 of the MPRDA requires Grootegeluk to have an environmental awareness plan to inform employees of any environmental risks which may result from their work. In addition to this, environmental awareness training has been identified during the EIA process as a mitigatory measure to prevent and minimise impacts on the receiving environment. Grootegeluk recognises the role of the environmental awareness plan in preventing and minimising its impacts from mining operations on the environment.

Therefore, the objectives of the environmental awareness plan is:

- To educate employees regarding their role in conserving the environment and the importance of conserving natural resources;
- To identify environmental training needs for employees and contractors at all levels;
- To ensure that employees whose work could cause significant environmental impact identified by the mine are competent to perform those tasks to which they are assigned;
- To enable employees to identify environmental impacts or non-conformances in their work activities on the environment;
- To familiarise employees with emergency preparedness and response requirements;

- To be aware of the potential consequences of deviation from specified operating procedures; and
- To conduct their work and manage mining activities in an environmentally responsible manner.

5.4 Monitoring and Control

Water resources monitoring is undertaken in terms of the Department of Water and Sanitation (DWS's) Best Practice Guidelines (BPG) for Water Monitoring Systems (2007). The objective of monitoring system is to:

- Develop environmental and water management plans based on impact monitoring;
- Generate monitoring data for the operational phase of the mine to be compared with baseline date before project implementation;
- Assess the impacts on receiving water environment; and
- Assess compliance with legal requirements.

Internal reporting includes monthly reports to the mine management on the performance against management commitments and expectation against authorisations and permits. External reporting requirements is guided by the permit and licenses received to that effect and the mine commit to comply with these statutory requirements at all times. This encompass incident reporting which, in terms of the Environmental Management System (EMS), requires classification of incidents into three categories (Levels 1, 2 & 3) depending on their severity or potential consequence to the environment.

All sampling & fieldwork shall be conducted based on the protocols and specifications, and code of practice contained in the SABS ISO 5667:1-15.

These international standards address all aspects from the program design, sampling methods as well as sample preservation and many other aspects.
Applicable standards include:

- ISO 5667-6: 2005 Part 6: Guidance on sampling of rivers and streams
- ISO 5667-1: 2006 Part 1: Guidance on the design of sampling programs
- and sampling techniques
- ISO 5667-3: 2003 Part 3: Guidance on preservation and handling of
- Samples
- ISO 5667-11: 1993 Part 11: Guidance on sampling of groundwater; and
- DWAF Best Practice Guidelines Series G3: General Guidelines for Water
- Monitoring Systems.

5.4.1 Surface Water Monitoring

The main objectives of surface water quality monitoring are to:

- Monitor and assess the quality of the water at different locations on the site and to determine if this complies with the stipulated requirements of regulatory authorities;
- Identify trends or changes to the water quality on or near the site. This is done by compiling a baseline record of certain water contaminants that are of concern to a coal mine and monitoring these throughout the life of the mine to assess any changes to these contaminants;
- Mitigate any negative effects that may impact on downstream water users from the coal mine operations;
- Provide Grootegeluk Mine with a guideline to ensure consistency in their surface water quality monitoring programme as well as ensuring that it is conducted in accordance with relevant permit and legal requirements;
- Serve as a reference to the frequency and methodology of their surface water quality monitoring programme; and
- Provide a consolidated reference of all monitoring sites and their locations to ensure samples are consistently measured at the same location.

Water quality monitoring for Grootegeluk Mine has been done constantly be the environmental department since January 2010. The samples and taken by the trained GG-Environmental Department personnel and then taken to an accredited laboratory where the samples are analysed.

The Water Monitoring Program for Grootegeluk which included the surface water monitoring plan and can be found in **Annexure I.** This document sets out the surface monitoring points, frequencies and methodology followed during the monthly sampling run.

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5.4.1.1 Surface Water Sampling

It should be noted that the nearest water course to Grootegeluk is a tributary to the Sandloop spruit which is approximately 5km to south of the mine. Thus, the surface water sample areas comprise of pollution control dams, dirty water conveyances like channels and in pit sumps.

The Grootegeluk approved Surface Water monitoring plan is available as part of the Grootegeluk Water Management Operational Practice Instruction (OPI). This monitoring plan is available as part of the Grootegeluk Water Management Operational Practice Instruction (OPI) (Rev 1)(**Annexure I**). It should be noted that the current amendment and

new uses will not trigger any changes to the current monitoring program.

The surface water quality monitoring points can be seen in Table 5.1 below and their locations are shown in Figure 5.3. The recorded average dam water qualities sampled for 2021 can be seen in Table 5.2. The annual surface water quality report for 2021 is attached in **Annexure J**.

The DWS also maintains some flow stations in the area. The river systems in this region have large sand banks and sediment and often run dry. They flow mainly during the months of January to March with low flows being recorded during December, April and May. The rest of the year has little, or no flow and the river runs dry during the winter and early spring. These flows correlate with the rainfall pattern of the area in that the rains peak from December through to March, allowing the rivers to flow freely.

Table 5.1 Surface Water Quality Monitoring Points

POINT ID	DESCRIPTION	COORDINATES		FREQUENCY
PSP	Product stockpile point	S -23.65531	E 27.55928	Monthly
CNL	Canal near new laboratory area	S -23.66192	E 27.55698	Monthly
TDB	Total depot bridge point	S -23.66587	E 27.55682	Monthly
GEO	Geo-hydrological membrane cut off trench	S -23.63427	E 27.57470	Monthly
PSS	Pit Service Station Separator	S -23.66923	E 27.55158	Monthly
CWS	Central workshop Separator	S -23.66562	E 27.56201	Monthly
PWDS	Pool workshop Separator	S -23.66169°	E 27.56504°	Monthly
VTJ	Voëltjie Dam	S -23.67927	E 27.55882	Monthly
D6D	Dam North of dump 6	S -23.66783	E 27.56132	Monthly
OXI	Oxidation Dam	S -23.67585	E 27.55946	Monthly
SWWT	New Sewage Waste Water Treatment Plant	S -23.67059	E 27.55608	Monthly
CPRWD	Cyclic Ponds Return Water Dams	S -23.63209	E 27.56914	Monthly
MMB	Mamba dam	S -23.63647	E 27.57276	Monthly
OLI	Olifantskop dam	S -23.66736	E 27.55842	Monthly
BSB	Bosbok Dam	S -23.64760	E 27.56294	Monthly
CHA	Char Pollution Control Dam	S -23.64867	E 27.55388	Monthly
PIT	Pit – Bench 11	S -23.67746	E 27.54612	Monthly
PIT 13	Bench 13	S -23.67699	E 27.52901	Monthly
CTL	Control sample (tap water for analysis reference)	S -23.66245	E 27.56065	Monthly
Attenuation dam 1	Next GG7&8 project office	S 23.650807	E27.544923	Monthly
Attenuation dam 2	Next to the Rail-loop	S 23.649121	E27.548007	Monthly
Attenuation dam 3	Adjacent capital yard	S 23.649188	E 27.548043	Monthly
Attenuation dam 4	Opposite Char plant	S 23.557873	E 27.551461	Monthly

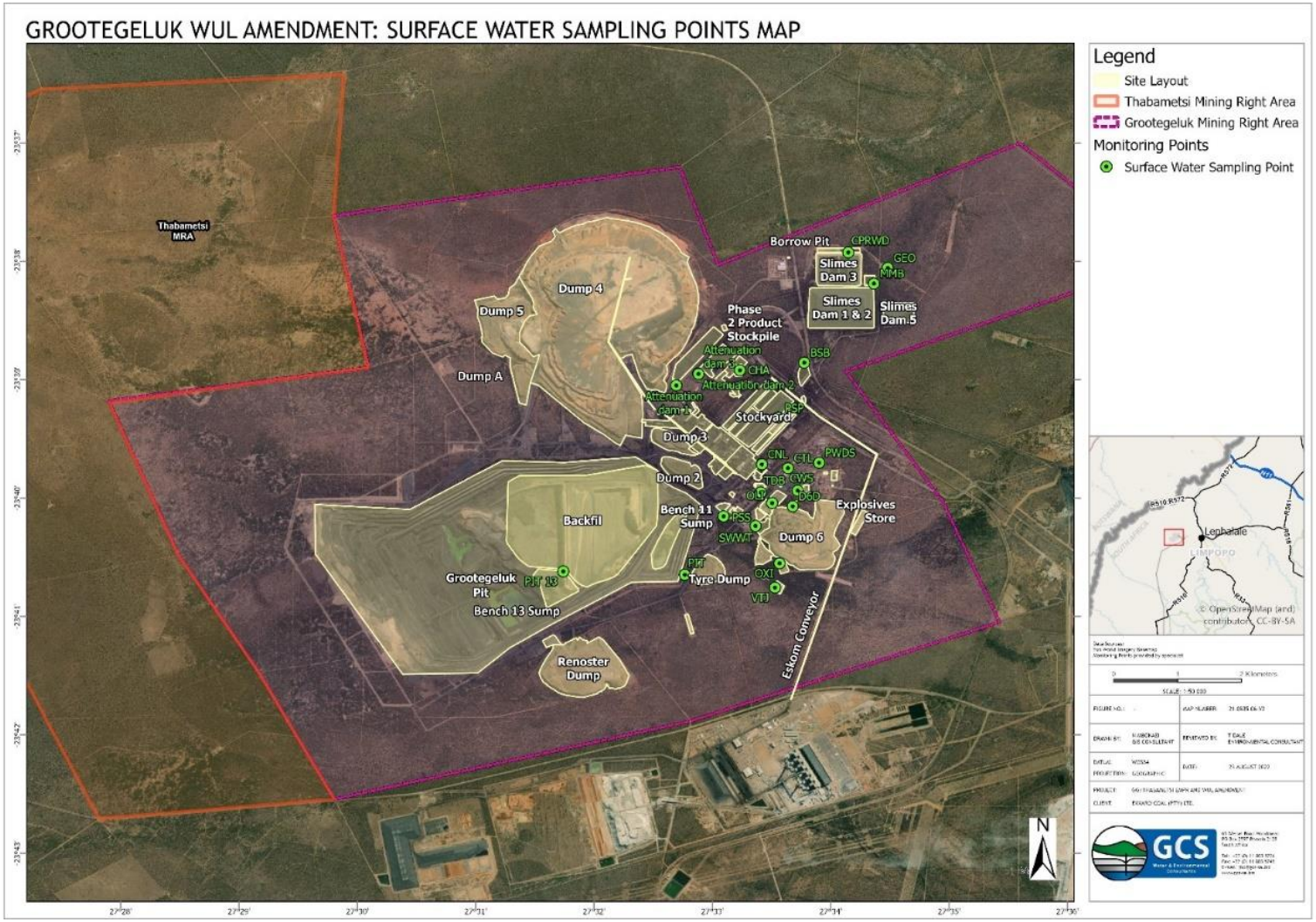


Figure 5.3 Surface Water Monitoring Points

Table 5.2 The average inorganic analysis results for the dam localities during the annual period.

AVERAGE DATA TABLE:															
PROJECT NAME				Grootegeluk Mine											
ASSESSMENT SET 1				IWUL; July 2018 GG Water Limits for Waste Water											
ASSESSMENT SET 2				General Authorisation Limit, Section 21f and h, 2013											
				Value exceeds the assessment set 1											
VARIABLE	UNITS	ASSESSMENT 1	ASSESSMENT 2	MONITORING LOCALITIES											
				BSB	CHA	CPRWD	MMB	OLI	OXI	VTJ	D6D	ATT D01	ATT D02	ATT D03	ATT D04
pH @ 25°C	pH	3.0/10.0	5.5/9.5	7.87	8.15	8.07	7.7	6.3		8.8	7.55	4.08	7.6	6.57	8.11
Electrical conductivity (EC) @ 25°C	mS/m	500	150	300	68.6	317	319	305		17.8	151	189	118	134	416
Total dissolved solids (TDS)	mg/l	-	-	2810	455	2948	3011	2706		112	1284	1623	947	1108	3770
Total hardness	mg CaCO3/l	-	-	1984	349	2119	2184	2014		76	856	1078	695	810	3025
Calcium (Ca)	mg/l	700	-	472	89.6	509	534	414		21.1	174	314	208	232	373
Magnesium (Mg)	mg/l	300	-	196	30.5	206	207	238		5.62	102	71.5	42.7	56.3	508
Sodium (Na)	mg/l	600	-	46	6.33	57.9	48.7	43.7		7.72	81.3	6.36	*1.81*	*0.883*	*41.9*
Potassium (K)	mg/l	-	-	20.3	4.52	22	20.5	18.6		2.67	13.9	6.34	2.04	1.15	32.1
Fluoride (F)	mg/l	5	1	0.91	0.841	1.41	*0.904*	1.89		*0.145*	0.555	*0.521*	*0.267*	*0.221*	*0.477*
Total alkalinity	mg CaCO3/l	-	-	79.5	78.4	113	69	28.1		44.8	133	*3.34*	21.4	14.8	95.6
Chloride (Cl)	mg/l	400	-	36.3	16.3	40.8	35.3	36.7		8.28	52.2	7.63	1.99	*0.981*	34.1
Sulphate (SO4)	mg/l	3000	-	1901	257	1963	2060	1927		34.5	771	1191	675	806	2720
Nitrate (NO3) as N	mg/l	35	15	19.4	*0.373*	16.7	13.9	1.39	Dry	*0.796*	*0.835*	0.459	0.424	0.332	0.407
Ammonium (NH_4) as N	mg/l	-	6	2.12	0.08	1.69	0.863	2.33		0.14	2.12	17.3	0.2	0.376	0.251
Orthophosphate (PO4) as P	mg/l	-	10	*0.02*	*0.02*	*0.019*	*0.023*	*0.015*		*0.041*	*0.154*	*0.003*	*0.003*	*0.003*	*0.012*
Aluminium (Al)	mg/l	-	-	*0.007*	*0.001*	*0.013*	*0.003*	*2*		*0.01*	*0.001*	18.9	*0.292*	*0.121*	*0.003*
Iron (Fe)	mg/l	-	0.3	*0.004*	*0.002*	*0.003*	*0.002*	*0.009*		*0.009*	*0.32*	*0.306*	*0.005*	*0.006*	*0.002*
Manganese (Mn)	mg/l	-	0.1	2.89	*0.007*	3.26	*1.02*	7.78		*0.004*	*1.58*	5.97	1.12	2.46	*0.777*
Nitrite (NO_2) as N	mg/l	-	-	1.73	*0.062*	1.13	0.394	*0.08*		*0.057*	*0.068*	*0.052*	0.092	*0.104*	*0.078*
Chemical oxygen demand (COD)	mg/l	-	75	54.9	55.8	33.4	44.5	86.4		55.6	240	208	30.8	275	76.9
Total suspended solids (TSS)	mg/l	-	25	43	*21*	26	30	*94*		*15*	*179*	408	*53*	377	66
Cadmium (Cd)	mg/l	-	0.005	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*		*0.001*	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*
Cobalt (Co)	mg/l	-	-	*0.029*	*0.002*	*0.01*	*0.004*	*0.592*		*0.002*	*0.044*	0.136	*0.007*	0.028	*0.006*
Sodium Adsorption Ratio	SAR	-	-	0.43	0.14	0.54	0.43	0.42		0.44	0.76	0.08	0.04	0.02	0.3

5.4.2 Groundwater Monitoring

The groundwater monitoring network design for Grootegeluk is based on the risk based source-pathway-receptor principle. A groundwater monitoring network contains monitoring positions assesses the groundwater status at certain areas.
Both the impact on water quality and water quantity should is catered for in the monitoring system. The boreholes in the network also covers the following:

- Source monitoring – monitoring close to possible contaminant sources;
- Plume (pathway) monitoring – monitoring along identified contamination plumes;
- Impact (receptor) monitoring – monitoring at expected sensitive receptors; and
- Monitoring of the background water quality and levels.

The groundwater monitoring network design for Grootegeluk is based on the risk based source-pathway-receptor principle. A groundwater monitoring network contains monitoring positions assesses the groundwater status at certain areas.
Both the impact on water quality and water quantity should is catered for in the monitoring system. The boreholes in the network also covers the following:

- Source monitoring – monitoring close to possible contaminant sources;
- Plume (pathway) monitoring – monitoring along identified contamination plumes;
- Impact (receptor) monitoring – monitoring at expected sensitive receptors; and
- Monitoring of the background water quality and levels.

It should be noted that both the Cyclic Ponds boreholes as well as the Abstraction Boreholes are represented in the Site and Compliance Monitoring Groups.

- Compliance Monitoring Boreholes positions are shown in Table 5.3 and Figure 5.4.
- Site Monitoring Boreholes positions are shown in Table 5.4 and Figure 5.5
- Abstraction Boreholes positions are shown in Table 5.5 and Figure 5.6.

The Annual Groundwater Quality Report for 2022 is available in **Annexure K** and indicates the detail of the sampling done during the 2022 sampling period. It also gives a detailed analysis of the groundwater quality data and the performance against the Limit of the Grootegeluk Water uses licence.

Table 5.3 Compliance Monitoring Boreholes

BOREHOLE NUMBER	LATITUDE	LONGITUDE	GROUNDWATER MONITORING OBJECTIVE	FREQUENCY
GW01S	-23.61215	27.52182	Shallow aquifer conditions north of Grootegeluk mine	Bi-Annually
LT23	-23.66379	27.49084	Aquifer conditions to the north west of GG pit	Bi-Annually
LT39	-23.65487	27.46632	Aquifer conditions South of Daarby Fault, north-east of Grootegeluk pit	Bi-Annually
MY19	-23.6458	27.4956	Aquifer conditions South of Daarby Fault, west of GG dump 4 &5	Bi-Annually
MYSPES50	-23.63903	27.49078	Thabametsi monitoring network	Bi-Annually
TE88	-23.68609	27.5693	Aquifer conditions south-east of GG mine, Dump 6 and borrow pit	Bi-Annually
TE90	-23.68176	27.5423	Aquifer conditions south of GG mine pit and south of Daarby fault	Bi-Annually
TE96	-23.68387	27.58156	Aquifer conditions south-east of GG mine, Dump 6 and borrow pit	Bi-Annually
VP03	-23.69996	27.48121	Aquifer conditions to the west of GG pit	Bi-Annually
WB41	-23.66767	27.55999	Site monitoring	Bi-Annually
WBR01	-23.66037	27.58915	Aquifer conditions north of Daarby fault to the north-east of GG mine (Dump 6)	Bi-Annually
WBR02	-23.65657	27.57637	Aquifer conditions north of Daarby fault to the north-east of GG mine	Bi-Annually
WBR07	-23.6422	27.5931	Aquifer conditions to the north-east of GG mine – north of Daarby fault	Bi-Annually
WBR09A	-23.62978	27.54518	Aquifer conditions north of Daarby fault to the north of Grootegeluk (GG) mine (Dump 4)	Bi-Annually
WBR10	-23.63479	27.52091	Aquifer conditions north of Daarby fault to the north-east of Grootegeluk mine (Dump 4 & 5)	Bi-Annually
WBR18	-23.67015	27.55221	Site monitoring	Bi-Annually
WBR32	-23.64543	27.56684	Aquifer conditions south of Slimes dams 1, 2 & 5 of GG mine	Bi-Annually
WBR33	-23.69752	27.52042	Aquifer conditions south-west of GG pit and Renoster dump	Bi-Annually
WBR38	-23.65431	27.6018	Aquifer conditions to the east of GG mine – north of Daarby fault	Bi-Annually
WBR41	-23.68444	27.48155	Aquifer conditions south of Daarby fault to the west of Grootegeluk mine	Bi-Annually
WBR42	-23.69528	27.48861	Aquifer conditions south of Daarby fault to the west of Grootegeluk mine	Bi-Annually
WBR43	-23.64926	27.55462	Aquifer conditions of GG Char Plant	Bi-Annually

BOREHOLE NUMBER	LATITUDE	LONGITUDE	GROUNDWATER MONITORING OBJECTIVE	FREQUENCY
WBR45	-23.63051	27.50545	Aquifer conditions to the east of GG mining waste and recycle yard	Bi-Annually
WBR46	-23.70937	27.49688	Aquifer conditions south-west of Grootegeluk mine	Bi-Annually
WBR48	-23.62806	27.48128	Aquifer conditions South of Daarby Fault, north- west of GG dump 4 & 5	Bi-Annually
WBR49 *	-23.62726	27.56745	Aquifer conditions north-east of GG mine, slimes Dump 1 and 2 and Cyclic Ponds, Tox	Quarterly
WBR50	-23.69916	27.53916	Aquifer conditions south of GG mine pit and south of Daarby fault	Bi-Annually
JY25	-23.65497	27.44669	Thabametsi monitoring network	Bi-Annually

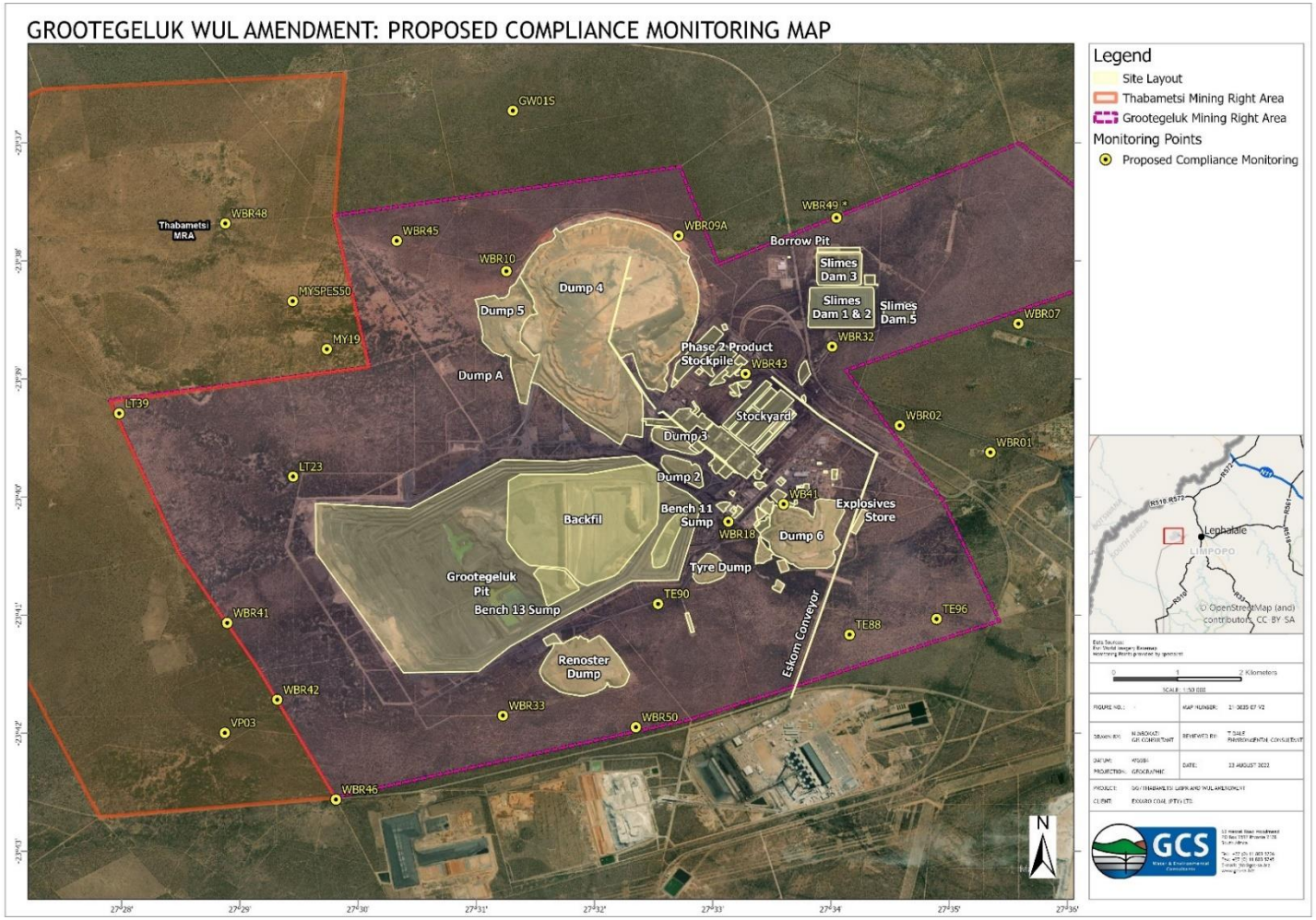


Figure 5.4 Compliance Monitoring Boreholes

Table 5.4 Proposed Site Monitoring Boreholes

Borehole Number	Latitude	Longitude	Groundwater Monitoring Objective	Frequency
WB25	-23.66033	27.56523	Site monitoring	Bi-Annually
WB34	-23.65471	27.54765	Site monitoring	Bi-Annually
WB36A	-23.65809	27.54053	Site monitoring	Bi-Annually
WB39A	-23.66761	27.55633	Site monitoring	Bi-Annually
WB45	-23.6649	27.56437	Site monitoring	Bi-Annually
WB46	-23.66846	27.5643	Site monitoring	Bi-Annually
WB50	-23.65078	27.56328	Site monitoring	Bi-Annually
WB53	-23.6646	27.55503	Site monitoring	Bi-Annually
WB55	-23.66136	27.56539	Site monitoring	Bi-Annually
WB56	-23.66	27.55012	Site monitoring	Bi-Annually
WB60	-23.65828	27.56271	Site monitoring	Bi-Annually
WB62	-23.65491	27.57133	Site monitoring	Bi-Annually
WBR03*	-23.63658	27.56375	Site monitoring, Tox, Cyclic ponds	Quarterly
WBR04*	-23.64251	27.57335	Site monitoring, Tox, Cyclic ponds	Quarterly
WBR05	-23.63652	27.57322	Site monitoring	Bi-Annually
WBR15	-23.64467	27.55609	Site monitoring	Bi-Annually
WBR17	-23.67195	27.54886	Site monitoring	Bi-Annually
WBR24*	-23.63901	27.57888	Site monitoring, Tox, Cyclic ponds	Quarterly
WBR31	-23.66472	27.55734	Site monitoring	Bi-Annually
WBR39	-23.67662	27.55924	Site monitoring	Bi-Annually
WBR40	-23.67527	27.55946	Site monitoring	Bi-Annually
WBR29	-23.66501	27.55661	Site monitoring	Bi-Annually
WBR35	-23.69299	27.53509	Site monitoring	Bi-Annually

Borehole Number	Latitude	Longitude	Groundwater Monitoring Objective	Frequency
AV01	-23.63514	27.57171	Site monitoring	Bi-Annually

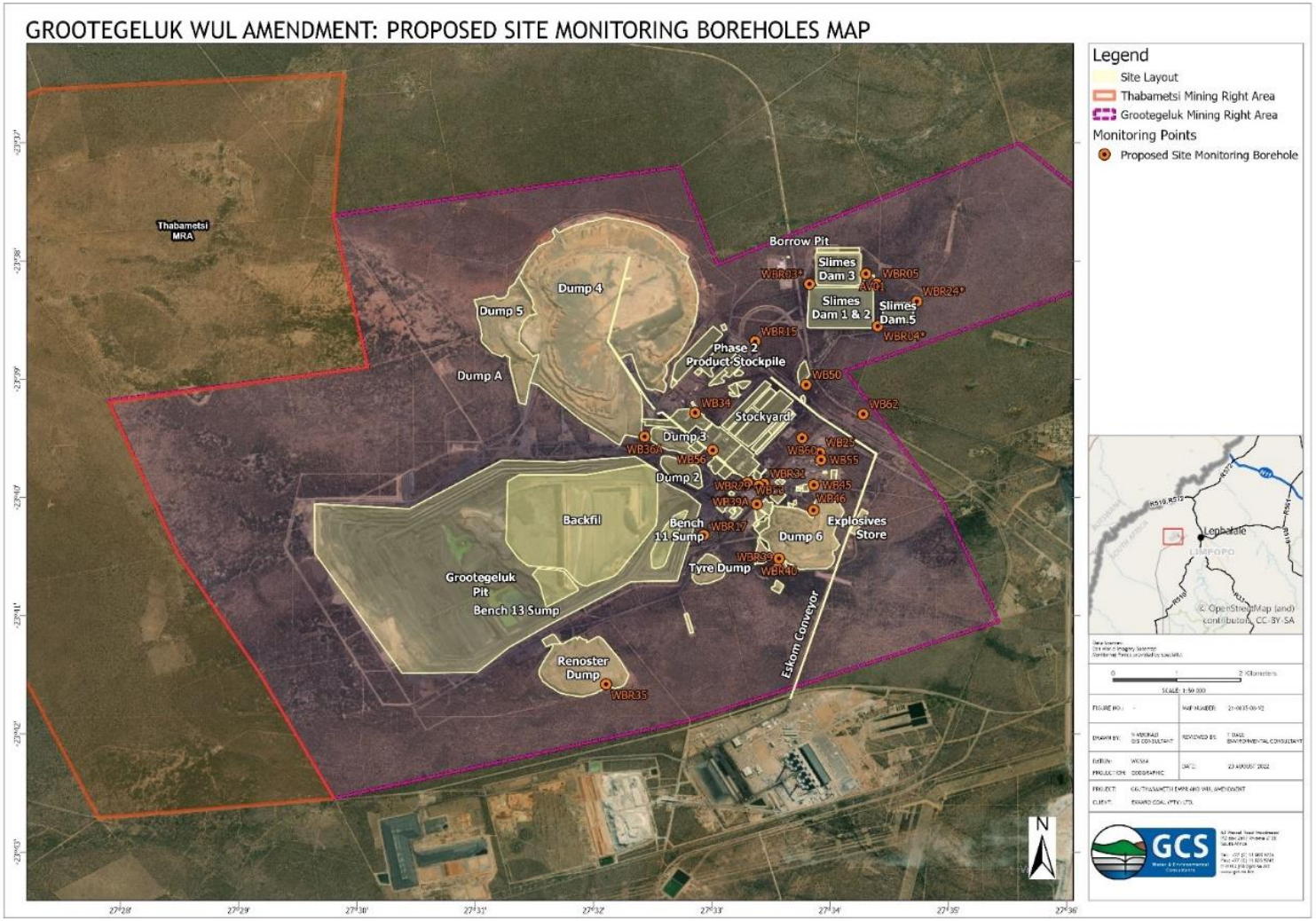


Figure 5.5 Site Monitoring Boreholes

Table 5.5 Abstraction Boreholes

Borehole Number	Latitude	Longitude	Groundwater Monitoring Objective	Frequency
WB 33	-23.6544	27.54896	Site Monitoring	Bi-Annually
WB 35	-23.6526	27.54501	Site Monitoring	Bi-Annually
WB 36A	-23.65809	27.54053	Site Monitoring	Bi-Annually
WB 38	-23.6615	27.5458	Site Monitoring	Bi-Annually
WB 39A	-23.66761	27.55633	Site Monitoring	Bi-Annually
WB 41	-23.665	27.56032	Site Monitoring	Bi-Annually
WB 42	-23.6671	27.55522	Site Monitoring	Bi-Annually
WB 43	-23.6626	27.55869	Site Monitoring	Bi-Annually
WB 45	-23.6622	27.5647	Site Monitoring	Bi-Annually
WB 46	-23.6658	27.56463	Site Monitoring	Bi-Annually
WB 49	-23.6553	27.5608	Site Monitoring	Bi-Annually
WB 50	-23.6481	27.5636	Site Monitoring	Bi-Annually
WB 51	-23.6579	27.56169	Site Monitoring	Bi-Annually
WB 52	-23.6654	27.55193	Site Monitoring	Bi-Annually
WB 53	-23.6619	27.55535	Site Monitoring	Bi-Annually
WB 54	-23.6651	27.56029	Site Monitoring	Bi-Annually
WB 55	-23.6587	27.56572	Site Monitoring	Bi-Annually
WB 56	-23.6573	27.55878	Site Monitoring	Bi-Annually
WB 57	-23.6498	27.55041	Site Monitoring	Bi-Annually
WB 59	-23.656	27.55546	Site Monitoring	Bi-Annually

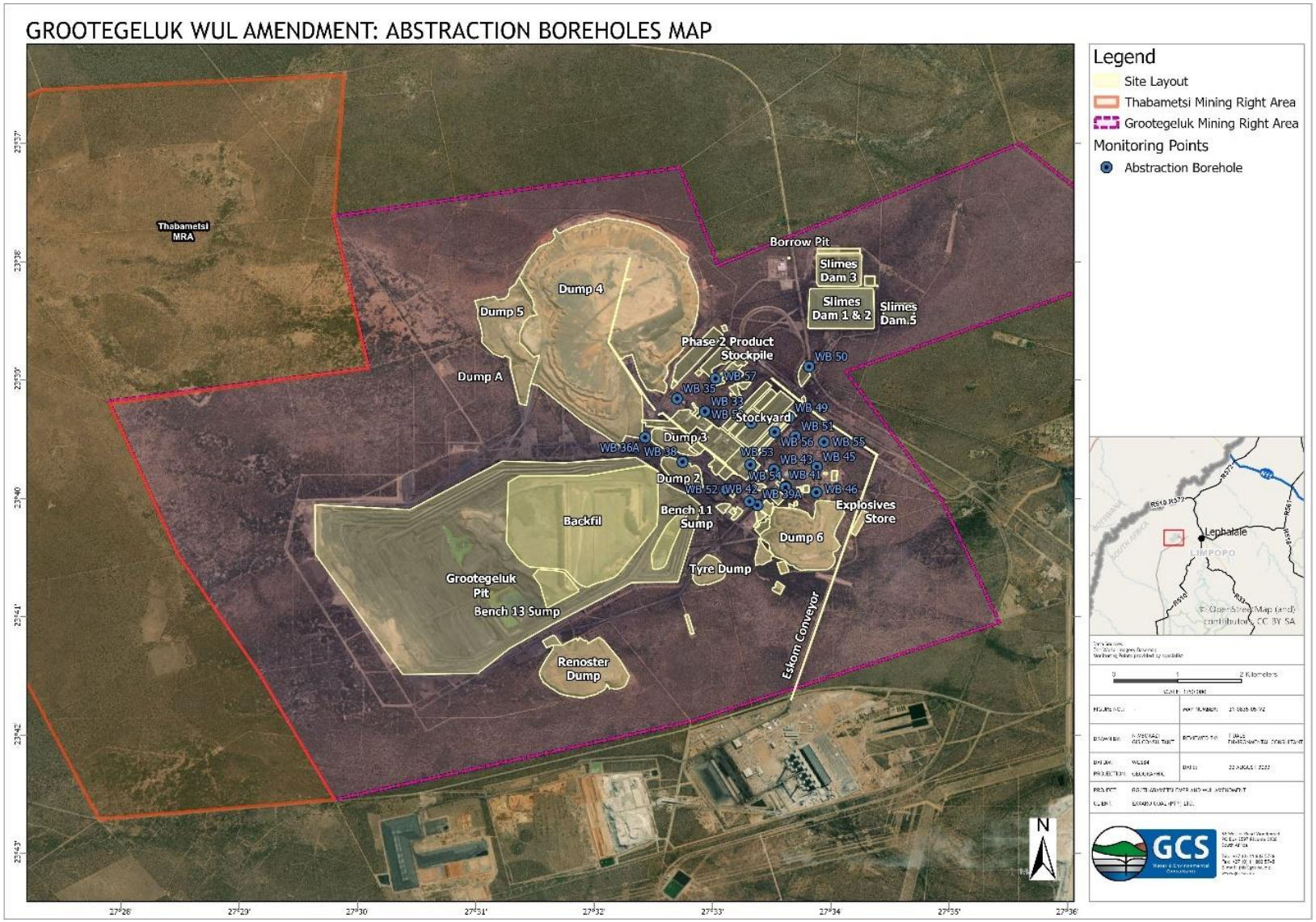


Figure 5.6 Abstraction Boreholes

5.4.3 Biomonitoring

Grootegeluk was issued with a Water Use license(07/A42J/CICI/6418) which authorise the altering of 63 seasonal pans in the Exxaro mining Authorisation area, for water use in terms of section 21(c) and (i) of the National Water Act, 1998 (Act 36 of 1998). The seasonal pans that occur in front of the Grootegeluk pit area will all be lost to mining in the next 30-years as the mine expands. The updated Bio-monitoring methodology that was submitted to DWS in September 2023 available in Annexure L,. According to with the methodology the monitoring will in future focus on the 27 pans out of the license 63 that will not be destroyed by mining due to the change in the mine plan. The implementation of the new monitoring program will commence in 2024. a total 18 pans are monitored. Table 5.6 **and Figure 5.7** gives the details and positions of the pans that will form part of the monitoring program.

Table 5.6 New Biomonitoring Points

Pan ID	Property Description	Co-ordinates		Cycle (Year 1, 2, 3)
		Longitude	Latitude	
Pan 8	Leeuwdrift 321 LQ	23°39'35.58"S	27°29'10.72"E	1
Pan 9	Leeuwdrift 321 LQ	23°39'41.48"S	27°29'7.74"E	2
Pan 10	Leeuwdrift 321 LQ	23°39'40.96"S	27°29'9.69"E	3
Pan 11	Leeuwdrift 321 LQ	23°39'42.92"S	27°29'9.25"E	1
Pan 12	Leeuwdrift 321 LQ	23°39'50.94"S	27°28'58.81"E	2
Pan 15	Leeuwdrift 321 LQ	23°39'29.05"S	27°28'50.84"E	3
Pan 16	Leeuwdrift 321 LQ	23°39'30.61"S	27°28'52.85"E	1
Pan 41	Hieromtrent 460 LQ	23°41'32.27"S	27°29'52.69"E	2
Pan 42	Hieromtrent 460 LQ	23°41'34.63"S	27°29'56.58"E	3
Pan 43	Hieromtrent 460 LQ	23°41'34.05"S	27°29'57.60"E	1
Pan 45	Hieromtrent 460 LQ	23°41'25.17"S	27°29'56.74"E	2
Pan 46	Hieromtrent 460 LQ	23°41'42.40"S	27°30'14.44"E	3
Pan 47	Hieromtrent 460 LQ	23°41'44.50"S	27°29'56.97"E	1

Pan ID	Property Description	Co-ordinates		Cycle (Year 1, 2, 3)
		Longitude	Latitude	
Pan 48	Hieromtrent 460 LQ	23°41'39.24"S	27°29'28.76"E	2
Pan 49	Hieromtrent 460 LQ	23°41'43.19"S	27°29'30.33"E	3
Pan 50	Hieromtrent 460 LQ	23°41'48.10"S	27°29'38.82"E	1
Pan 51	Hieromtrent 460 LQ	23°41'50.92"S	27°30'19.25"E	2
Pan 52	Hieromtrent 460 LQ	23°41'55.24"S	27°30'17.10"E	3
Pan 53	Hieromtrent 460 LQ	23°42'20.85"S	27°30'33.75"E	1
Pan 54	Hieromtrent 460 LQ	23°42'10.58"S	27°30'42.97"E	2
Pan 55	Hieromtrent 460 LQ	23°42'08.86"S	27°30'43.64"E	3
Pan 56	Hieromtrent 460 LQ	23°42'05.88"S	27°30'44.24"E	1
Pan 57	Hieromtrent 460 LQ	23°42'15.54"S	27°30'56.41"E	2
Pan 58	Hieromtrent 460 LQ	23°42'13.15"S	27°30'57.61"E	3
Pan 60	Hieromtrent 460 LQ	23°42'10.14"S	27°31'26.96"E	1
Pan 61	Hieromtrent 460 LQ	23°41'58.32"S	27°32'10.08"E	2
Pan 62	Hieromtrent 460 LQ	23°41'54.67"S	27°32'29.58"E	3

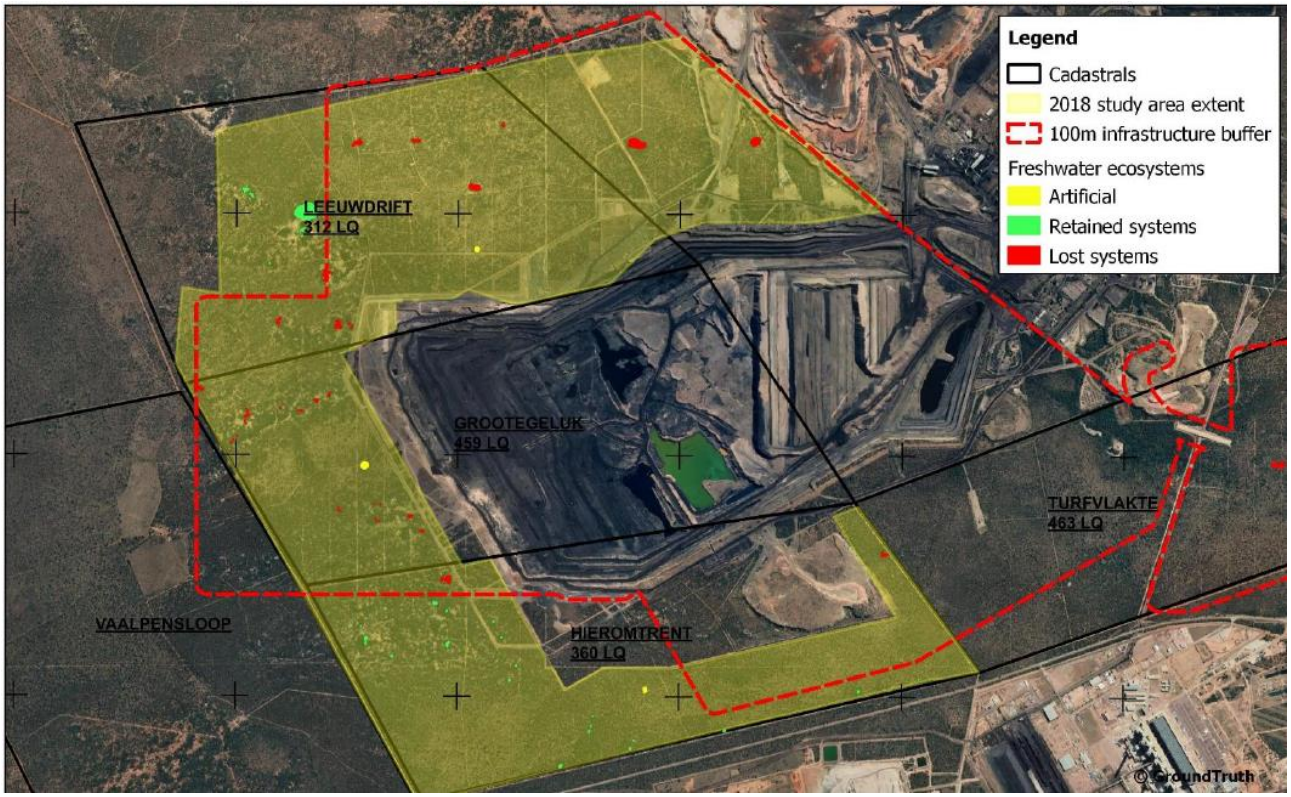


Figure 5.7 New Biomonitoring sites linked to the retained systems

5.4.4 Waste Monitoring

In terms of the waste monitoring that is performed on site, a risk management approach is adopted. Continuous assessments are also performed i.e. audits, in order to assess the performance of the waste management on site. After the evaluation and the necessary controls have been set up to eliminate wastages, the environmental management have to ensure continuity and follow up:

- Issue based assessments regarding Waste Management, when required;
- Continuous assessments regarding Waste Management;
- Training and education with regards to the Waste Management;
- PPE (application, availability, types, usage, and costs);
- Purchasing standards with regards to waste producing equipment and machinery;
- Periodic review of the Base Line Risk Assessment regarding Waste; and
- Periodic review of this procedure.

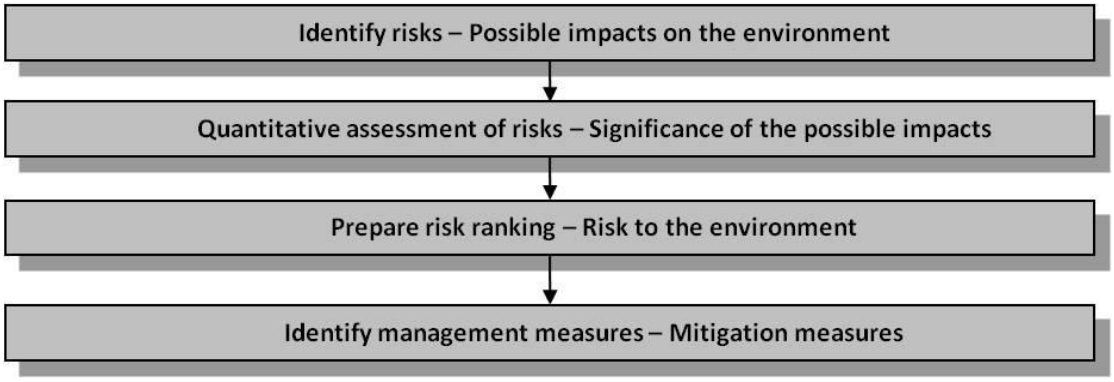
All necessary tests are carried out by the contracted waste removal company.

5.5 Risk Assessment/Best Practice Assessment

To ensure uniformity, the assessment of potential impacts was addressed in a standard manner so that a wide range of impacts is comparable. For this reason, a clearly defined rating scale was provided to the specialist to assess the impacts associated with their investigation.

Each impact identified was assessed in terms of probability (likelihood of occurring), scale (spatial scale), magnitude (severity) and duration (temporal scale). To enable a scientific approach to the determination of the environmental significance (importance), a numerical value will be linked to each rating scale.

The following process was followed:



The following methodology was used to rank potential impacts. Clearly defined ranking scales were used to assess the impacts associated with the proposed activities.

Each impact identified was rated according the expected magnitude, duration, scale and probability of the impact (refer to Table 5.14). Each impact identified was assessed in terms of scale (spatial scale), magnitude (severity) and duration (temporal scale). Consequence is then determined as follows:

Consequence = Severity + Spatial Scale + Duration

The Risk of the activity is then calculated based on frequency of the activity and impact, how easily it can be detected and whether the activity is governed by legislation. Thus:

Likelihood = Frequency of activity + frequency of impact + legal issues + detection

The risk is then based on the consequence and likelihood.

Risk = Consequence x likelihood

In order to assess each of these factors for each impact, the ranking scales in Table 5.7 to Table 5.13 were used.

Table 5.7 Severity

Insignificant / non-harmful	1
Small / potentially harmful	2
Significant / slightly harmful	3
Great / harmful	4
Disastrous / extremely harmful / within a regulated sensitive area	5

Table 5.8 Spatial Scale - How big is the area that the aspect is impacting on?

Area specific (at impact site)	1
Whole site (entire surface of site)	2
Local (within 5km)	3
Regional / neighbouring areas (5km to 50km)	4
National	5

Table 5.9 Duration

One day to one month (immediate)	1
One month to one year (Short term)	2
One year to 10 years (medium term)	3
Life of the activity (long term)	4
Beyond life of the activity	5

Table 5.10 Frequency of the activity - How often do you do the specific activity?

Annual or less	1
Bi-annually	2
Monthly	3
Weekly	4
Daily	5

Table 5.11 Frequency of the incident/impact - How often does the activity impact the environment?

Almost never / almost impossible / >20%	1
Very seldom / highly unlikely / >40%	2
Infrequent / unlikely / seldom / >60%	3
Often / regularly / likely / possible / >80%	4
Daily / highly likely / definitively / >100%	5

Table 5.12 Legal issues - How is the activity governed by legislation?

No legislation	1
Fully governed by legislation	5

Table 5.13 Detection - How quickly/easily can the impacts/risks of the activity be detected on the environment, people and property?

Immediately	1
Without much effort	2
Need some effort	3
Remote and difficult to observe	4
Covered	5

Environmental effects will be rated as either of high, moderate or low significance on the basis provided in Table 5.14.

Table 5.14 Impact Ratings

Rating	Class
1-55	(L) Low Risk
56 – 169	(M) Moderate Risk
170 - 600	(H) High Risk

No specialist findings have been modified by the Consultant. The information provided within this report reflects the opinion of the specialists, in agreement with the Consultant. The applicant has reviewed all the conditions.

The rating of the identified impact associated with the two boreholes and the associated mitigation measures proposed are provided in Table 5.15. The impacts relating to the rest of the mining area are submitted annually as part of the required IWWMP updates and were authorised as part of the original application and licenses issued.

Table 5.15 Impacts and Management Measures

Impact description					Significance before mitigation	Significance after mitigation	Mitigation measures
No.	Phases	Activity	Aspect	Impact			
1	Operation	Pit	In-pit storage of process water	Pit fills up and impacts on production causing flooding into mine workings	M	M	Investigate additional storage requirements due to expansion of mining operation. (GGIWMS Project). Optimisation of re-use and recycle of process water stored in pit. Annual update of the water balance and WC/WDM plan results to determine areas of improvement.
2	Operation	Reductants Plant	Exceedance of liquor tank capacity	Overflow from bunded area to unlined surface areas.	M	M	Stop storing excess liquor in the bunded area of the plant during stoppages. Investigate alternative.
3	Operation	Reductants Plant	Feed and Product Stockpiles not lined as per license requirements	Deterioration in groundwater qualities under the plant	M	M	The facilities are to be lined with the refurbishment of the Reductant plant area.

Impact description					Significance before mitigation	Significance after mitigation	Mitigation measures
No.	Phases	Activity	Aspect	Impact			
4	Operation	Plant Areas	Kidney Stockpile tunnel flooding	Cessation of operations due to flooding of underground tunnels	M	M	Ongoing maintenance and monitoring of area
5	Operation	Plant Areas	Excessive sedimentation inside water management infrastructure	Loss of functionality of conveyance system due to excessive siltation and legal non- compliance with GN704 resulting in legal action.	M	M	Optimal operation of plant ensure cleaning contract is in place. Investigate how fines in channels can be minimised.
6	Operation	Plant Areas	Deterioration in process water quality	Impact on localised aquifer	M	M	Implement planned additional lime dosing facilities. Maintain groundwater abstraction programme
7	Operation	Slimes Dams Complex	Incorrect ratios of fines and ultra-fines on Slimes Dam (SD) 1&2	Spillage to receiving environment resulting in legal non-compliance and legal action.	M	M	Maintain current control in terms of maintenance and stability management. Continue with quarterly stability inspections.
8	Operation	Discard Dump	Inadequate storm water system around Dump 4 & 5	Dirty water contaminating clean storm water and reports to environment	M	M	Implement the Rehab Project and final design once authorization is received. Implement the Erosion Control Action Plan.

Impact description					Significance before mitigation	Significance after mitigation	Mitigation measures
No.	Phases	Activity	Aspect	Impact			
9	Operation	Pit	Backfilling of pit with carbonaceous s material	Corrosion of plant equipment.	M	M	Complete the GGIWMS Project looking at minimizing water to the pit. • Improving re-use of water from pit • Improving quality of water be considering treatment
9	Operation	Pit	Backfilling of pit with carbonaceous s material	Adverse impact on post-closure land-use potential.	H	M	• Closure capping of the area to support the final land-use. This is to be investigated once backfill can be covered.
10	Operation	Workshops	Ineffective oil separator and conveyance systems.	Hydrocarbon contaminated soil.	M	M	Maintenance of current separators and conveyance systems
10	Operation	Workshops	Ineffective oil separator and conveyance systems.	Potential groundwater separation.	M	M	Investigate increasing size of drying beds. Ongoing maintenance and cleaning of system and silt traps
11	Operation	Pit	In-pit storage of process water.	Legal non- compliance resulting in legal action or pre-directive.	M	M	Continued engagement with DWS. Complete the GGIWMS Project looking at minimizing water to the pit.
12	Operation	Pit	Impact on Seasonal pans as pit expands	Loss of pans and drop PES level before being mined.	H	M	Implementation of Bio-monitoring plan. Ensure Offset plan is implemented to compensate for loss of seasonal pans. Minimize impact on the pans as far as possible before they are lost.
13	Operation	Plant Areas	Recharge of poor- quality water from various	Migration of polluted plume of contaminated water via faults outside the mine area.	M	M	Continue existing control. Maintain groundwater abstraction programme Monitoring of groundwater levels and

Impact description					Significance before mitigation	Significance after mitigation	Mitigation measures
No.	Phases	Activity	Aspect	Impact			
			historical sources.	Structural integrity of plant compromised.			quantities and assessment of pollution plume
14	Operation	Plant Areas	Process water insecurity.	Production loss and increase in water tariffs	H	M	Continue with water optimisation initiatives
15	Operation	Reductants Plant	Reductants storm water drainage system does not cater for the full feed stockpile area	Contaminated storm water reports to mine dirty storm water management system.	M	M	Include storm water management upgrade in Reductants expansion project where required.
16	Operation	Reductants Plant	Overtopping of Reductants PCD.	Introduced to plant storm water system.	M	M	Continue existing control. Maintain groundwater abstraction programme. Monitoring of groundwater levels and quantities and assessment of pollution plume
16	Operation	Reductants Plant	Overtopping of Reductants PCD.	Potential new pollutants (NAPLS)	M	M	Continue existing control. Maintain groundwater abstraction programme. Monitoring of groundwater levels and quantities and assessment of pollution plume
17	Operation	Slimes Dams Complex	Remaining gaps in storm water drainage around SD1&2	Contaminated storm water runoff reporting to receiving environment.	H	M	Complete storm water upgrade to include the inlet into the cement dam.

Impact description					Significance before mitigation	Significance after mitigation	Mitigation measures
No.	Phases	Activity	Aspect	Impact			
18	Operation	Slimes Dams Complex	Unlined SDC.	Deterioration of regional groundwater quality.	H	M	Maintain current control.
19	Operation	Discard Dump	Inadequate storm water drainage from and around dumps.	Mobilisation of material reporting to the environment impacting on soil quality	H	M	Develop final shape and design, inclusive of storm water monitoring, and then implement.
20	Operation	Discard Dump	Excessive ponding on Dump 3 near the slope area.	Movement of material into plant area causing destruction of crushers and breakers in plant area.	M	M	Maintain current control.
21	Operation	Discard Dump	Unlined residue disposal facilities.	Deterioration of groundwater quality.	M	M	Continue existing control. Maintain groundwater abstraction programme. Monitoring of groundwater levels and quantities and assessment of pollution plume
23	Operation	All Areas	Post closure water management and decant (abstraction boreholes)	Accumulation of contaminated water and pollution of surface and groundwater	M	M	Ensure closure provision is adequate for post closure water management
24	Operation	All Dams	Current scheduled clean-up operation during dry season	Decrease of storage capacity increasing the possibility of overflow	M	M	Maintain current controls Optimal operation of plant
25	Operation	Plant Areas	Overtopping of storm water canal in proximity of GG1 - GG6	Flooding of GG1 - GG6 operational areas	M	M	Contract in place for the continuous cleaning of channels and PCD's. Internal control SCADA to optimize water usage in the plants.

Impact description					Significance before mitigation	Significance after mitigation	Mitigation measures
No.	Phases	Activity	Aspect	Impact			
27	Operation	Slimes Dams Complex	Power supply failure at Cement Dam.	Overflow of cement dam and Mamba Dam to receiving environment.	M	M	Maintain current control.
28	Operation	Temporary waste storage	Temporary storage of waste.	Legal non- compliance resulting in legal action.	M	M	New facility in in line with NEM:WA requirement and in operation.
29	Operation	Pit	Inadequate clean water diversion infrastructure.	Contamination of clean storm water and consequent non- compliance.	M	M	Maintain current controls

5.6 Issues and Responses from Public Consultation Process

Public participation is an essential and legislative requirement for any environmental authorisation process. The principles that demand communication with society at large are best embodied in the principles of the National Environmental Management Act 1998 (Act No. 107 of 1998) (NEMA), South Africa's overarching environmental law.

Section 41 (4) of the NWA provides that the competent authority, the DWS, may, at any stage of the application process, require the applicant to place a suitable notice in newspapers and other media, and to take other reasonable steps as directed by the competent authority to bring the application to the attention of relevant organs of state, interested persons and the general public. The required Public Participation Process (PPP) is outlined in the Government Notice Regulation 267, Regulations Regarding the Procedural Requirements for Water Use Licence Applications and Appeals published in Government Gazette 40713 on 24 March 2017.

As such, the following PPP was undertaken for this WULA in accordance with GNR.267:

- Erecting of Site Notices (English) on the 1st February 2024;
- Distribution of Background Information Documents (BIDs) to adjacent landowners, the respective local governments and any other Interested and Affected Party (I&AP) on the 1st February 2024 (via email); and
- Placement of an advertisement in one local newspapers (Mogal Pos) on the 2nd February 2024.

The PPP commenced on the 1st February for 60 days ending on the 1st April 2024. The full PPP report will be updated and submitted to DWS as Annexure Q.

5.7 Matters Requiring Attention/Problem Statement

Not applicable to this application.

5.8 Assessment of Level and Confidence of Information

All information contained in this IWWMP was sourced from the specialist studies conducted for the mine. The specialists appointed to undertake the various investigations are considered to be competent in their particular fields. In light of the above, the level of confidence with regards to the information and reports used to compile this document is high.

6 WATER AND WASTE MANAGEMENT

6.1 Water and Waste Management Philosophy

Water is a strategic natural resource for South Africa and our business. Exxaro are committed to responsible and sustainable water use as enshrined in their water management policy that focuses on efficient water reuse and recycling. The policy aligns with the legislated environmental framework mainly governed by the National Water Act, 1998 (Act 36 of 1998), supported by the integrated water resource management hierarchy issued by the Department of Water and Sanitation (DWS) to prioritise mine and waste management decisions and actions. The hierarchy informs our policy and strategy on mine and wastewater management by:

- Preventing pollution
- Minimising environmental impacts
- Maximising water reuse and reclamation
- Responsible water discharge and disposal

6.1.1 Water treatment

Exxaro are committed to implementing this policy with a management standard on water for mining and industrial use. The standard articulates an effective integrated water and waste management plan across a mine's lifecycle, including planning, construction, operation, decommissioning, closure and rehabilitation phases. The standard also reflects management's vision to:

- Ensure a cost-effective integrated approach to water management
- Environmental responsibility
- Ecological sustainability
- Group Water Strategy
- Our group water strategy was approved in 2017, aiming for excellence in:
- Compliance
- Operational water efficiency
- Policies, standards and processes
- Water technologies
- Stakeholder partnerships

A comprehensive programme entrenches responsible and sustainable water management throughout our BUs, concentrating on water use and related risks — from security of supply to water efficiency and cost management — in terms of current and anticipated regulatory compliance. We support the programme with research and skills development as well as water issues awareness through ongoing communication and training.

They manage water-related risks, minimise impacts and operate efficiently by reducing, reusing and recycling water in line with water conservation plans that support the national strategy. Equitable distribution of water resources considers business growth and sustainable consumption.

They are also committed to protecting and improving water quality by discharging water treated in our BUs through our reverse-osmosis water treatment plant at Matla. The plant has been operating since 2015 and can treat 10ML of water per day.

They continue collaborating with other mining houses and universities through the Coaltech research initiative in projects that provide guidelines on sustainable mine water management and mine closure. Our collaboration also affords accurate final land-use planning.

The Mine Water Coordinating Body, formed in 2017, further strengthens our public-private collaboration by providing a platform to align our mine water management plans with the National Water Resource Strategy and investigate regional solutions in the Olifants River catchment of Mpumalanga.

6.1.2 Water use

Exxaro refined their water intensity targets in 2020 and developed a new five-year target in line with industry norms and site-specific conditions.

Exxaro lowered their previous aggregated target of 200L/t to 180L/t. This target is well below the coal industry average of 380L/t. It supports our strategy to reduce water intake in line with the DWS's drive to increase water conservation and reclamation. Our overall water efficiency rate deteriorated by 39% due to the ramp-up of our Belfast operation and changes to in-pit conditions at Grootegeluk.

6.1.3 Water recycling

Exxaro introduced a water recycling ratio in 2020 and set a target of 38% for 2025. We define our water recycling ratio as the total water recycled divided by total water used (including recycled water). Our overall water recycling ratio is 45%. The coal industry average is 6%, as outlined in the national water use efficiency benchmarks of the DWS.

6.1.4 Process Water

The philosophy with respect to process water management is to:

- Minimise the amount of process water produced (continually investigate emerging technologies for processing);

- Contain all process water to ensure zero discharge to the environment; and
- Re-use process water for dust suppression and in the process.

6.1.5 Storm Water

The philosophy for stormwater management on site is in keeping with the GN704 principles:

- To keep clean and dirty water separated;
- To contain any dirty water within a system;
- To prevent contamination of clean water; and
- To return clean water to the catchment.

6.1.6 Groundwater

The philosophy for waste management of groundwater is:

- Ensure that all potential groundwater impacts are identified; and
- Ensure that groundwater monitoring is conducted quarterly and that records are kept and a database compiled to identify trends over time.

6.1.7 Waste

The philosophy for the management of the various waste streams on site is:

- Minimisation of waste through reducing, re-using and recycling of waste;
- Monitoring of waste management practises;
- Best practise storage and disposal of waste; and
- Consideration of alternative cost-effective technologies with regards to waste Management.

6.2 Strategies

The following strategies have been outlined and implemented for Grootegeluk.

6.2.1 Process Water

Process water management will consist of:

- Investigating new alternatives for process water treatment and re-use; and
- Continued, regular monitoring of dirty water dams which contain process water to ensure that the water quality is appropriate for re-use.

6.2.2 Storm Water

A storm water management plan should be developed and updated for the Grootegeluk operations. Storm water management will comprise of:

- Regular monitoring of surface water quality; and

- Regular monitoring and maintenance of stormwater control structures.

6.2.3 Groundwater

Groundwater management strategies will comprise of:

- Continued, regular monitoring of groundwater levels and quality; and
- Annual compliance audits.

6.2.4 Waste

Waste management strategies will consist of:

- Implementation of good housekeeping and best practises;
- Investigating new, cleaner and more cost-effective technologies to reduce and manage waste;
- Monitor compliance with best practises; and
- Creating environmental awareness and sensitivity through improvements to the induction programme for employees.

6.3 Performance Objectives/Goals

Measures to achieve and sustain performance objectives for process water, storm water, groundwater and waste have been established at Grootegeluk. Refer to Section 6.4 for the measures to achieve the performance objectives.

The performance objectives will be reviewed and assessed on a regular basis to reflect the current situation and to determine if performance objectives are being met.

6.4 Measures to Achieve and Sustain Performance Objectives

Refer to Table 6.1for the detailed action plan relating to the performance objectives.

Table 6.1 Performance objectives relevant to the Grootegeluk Complex

Theme	Performance objective
Waste	• Disposal of all general and hazardous waste in accordance with legislative requirements; • Waste separation at source and increased recycling and reuse of waste streams generated on site;

Theme	Performance objective
	• Deposition of mine residue, slurry and coal discard on surface in accordance with a deposition strategy based upon a sustainable final • landform for the residue deposits, slimes dams and discard dumps; and • Disposal of mine residue in-pit in accordance with a deposition strategy informed by the geochemical characterisation of the material and impact • prediction of the long-term impact on the receiving environment.
Storm water	• Collection and containment of all contaminated runoff from the mine in adequately sized, properly designed and engineered storm water • infrastructure; • Reuse and recycling of contaminated storm water as process water; • Zero discharge of contaminated runoff from the mine residue deposits and mine infrastructure to the receiving environment; and • Diversion and routing of clean runoff to the receiving environment.
Groundwater	• Prevention of contaminated groundwater from reporting to and impacting on the fitness of use of water utilised by downstream water users; and • Management of the current pollution plume so as to ensure containment inside the mine operational area, • Management of groundwater levels in the groundwater compartment underneath the plant area to prevent any impact on the structural integrity • of the plant infrastructure.
Process water	• Conveyance and containment of all process water in adequately sized, properly designed and engineered process water infrastructure; • Re-use and recycling of process water and contaminated storm water resulting in a reduction in the intake of fresh water into the process; • Zero discharge of process water to the receiving environment; and • Implementation of water conservation and water demand management plan.

6.5 Option Analysis and Motivation for Implementation of Preferred Options

Grootegeluk's mining operation is an existing operation and as such, no alternatives have been investigated.

6.6 IWWMP Action Plan

An Action Plan provided herein shall provide water and waste management options for issues requiring immediate attention at the Grootegeluk Coal mine. The broad objective of the

Action Plan is to provide robust and sustainable water and waste management practice for the mining operation. The following aspects will be addressed as part of the Action Plan:

- Key performance areas
- Objectives
- Roles and responsibilities
- Timeframes

The compilation of an IWWMP is a long-term commitment in terms of resources requirements including technical investigations that are conducted. These also require disbursing financial resources to implement management measures which can in most cases take months. With this in mind, this IWWMP has been developed for medium term (i.e. first 5 years of operation of the mine), with the Action Plan herein reviewed and updated every year. It is thus the intention of the mine to have yearly interaction with DWS and update the Action Plan accordingly. Refer to Table 6.2 for the Grootegeluk IWWMP Action Plan.

Table 6.2 Grootegeluk's IWWMP Action Plan

Theme	Performance objective	Actions	Implementation Date	Responsible Person
Waste	Waste separation at source and increased recycling and reuse of waste streams generated on site	• Investigating, drafting a recycling and waste reclamation strategyfor Grootegeluk	December 2022	SHEQ
		• Implementing & rolling out a recycling and waste reclamationstrategy for Grootegeluk	December 2023	SHEQ & Engineering Services
		• Identify central areas in the Plant & Mine for placement of Skipsto ensure separation at source	July2023	Plant & Mining Sups
		• Investigate the expansion of the reclamation yard Recycling facilityfor sorting, storage and disposal of Recyclable waste streams	August 2023	Supply Chain Management
		• Implement ongoing clean up in the plant area to remove spillages underneath conveyer belts.	Ongoing	Plant operations
	Hydrocarbon management	• Maintenance of current separators and conveyance systems	Ongoing	Mining and Services Engineering
		• Finalize the project to increasing size of the separator drayingbeds	Completed	Project section
		• Ongoing maintenance and cleaning of system and silt traps	Ongoing	Mine and Services Engineering
		• Conduct immediate reporting and clean-up of spillages	Ongoing	All
		• Continuous maintenance of fuel depot facility	Ongoing	Total
		• Ensure operational procedures are adhered	Ongoing	Total

Theme	Performance objective	Actions	Implementation Date	Responsible Person
Waste	Hydrocarbon management	• Investigate the Increase liquor storage capacity as part of the Reductants refurbishment process, or consider alternative storage for this liquid during down times	On hold – Plant decommissioning being investigated	Plant operations /Project section
Storm water	Collection and containment of all contaminated runoff from the mine in adequately sized, properly designed and engineered storm water infrastructure	• Maintain and clean the drains between the workshops and the process water dams and sumps to prevent spillage into the clean areas and to support the efficient operation thereof.	Ongoing	Mine and Service Engineering
	Reuse and recycling of contaminated storm water as process water	• Ensure that all dirty storm water runoff is collected and contained in pollution control dams; and	Ongoing	Plant Operations
	Zero discharge of contaminated runoff from the mine residue deposits and mine infrastructure to the receiving environment	• Maintenance and removal of silt from water management facilities	Ongoing	Plant operations
		• Investigate interim storm water measures to contain the dirty storm water from Dump 4 & 5 where reasonably possible. • As part of the outcome of the GGIWMS project prefeasibility study, project **GGX-000825:** Grootegeluk Clean and Dirty Storm Water Separation (**BFS**) was initiated.	December 2024	Project section
		• • As part of the capping and final landform redesign for the rehabilitation of Dump 4&5 will include a storm water design	December 2025	Project section

Theme	Performance objective	Actions	Implementation Date	Responsible Person
	Diversion and routing of clean runoff to the receiving environment	• Implement measures such as upslope diversion berms to prevent the ingress of clean water into the mine operations.	Continuous	Mining and Plant operations
Ground-water	Prevent contaminated groundwater from reporting to and impacting on the fitness of use of water utilised by downstream water users	• Utilise geochemical characterisation and impact prediction to determine the long-term impact of mine residue disposal (interburden, slurry and discard) on surface and in-pit on groundwater quality. Flow Transport model updated.	Completed	
		• Maintain and update the geohydrological model	Ongoing	SHEQ
		• Updated groundwater monitoring plan to be submitted to DWS for approval	Completed	SHEQ
		• Maintain groundwater abstraction programme based on results obtained from the groundwater model	Ongoing	SHEQ
		• Monitor groundwater levels and quantities and continuous assessment of pollution plume	Ongoing	SHEQ
		• Maintain current drainage systems under current product stockpiles	Ongoing	Plant operations
		• Lining of new facilities according to IWUL requirements and waste classification.	As per project schedule	SHEQ and Engineering
		• Lining of the Olifantskop dam as part of the IGGWMS for GG	Completed	Project Manager

Theme	Performance objective	Actions	Implementation Date	Responsible Person
	Management of groundwater levels in the groundwater compartment underneath the plant area to prevent any impact on the structural integrity of the plant infrastructure	• In order to maintain a 6 m dry foundation beneath the plant area, the numerical groundwater flow model predicts that approximately 1 700 m3/day must be abstracted from strategically located boreholes. Higher abstraction rates may be required if the existing abstractions well system is used; and • Further site investigations are, however, required to determine the limitations of the existing abstraction system and to determine which boreholes would most efficiently achieve this.	Ongoing	Engineering services SHEQ
		• Abstraction of contaminated groundwater in groundwater compartment located underneath the plant area in accordance with the long-term groundwater management plan	Ongoing	Engineering services
		• Monitoring of groundwater levels as part of the groundwater monitoring programme	Ongoing	SHEQ
Process water	**Water quality management**	• Maintain current lime dosing facilities	Ongoing	Engineering services
		• Implement the project as approved as part of the outcomes and recommendations for the GGIWMS Project.	December 2027	Project section
	Implement water conservation and water demand management Performance objective	• Implement water conservation and demand management plan focused on reducing raw water intake	**Ongoing**	**SHEQ and Plant operations**
		• Update and review plan on an annual basis to ensure optimisation of water conservation strategy	Ongoing	SHEQ and Plant operations

Theme	Performance objective	Actions	Implementation Date	Responsible Person
	Water storage	• Maintenance and desilting of current PCDs	Ongoing	Plant operations
		• Maintaining freeboard of PCDs	Ongoing	Plant operations and Engineering services
		• Maintenance of storm water infrastructure	Ongoing	Plant operations
		• Investigate additional storage requirements due to expansion of mining operation as and when required	Ongoing	Project section
		• Optimise re-use and recycling of process water	Ongoing	Plant operations and Engineering services
	Post closure water management	• Ensure closure provision is adequate for the post closure water management strategy	Continuous	SHEQ
	Update of water balance	• Annual update of water balance and adequate flow monitoring	Ongoing	SHEQ

6.7 Control and Monitoring

6.7.1 Monitoring of Change in Baseline information

6.7.1.1 Surface Water Monitoring

Refer to Section 5.4.1 for the monitoring undertaken for surface water resources at the Grootegeluk Complex.

6.7.1.2 Groundwater Monitoring

Refer to Section 5.4.2 for the monitoring undertaken for groundwater resources the Grootegeluk Complex.

6.7.1.3 Biomonitoring

Refer to Section 5.4.3 for the biomonitoring undertaken at the Grootegeluk Complex.

6.7.2 Audit and Report on Performance Measures

Regular review and auditing is important to ensure systems are up-to-date and still relevant for current situations. Evaluation is required to verify its appropriateness and suitability by comparing performance to objectives set. Changes or adjustments to systems are required where review/auditing highlights shortcomings or gaps. Performance should be measured against:

- Internal audits (conducted quarterly and annually);
- External audits (conducted annually); and
- DWS reporting (conducted bi-annually).

As per the approved IWUL (License No. 07/A42J/GB/6418) an internal and external IWUL Audit is conducted to ensure compliance with the stipulated conditions of the licence issued to Exxaro. These audits are conducted on an annual basis and submitted to the DWS.

Refer to **Annexure M** for the IWUL 2021 external compliance audits.

7 CONCLUSION

7.1 Regulatory Status of Activity

Exxaro Grootegeluk Coal Complex which includes the Reductants (Char) is in possession of a Water Use Licence (WUL) (Licence No. 07/A42J/GB/6418) dated 5 July 2018. An amendment of the WUL was also issued in terms of Section 50 of the National Water Act, 1998 (Act No. 36 of 1998) (NWA) on the 30th November 2018. The WUL was issued for various water uses

being undertaken on site in terms of Section 21 of the NWA. The license was issued for the following water uses:

- Section 21(a) – Taking of water from a water resource;
- Section 21 (b) – Storing water;
- Section 21(g) – Disposing of waste in a manner which may detrimentally impact on a water resource; and
- Section 21(j) – Removing, discharging or disposing of water found underground.

7.2 Statement of Water Uses Requiring Authorisation

Additional water uses have been identified that require authorisation in terms of Section 21 of the NWA in the form of an Integrated Water Use License Application (IWULA). The following additional water uses are required to be licenced for the Grootegeluk Complex:

- Section 21(g) – 'Disposing of waste in a manner which may detrimentally impact on a water resource.

In addition to the new water uses triggered, several amendments are required to some of the existing authorised water uses. An audit undertaken by Golder Associates Africa (Pty) Ltd in 2021 recommended that various conditions of the license be amended. These amendments have been included in this report and where licensed volumes are required to be increased, these water uses have been applied for as new water uses as part of this application.

7.3 Section 27 Motivation

Refer to **Annexure N** for the Section 27 Motivation.

7.4 Proposed License Conditions

The original license is dated 05 July 2018 for a duration of 29 years. It is hereby recommended that the new water uses be authorised under a water use licence issued by the DWS for a period of 25 years with a review period of 5 years.

8 REFERENCES

Refer to Annexures.