Basic Assessment Report

Combined Water Treatment Plant for Arnot Closed Colliery

For Public Review

Seriti Coal (Pty) Ltd

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GLOSSARY	
AIP	Alien Invasive Plants
ASPT	Average Score per Taxon
BA	Basic Assessment
BP	Before Present
CARA	Conservation of Agricultural Resources Act (Act no 43 of 1983)
CBA	Critical Biodiversity Area
CVB	Channel Valley Bottom
CWTP	Combined Water Treatment Plant
DARDLEA	Department of Agriculture, rural development, land and environmental affairs
DFFE	Department of Forestry, Fisheries and the Environment
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECO	Environmetal Control Officer
EIA	Environmental Impact Assessment
EIA	Early Iron Age
EMPr	Environmental Management Programme
ESA	Early Stone Age
GPS	Global Positioning System
HIA	Heritage Impact Assessmet
I&AP	Interested and Affected Party
LIA	Late Iron Age
MHW	Mpumalanga Highveld Wetlands
MIA	Middel Iron Age
MIRAI	Macroinvertebrate Response Assessment Index
MNCA	Mpumalanga Nature Conservation Act, 1998 (Act No. 10 of 1998)
MPHRA	Mpumalanga Heritage Resources Agency
MTPA	Mpumalanga Tourism AND Parks Agency
NEMA	National Environmental Management Act (Act no 107 of 1998)
NEMWA	National Environmental Management: Waste Act (Act no 59 of 2008)

NF	Nano-filtration
NFA	National Forest Act (Act no 84 of 1998)
NGL	Natural Ground Level
PES	Present Ecological State
POC	Probability of Occurrence
PPP	Public Participation Process
SAHRA	South Africa Heritage Resource Agency
SANBI	South African National Biodiversity Institute
SASS5	South African Scoring System version 5
SCC	Species of Conservation Concern
STLM	Steve Tshwete Local Municipality
TDS	Total Dissolved Solids
UCVB	Unchanneled Valley Bottom
ZLD	Zero Liquid Discharge

mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

BASIC ASSESSMENT REPORT
And
ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

SUBMITTED FOR ENVIRONMENTAL AUTHORIZATIONS IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 AND THE NATIONAL ENVIRONMENTAL MANAGEMENT WASTE ACT, 2008 IN RESPECT OF LISTED ACTIVITIES THAT HAVE BEEN TRIGGERED BY APPLICATIONS IN TERMS OF THE MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT, 2002 (MPRDA) (AS AMENDED).

NAME OF APPLICANT: Seriti Coal Proprietary Limited

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IMPORTANT NOTICE

In terms of the Mineral and Petroleum Resources Development Act (Act 28 of 2002 as amended), the Minister must grant a prospecting or mining right if among others the mining "will not result in unacceptable pollution, ecological degradation or damage to the environment".

Unless an Environmental Authorisation can be granted following the evaluation of an Environmental Impact Assessment and an Environmental Management Programme report in terms of the National Environmental Management Act (Act 107 of 1998) (NEMA), it cannot be concluded that the said activities will not result in unacceptable pollution, ecological degradation or damage to the environment.

In terms of section 16(3)(b) of the EIA Regulations, 2014, any report submitted as part of an application must be prepared in a format that may be determined by the Competent Authority and in terms of section 17 (1) (c) the competent Authority must check whether the application has taken into account any minimum requirements applicable or instructions or guidance provided by the competent authority to the submission of applications.

It is therefore an instruction that the prescribed reports required in respect of applications for an environmental authorisation for listed activities triggered by an application for a right or a permit are submitted in the exact format of, and provide all the information required in terms of, this template. Furthermore please be advised that failure to submit the information required in the format provided in this template will be regarded as a failure to meet the requirements of the Regulation and will lead to the Environmental Authorisation being refused.

It is furthermore an instruction that the Environmental Assessment Practitioner must process and interpret his/her research and analysis and use the findings the ECO to compile the information required herein. (Unprocessed supporting information may be attached as appendices). The EAP must ensure that the information required is placed correctly in the relevant sections of the Report, in the order, and under the provided headings as set out below, and ensure that the report is not cluttered with un-interpreted information and that it unambiguously represents the interpretation of the applicant.

OBJECTIVE OF THE BASIC ASSESSMENT PROCESS

The objective of the basic assessment process is to, through a consultative process–

(a) determine the policy and legislative context within which the proposed activity is located and how the activity complies with and responds to the policy and legislative context;

(b) identify the alternatives considered, including the activity, location, and technology alternatives;

(c) describe the need and desirability of the proposed alternatives,

(d) through the undertaking of an impact and risk assessment process inclusive of cumulative impacts which focused on determining the geographical, physical, biological, social, economic, heritage , and cultural sensitivity of the sites and locations within sites and the risk of impact of the proposed activity and technology alternatives on the these aspects to determine:

(i) the nature, significance, consequence, extent, duration, and probability of the impacts occurring to; and

(ii)the degree to which these impacts—

(aa)can be reversed;

(bb) may cause irreplaceable loss of resources; and

(cc)can be managed, avoided or mitigated;

(e) through a ranking of the site sensitivities and possible impacts the activity and technology alternatives will impose on the sites and location identified through the life of the activity to—

(i) identify and motivate a preferred site, activity and technology alternative;

(ii) identify suitable measures to manage, avoid or mitigate identified impacts; and

(iii) identify residual risks that need to be managed and monitored.

PART A: SCOPE OF ASSSSMENT AND BASIC ASSESSMENT REPORT

Contact Person and correspondence address

(a) Details of the Environmental Assessment Practitioner (EAP)

(i) Expertise of the EAP

Name of The Practitioner:	Ms Natanya Whitehorn
Tel No.:	012 427 3081
Fax No.:	086 574 2929
E-mail address:	Natanya.Whitehorn@zutari.com

(ii) Expertise of the EAP

(1) The qualifications of the EAP

Natanya Whitehorn holds a bachelor's degree (Honours) in Geography, majoring in Geo-Informatics and Strategic Environmental Planning, form the University of Johannesburg, South Africa, in 2002. She has also completed a South African Auditor and Training Certification Authority (SAATCA) Certified ISO 14001 Lead Auditors Course. She is a member of the International Association for Impact Assessment South Africa (IAIAsa) as well as the Geo-Information Society of South Africa (GISSA). Please refer to **Appendix A.**

(2) Summary of the EAP's past experience.

(In carrying out the Environmental Impact Assessment Procedure)

Natanya Whitehorn is a Manager and has more than 15 years of experience in environmental impact assessment and planning processes in various countries, including South Africa. Natanya has managed integrated environmental management processes such as environmental impact assessments and basic assessment (BA) reports for a wide variety of projects in the infrastructure and power sector. Using her technical experience and background as an environmental assessment practitioner she is able to manage complex and multidimensional processes during the impact assessment process whilst also being an exceptionally good collaborator with project team members, external specialists and the client.

(b) Location of the overall Activity.

Farm Name:

Farm name	Farm no	Ptn no
Preferred Route And Layout		
Rietkuil	491	33
Rietkuil	491	24 RE
Arnot East	984	0
Farm	983	RE
Tweefontein	458	10
Mooifontein	448	5
Mooifontein	448	4
Braamspruit	465	0
Bosmansspruit	459	5
Bosmansspruit	459	3
Bosmansspruit	459	2
Bosmansspruit	459	4
Bosmansspruit	459	10
Bosmansspruit	459	11
Bosmansspruit	459	0

	Kwaggafontein	460	4
	Kwaggafontein	460	5
	Alternative Routes and Layouts		
	Rietkuil	491	11
	Rietkuil	491	33
	Rietkuil	491	24
	Arnot East	984	0
	Farm	983	RE
	Tweefontein	458	15
	Mooifontein	448	5
	Mooifontein	448	4
	Mooifontein	448	3
	Braamspruit	465	0
	Bosmansspruit	459	5
	Bosmansspruit	459	3
	Bosmansspruit	459	2
	Bosmansspruit	459	4
	Bosmansspruit	459	12
	Bosmansspruit	459	10
	Bosmansspruit	459	11
	Bosmansspruit	459	0
	Kwaggafontein	460	1
	Kwaggafontein	460	5
Application area (Ha)	Preferred pipeline option total application area: 1.244ha Preferred Combined Water Treatment Plant (CWTP) area: 3.1ha Preferred Storage dams area: 0.0509ha		
Magisterial district:	Steve Tshwete Local Municipality and Nkangala District Municipality		
Distance and direction from nearest town	23km Southeast of Middelburg		
21 digit Surveyor General Code for each farm portion	T0JS00000000049100033		
	T0JS00000000049100024		
	T0JS00000000098400000		
	T0JS00000000098300000		
	T0JS00000000045800010		
	T0JS00000000044800005		
	T0JS00000000044800004		
	T0JS00000000046500000		
	T0JS00000000045900005		
	T0JS00000000045900003		
	T0JS00000000045900002		
	T0JS00000000045900004		
	T0JS00000000045900010		
	T0JS00000000045900011		
	T0JS00000000045900000		
	T0JS00000000046000004		
	T0JS00000000046000005		

(c) Locality map

(show nearest town, scale not smaller than 1:250000).

The proposed site is located approximately 23 km southeast of Middelburg town, in the Steve Tshwete Local Municipality in the Mpumalanga Province. The proposed activity will take place on the Seriti and Arnot Opco mines as indicated in Figure 1.

(d) Description of the scope of the proposed overall activity.

Provide a plan drawn to a scale acceptable to the competent authority but not less than 1: 10 000 that shows the location, and area (hectares) of all the aforesaid main and listed activities, and infrastructure to be placed on site, refer to Figure 2.

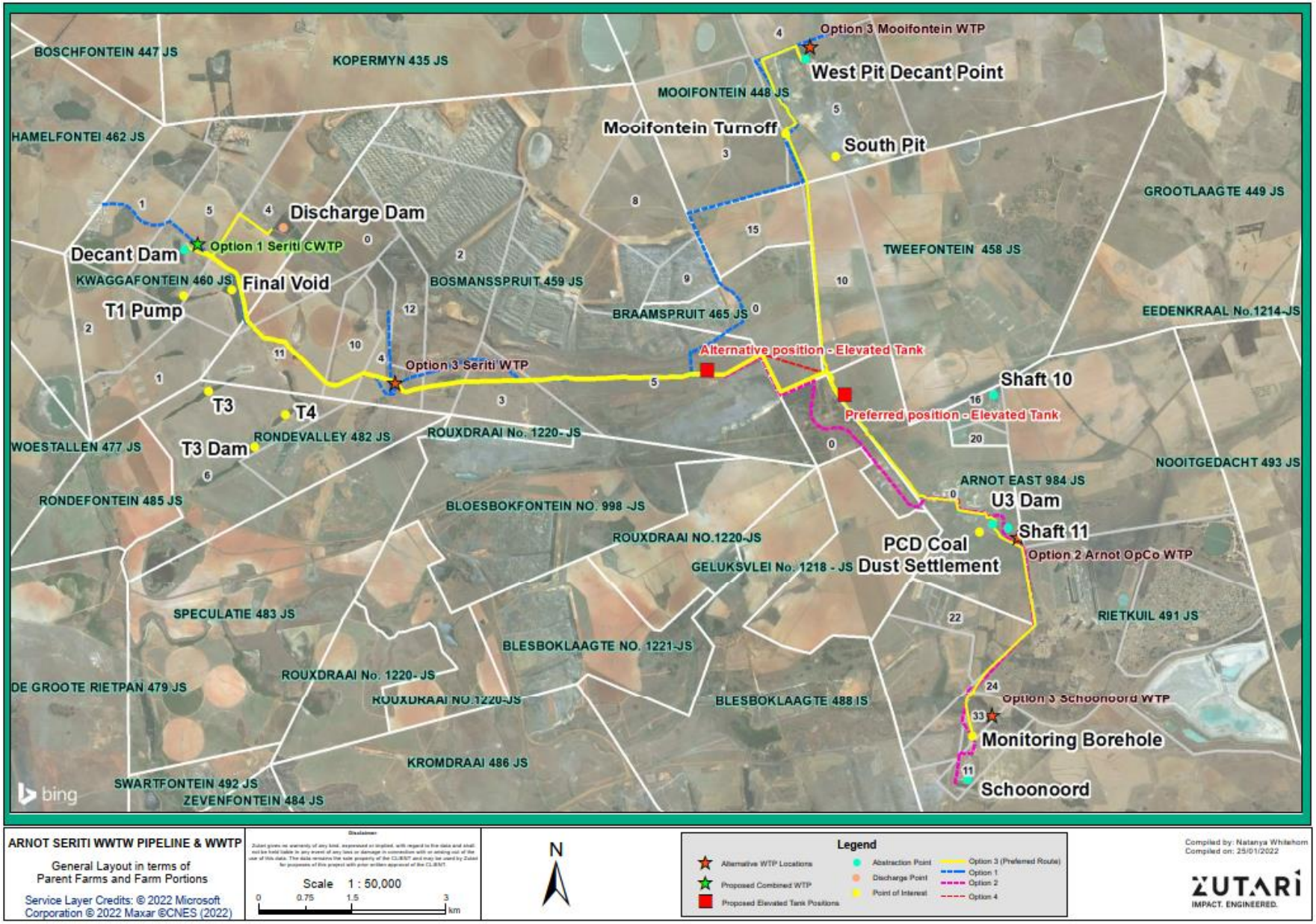


Figure 1: **Cadastral Locality Map indicating the project alternatives.**

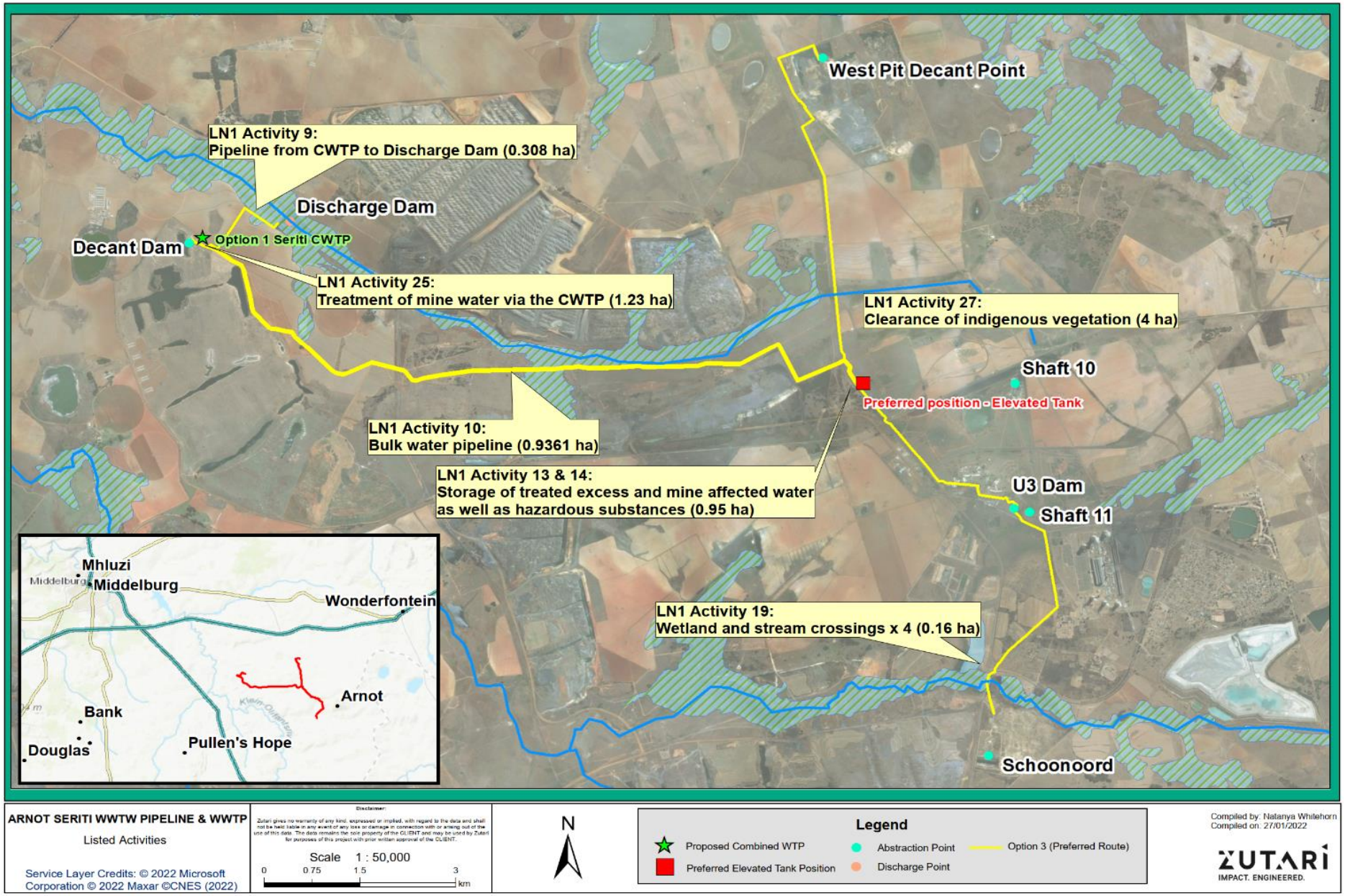


Figure 2: Location of the proposed CWTP, associated pipeline infrastructure and storage facilities.

(i) Listed and specified activities

NAME OF ACTIVITY **(E.g. For prospecting -** drill site, site camp, ablution facility, accommodation, equipment storage, sample storage, site office, access route **etc…etc…etc** **E.g. for mining**,- excavations, blasting, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and boreholes, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc…etc…etc.)	Aerial extent of the Activity Ha or m²	**LISTED ACTIVITY** Mark with an X where applicable or affected.	**APPLICABLE LISTING NOTICE** (GNR 544, GNR 545 or GNR 546)
The treated discharge water from the CWTP will be conveyed within a HDPE pipeline to the decant point. This pipeline will exceed 0.36 m in internal diameter.	0.308 ha	**X**	GNR 983 Listing Notice 1: Activity 9
A bulk water pipeline will be constructed as a conveyance system to transport decant water from the abstraction points to the various decant dams and tanks and from the decant dam to the CWTP. This pipeline will exceed 0,36 m in internal diameter.	0.9361 ha	**X**	GNR 983 Listing Notice 1: Activity 10
Storage dams are proposed to be constructed for the storage of treated excess water and mine affected water. The combined surface area of the dams will exceed 100 square metres.	0.95 h	**X**	GNR 983 Listing Notice 1: Activity 13
The treatment of mine water within the CWTP will include storage tanks as part of the plant. Furthermore, the elevated tank which will receive decant water from Arnot OpCo's U3 dam and Mooifontein has a capacity of 356m3. The total storage of mine decant water will result in a combined storage volume of more than 80 m3 but less than 500m3.	0.95 ha	**X**	GNR 983 Listing Notice 1: Activity 14
The pipeline and associated structures will result in two wetland and two stream crossings where the infilling or depositing, dredging, excavation, removal or moving of soil, sand, pebbles or rock of more than 10 cubic metres from the affected watercourses.	0.16ha	**X**	GNR 983 Listing Notice 1: Activity 19
A CWTP will be constructed for the treatment of mine affected water with a throughput of more than 2000 cubic metres.	1.23 ha	**X**	GNR 983 Listing Notice 1: Activity 25
Clearance of vegetation for the construction of all infrastructure which could include more than 1 ha of indigenous vegetation	4 ha	**X**	GNR 983 Listing Notice 1: Activity 27

(ii) Description of the activities to be undertaken

(Describe Methodology or technology to be employed, including the type of commodity to be prospected/mined and for a linear activity, a description of the route of the activity)

Large open cast mining operations at Seriti Arnot ceased in 1992. The area is currently undergoing mine closure rehabilitation as part of the fulfilment of the mine closure obligations. Since the ceasing of mine operations, mine impacted water emanating from Seriti's mining area is conveyed through a water reservoir network to the final void dam. From the dam, water is pumped to evaporators which are used to dissipate decant water for irrigation purposes. The high energy and maintenance requirements of the mechanical evaporation is problematic due to the high costs associated with the system.

The Arnot OpCo mining area, recently acquired from Exxaro, consists of an underground and two open cast mining sections which have recently been closed. At Arnot OpCo, decant water from the Schoonoord area is managed through pumping from boreholes and shafts to U3 Dam. At the Mooifontein opencast area, decant water is pumped from the West to the South Pit resulting in a circulatory flow of water.

As part of the mine closure requirements, Seriti and Arnot OpCo are responsible for ensuring that mine impacted water is properly managed prior to discharge to either the local catchment or to a nominated and

acceptable end user. Management of decant water may necessitate treatment intervention to ensure that the water does not have a detrimental impact on the surrounding environment or downstream water users. Due to the institutional arrangement between the coal miners (Seriti and Arnot OpCo) and the coal consumer (Eskom), the financial liability of mine closure is held by Eskom.

A pre-feasibility study conducted in May 2018 investigated various treatment options and proposed a treatment train consisting of a centralised Lime Softening, Ultrafiltration and Nanofiltration as the go-forward water treatment solution. The CWTP was to be situated near the previous Seriti mine area and required to be designed for a capacity of approximately 12.3 Mℓ/d, abstracted from both Seriti and Arnot OpCo.

The water treatment and conveyance systems include the following major units:

- A decant water abstraction system
- A decant water conveyance system
- A Combined Water Treatment Plant (CWTP)
- A treated water conveyance system
- A waste and solids handling system
- Requisite access roads and associated security infrastructure
- Requisite electrical and commercial and industrial (C&I) infrastructure

The development will also require road, stream and railway line crossings. Eskom power lines are also found within the pipeline route and will be negotiated with Eskom prior to construction.

1. Abstraction points

Arnot OpCo's decant water will be abstracted from Schoonoord Pit, the underground works at Shaft 10 and Shaft 11, and the Mooifontein West Pit natural decant area. Excess mine water from Schoonoord underground workings will first be directed to the U3 Dam. The water from the U3 dam and Mooifontein Pit will be pumped to an elevated tank where the water will then gravity feed to the proposed CWTP.

Seriti's excess mine water will be abstracted from the Decant Dam and pumped to the proposed CWTP inletworks, See **Figure *3***.

2. Water balance

A summary of the abstracted design flow rates are presented in Table 1. It shall also be noted that the pumping flow rates were based on 20 hours per day, allowing downtime, such as maintenance.

Table 1: Abstraction design flowrates

Location	Revised Design Flow (Mℓ/d)	Pump Flow Rate (ℓ/s)
Seriti – Opencast Combined (Pit 1, Pit 2E and Pit 2W)	6.0	83.33
Arnot OpCo – Underground Works	5.513	76.57
Arnot OpCo – Opencast (Mooifontein) Combined	0.530	7.36
Arnot OpCo – Opencast (Schoonoord)	0.285	3.96
Total	**12.328**	**-**

3. Conveyance system

This section details the proposed conveyance system for the mine water to reach the CWTP and discharge of product water into the Boesmanspruit decant point. **Figure *3*** and **Figure *4*** illustrate the conveyance route.

Figure 3: Conveyance route of mine water to the proposed Arnot CWTP via the preferred option 3 pipeline route

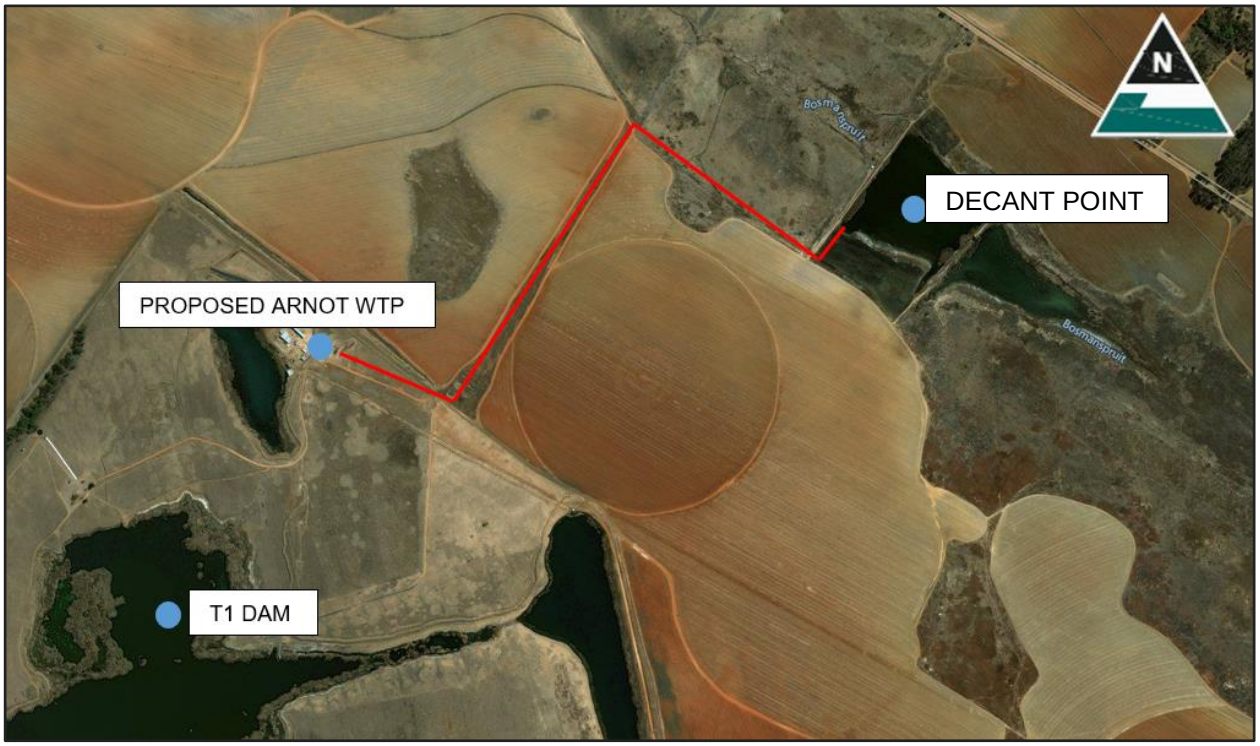


Figure 4: Proposed discharge point of treated water from the CWTP to Boesmanspruit (Decant point)

- Decant water will be abstracted and pumped from Arnot OpCo's Schoonoord pit to the U3 Dam near the Underground Works;
- Decant water will be abstracted and pumped from Arnot OpCo's U3 Dam and Mooifontein pit to a proposed Elevated Tank.
- Decant water will be conveyed under gravity from the proposed Elevated Tank to the CWTP inlet works;

- Decant water will be abstracted and pumped from Seriti's Decant Dam to the CWTP Inlet Works; and
- Treated water will be conveyed under gravity from the CWTP to the Decant point.

In the past, at the Mooifontein opencast area, approximately 2000 m^3/day used to be pumped from the West Pit to the South Pit, which subsequently decanted back to the West Pit resulting in a circulatory flow of water. A wetland separates the Mooifontein East and West Pits. Mooifontein west pit has subsequently been backfilled and a temporary 1ML treatment works has been established to treat the decant water. This treated water is then discharged into the wetland. Once the proposed CWTP is established, this temporary treatment works will be removed to allow all water to be treated at the new plant.

A summary of the proposed conveyance system is shown in Table 2, while a summary of the process arrangement is shown in Figure 5.

Table 2: Conveyance network summaries

Component	Design Q	Description
Pipelines:		
Mooifontein to Elevated Tank	7.36 ℓ/s	DN 140 HDPE PN16 (CH 0.0 – CH 5,985) (L = 5,985 m)
Schoonoord to the U3 Dam	3.958 ℓ/s	DN90 HDPE PN16 (CH 0.0 – CH 3,400.0) (L = 3,400 m) DN75 HDPE PN16 (CH 3,400.0 – CH 3,643.0) (L = 243.0 m)
U3 Dam to Elevated Tank	80.53 ℓ/s	DN 355 HDPE PN16 (CH 0.0 – CH 3,110.0) (L = 3,110 m)
Elevated Tank to NF Feed Tank	87.89 ℓ/s	DN355 HDPE PN16 (CH0.0 – CH9,080.0) (L = 9,080.0) DN315 HDPE PN16 (CH9,080.0 – CH 11,004.0) (L = 1,924.0 m)
Decant Dam to WTP Inlet Tank	83.33 ℓ/s	DN 400 HDPE PN16 (CH 0.0 – CH 200.0) (L = 200.0 m)
WTP to Decant point	< 143 ℓ/s (TBC)	DN 400 HDPE PN16 (CH 0.0 – CH 1,550.0) (L-1,550.0 m) (TBC)
Pumps:		
Schoonoord	3.958 ℓ/s	92.64 m (5.15 kW)
U3 Dam	80.53 ℓ/s	52.06 m (58.75 kW)
Mooifontein	7.36 ℓ/s	72.81 m (7.51 kW)
Decant Dam	83.33 ℓ/s	7 m (8 kW)
Storage:		
Elevated Tank		350 m^3 (1 h storage)

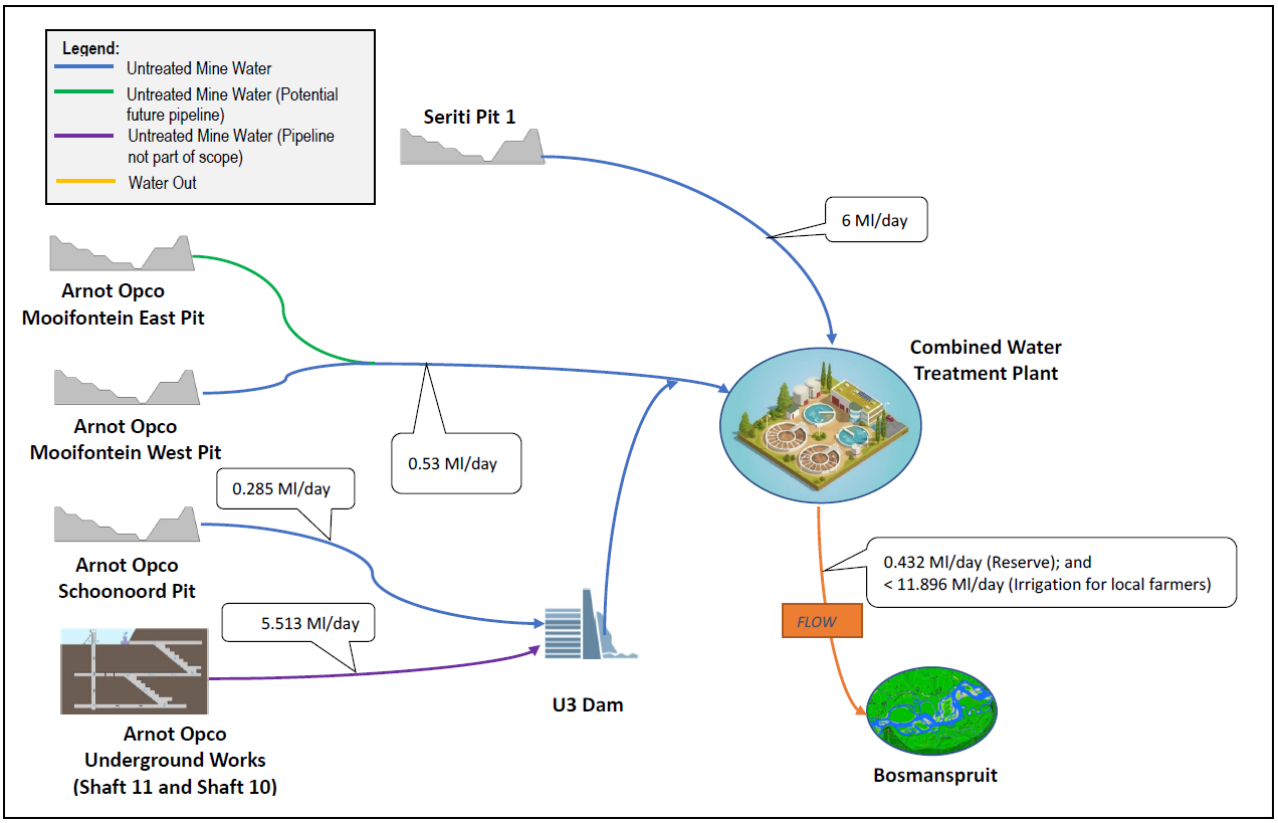


Figure 5: Proposed Arnot CWTP arrangement

4. Pipelines:

4.1 Mooifontein to elevated tank

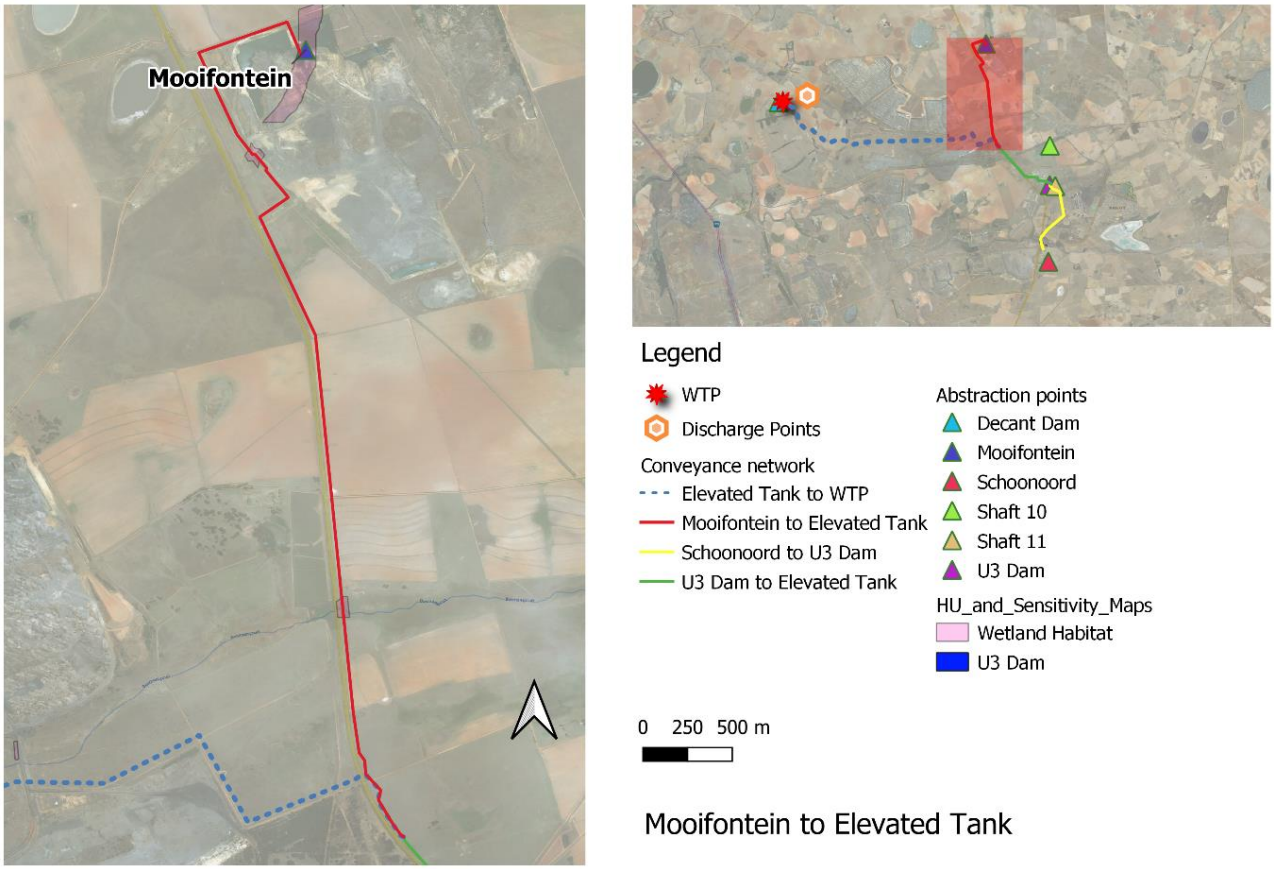


Figure 6: Mooifontein to elevated tank pipeline alignment

The water from the Mooifontein west pit shall be pumped to the elevated tank through a 6m, DN140 HDPE PN16 pipeline. The hydraulic analysis is shown in Figure 7 and pipeline alignment properties are shown in Table 3.

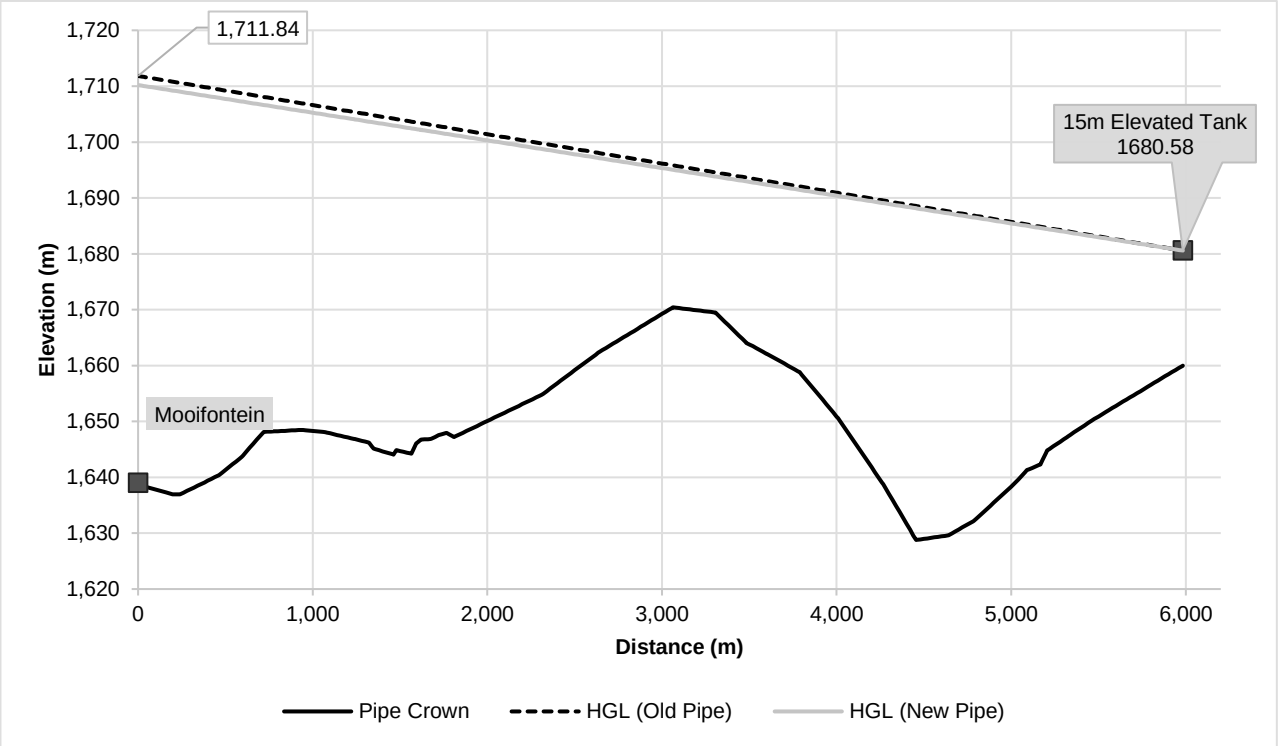


Figure 7: Hydraulic analysis - Mooifontein to elevated tank

Table 3: Pipeline alignment properties - Mooifontein to elevated tank

Chainage from	Chainage to	Length	Flow	ND	Pipe Class	ID	Velocity
(m)	(m)	(m)	(ℓ/s)	(mm)	PN	(mm)	(m/s)
0.0	5,985	5,985	7.361	140	16	113	0.73

4.1.1 Mooifontein to Elevated Tank Stream Crossings:

The alignment from Mooifontein pit crosses the Boesmanspruit river as shown in **Figure *8***. The design has allowed for pipe protection, using concert encasement of the buried HDPE pipeline. The co-ordinates of the crossing location are shown in **Table *4***.

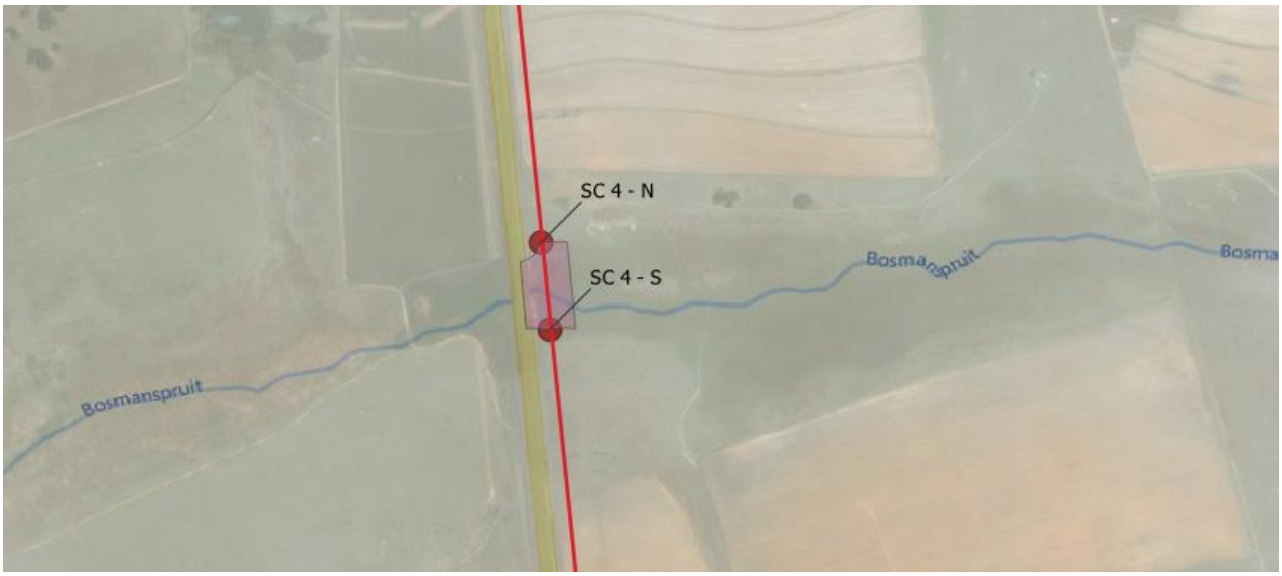


Figure 8: Mooifontein to elevated tank wetland crossing 4

Table 4: Mooifontein to Elevated Tank stream crossing 4 co-ordinates

Position	Description	Longitude	Latitude
South	4111-SC-1-S	29°45'14.19"E	25°54'25.96"S
North	4111-SC-1-N	29°45'13.74"E	25°54'21.77"S

4.1.2 Mooifontein to Elevated Tank Scour Positions:

The scours positions along the proposed pipeline are provided in **Table *5***.

Table 5: - Scour positions of the Mooifontein to Elevated Tank pipeline

Description	Latitude	Longitude	X (m)	Y (m)
4111-SV-1	S25° 52' 26.36"	E29° 45' 02.88"	29.7507988300	-25.8739896000
4111-SV-2	S25° 52' 57.08"	E29° 44' 59.35"	29.7498190400	-25.8825235000
4111-SV-3	S25° 54' 25.28"	E29° 45' 14.18"	29.7539384500	-25.9070213000

4.2 Schoonoord to the U3 Dam

Decant water is abstracted and pumped from Arnot OpCo's Schoonoord pit to the U3 Dam, as seen in Figure 9. It should be noted that although there is an existing DN150 steel pipeline from Schoonoord to the U3 Dam, the feasibility of using it to convey decant water has not been investigated.

The worst case scenario of pipe replacement has been assumed, although practically it may only need certain failing sections to be replaced. This existing steel pipeline has certain sections buried by rubble or soil but the majority of the pipeline rests on the surface of the ground.

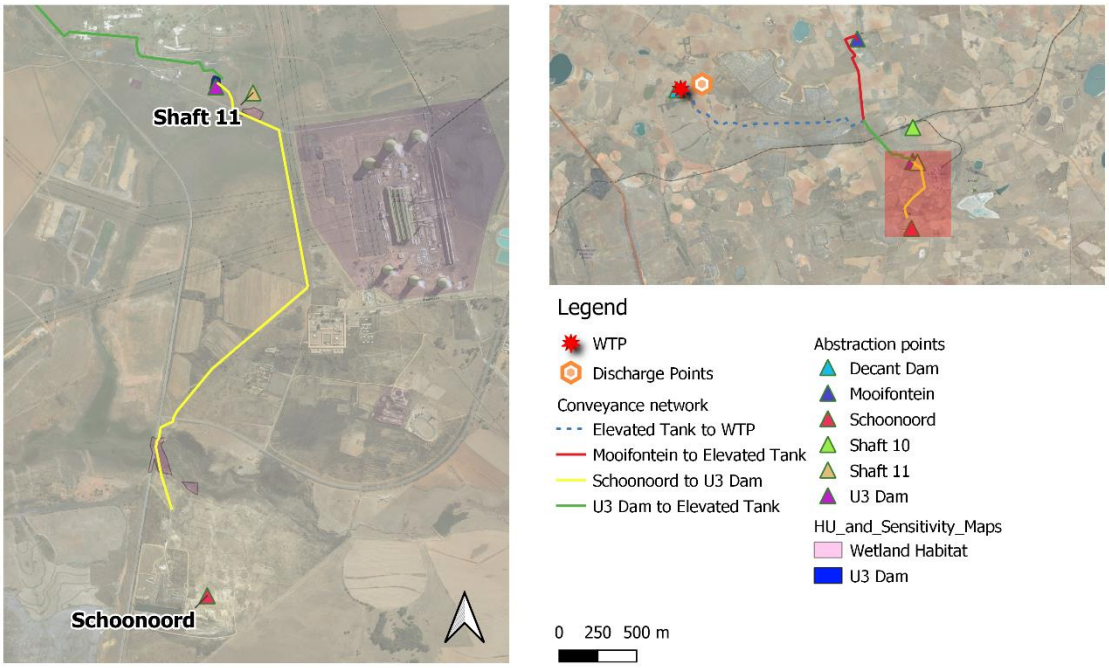


Figure 9: Schoonoord to U3 Dam pipeline layout

To date, the design report has investigated two options for the conveyance of the water via this existing pipeline:

1. Construction of a new HDPE pipeline offset from the existing pipe route. The pipe is proposed to be 3,500 meters of ND 90 and 181.9 meters of ND 75. All pipes will be PN 16 rated. The proposed alignment properties can be seen in Table 6.

Table 6: Alignment properties - Schoonoord to U3 Dam

Chainage from	Chainage to	Length	Flow	ND	Pipe Class	ID	Velocity
(m)	(m)	(m)	(ℓ/s)	(mm)	PN	(mm)	(m/s)
0.0	3,400.0	3,400.0	3.958	90	16	73	0.95
3,400.0	3,643.0	243.0	3.958	75	16	61	1.35

2. Use of existing pipeline, with the potential to replace portions deemed unfit following a condition assessment of the existing pipeline

The hydraulics of the proposed system can be seen in Figure 10. The pipeline has been analysed to ensure that there is a minimum pressure of 5 meters within the pipeline to ensure the air valves will operate correctly.

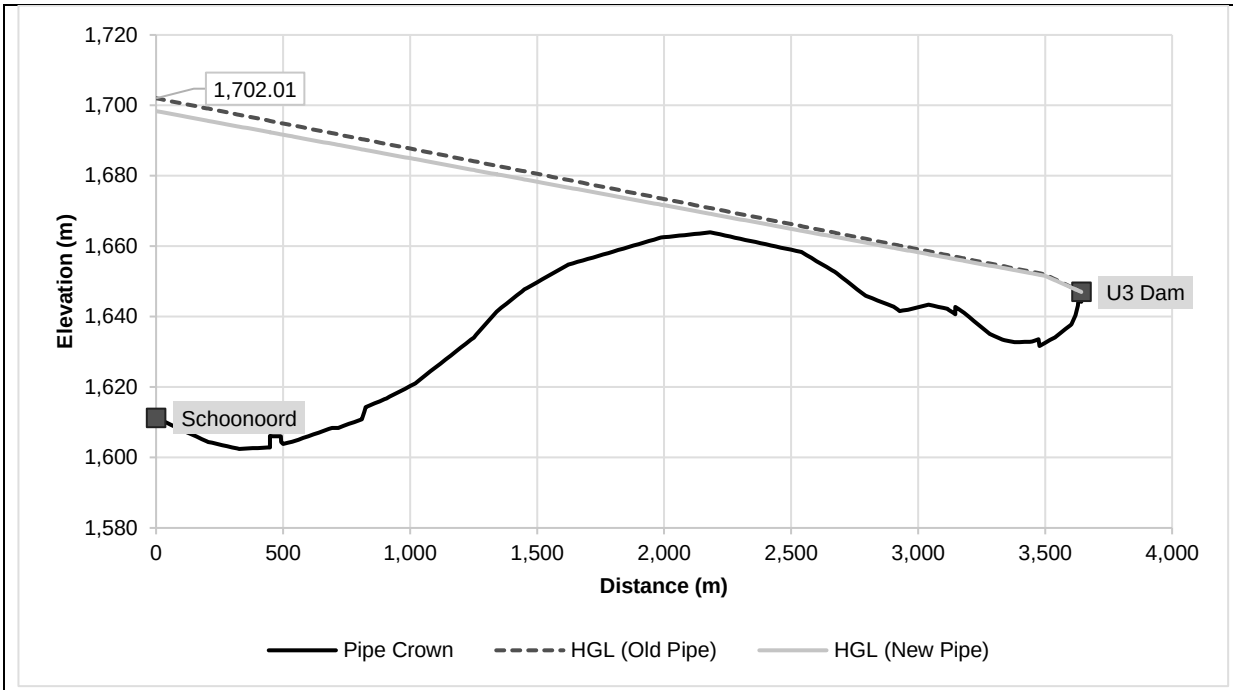


Figure 10: Hydraulic analysis - Schoonoord to U3 Dam

4.2.1 Schoonoord to U3 Dam Stream Crossings:

► Stream crossing no.1

The alignment is proposed to cross the Rietkuilspruit, near a bridge as shown in **Figure *11***. It is proposed that the HDPE pipeline will be routed to cross the river using the existing bridge. The HDPE pipe will surface outside of the 1:100-year flood plain, transition to a steel pipe, which will be routed along the bridge to outside of the 1:100-year flood plain, before transitioning back to HDPE. The steel pipe portion of this crossing is proposed to either be laid on concrete plinths between the bridge edge and the road edge, or is proposed to be placed on pipe supports, anchored into the side of the bridge for the pipe to run along. The co-ordinates of the proposed crossing location are shown in **Table *7***.

Figure 11: Schoonoord to U3 stream crossing 1

Table 7: Schoonoord to U3 Dam stream crossing no. 1 co-ordinates

Position	Description	Longitude	Latitude
North	4112-SC-1-N	E29° 46’ 30.78”	S25° 57’ 31.01”
South	4112-SC-1-S	E29° 46’ 30.57”	S25° 57’ 32.39”

► Stream crossing no.2

The second stream crossing along this alignment is located near chainage CH2900. It will be ensured that the pipe is protected between the 1:100-year floodlines on either side of the stream. The co-ordinates of the crossing location are shown in **Table *8***.

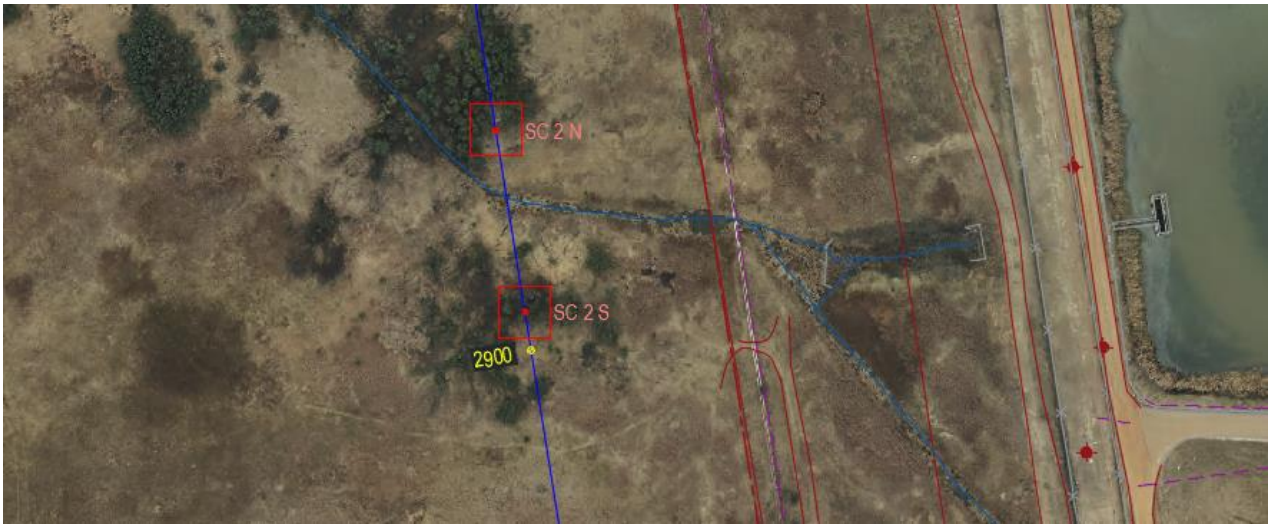


Figure 12: Schoonoord to U3 stream crossing no. 2

Table 8: Schoonoord to U3 Dam stream crossing no. 2 co-ordinates

Position	Description	Longitude	Latitude
North	4112-SC-2-N	E29° 47' 00.76"	S25° 56' 24.88"
South	4112-SC-2-S	E29° 47' 00.88"	S25° 56' 25.57"

► Stream crossing no.3

The third-stream crossing is situated south of shaft 11 abstraction point and runs underneath an existing conveyor system. The existing pipeline from Schoonoord is running along the conveyor system. The proposed method for crossing this river will be to use the existing pipe or to mount a new pipe to the side of the conveyor’s stand. An overview of this crossing is shown in **Figure *13***. The co-ordinates of the crossing location are shown in **Table *9***.

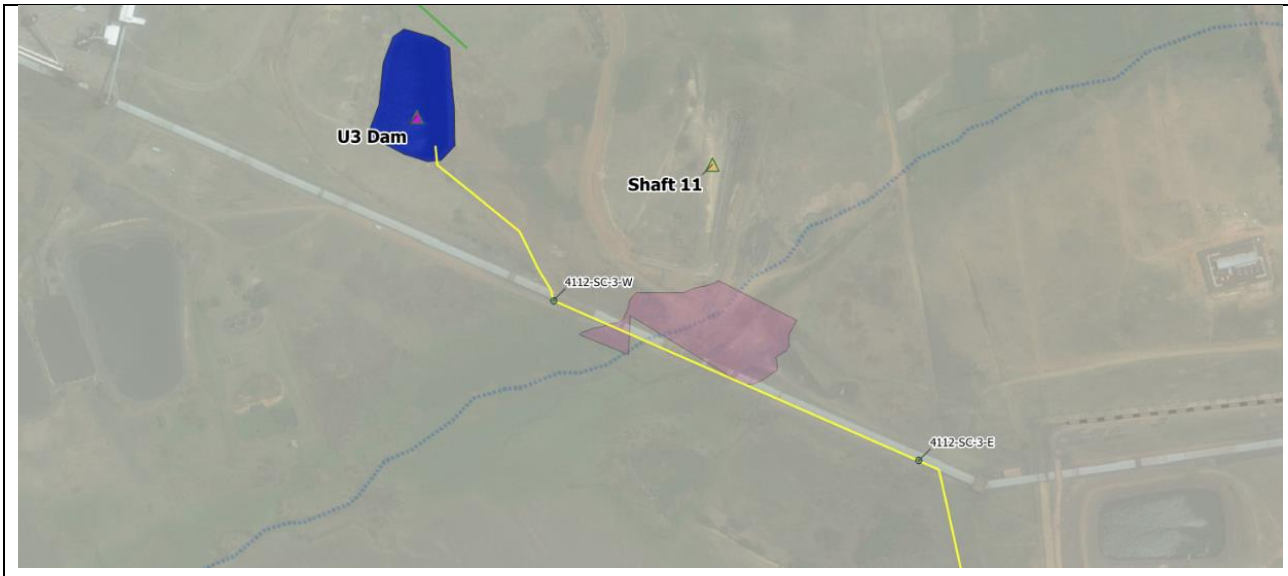


Figure 13: Schoonoord to U3 stream crossing 3

Table 9: Schoonoord to U3 Dam stream crossing no.3 co-ordinates

Position	Description	Longitude	Latitude
East	4112-SC-3-E	E29° 46' 59.00"	S25° 56' 18.97"
West	4112-SC-3-W	E29° 46' 48.39"	S25° 56' 14.32"

4.2.2 Schoonoord to U3 Dam Scour Positions

The pipeline is proposed to have scour positions as detailed in **Table *10***

Table 10: - Scour Positions on Schoonoord to U3 Dam pipeline

Description	Latitude	Longitude	X (m)	Y (m)
4112-SV-1	S25° 57' 35.87"	E29° 46' 31.23"	29.7753430200	-25.9599627000
4112-SV-2	S25° 57' 30.77"	E29° 46' 30.92"	29.7752568100	-25.9585484000
4112-SV-3	S25° 56' 25.71"	E29° 47' 00.91"	29.7835849900	-25.9404762000
4112-SV-4	S25° 56' 18.97"	E29° 46' 59.00"	29.7830558000	-25.9386018000
4112-SV-5	S25° 56' 14.32"	E29° 46' 48.39"	29.7801092300	-25.9373099000

4.3 U3 Dam to elevated tank

Water from U3 Dam is planned to be extracted through a floating suction outlet works, into a pump station, from which the water will be lifted through a HDPE rising main to the elevated tank through a top inlet pipe 300 mm below the top of the tank, refer to Figure 14 and Figure 15. The pipe is proposed to be a ND315 HDPE PN 16 for the entire length. The alignment properties are shown in **Table *11***.

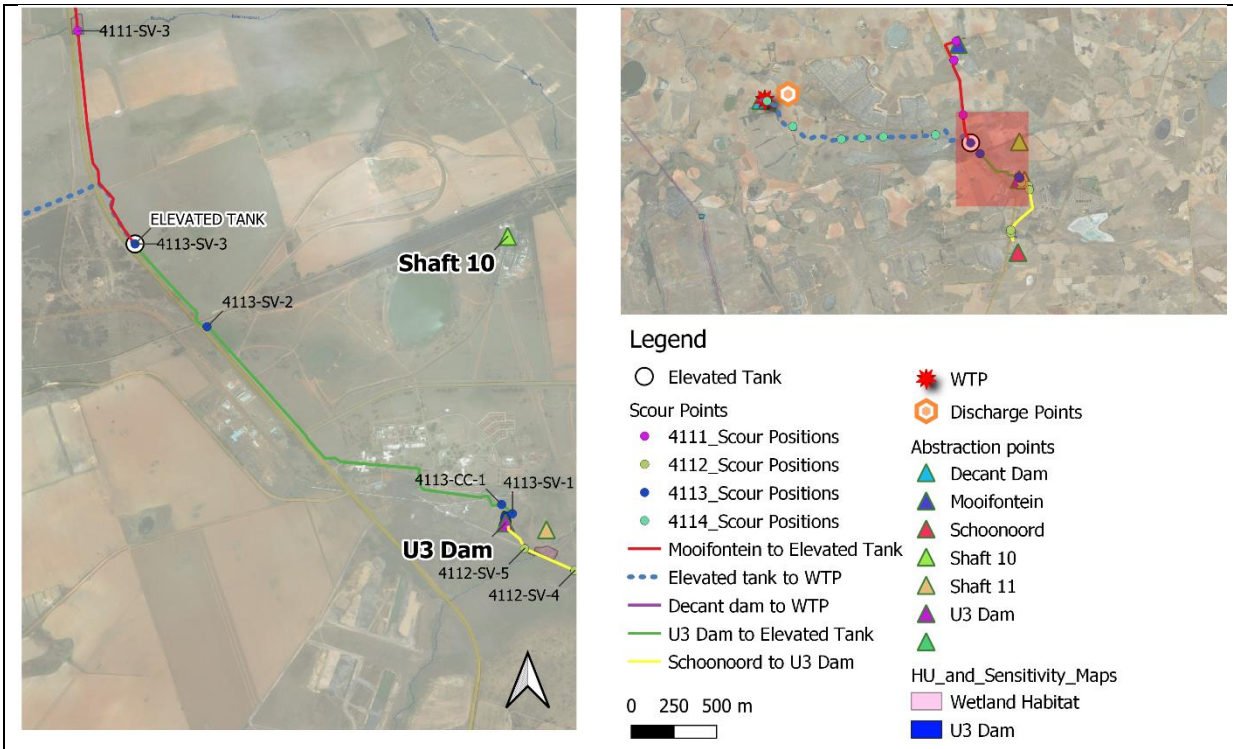


Figure 14: Alignment - U3 Dam to Elevated Tank

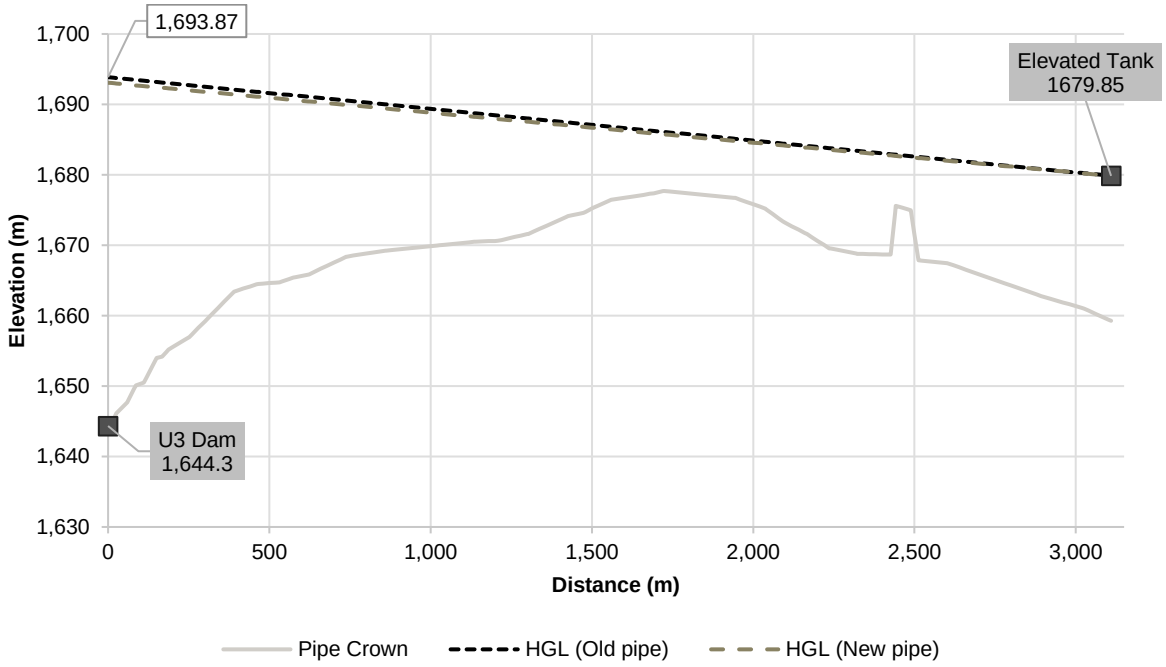


Figure 15: Hydraulic analysis - U3 dam to elevated tank

Table 11: Alignment properties - U3 dam to elevated tank

Chainage from	Chainage to	Length	Flow	ND	Pipe Class	ID	Velocity
(m)	(m)	(m)	(ℓ/s)	(mm)	PN	(mm)	(m/s)
0.0	3,110.0	3,110.0	80.53	355	16	288	1.24

The pipeline route has 9 road crossings along its alignment. Provision will be made for each road crossing. The owner and class of the roads still needs to be determined, based on road crossing design (i.e., cut and cover, sleeved, length of road crossings, directional drilling).

4.3.1 Scour Positions on U3 dam to elevated tank pipeline

The pipeline is proposed to have scour positions as detailed in **Table *12***.

Table 12: U3 Dam to Elevated Tank Scour Positions

Description	Latitude	Longitude	X (m)	Y (m)
4113-SV-1	S25° 56' 06.97"	E29° 46' 45.87"	29.7794071000	-25.9352697000
4113-SV-2	S25° 55' 27.59"	E29° 45' 41.45"	29.7615129400	-25.9243303000
4113-SV-3	S25° 55' 10.16"	E29° 45' 26.25"	29.7572915200	-25.9194888000

4.4 Elevated Tank to the CWTP inlet chamber

From the elevated tank, it is proposed that the water be gravity fed to a top inlet at the nano-filtration (NF) feed tank within the CWTP. The proposed alignment of this pipeline is shown in **Figure *16***.

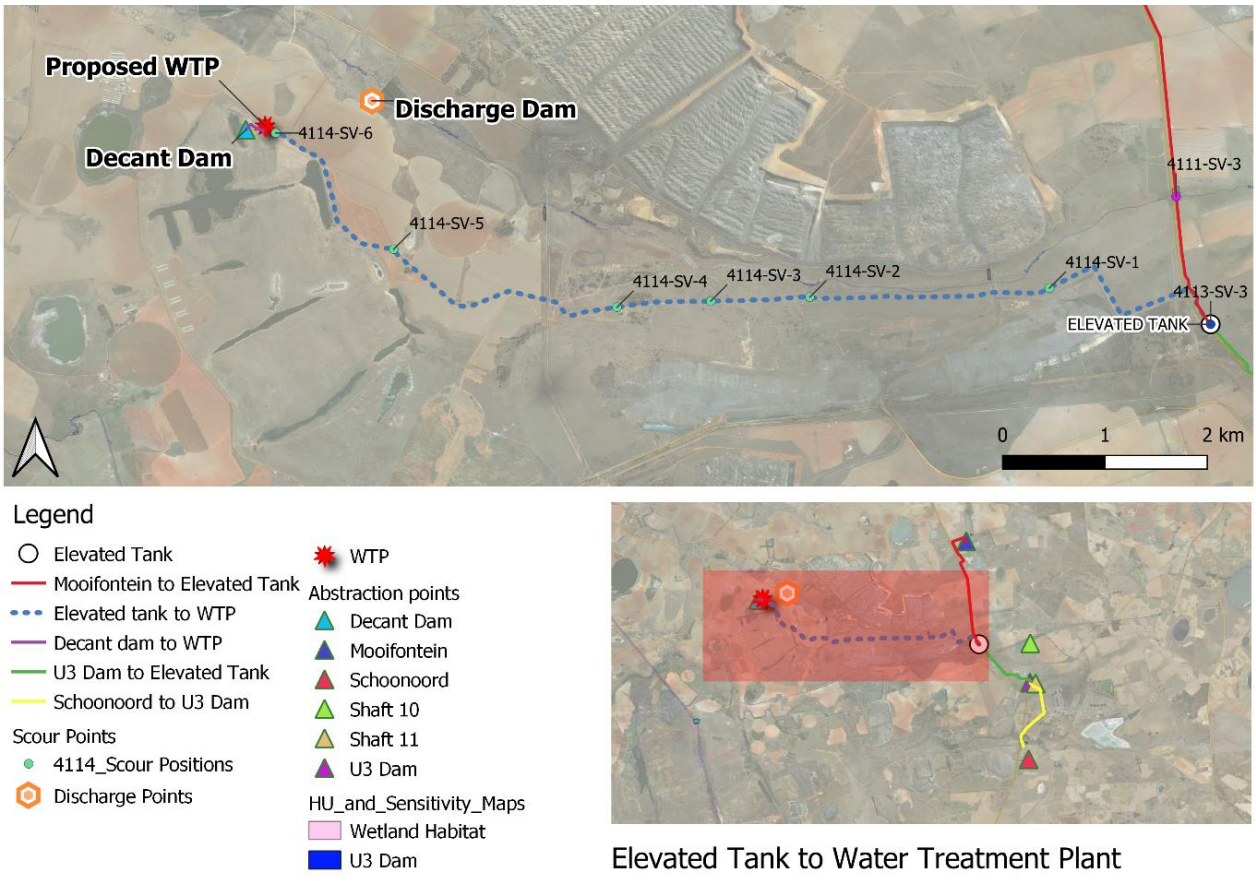


Figure 16: Alignment Elevated tank to Water Treatment Plant

The pipeline has been analysed to draw water from one meter above the bottom of the elevated tank and to enter the NF inlet tank through a top inlet pipe one meter below the top of the tank. A hydraulic analysis was done on the pipeline for the maximum flow of 87.89 l/s considering an old and a new HDPE pipe. The results of the analysis are shown in Figure 17.

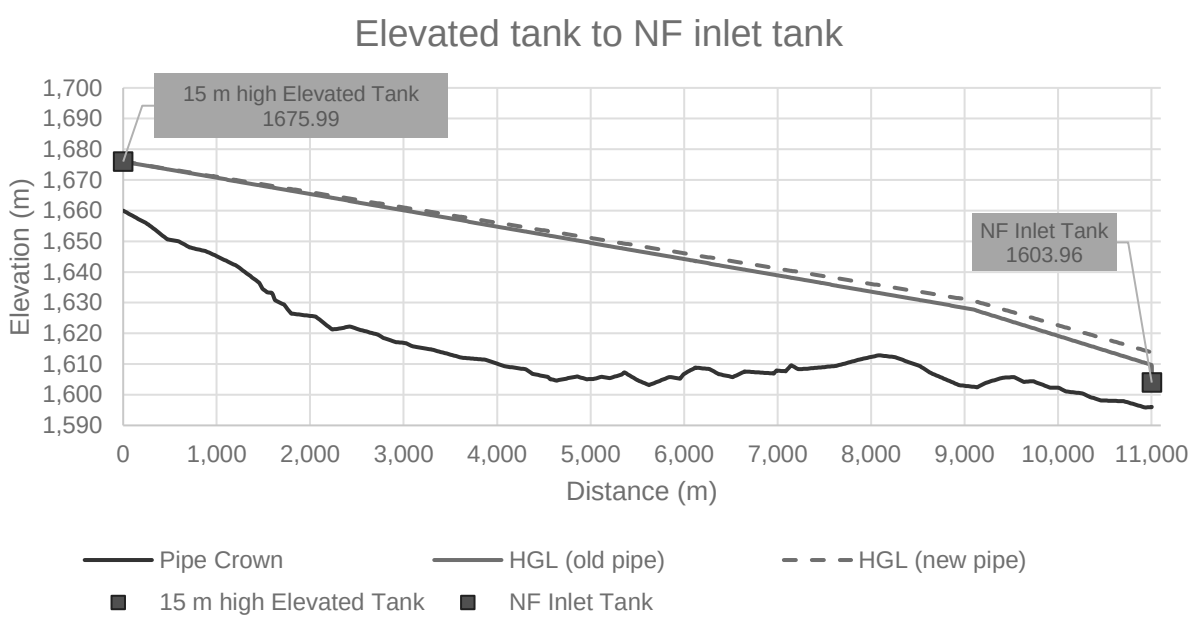


Figure 17: Hydraulic analysis - Elevated tank to NF inlet tank

The pipe is proposed to have two pipe diameters of PN16 HDPE along its alignment which will consist of 9,080 meters of DN355, and 1,924 meters of DN315. The velocities within these pipes will be 1.35 m/s and 1.71 m/s respectively. A summary of the alignment properties can be seen in **Table *13***.

Table 13: Alignment properties - Elevated tank to NF inlet tank

Chainage from	Chainage to	Length	Flow	ND	Pipe Class	ID	Velocity
(m)	(m)	(m)	(ℓ/s)	(mm)	PN	(mm)	(m/s)
0.0	9,080.0	9,080.0	87.89	355	16	288	1.35
9,080.0	11,004.0	1,924.0	87.89	315	16	256	1.71

4.4.1 Scour Positions on pipeline from Elevated Tank to CWTP

The scours are proposed to be positioned as detailed in **Table *14***.

Table 14: Elevated tank to WTP - Scour Positions

Description	Latitude	Longitude	X (m)	Y (m)
4114-SV-1	S25° 54' 57.44"	E29° 44' 29.65"	29.7415701900	-25.9159558000
4114-SV-2	S25° 55' 00.61"	E29° 43' 05.55"	29.7182074600	-25.9168357000
4114-SV-3	S25° 55' 02.00"	E29° 42' 30.77"	29.7085459800	-25.9172210000
4114-SV-4	S25° 55' 04.16"	E29° 41' 57.86"	29.6994067100	-25.9178216000
4114-SV-5	S25° 54' 43.78"	E29° 40' 39.47"	29.6776307700	-25.9121610000
4114-SV-6	S25° 54' 02.96"	E29° 39' 58.08"	29.6661322000	-25.9008212000

4.5 Decant Dam to CWTP Inlet Tank

The water from Seriti's decant dam to the CWTP inlet works is proposed to be extracted from the dam through a floating suction pipeline to a pump station that will lift the water through a ND315 HDPE pipeline. The layout of the pipeline is shown in **Figure *18***. Hydraulics of the proposed pipeline is shown in **Figure *19***.

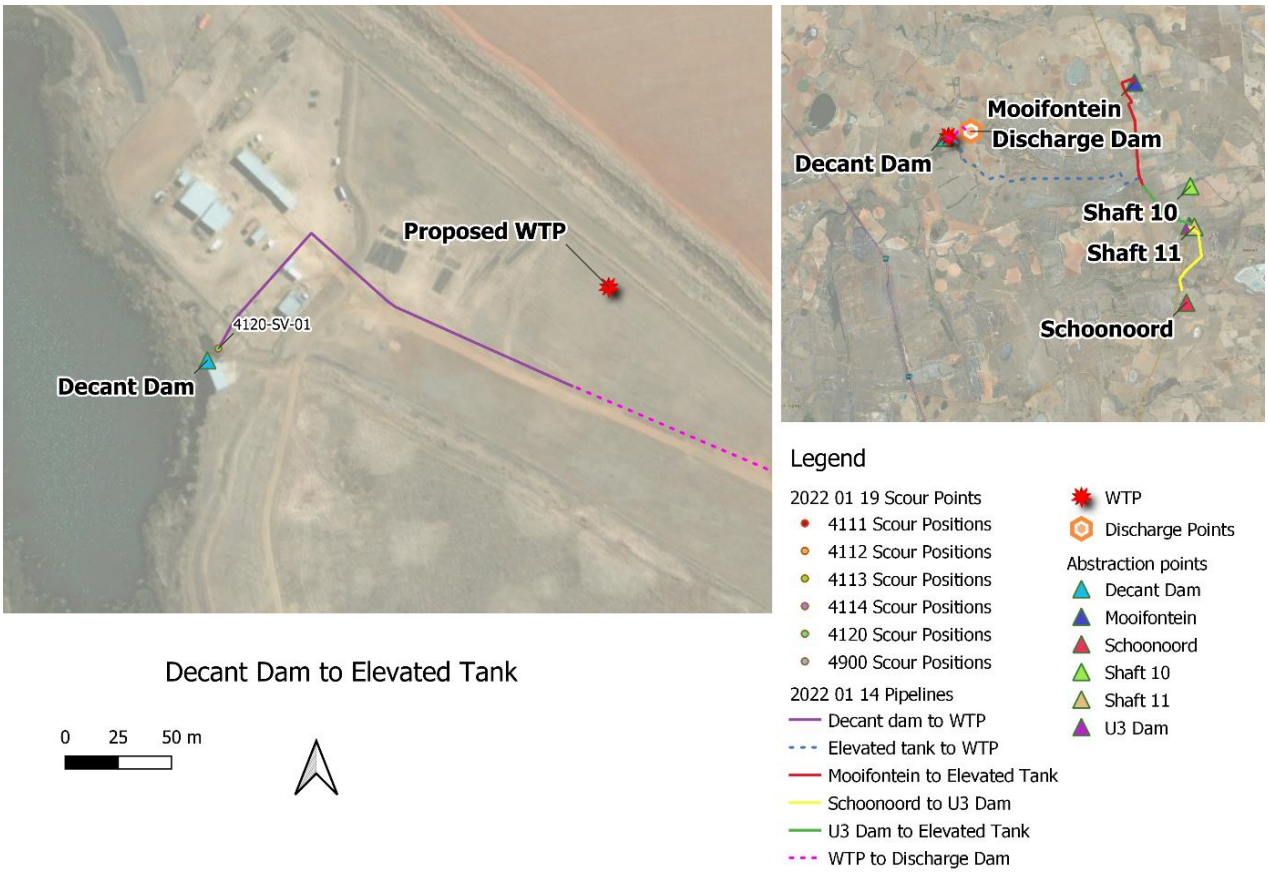


Figure 18: Alignment Decant Dam to Water Treatment Plant

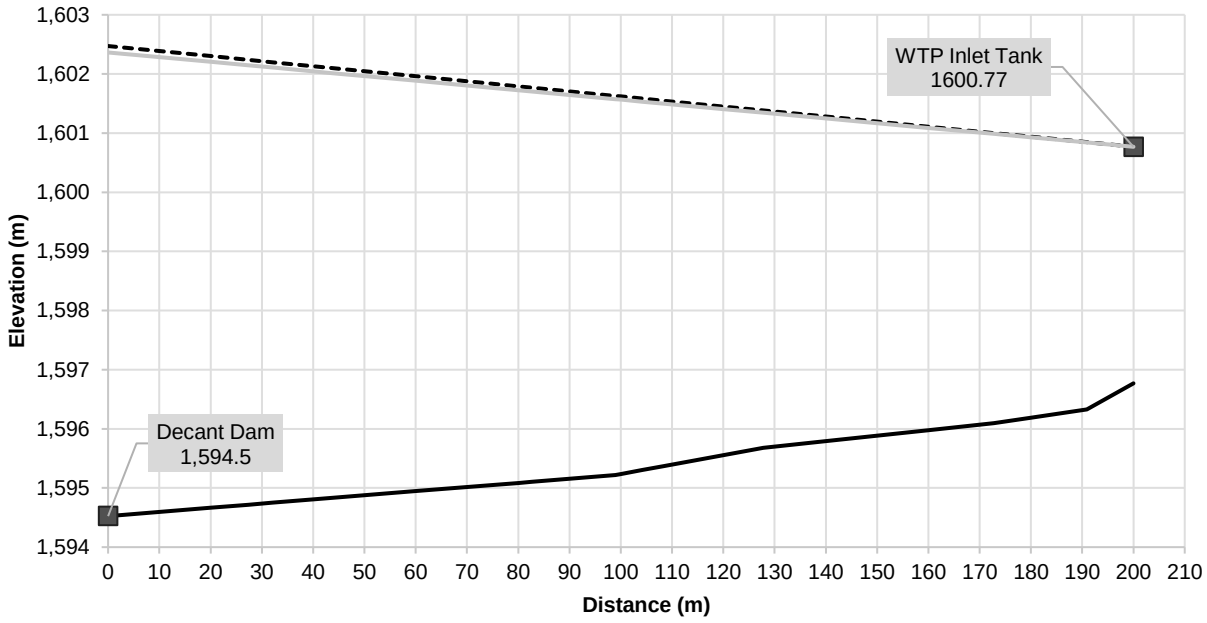


Figure 19: Hydraulic analysis - Decant dam to WTP Inlet

The proposed alignment properties are detailed in **Table *15***.

Table 15: Alignment properties - Decant Dam to WTP

Chainage from	Chainage to	Length	Flow	ND	Pipe Class	ID	Velocity
(m)	(m)	(m)	(ℓ/s)	(mm)	PN	(mm)	(m/s)
0.0	214	214	83.33	400	16	325	1.00

4.5.1 Scour Positions along the Decant Dam to CWTP pipeline

The scours are proposed to be positioned as detailed in Figure 16.

Table 16: Decant Dam to WTP - scour positions

Description	Latitude	Longitude	X (m)	Y (m)
4120-SV-1	S25° 54' 01.64"	E29° 39' 47.76"	29.6632666600	-25.9004555000

4.6 CWTP to Decant point

The treated discharge water from the combined water treatment works will be conveyed within a HDPE pipeline to the decant point which is the discharge point into the Boesmanspruit. This pipeline will require confirmation of the design flow following the detailed design of the water treatment as this will influence the efficiencies within the process, the discharge quantities and the peak flows.

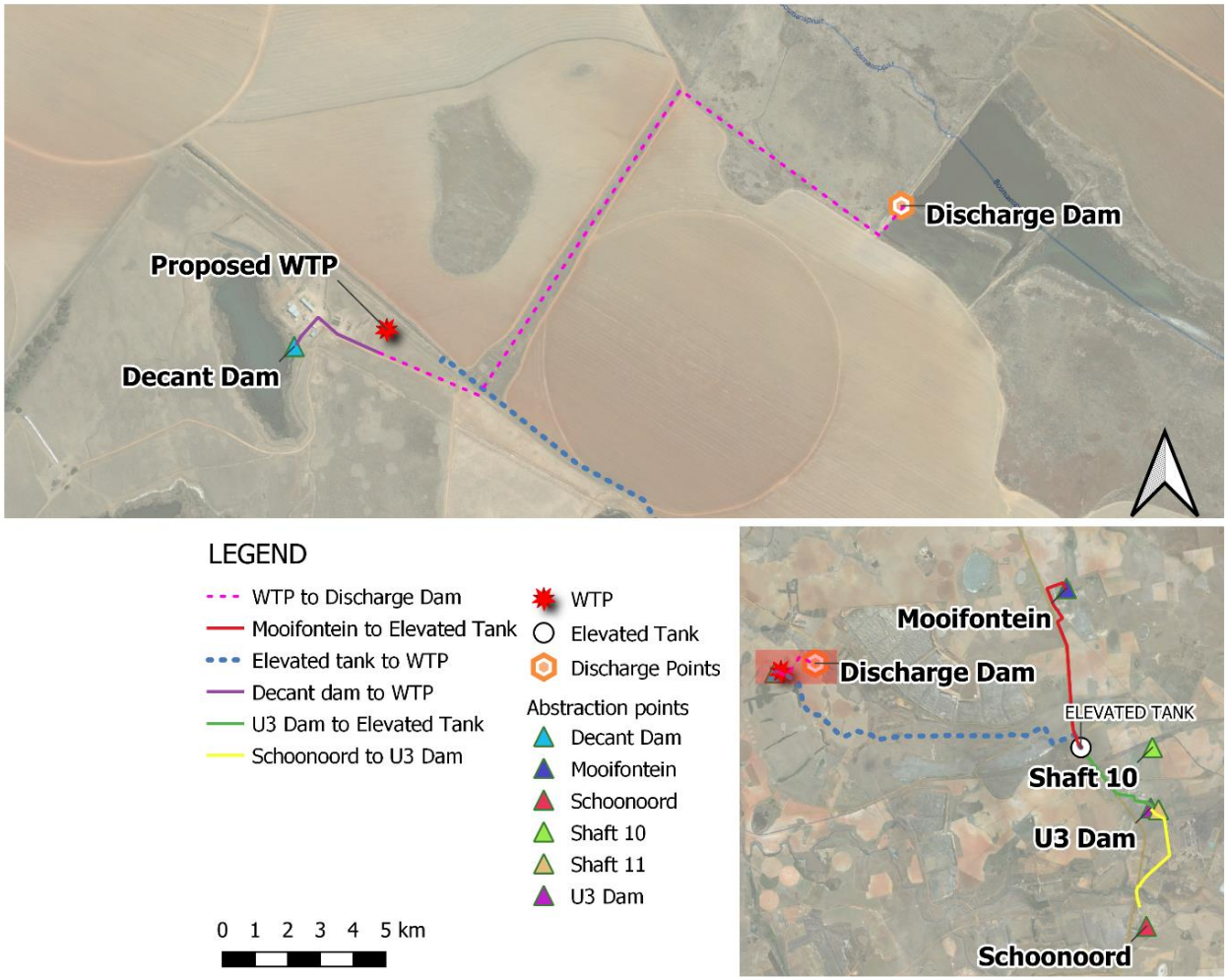


Figure 20: Water Treatment Plant to Decant point layout

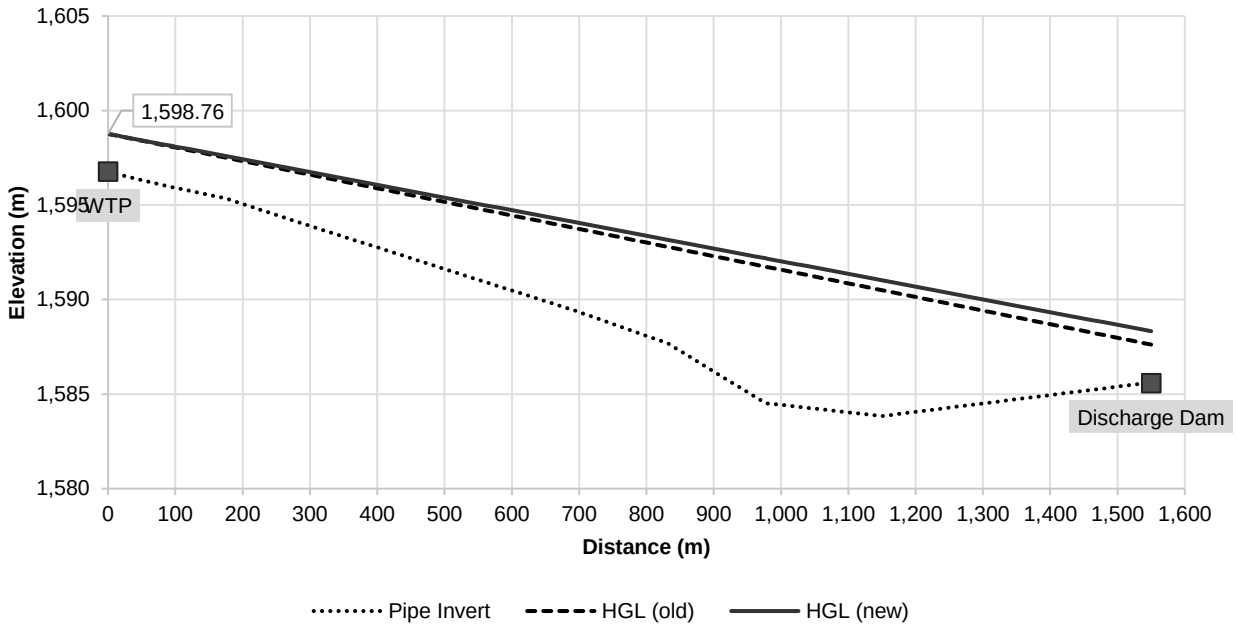


Figure 21: Hydraulic analysis – WTP to Decant point

4.6.1 Scour Positions on pipeline from CWTP to Decant point:

The scours are proposed to be positioned as detailed in **Table *17***.

Table 17: WTP Decant point - scour positions

Description	Latitude	Longitude	X (m)	Y (m)
4900-SV-1	S25° 53' 47.67"	E29° 40' 20.89"	29.6724694400	-25.8965750000

5. Storage:

5.1 Elevated tank

The elevated tank is proposed to be a pressed steel tank, which will be supported by a structural steel frame. The proposed 15-meter height of the frame has been determined from the system hydraulics, to allow the minimum height required to gravity feed the water from the proposed position to the CWTP.

Two positions are currently under consideration for the position of the elevated tank with the locations shown in **Table *18***.

Table 18: Elevated tank positions

Position	Longitude	Latitude
1	29°45'26.25"E	25°55'10.16"S
2	29°45'56.61"E	25°55'43.12"S

The outlet pipe will be a bottom outlet. The inlet pipe is proposed to be placed to allow for the pipe diameter as well as minimum freeboard within the tank. The elevated tank has been sized to allow for 1 hour of storage from Mooifontein and U3 dam, to be 350 m^3. A preliminary proposal to size the tank to be 4 panels high, 7 panels wide, and 7 panels long. Each panel is 1.22 m x 1.22 m, therefore creating a total storage volume of 355.9 m^3. An illustration of the proposed tank is shown in **Figure *22***.

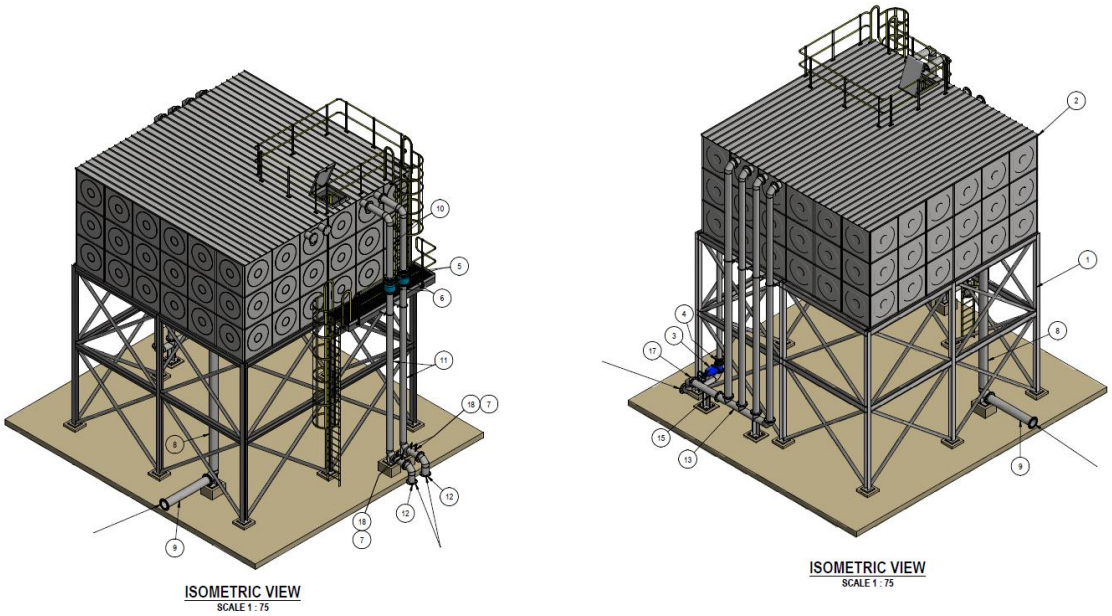


Figure 22: Typical detail - elevated tank

6. Treatment

The Arnot CWTP will be fed raw water from two incoming streams, namely:

- The Seriti Decant Dam abstraction line; and
- The combined Arnot OpCo water conveyance line.

The CWTP will be designed to treat both raw water streams having water quality profiles adopted using conservative approaches.

For Seriti, samples were taken at various locations over a 6-year period, with surface water run-off in the area generally flowing towards the Decant Dam. The 95th percentile values were calculated at each of the sample locations for all parameters. The highest concentration (or lowest pH) of the various sampling locations was used to represent the design water quality for Seriti's feed stream.

For Arnot OpCo, the 95th percentile value for all relevant water quality parameters were calculated for the combined water sources based on the available data. A water quality prediction was also modelled. The highest concentration (or lowest pH) of the current data and predicted dataset was selected to represent the blended Arnot-OpCo water.

Table 19 below provides an indication of the raw water quality emanating from each respective area that the WTP will be designed for. Since these feeds enter the treatment train at different places their quality is reported separately.

Table 19: Expected raw water quality

Parameter	Units	Seriti	Arnot OpCo	Combined Raw Water
Suspended solids	mg/ℓ	799	Unknown	Unknown
Total dissolved solids	mg/ℓ	6,653	1,380	3,787
Total alkalinity	mg/ℓ as CaCO3	878	330	599
pH	-	6.17	6.9	6.31
Electrical conductivity	mS/m	712	194	390
Aluminium	mg/ℓ	2.12	0.203	1.14
Calcium	mg/ℓ	581	149	361
Iron	mg/ℓ	54.4	1.52	27.4

Potassium	mg/ℓ	78.3	12.3	44.7
Magnesium	mg/ℓ	619	90	349
Manganese	mg/ℓ	12.1	0.113	5.99
Sodium	mg/ℓ	142	177	161
Chloride	mg/ℓ	24.4	70	47.9
Sulphate	mg/ℓ	3 475	691	2058

Generally, the feed water in both mining areas can be characterised as very hard water due to the elevated Calcium and Magnesium levels. It is noteworthy that the Non-Carbonate Hardness is much greater than the Carbonate Hardness. In addition, the raw water has a high sulphate concentration and is slightly acidic.

Figure *23* below provides a conceptual diagram for the requisite treatment process.

The treatment train, in the order presented, shall be designed to include the following key process steps:

- Main Treatment Train
  - Lime softening and clarification of Seriti stream
  - Blend softened Seriti stream and raw Arnot OpCo streams
  - Nanofiltration (hollow-fibre membranes)
- Brine Minimisation & Concentrating Train
  - Cascade membrane process
  - Thermal evaporation
- Sludge Dewatering
  - Membrane filter press

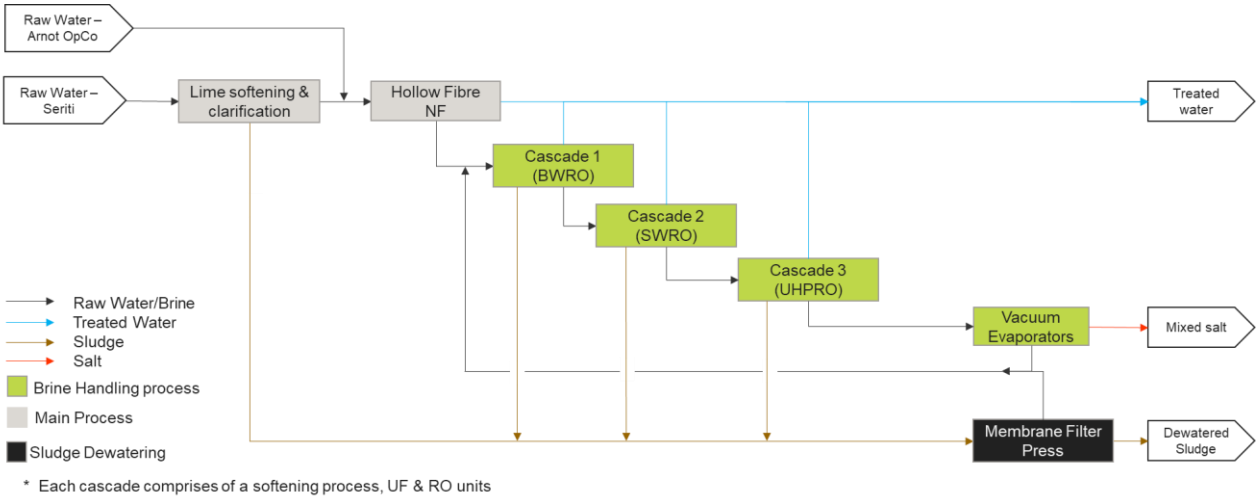


Figure 23: Simplified conceptual diagram of the process train

The Central WTP shall be designed to soften the incoming raw water via a combination of lime softening and hollow fibre NF membrane filtration for the removal of calcium and magnesium hardness (main treatment train). The lime softening step will be undertaken in a solids contact clarifier and will also serve to precipitate some iron, aluminium and manganese from the raw water in addition to removing other suspended solids, thereby acting as a pre-treatment step for the downstream hollow fibre NF membrane filtration process. The hollow fibre NF membrane filtration process will serve to remove residual suspended solids in addition to removing divalent ions and some monovalent ions, thereby producing a permeate in line with the target water quality parameters.

The brine generated during the hollow fibre NF membrane filtration step will be subjected to a series of cascading membrane processes. Each cascading step will comprise a softening plant, an ultrafiltration plant

and a reverse osmosis plant. The brine is concentrated through the series of membrane cascade processes prior to being fed to a vacuum evaporator. The concentrated brine is evaporated to produce a mixed salt slurry waste stream which must be appropriately disposed of.

Sludge will be produced at the upfront lime softening process as well as at each softening stage within the membrane cascade system. The sludge will be collected in a holding tank and fed to a membrane filter press which produces a solid residue suitable for efficient handling and disposal.

7. Solid waste handling

The water treatment process will produce a considerable amount of sludge over the various softening steps that will be combined at the dewatering facility. The sludge is a dewatered solid as opposed to a liquid stream or a slurry. The composition and quality of the sludge is directly informed by the raw water quality, lime and/or soda ash dose rates, solids contact clarifier operating conditions and sludge recirculation ratios. It will comprise of a combination of metal oxyls, metal hydroxides and gypsum.

The dewatered sludge (estimated 70wt% solids) is not intended to be stored on site, although temporary storage may be required from time to time to prevent process delays or so called “bottlenecks”. Since the sludge will include gypsum and calcite, there is potential for beneficial/comercial use. However, an agreement between the WTP and an off-taker will most likely be contingent upon the laboratory analysis of a physical sludge sample. This can only be fast-tracked by replicating the entire process train as a pilot-plant after finalisation of the design and prior to construction of the Works. Barring such an agreement, the sludge will have to be disposed of at a licenced landfill.

The nearest landfill that can potentially accept the sludge is the Holfontein Landfill operated by Enviroserv. The landfill is over 130km away from the project site.

The thermal evaporative crystallisation process will also produce a solid waste stream. However, this is expected to be a mixed salt that primarily consists of sodium sulphate decahydrate. As of 23rd August 2021, new legislation has come into effect as indicated in the National Norms and Standards for Disposal of Waste to Landfill (GNR 636) that is applicable to the disposal of salt waste. In terms of GN R 636, a waste with a total dissolved solids (TDS) exceeding 5% or a leachable TDS of 100 000 mg/ℓ, may no longer be landfilled. The overall TDS is expected to be above the 5% threshold; therefore the legislation applies.

It would be financially preferable to have the mixed salt beneficiated. However, it is possible for Enviroserv to accept the mixed salt for further treatment and final disposal at Holfontein.

8. Eskom Infrastructure

The pipeline route runs parallel to various Eskom high voltage powerlines. The route crosses various roads.

Required applications for working within the vicinity of the Eskom will be submitted to Eskom for approval. The requirements for the design of the pipeline alignment in proximity to the Eskom infrastructure needs to be determined and complied to.

9. Design Details

9.1 Road crossings

Provision will be made at each instance where the pipeline crosses a road. The use of soilcrete as backfill material is preferred in the design process to reduce construction time, reduce the risk of open excavations and traffic interaction along with less time required to keep traffic accommodation in place. The additional material cost is offset by the reduced time require to complete the construction. The typical detail of the road crossing is shown in Figure 24 and Figure 25.

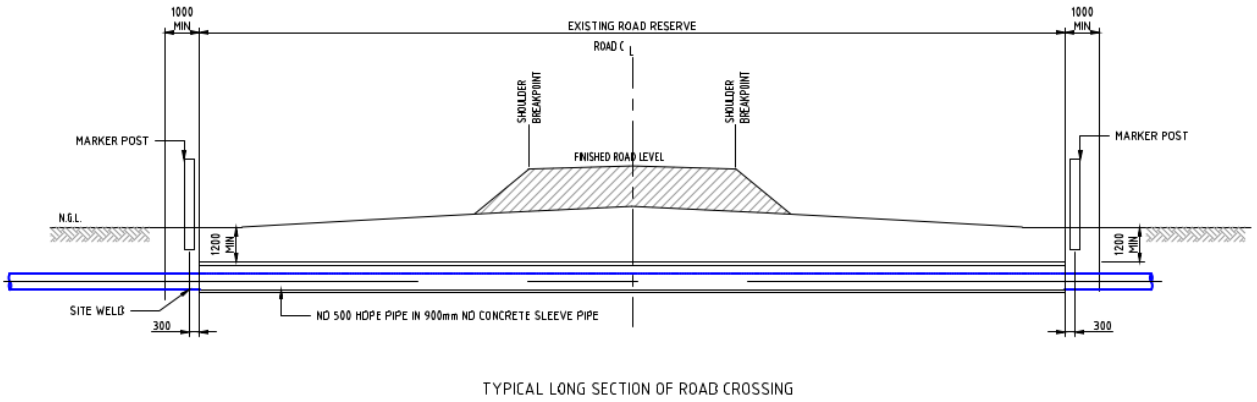


Figure 24: Typical detail - Road crossing long section

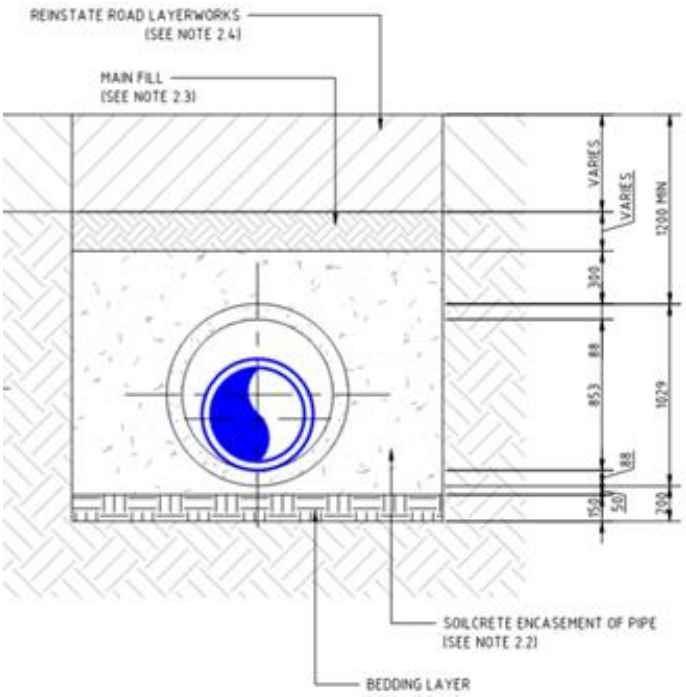


Figure 25: Typical detail - Road crossing section

9.2 Rail crossings

Where railways need to be crossed, considerations will need to be taken to cross the line with the least effort required, while complying with the relevant standards from the owner of the railway tracks. Considerations, in order of preference, that can be considered include:

1. Using existing infrastructure such as bridges running over the railway tracks as a support for a steel pipe to cross the railway.
2. Using nearby stormwater culverts and crossings to house a steel pipe that can be run under the rail crossing.
3. Pipe jacking a concrete sleeve pipe underneath the railway to allow the HDPE pipe to run inside.

9.3 Stream crossings

At river, stream and wetland crossings, as well as at scour points, the pipeline will be designed to resist floating forces when the pipe is empty, and the pipe will be protected against flooding and erosion. Appropriate measures will be implemented to protect pipelines where necessary. Dependant on the type of stream crossing the following option will be preferred, but may differ due to specific application:

A gabion reno mattress constructed over the pipeline and following the Centre Line (C/L) through the stream crossing (with a minimum of 400 mm below natural ground level (NGL)) provides protection from surface erosion such cattle and/or vehicle crossing. A typical detail of this installation is shown in Figure 26.

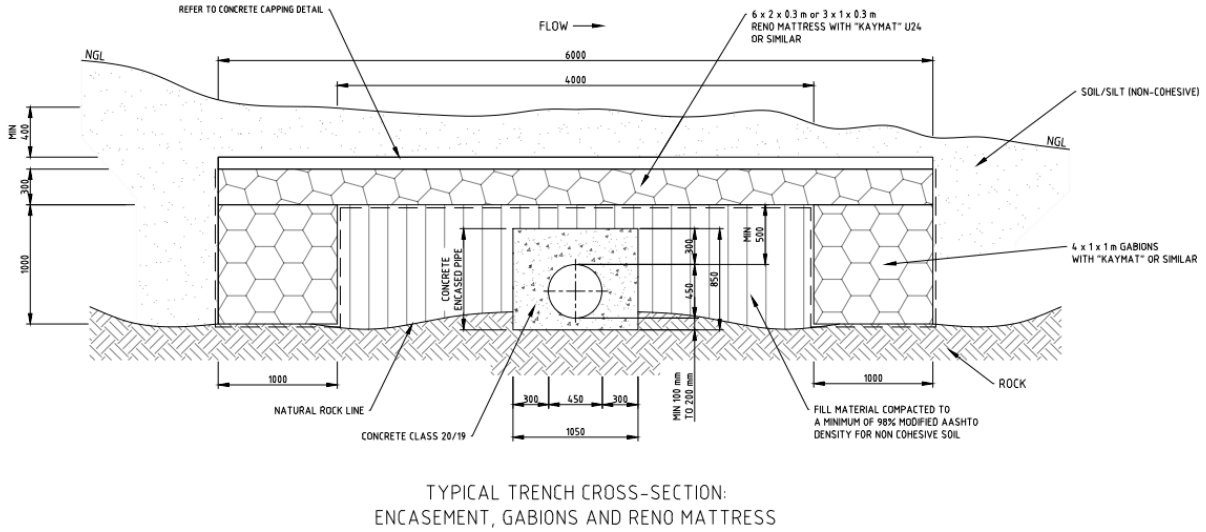


Figure 26: Typical detail - Stream crossing

9.4 Air valves

Once the pipeline route has been finalised, air valve sizes and positions will be determined for the longitudinal pipeline sections. Either of the utility programmes developed by VENT-O-MAT or ARI will be used for this purpose. The sizing and positioning of air valves will be based on the rate at which air will be introduced or expelled from the pipeline, taking account of the following:

- Filling conditions;
- Dewatering conditions;
- Pipe rupture;
- Normal operating conditions;
- Surge / water hammer conditions; and
- The differential pressure across air valves during air intake will be limited to 3 m.

The air valves will be installed in chambers constructed from precast concrete manhole rings. Vandal resistant air valves will be installed as protection measure to provide minimal downtime for maintenance due to theft or vandalism. Vandal resistant manhole access lids will be installed to prevent unauthorised access into chambers as far as possible. Vandal resistant air vents are included in the design which will allow for the required ventilation in the chambers for save access of the chambers when maintenance is required.

A typical detail of the proposed air valve is shown in **Figure *27***.

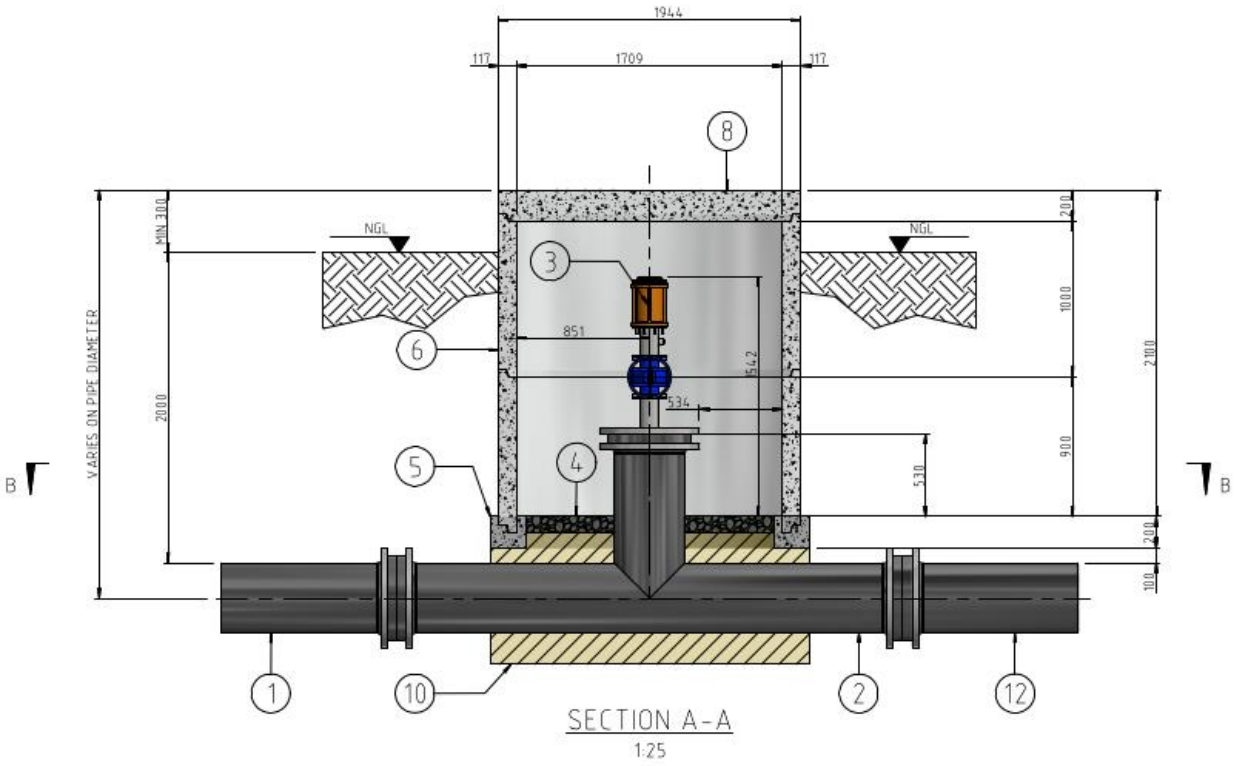


Figure 27: Typical detail - Air valve section

9.5 Scour valves

Scour installations will be provided at all low points along the pipeline profile, but not if they fall inside a stream. Scour installations, in combination with inline isolating valves, will be sized to allow any section of the pipeline to be drained within a maximum of 8 hours. Scour installations will be designed to ensure that the maximum scour velocity in the pipeline is between 0.4 - 0.5 m/s and the maximum velocity through the scour outlet does not exceed 6 m/s.

The scour valves will be installed in chambers constructed from precast concrete manhole rings. Vandal resistant manhole access lids will be installed to prevent unauthorised access into chambers as far as possible. Vandal resistant air vents are included in the design which will allow for the required ventilation in the chambers for save access of the chambers when maintenance is required.

A typical detail for the proposed scour valve is shown in Figure 28.

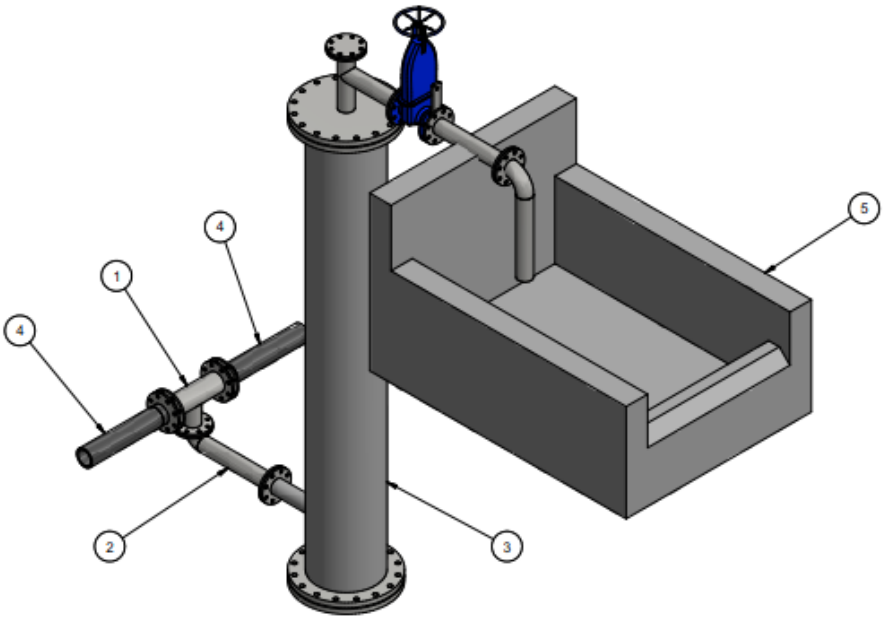


Figure 28: Typical detail - Scour pipe isometric

(e) Policy and Legislative Context

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT (a description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process	**REFERENCE WHERE APPLIED**	**HOW DOES THIS DEVELOPMENT COMPLIY WITH AND RESPOND TO THE LEGISLATION AND POLICY CONTEXT.** (E.g. In terms of the National Water Act a Water Use License has/ has not been applied for)
The Republic of South Africa Constitution Act (Act No. 108 of 1996) ("the Constitution")	BA Report and EMPr	The environmental right contained in Section 24 of the Constitution provides that everyone is entitled to an environment that is not harmful to his or her well-being.
National Environmental Management Act, 1998 (Act No. 107 of 1998 as amended) (NEMA) and the Environmental Impact Assessment (EIA) Regulations, 2014 (as amended by GNR 326 effective April 2017.	BA Report and EMPr	Application for Environmental Authorisation (EA). The BA Process for the proposed project has been carried out in accordance with the Regulations 19 and 20 of the NEMA EIA Regulations, 2014.

Conservation of Agricultural Resources Act (Act No. 43 of 1983) (CARA)	BA Report and EMPr	The CARA makes provision for the conservation of agricultural resources through limiting the sub-division of agricultural land, maintaining the production potential of land, combating and preventing erosion, preventing the weakening or destruction of water sources, protecting vegetation, and combating weeds and invader plants. As such, as part of the BA process, recommendations should be made to ensure that measures are implemented to maintain the agricultural production of land (if possible).
National Environmental Management Act: Biodiversity Act, 2004 (Act No. 10 of 2004) read together with applicable amendments and regulations thereto.	BA Report and EMPr	Ecological impact assessments (floral, faunal) have been undertaken to determine if any listed species are located on the proposed site.
National Water Act (NWA), as amended, Act No. 36 of 1998	BA Report and EMPr	An application for Water Uses will be lodged. A freshwater ecological impact assessment has been undertaken to comply with the legislation requirements
National Environmental Management: Waste Act (NEMWA): Act No. 59 of 2008; National Environmental Management Act: Waste Amendment Act (WAA), Act No. 26 of 2014; NEMWA: Waste Management Activities, GN No. 921 of 29 November 2013; NEMWA: Waste Classification and Management Regulations, GN No. 634 of 23 August 2013	EMPr	Although a waste management license is not legally required, the NEMWA principles have been incorporated into the EMPr.
National Heritage Resources Act (NHRA), Act No. 25 of 1999	Heritage Impact Assessment (HIA) as an appendix to the BA Report	In terms of the NHRA, any person who intends to undertake "any development which will change the character of a site exceeding 5,000 m^2 in extent, or involving three or more existing erven or subdivisions thereof", "the construction of a road powerline, pipeline exceeding 300 m in length" or "the rezoning of site larger than 10,000 m2 in extent…" must at the very earliest stages of initiating the development notify the responsible heritage resources authority, namely SAHRA or the relevant provincial heritage agency.
Guideline on Need and Desirability, EIA Guideline and Information Document Series (Department of Environmental Affairs and Development Planning (DEA&DP), 2013)[1].	BA Report and EMPr	This guideline was consulted to inform need and desirability aspects of the proposed project.
Public Participation Guideline in terms of the NEMA EIA Regulations	BA Report and EMPr	Public Participation will be conducted in accordance with the guidelines published in terms of the NEMA EIA Regulations

[1] Although this guideline is written for the Western Cape, it remains only one available on the issue of need and desirability amongst the nine provincial authorities and two national authorities (DFFE and DMRE).

Stakeholder Engagement, Integrated Environmental Management, Information Series 3 (DEAT, 2002).	BA Report and EMPr	The Public Participation guideline was consulted to ensure that an adequate public participation process is undertaken.

(i) Need and desirability of the proposed activities.

(Motivate the need and desirability of the proposed development including the need and desirability of the activity in the context of the preferred location).

The Seriti and Arnot Opco mining areas consist of underground and opencast mining operations which used to supply coal to Eskom's Arnot Power Station. The Seriti mining area has undergone complete closure and current efforts are focused on rehabilitation. However, with Arnot Opco, some sections of the mine are still operational and only a section of the mine is undergoing closure and rehabilitation. As part of the rehabilitation efforts, all mine water emanating from the closed mine workings will require treatment prior to environmental discharge and beneficial use of the water.

Therefore, a 12.3 ML/day CWTP will be required to treat all the decant water and ensure it meets an acceptable discharge quality. The project will consist of multiple abstraction points, a conveyance system, a CWTP and a suitable sludge and waste handling plant as detailed in the project description.

Due to the complex nature of the project and an effort to make use of gravitational pipelines where possible (to reduce the need for pumps and thereby reduce the project's energy consumption), the layout of the pipelines, dams and CWTP were carefully considered by the engineering team. The current layout and location of the proposed project poses the least amount of risk to the environment. Surrounding landowners and privately owned property have also been considered and every effort made to remain within the Seriti and Arnot Opco mining boundaries.

However, any additional issues or concerns found during the basic environmental assessment process will be considered and included in the process in an effort to reach the optimal design for the project through this process.

(ii) Motivation for the overall preferred site, activities and technology alternative.

Location: The preferred plant location was based on minimising the piping infrastructure and related pumping costs. The location options were also based on land owned by the project principals (Seriti and Arnot Opco own the surface rights). The plant was located close to the single largest abstraction point on the project site in order to minimise size of the pipe infrastructure, pumping costs and storage volumes.

Technology: The treatment technology is fit for purpose and designed to approach Zero Liquid Discharge (ZLD) and to comply with the desired treated water quality. Hollow fibre and Nano filtration are considered state of the art technology for water treatment plants.

Infrastructure: The pipeline infrastructure was designed to minimise pipeline length, sizes and encroachment into privately owned land and environmentally sensitive areas.

Design/layout: The detailed plant layout is still undergoing detailed design; however, the design will minimise plant footprint and the impact on the environment.

(iii) Full description of the process followed to reach the proposed preferred alternatives within the site.

NB!! – This section is about the determination of the specific site layout and the location of infrastructure and activities on site, having taken into consideration the issues raised by interested and affected parties, and the consideration of alternatives to the initially proposed site layout.

(1) Details of the development footprint alternatives considered.

With reference to the site plan provided as Appendix C and the location of the individual activities on site, provide details of the alternatives considered with respect to:

(a) the property on which or location where it is proposed to undertake the activity;

(b) the type of activity to be undertaken;

(c) the design or layout of the activity;

(d) the technology to be used in the activity;

(e) the operational aspects of the activity; and

(f) the option of not implementing the activity.

The project alternatives that were considered are:

(a) Location alternatives

(b) Technology alternatives

(c) Design alternatives

(d) No-go alternative

These alternatives are described in more detail below and indicated in **Figure *29***.

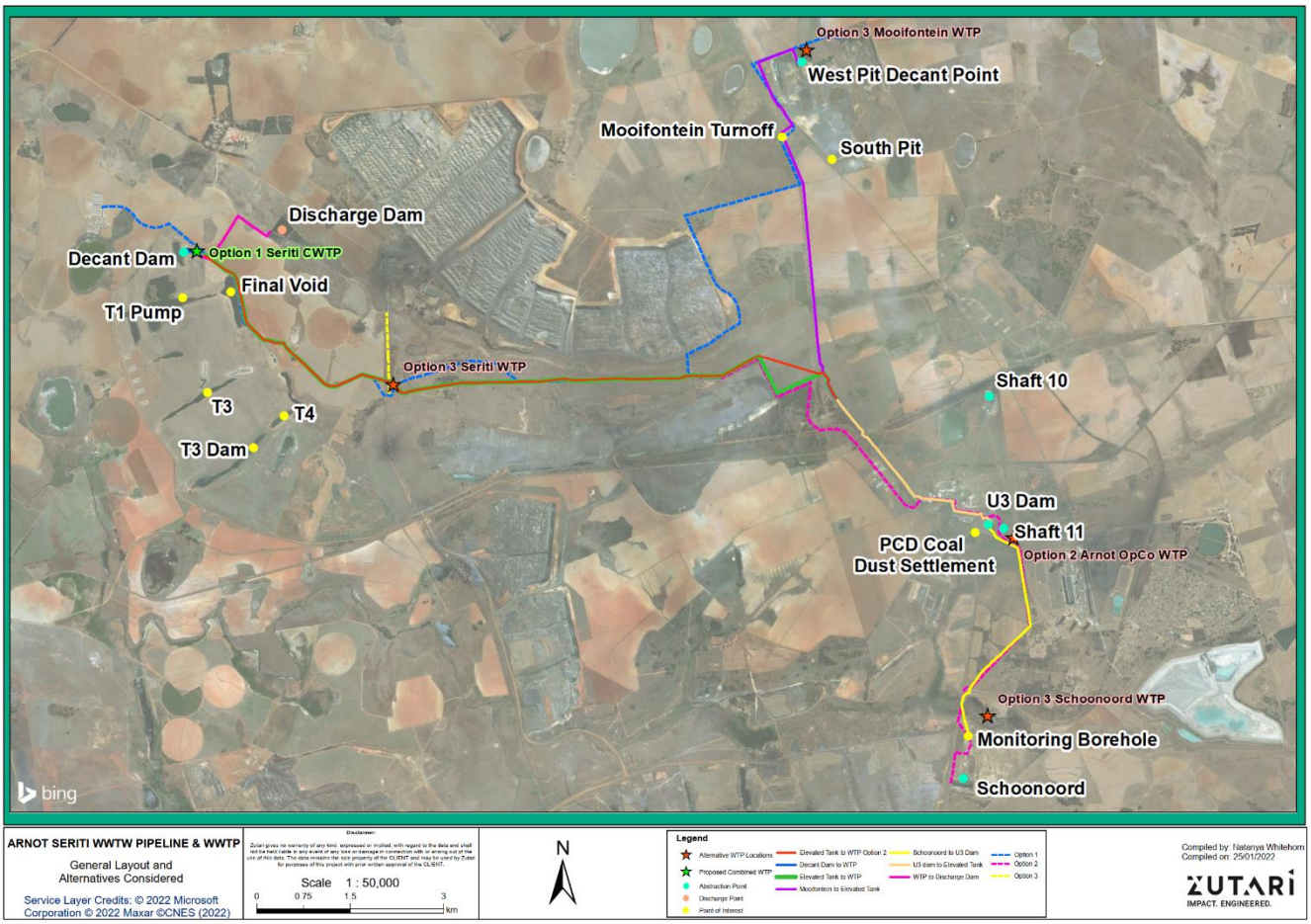


Figure 29: Map indicating alternative pipeline routes and water treatment plant locations

a) Location Alternatives

The following locations for the water treatment plant were considered:
Option 1: CWTP located at Seriti (**preferred**)
Option 2: CWTP located at Arnot Opco

Option 3: Local water treatment plants at Seriti, Mooifontein and Schoonoord. Each water treatment plant will then convey pipe treated water individually to the discharge point.

All of the location alternatives considered for this project fall within the project area. In addition, the locations all fall within reasonable proximity to one or more abstraction points. Since all the abstracted water will require treatment, treatment could either be localised (option 3) or centralised (options 1 and 2). In the case of local treatment, each abstraction point would be provided with a suitably sized and designed water treatment plant. Whilst for the CWTP options, all the abstracted water would be conveyed to a central location for combined treatment.

Option 1 is considered the preferred option as the CWTP minimises the development footprint to what is absolutely required. Furthermore, it reduces development costs by only constructing a single water treatment plant to which the mine water is conveyed via a pipeline. The decant dam at Seriti is also the largest of the mine water sources so it is sensible to develop the water treatment plant at this location as opposed to the Arnot Opco site.

Taking the above into account, the option for localised water treatment plants (Option 3) was considered an unfeasible option as the increase in footprint size, cost and associated environmental disturbance is far greater when compared to Option 1 and Option 2. Option 3 was therefore not considered during the impact assessment of the BA process.

b) Technology Alternatives

The following technology alternatives have been considered:

Option 1 (Hollow fibre + Nanofiltration) (**preferred**)
Option 2 (Ultrafiltration + Reverse Osmosis)
Option 3 (Passive Treatment)

Option 1 (Hollow fibre + Nanofiltration) is the preferred option as the treatment technology is fit for purpose and designed to approach ZLD and to comply with the desired treated water quality.

c) Design/Infrastructure Alternatives

The following design/infrastructure alternatives have been considered. The pipelines alternatives have been considered per section as detailed below:

I. Option 1 pipeline route:
   a. Pipeline to convey treated water (from the Option 3 Mooifontein water treatment plant) to the alternative elevated tank location;
   b. The pipeline then joins the Option 3 Seriti WTP via the same pipeline route section as Option 2 or 3 and
   c. The treated water is then conveyed either via a short pipeline from the Option 3 Seriti water treatment plant to the Bosmansspruit or to a holding tank near a potential end user for irrigation purposes on the western most end of the Option 1 pipeline route.
   d. The Option 3 Arnot OpCo water treatment plant will function locally to treat water from Shaft 11.

II. Option 2 pipeline route:

The option 2 pipeline route follows a similar route as the preferred option (Option 3) except for minor deviations. This route was considered as the preferred alternative route before being optimised to the Option 3 pipeline route, which is now the preferred route. This option 2 route is more complex as it curves and bends away from the preferred Elevated Tank option to join the alternative Elevated Tank. From here it follows the same route as the preferred pipeline route.

III. Option 3 pipeline route (preferred):

As mentioned above, option 3 pipeline route is simply the optimised route which was determined during more detailed designs. The pipeline infrastructure for this route was designed to minimise pipeline length, sizes and encroachment into third party owned land.

IV. Option 4 pipeline route:

The option 4 pipeline route is consistent with the preferred Option 3 route with the exception of a small section that is proposed to run diagonally across the open area from near the preferred Elevated Tank location to join the preferred pipeline route. This reduces the length of the pipeline and eliminates the sharp bend that would be

required when remaining within the road's servitude as per Option 3. Option 4 can therefore be seen as the preferred route from an engineering and cost perspective. The environmental impacts and sensitivity of this option is expected to be similar to that of Option 3. However, this option does increase the disturbance footprint when compared to Option 3, as Option 3 will remain within the road servitude in this section.

From an ecological perspective, option 1 was determined to potentially have a lower impact on the affected sensitivities and biodiversity areas as the other pipeline options cross a small section of an irreplaceable critical biodiversity area (CBA) according to the Mpumalanga Biodiversity Sector Plan (MBSP) near the Schoonoord monitoring borehole. Option 1 was therefore considered the preferred option by the terrestrial biodiversity specialist as it does not include the southern section of the pipeline.

However, when considering Option 3 of the water treatment plant layouts, the option for localised water treatment plants was considered an unfeasible option as the increase in footprint size, cost and associated environmental disturbance is far greater when compared to Option 1 and Option 2 of the WTP layouts. Option 3 of the water treatment plant layouts was therefore not considered during the impact assessment of the BA process. As Option 1 pipeline route caters for Option 3 of the WTP layout, this option was similarly considered unfeasible.

Taking the reduced footprint required for **option 3 pipeline layout** and **option 1 water treatment plant layout** into account together with the mitigation measures recommended by the specialists, these options were deemed viable to continue as the preferred options when considering all aspects of the project.

d) No-Go alternative

The No-Go alternative is the option of not undertaking the proposed activity, which means no development of the CWTP for the mine affected water as part of the rehabilitation of the closed mining operations in Seriti and sections of Arnot Opco. The No-Go alternative is associated with negative impacts that affect the biophysical and social environment. These impacts include water pollution, surface and groundwater contamination from the mine affected water which is detrimental to the environment.

The current pumps may not have the required capacity to continue pumping and recycling decant water to the existing earth dams, which may affect the neighbouring catchment and downstream users. The development of the CWTP will be beneficial to the local catchment, farmers and community.

(iv) Details of the Public Participation Process Followed

Describe the process undertaken to consult interested and affected parties including public meetings and one on one consultation. NB the affected parties must be specifically consulted regardless of whether or not they attended public meetings. (Information to be provided to affected parties must include sufficient detail of the intended operation to enable them to assess what impact the activities will have on them or on the use of their land.

Consultation with the public forms an integral component of the EA process. This process enables Interested & Affected Parties (I&APs) (e.g. directly affected landowners, national-, provincial- and local authorities, and local communities), to raise issues and concerns regarding the proposed activities, which they feel should be addressed in the EIA process. The Public Participation Process (PPP) has thus been structured to provide I&APs with an opportunity to gain more knowledge about the proposed project, to provide input through the review of documents/reports, and to voice any issues or concerns at various stages throughout the BA process.

The objectives of public participation are to provide information to the public, identify key issues and concerns at an early stage, respond to the issues and concerns raised, provide a review opportunity, and to document the process properly. The PPP will be managed to meet these objectives throughout the BA. The approach followed for the PPP is according to Chapter 6 of the EIA Regulations, 2014 published in Government Notice No. 982 of 4 December 2014. The PPP conducted to date is summarised in **Table *20***:

Table 20: Summary of the PPP to be undertaken

Task	Details	Date
I&AP notification (relevant authorities and I&APs)		
I&AP identification	An I&AP database will be developed through: • The Seriti and Arnot Opco latest Stakeholder Database will be perused to identify I&APs for the proposed project. • Desktop searches of Google Earth and drawing Windeed reports will aid in identifying landowners and neighbouring properties of the project site; • Local community leaders known to Zutari through previous work in the area will be contacted to identify additional potential I&APs; and A site visit has been conducted by the project team, along with regular meetings with the applicant to determine who the key stakeholders are for the project. The database will be continually updated as new I&APs are identified throughout the project lifecycle. The current list of potential I&APs is attached in Appendix E.	Continuous process which commenced in 2019.
Written notification	All identified I&APs will be notified of the proposed project via emails and registered mail. Copies of these notification letters and transmittal proofs are attached in Appendix E.	February 2022
Site notices	Site notices of 600 mm x 420 mm in size will be put up to inform the general public of the proposed project and the PPP. Photos of the site notices will be included in the final BAR. Site notices will be placed at: • Conspicuous places along the pipeline route; • At the proposed site for the CWTP; and • Near neighbouring landowners, entrances and other sites where larger public traffic is observed.	February 2021
Consultation (Draft) BA Report	Copies of the draft BA Report will be made available for download from the Zutari website at www.zutari.com/SeritiArnot . Due to Covid restrictions it is advised that hard copies are not made available to large groups of people. Instead, the EAP will endeavour to provide any party with a hard copy upon specific request.	February 2021
Media adverts	The proposed project will be advertised in The Citizen (regional newspaper) in English, to indicate the availability of the draft BA Report for public review and comment.	February 2021
Comments received	Comments, when received, will be included and responded to in the final BA Report after the public commenting period has been completed. Concerns from I&APs will also be given due consideration during the finalisation of the BA Report and the Comments and Response Report (CRR) will be circulated to all I&APs which will serve as a response to their comments.	March 2021

(v) Summary of issues raised by I&Aps

(Complete the table summarising comments and issues raised, and reaction to those responses)

Note that this is the draft BA Report which will be circulated for public comment. All comments and responses will be recorded and added once the public comment period has been completed and will be submitted with the final BA Report for decision making. Details of the I&APs who have been notified of the project and provided an opportunity to comment have been included below.

Interested and Affected Parties List the names of persons consulted in this column, and Mark with an X where those who must be consulted were in fact consulted.		Date Comments Received	Issues raised	EAPs response to issues as mandated by the applicant	Section and paragraph reference in this report where the issues and or response were incorporated.
AFFECTED PARTIES					
Landowner/s	X				
Eskom Holdings Ltd	X				
Anglo Operations Pty Ltd	X				
Alzu Prop Pty Ltd	X				
Gold Fields Coal Ltd	X				
Optimum Coal Mine Pty Ltd	X				
Leon Alfred Cass	X				
Nicolaas Rudolph van Eeden	X				
Lawful occupier/s of the land					
Leon Alfred Cass	X				
Nicolaas Rudolph van Eeden	X				
Landowners or lawful occupiers on adjacent properties	X				
Gabriel Daniel Roux	X				

Eskom Holdings Ltd	X				
Bosspruit Ondernemings Pty Ltd	X				
Gert Cornelius van Eeden	X				
Bosmanspruit Beleggings	X				
Leon Alfred Cass	X				
Anglo Operations Pty Ltd	X				
Alzu Prop Pty Ltd	X				
Birk Stead Inv Holdings	X				
Blyder Beleggings	X				
Johanna Magdalena Elizabeth Weyers	X				
Henning Johannes van Eeden	X				
Wyers Stephanus Jansen	X				
Evert Philippus Ehlers	X				
Paul Machiel Swart	X				
Jacobus Johannes Oosthuysen	X				
Theodorus Cornelius Ernest Kleinhans	X				
Eyesizwe Coal Pty Ltd	X				
Alkebu-Lan Farming CC	X				
Municipal councillor	X				
Municipality	X				
Organs of state (Responsible for infrastructure that may be affected Roads Department, Eskom, Telkom, DWA					
Eskom	X				
SANRAL	X				
Department of Water and Sanitation (DWS)	X				
Nkangala District Municipality	X				
Communities					

Dept. Land Affairs					
Traditional Leaders					
Dept. Environmental Affairs					
Department of Forestry, Fisheries and the Environment (DFFE)					
Other Competent Authorities affected					
MPHRA	X				
SAHRA	X				
Mpumalanga DARDLEA	X				
OTHER AFFECTED PARTIES					
INTERESTED PARTIES					

(vi) The Environmental attributes associated with the alternatives.

(The environmental attributed described must include socio-economic, social, heritage, cultural, geographical, physical and biological aspects)

(1) Baseline Environment

(a) Type of environment affected by the proposed activity.

(its current geographical, physical, biological, socio- economic, and cultural character).

This section describes the biophysical, cultural and socio-economic environment that may be affected, and the baseline conditions which are likely to be affected by the proposed project. A summary of the specialist baseline work has been provided and the Mine's existing consolidated Environmental Management Programme (EMPr) was also used to ensure cohesion between all aspects and impacts. Please refer to Appendix D (specialist assessments) for complete baseline environment descriptions.

1. Climate

The Seriti and Arnot Mines are situated on the Highveld in the central part of Mpumalanga Province. The area is characterised by strongly seasonal summer rainfall, with very dry winters. The region has a Mean Annual Precipitation (MAP) of 726mm, a Mean Annual Temperature (MAT) of 14.7 °C. It also has 32 Mean Frost Days (MFD), Mean Annual Potential Evaporation (MAPE) of 1926mm and Mean Annual Soil Moisture Stress of 73%.

2. Topography

The study area is characterised by gently undulating topography with numerous pans in the greater area. The highest point in the immediate vicinity of the site is approximately 1 730 m above sea level with the topography generally sloping towards the north and west following the drainage of the Rietkuilspruit, Boesmansspruit and Mooifonteinspruit which are all tributaries of the Klein Olifants river.

3. Geology

The project area is situated in the Witbank Coal field and is located on the Karoo Super Group. The basement of the Karoo Super Group consists of Dwyka tillites that are regularly deposited over the basin with the exception of paleo-topographical highs. The Dwyka tillites are overlain by the Vryheid formation which hosts the coal seams. The Vryheid formation consists of various sequences of sandstones, shales and siltstones with the various coal seams located within them.

The site area is characterised by red to yellow sandy soils of the Ba and Bb land types found on shales and sandstones of the Madzaringwe Formation (Karoo Supergroup). Land types Bb (65%) and Ba (30%).

4. Biodiversity (Flora and Fauna)

a. Flora

Scientific Terrestrial Services (STS) compiled an ecological assessment (refer to Appendix D) of the proposed wastewater treatment works and its associated conveyance infrastructure. The key findings of this assessment are as follows:

The entire study area falls within the remaining extent of the Eastern Highveld Grassland (refer to Figure 19 below). The vegetation type is considered vulnerable and is currently poorly protected. Based on the field assessment, most vegetation communities within the study area no longer represent the reference vegetation type as both species composition and vegetation structure have been modified due to historic and current impacts.

Irreplaceable CBA were identified along the proposed pipeline immediately north of the Schoonoord Survey Area. CBA areas are of high biodiversity value and need to be maintained in a natural state. The CBA irreplaceable Category includes areas required to meet targets and with irreplaceability values of more than

80%, they also represent critical linkages or pinch-points in the landscape that must remain natural. The northern portion of the proposed development is located within a CBA Optimal Area. Refer to Figure 31.

Other areas in which the study area is situated, include

I. Heavily or moderately modified areas,
II. Heavily or Moderately Modified: Old Lands, including cultivated land.
III. Other Natural Areas, including areas that have not been identified as a priority in the current systematic biodiversity plan but retain most of their natural character and perform a range of biodiversity and ecological infrastructural functions.

No South African National Biodiversity Institute (SANBI) Red Data Listed species or any protected species under the National Forest Act, 1998 (Act No. 84 of 1998) (NFA) were observed during the field assessment. However, a Protected species, *Crinum sp*., as per Schedule 11 of the Mpumalanga Nature Conservation Act, 1998 (Act No. 10 of 1998) (MNCA) was identified within the Degraded Grassland and *Hyparrhenia*-rich Grassland Subunits. It is recommended that a summer season walkdown be undertaken and all potentially occurring protected floral species within the final development footprint be marked by means of a Global Positioning System (GPS) device prior to the commencement of construction. Permits from the Mpumalanga Tourism and Parks Agency (MTPA) and the Department of Forestry, Fisheries and the Environment (DFFE) in the case that any NFA listed tree species are recorded) should be obtained to remove, cut, or destroy the above-mentioned protected species before any vegetation clearing may take place.

Following the ecological assessment of the biodiversity within the proposed infrastructure sites, the impacts associated with the proposed development activities were determined. Perceived impacts on the floral and faunal habitat, diversity and species of conservation concern (SCC) are considered to range from medium-high to very low significance impacts prior to the implementation of mitigation measures. With mitigation measures implemented, the impacts are expected to decrease.

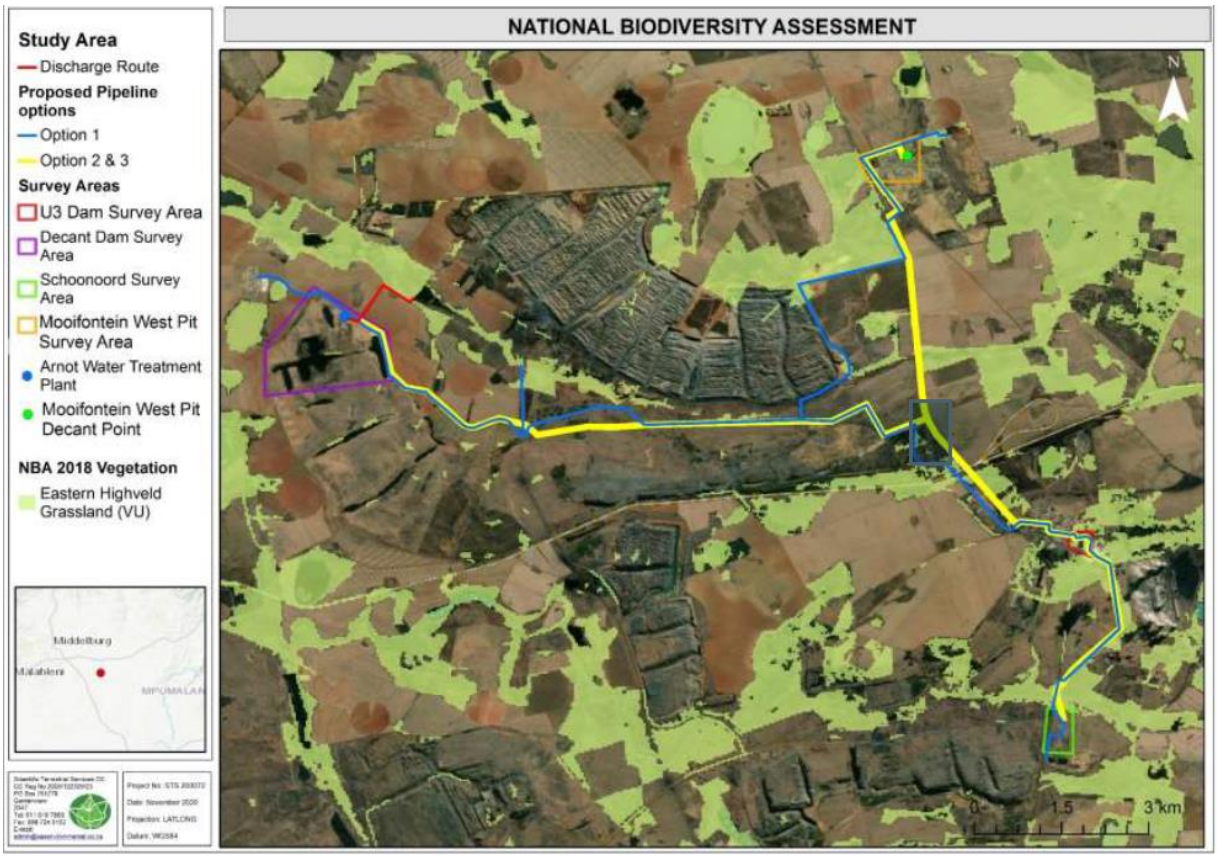


Figure 30: The remaining extent of the Eastern Highveld Grassland (VU), according to the National Biodiversity Assessment (NBA, 2018)

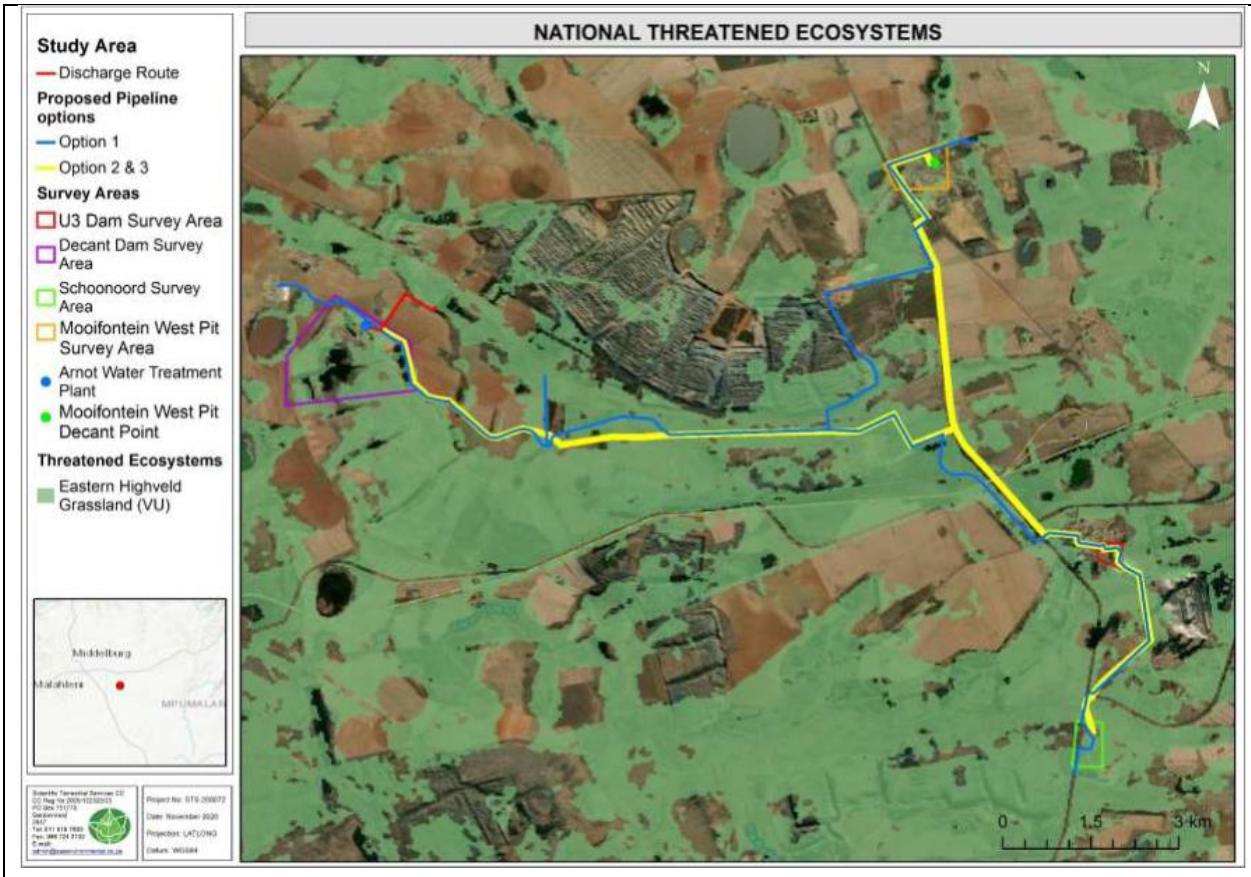


Figure 31: Vulnerable ecosystems associated with the study area, according to the National Threatened Ecosystem database (2011)

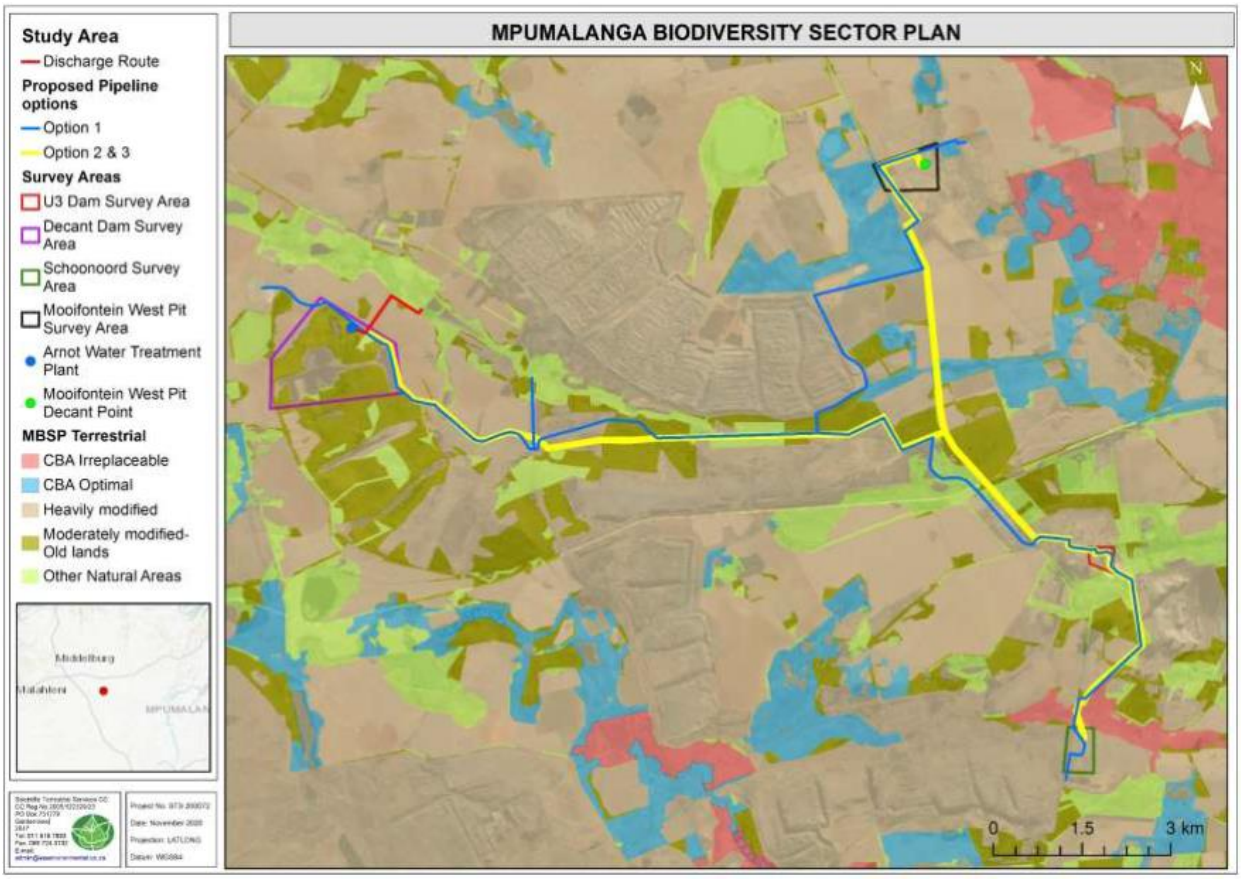


Figure 32: Importance of the study area according to the Mpumalanga Biodiversity Plan (2019)

b. Fauna

During the field assessment, scat and spoor of *Leptailurus* serval (Serval, NT) were observed in two separate areas on the western side of study area. Even though this species is listed as near threatened, it seems able to dwell amongst disturbed surroundings, frequently having been recorded near coal mines within the surrounding vicinity to this study area. Other mammal SCC with a High probability of occurrence (POC) in the study area include *Orycteropus afer* (Antbear, NE) and *Atelerix frontalis* (Southern African Hedgehog, NT), both having been recently recorded in the area and suitable habitat and food (termite mounds) was identified within the study area for these species. Please see section 3.6 of the ecological impact assessment (Appendix D) for a list of other mammal SCC that may occur within or near the study area.

Historic and current transport (vehicles), agricultural and mining activities, within and surrounding the study area has resulted in long term fauna habitat disturbance that has significantly fragmented, reduced and transformed fauna habitat, thereby degrading habitat integrity and food resources for many mammal species. This has restricted mammal fauna diversity in the study area, by reducing habitat suitability. **Mammal** diversity is considered to be intermediate, as seven mammal species, were recorded, albeit commonly occurring species that are adept to surviving within disturbed habitats and are often noted within areas adjacent to communities and agricultural lands.

Mammal sightings were concentrated in the northwest of the study area, along the perpendicular portion of proposed Pipeline Option 1 and the proposed discharge route areas that are surrounded by cultivated fields and an artificial dam. Higher mammal abundance is likely due to higher levels of food and water resources. There was higher avifaunal diversity near the wetland, dam and adjacent reed habitats, which serve as a food resource for predators such as Jackal and Serval, whilst the dams provide suitable habitat for species such as Water Mongoose. The cultivated fields likely attract species such as common duiker and porcupine. The wetland directly north of the proposed Discharge Route provides a movement corridor from the proposed development into a neighbouring property with less human disturbance (as it's a game ranch property).

The overall mammal species diversity and sensitivity for the proposed development sites is deemed to be intermediate, with mammal recordings restricted to localised areas within the study area and to commonly occurring, well-adapted species. Mammal diversity in the study area has been limited by historic and current anthropogenic disturbances.

No **avifaunal** SCC were encountered during the field assessment. The degraded nature of most of the habitat units within the study area limits the occurrence of avifaunal SCC within the areas of the proposed development sites. However, avifauna SCC are capable of far distance travel, and their occurrence on site should still be considered. Avifauna SCC that have been recently recorded in the area and suitable habitat has been identified on site include: Tyto capensis (Grass Owl, VU), Phoenicopterus ruber (Greater flamingo, NT) *Anthropoides paradise* (Blue Crane, NT), and *Oxyura maccoa* (Maccoa Duck, VU) that will likely utilise the wetland systems, rated with a "Moderately High" fauna sensitivity.

Avifaunal diversity is considered intermediate with an abundance of common, well adapting species that utilise widespread habitats throughout the study area were observed. It appears that the avifauna diversity pattern follows that of the vegetation, which is largely homogenous and to a large extent disturbed. The abundance of avifauna species was observed to be high, but the diversity of species observed overall, was low (poor species richness). Particularly abundant species were: *Numida meleagris*, (Helmeted Guineafowl, LC) in the Cultivated Fields; *Saxicola torquatus* (African Stonechats, LC), *Cisticolas sp* (Cisticolas, LC), *Euplectes progne* (Long-tailed Widowbirds, LC) and *Vidua macroura* (Pin-tailed Whydahs, LC) in the Grassland Habitat. *Ploceus velatus* (Southern Masked Weavers, LC) and *Euplectes orix* (Southern Red Bishops, LC) in reeds near water.

The high abundance of granivorous bird species, indicates adequate and abundant food and habitat supply specifically for species adapted to grass land. Insectivores, like *Apus* spp (Swifts) and *Hirundo* sp (Swallows) were also abundant, which is representative of high numbers of flying insects. Two birds of prey were observed, which indicates that prey availability, in the form of small birds and rodents must be at an adequate level to attract these species. Therefore, food resource availability for avifauna is considered moderately high.

No **amphibian** or reptile SCC were observed during the assessment. It is unlikely that reptilian SCC will occur in the vicinity of the proposed linear developments, as there is very little habitat availability for reptiles on site, with little rocky outcrops and fallen tree cover. The Giant Bullfrog (*Pyxicephalus adspersus*, VU) has been

historically recorded in the area and has habitat (although very small and localised) on site and has a low possibility of occurring near the proposed developments.

During the field assessment no **invertebrate** SCC were observed. However, due to the presence of wetland habitat with emergent vegetation on site, *Pseudagrion coeleste* (Catshead Sprite, CR), *Pseudagrion inopinatum* (Balinsky's Sprite VU) and *Pseudagrion newtoni* (Newton's Sprite) may potentially utilise the study area, as these species have historically occurred in the region. *Metisella meninx* (Marsh Sylph, VU) has been previously recorded in the area, even though its primary food source (*Leersia hexandra*) was not present on site. It must be noted that the Mpumalanga State of the Environment Report (2003) makes no provision for arachnid species within its protected species lists.

5. Freshwater biodiversity

Six wetlands associated with the study area of the proposed pipeline options and associated infrastructure were identified and delineated by the aquatic specialist during extensive field assessments. This is in contrast to the Mpumalanga Highveld Wetlands (MHW) database which identified four floodplain wetlands and various seep, unchanneled valley bottom (UCVB) and depression wetlands. Two of the six delineated wetlands were classified as UCVB wetlands, two as a channelled valley bottom (CVB) and two depression wetlands.

UCVB wetland 1, is associated with the Boesmanspruit and is located along the central portion of the pipeline options, flowing in a westerly direction.

The second UCVB wetland is located along the north-eastern portion of proposed pipeline options. A CVB wetland associated with the Rietkuilspruit and an unnamed tributary of the Rietkuilspruit were also identified, although these are two separate hydrogeomorphic (HGM) units, they were grouped during the assessment given the homogeneity of the freshwater systems.

The UCVB wetland 1 and the CVB wetland were assessed to be largely modified and of moderate ecological importance and sensitivity. Meanwhile the UCVB 2 wetland was assessed to be seriously modified and of low/marginal ecological importance and sensitivity.

Two largely natural depression wetlands were identified, but these freshwater ecosystems will not be directly traversed by the proposed pipeline options and the associated infrastructure. As such, these freshwater ecosystems were mapped and assessed on a qualitative level but a formal assessment of the Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS) of these depression wetlands was not conducted.

As such, it was concluded that four wetlands will be directly affected by the proposed development (Figure 34).

The Bosmanspruit and Rietkuilspruit assessment points displayed poor habitat availability and limited diversity of biotopes with significantly reduced flow rates which were likely to have influenced the macro-invertebrate community assemblage present. At the downstream site of the Bosmanspruit, elevated dissolved salts were measured, and this likely results in the observed decrease in the South African Scoring System version 5 (SASS5) and Average Score per Taxon (ASPT) scores measured in the downstream direction.

In terms of the anticipated risk to these freshwater ecosystems, on consideration of the location of these wetlands within the landscape, the risk significance is considered to be limited. As a result of the absence of significant flow due to upstream impoundments and general flow discontinuity on the Bosmanspruit and Rietkuilspruit, the macro-invertebrate community integrity at the assessed points was low, ranging from Class D (largely modified) to D/E (largely/seriously modified) according to the Macroinvertebrate Response Assessment Index (MIRAI) assessment. The toxicological risk of the process water system was measured to range between Class 3 (acute) and Class 4 (high acute) hazard due to the risk the water contained within the dams poses to especially benthic macro-invertebrates and ecological functioning.

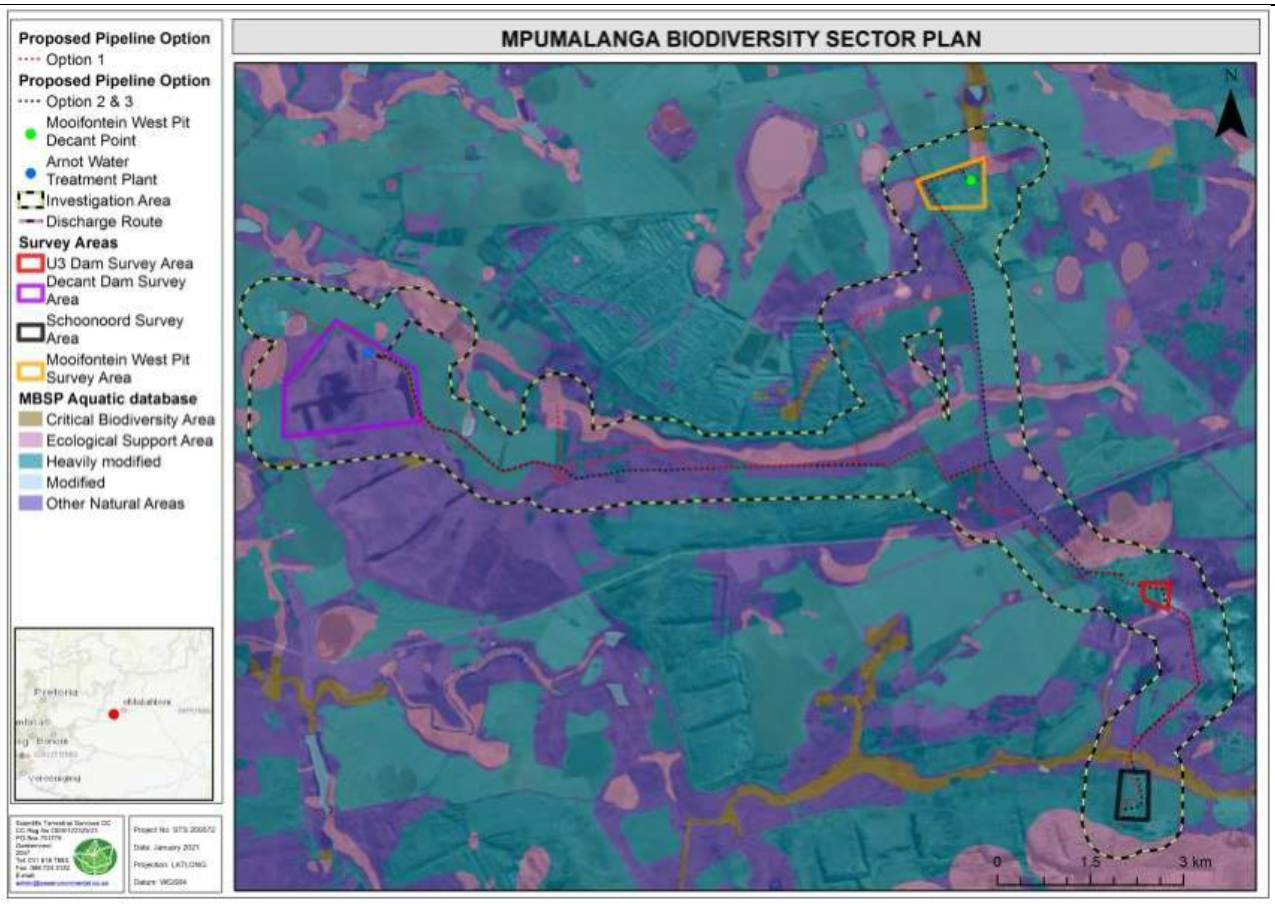


Figure 33: Aquatic map of the study area according to the MBSP database (2014)

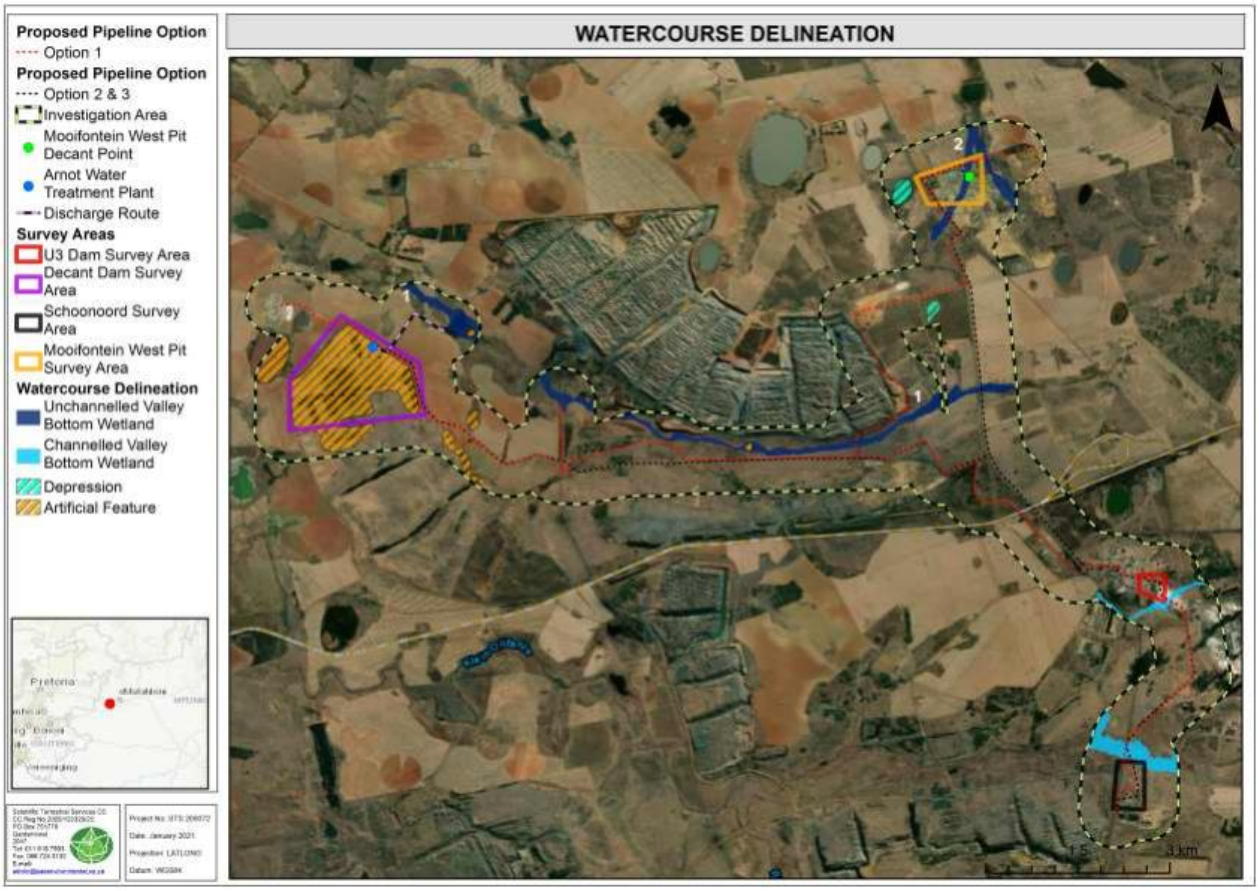


Figure 34: The location of the delineated wetlands and various artificial impoundments within the investigation area associated with the proposed project.

6. Heritage

During the fieldwork, the study area was found to be located in a landscape that is generally level. The fieldwork also revealed that the vast majority of the development footprints overlay highly disturbed terrain. Overall, the accessibility of the project footprint area was fairly good. Visibility of the site was limited due to the grassy vegetation, wetlands, and previous agricultural and mining activities that have disturbed the area. The northern section of the project area is located around the Seriti water pits and dams, as well as the agricultural fields and chicken houses of Alzu. The middle section of the project area is located close to the Optimum Coal mine dump. The eastern section of the project area is characterised by several agricultural fields as well as the Arnot Opco Coal mine and the Arnot Power Station.

Existing surrounding land uses associated with the project area include a combination of:

• Mining infrastructure;

• Agricultural activities; and

• Electricity lines

Desktop study findings revealed the following of the study area and surrounding areas:

a. Stone Age:

The South African Stone Age is the longest archaeologically identified phase identified in human history and lasted for millions of years. Although this area would have been well suited for human habitation over the last 1.7 million years, very little information is known about especially the Stone Age history of the area and its surroundings. This can likely be attributed to a lack of research focus in this area over the past half a century or more and does not necessarily mean that no such sites exist here.

The Earlier Stone Age is the first and oldest phase identified in South Africa's archaeological history and comprises two technological phases. The earliest of these technological phases is known as Oldowan which is associated with crude flakes and hammerstones and dates to approximately 2 million years ago. The second technological phase in the Earlier Stone Age (ESA) of Southern Africa is known as the Acheulian and comprises more refined and better-made stone artefacts such as the cleaver and bifacial handaxe. The Acheulian phase dates back to approximately 1.5 million years ago. No information with regard to ESA sites from the surrounding area could be found. However, it seems possible for such sites to exist here. The Middle Stone Age (MSA) dates to between 250 000 to 40 000 years Before Present (BP).

Middle Stone Age (MSA) dates of around 250 000 BP originate from sites such as Leopards Kopje in Zambia, while the late Pleistocene (125 000 BP) yields a number of important dated sites associated with modern humans (Deacon & Deacon,

1999). The MSA is characterised by flake and blade industries, the first use of grindstones, wood and bone artefacts, personal ornaments, use of red ochre, circular hearths and hunting and gathering lifestyle. While no MSA sites are known from the study area or surroundings, low-density surface scatters of MSA material are known from areas closer to Ogies and Emalahleni (CRM Africa & Matakoma, 2001) (Birkholtz & De Bruyn, 2020).

The Later Stone Age (LSA) is the third phase identified in South Africa's Stone Age history. This phase in human history is associated with an abundance of very small stone artefacts or microliths. Several surface occurrences of LSA materials are likely to be found around the general vicinity of the study area. Unfortunately, these are expected to be in the form of surface material which has been eroded out of dongas and riverbeds. While no LSA sites are known from the study area and immediate surroundings, LSA sites, including rock paintings, are known from the farm Groenvlei located roughly 5km east of Carolina (Van Niekerk, 1984) (Bergh, 1999). These sites are located approximately 41km south-east of the present study area.

b. Iron Age:

The arrival of early farming communities during the first Millennium heralded in the start of the Iron Age for South Africa. The Iron Age is that period in South Africa's archaeological history associated with pre-colonial

farming communities who practised cultivation and pastoralist farming activities, metalworking, cultural customs such as lobola and whose settlement layouts show the tangible representation of the significance of cattle (known as the Central Cattle Pattern) (Huffman, 2007).

The Southern African Iron Age can be divided into an Early Iron Age (EIA) (AD 200 – AD 900), Middle Iron Age (MIA) (AD 900 – AD 1300) and Late Iron Age (LIA) (AD 1300 – AD 1840) (Huffman, 2007). Maggs (1976) opines that the Highveld areas of Mpumalanga were not occupied by the EIA due to the existing environment. The extensive grassland endemic to this area was of little value to their economy as they were dependent on slash-and-burn (swidden) agriculture. Radiocarbon dating from pottery places the EIA in the first millennium (Evers 1977); however, the land became valuable only when LIA populations had increased livestock numbers to the point that they formed a principal resource. It is during this time that the LIA populations would have migrated to the high grasslands of the Highveld to take advantage of the open grazing lands (Hall 1987).

Delius (2007) mentions that from around the beginning of the sixteenth century, LIA communities would have migrated to Mpumalanga during times of climate shift and political instability. At around 1640, during a warmer phase within the Little Ice Age, the population growth showed a considerable increase.

As the population increased, the frequency of interactions dealing with land and resources between various groups also intensified.

A screening of the available Google Earth imagery was made. While no LIA stone walled settlements are evident from within the study area and its direct surroundings, large numbers of such settlements start appearing west of eMakhazeni (Belfast), approximately 26km north-east of the present study area.

c. Early Historical Area:

The early Historical Period within the study area and surroundings were characterised by the arrival of newcomers to this area. The first arrivals would almost certainly have been travellers, traders, missionaries, hunters and fortune seekers. However, with time, this initial trickle was replaced by a flood of white immigrants during the 1830s, when mass migration of roughly 2 540 Afrikaner families (roughly 12 000 individuals) from the Cape Colony's frontier zone to the interior of Southern Africa took place. The people who took part in this Great Trek were later known as Voortrekkers (Visagie, 2011).

The area and its applicable farm properties have a rich South African history, including British troops visiting the farm Bosmansspruit on two occasions. The farm owner histories and general aspects regarding the history of the farms associated with the study area are discussed in detail in the HIA (Appendix D).

7. Socio-economy

a. Demographics

The project area is located in the Steve Tshwete Local Municipality (STLM) situated within the Nkangala District Municipality (DM) in Mpumalanga Province. The municipal area covers 3993 km² and has an estimated population of 278 749 residents, largely based in the towns of Middelburg and Mhluzi, as well as in smaller mining towns such as Hendrina and its neighbouring township Kwazamakuhle, the mining village known as Rietkuil, and rural areas (STLM,IDP 2020/21).

The population grew by 4.4 % over the nine-year period from 2007 to 2016, STLM's population increased by 9.7%. In 2016, the municipality ranked the 7th largest population in the province and 19.3% of total population of Nkangala as per the 2016 community survey. This could be attributed to the number of industries that were opened within the 10 years (2001-2011) that attracted workers into Middelburg. It is estimated that the population number for 2030 will be at more or less 509 000 people given the historic population growth per annum which will put pressure on the infrastructure and basic service delivery and eventually also sustainable job creation in the long run. African/ black population continues to constitute the highest group followed by the white population since 1996 to date. Asian and coloured population constitute the minor population group.

The male population in STLM is larger than the female population. Such an age structure is usually observed in populations that attract migrants due to lucrative employment opportunities. The manufacturing, industrial and mining companies in STLM attract people from across the country and other African countries. According

to the Census 2011 migration data, STLM attract people, particularly from Limpopo 8%, Gauteng 7%, KwaZulu Natal 4% and regionally 4%.

A significant portion of the population growth is between 20 and 34 cohort as well as the infants (0-4 cohort). Refer to Figure 35 below, the most populous age group in 2016 were between ages 25 to 29. This could be the result of people migrating to the municipality seeking job opportunities as STLM is considered to be one of the economic hubs of Mpumalanga and is often the preferable choice of destination by job seekers across Mpumalanga Province. Figure 35 also indicates that the Youth population (15-34 years) constitute about 40.7% of the total population and the share of the male population in 2016 according to the census was 52.4% and females 47.6%

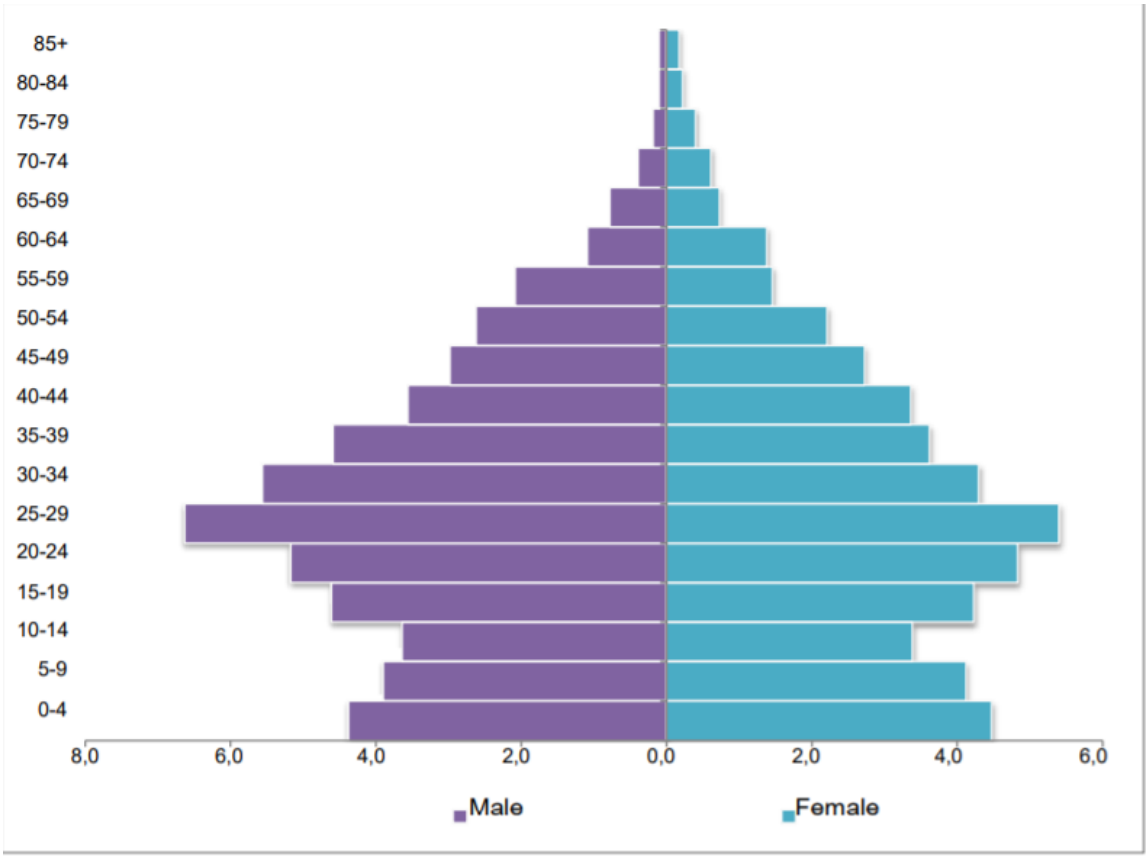


Figure 35: Distribution of population by age and sex, 2016

b. Education

The majority of the population of the STLM have some form of education, with only 14.4 % of the population having no schooling as depicted in the Figure 36 (Census 2011). According to the 2016 Community Survey, the population in STLM aged 20+ completed grade 12, increased from 73 793 in 2011 to 97 943 (increase of 24 150) in 2016 which translate to an increase of 32.7% in the relevant period. STLM grade 12 pass rate improved from 74.4% in 2011 to 86.3% in 2015 and became the 2nd highest of the municipal areas of the Province. The area achieved an admission rate to university/degree studies of 30.5% in 2015. In 2016, 22.9% grade 12s obtained admission to university/degree studies. Over the years, there has been great improvement of about 4.7% for grade 12 pass rate improved in STLM from 85.6% in 2014 to 89.0% in 2019 – ranked number 1 again in the province.

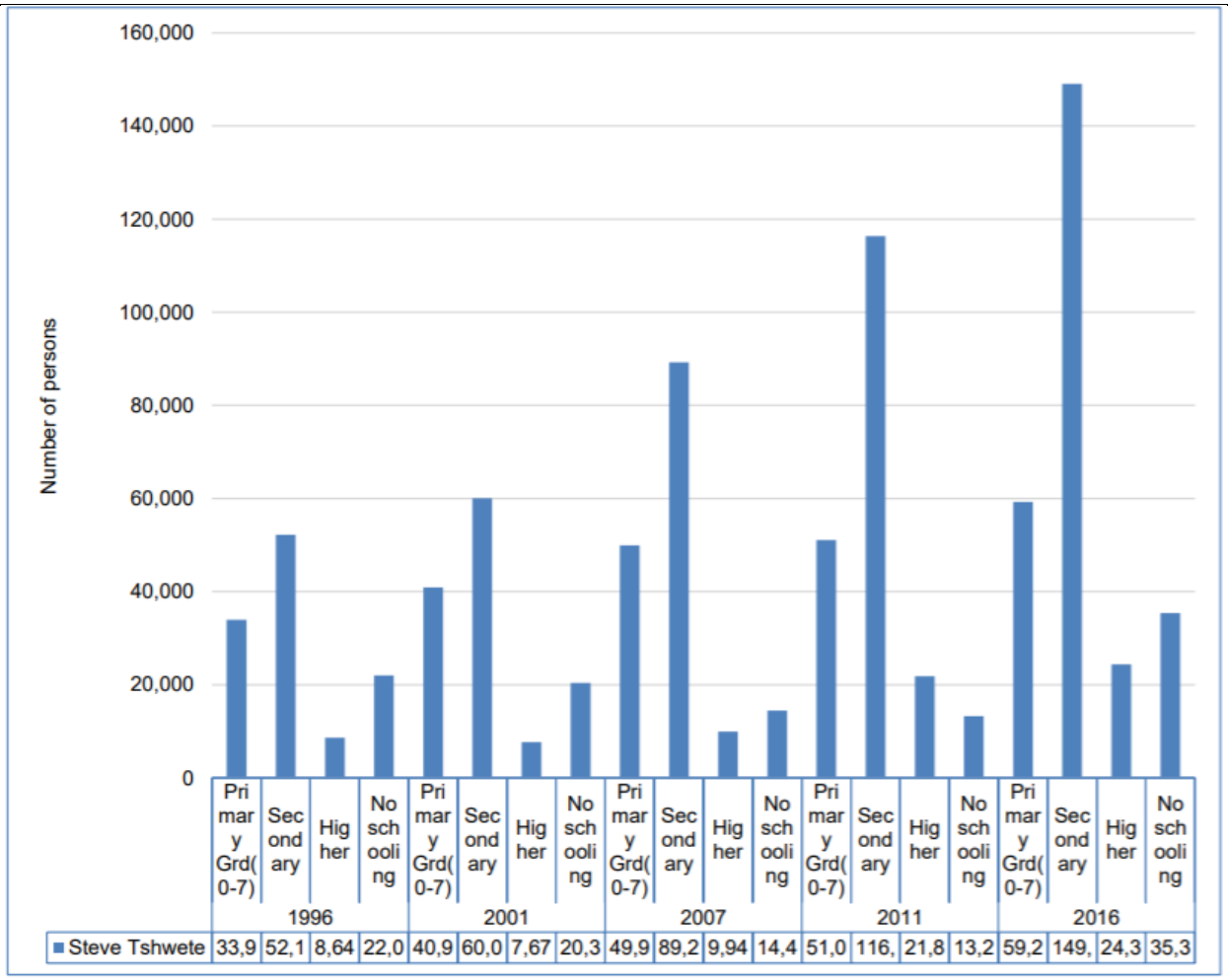


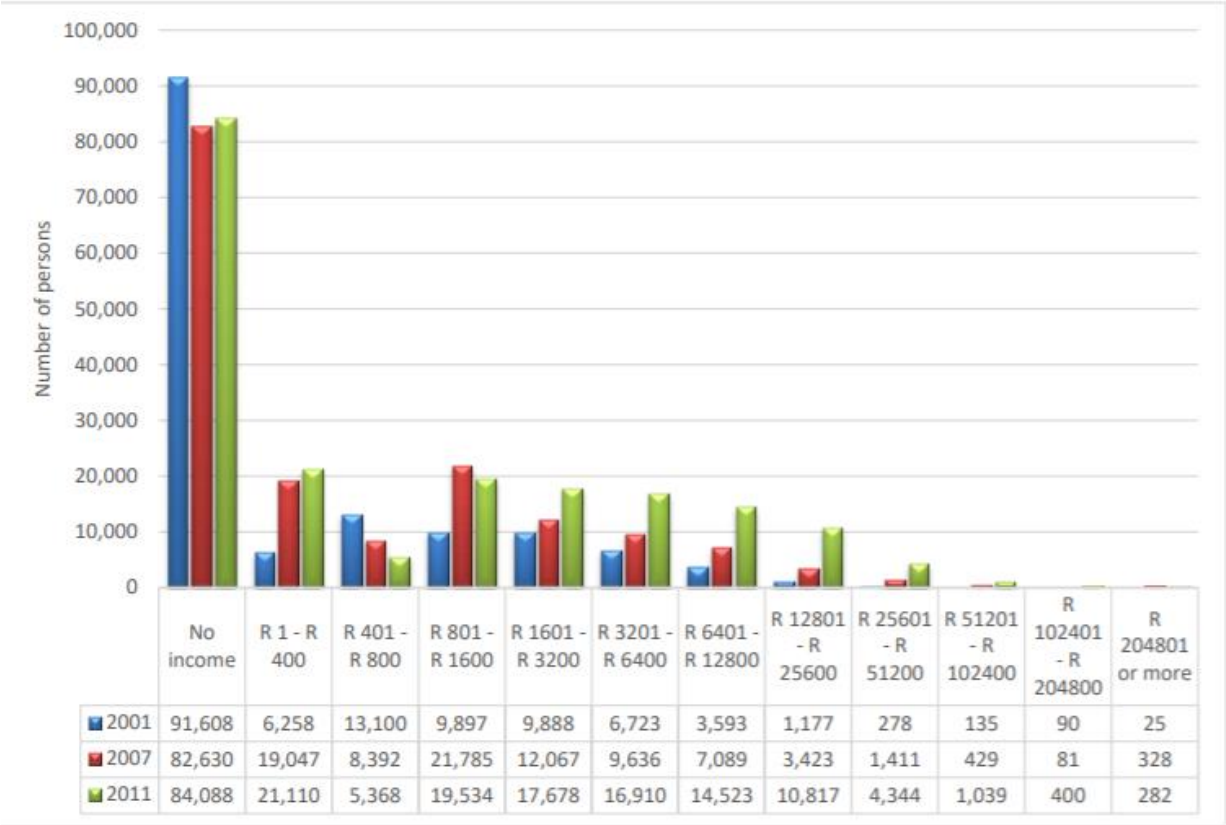
Figure 36:Highest Educational attainment (20 + years)

c. Living conditions

STLM economy is one of the biggest economic areas and it is therefore expected that a significant number of employment opportunities are being provided in the area. Mining, trade and manufacturing are the major leading employment drivers in STLM. The unemployment rate of STLM decreased slightly from 19.7% in 2011 to 16.4% in 2015 and was the lowest among all the municipal areas of Mpumalanga. In 2018, the municipality has recorded a slight increase yet again from 2015 figures to just 17,9%. Unemployment rate for females has increased from 21.8% in 2015 to 23.1% in 2018 and that of males from 12.9% in 2015 to 14.5% in 2018. Though there is a high growth rate of unemployment, STLM still has the lowest percentage unemployment in the province. Youth unemployment rate according to the 2011 Census was 27.1% . The largest employing industries in STLM are trade (including industries such as tourism), community/government services and mining.

d. Individual income

According to the census, the number of people without an income has decreased from 91608 to 84088 between 2001 and 2011. The majority (63690) of STLM individuals earn within the R1-R3200 bracket followed by about 47633 individuals who between R3200-R102 400 in 2011. The share of population in STLM below the so-called lower-bound poverty line (of Stats SA) deteriorated from 23.4% in 2015 to 26.9% in 2018. In 2018, STLM share of population below the lower-bound poverty line was however, the lowest (favourable) among the municipal areas of Mpumalanga. The number of people below the lower bound poverty line was high at more than 70 000 people in 2018. Individual income distribution in STLM is detailed in Figure 37:



	No income	R 1 - R 400	R 401 - R 800	R 801 - R 1600	R 1601 - R 3200	R 3201 - R 6400	R 6401 - R 12800	R 12801 - R 25600	R 25601 - R 51200	R 51201 - R 102400	R 102401 - R 204800	R 204801 or more
2001	91,608	6,258	13,100	9,897	9,888	6,723	3,593	1,177	278	135	90	25
2007	82,630	19,047	8,392	21,785	12,067	9,636	7,089	3,423	1,411	429	81	328
2011	84,088	21,110	5,368	19,534	17,678	16,910	14,523	10,817	4,344	1,039	400	282

Figure 37: Individual income distribution in Steve Tshwete 2001 and 2011

e. Health

HIV and AIDS is one of the biggest challenges the country is facing.. According to the 2013 Antenatal Care Survey, the HIV prevalence rate has decreased from 52% - 43%. This positive change can be attributed to the active Aids Council, vigorous HCT campaigns and community awareness. HIV/AIDS has a devastating effect on the social and economic development of STLM population and the Council in collaboration with various stakeholders will continue to maximize its efforts in this area, in order to ensure that prevalence rates decreases.

(b) Description of the current land uses.

The wider area is characterised by large tracts of intensively farmed lands starkly contrasted by coal mining infrastructure. The area around the Arnot Power Station has been transformed by the mine shafts and other mining infrastructure into an industrial area that serves much of the energy demands of the country. Amidst the infrastructure, fields of maize blanket the un-mined areas.

(c) Description of specific environmental features and infrastructure on the site.

Within the site, approximately 40% of the land is ploughed fields, 34% natural Veld, 2.4% Mine Infrastructure, 2.4% Pans and 19% wetlands, therefore at least 40% of the natural vegetation has been transformed due to agricultural activities in the form of arable land. Land use in the surrounding area consists mainly of agriculture and mining. The majority of farmers in the area farm maize, potatoes, cattle and sheep. The Arnot Coal Mine mining rights area is currently used predominantly for mining, power generation (Eskom - Arnot Power Station), residential (Rietkuil Village), crop cultivation and livestock farming. There is an abundance of water as the area is characterised by wetlands and pans. In a broader descriptive context, the area lies within the Highveld Maize Belt of South Africa, but the surrounding area is predominantly occupied by existing mines. This has changed land use and the transformation of natural vegetation within the area significantly.

The existing surrounding land uses associated with the project area are indicated in **Figure *38*** which include a combination of:

- Mines and quarries.

- Urban / built up land.
- Agricultural activities.
- Natural habitat.
- Aquatic features.

(d) Environmental and current land use map.

(Show all environmental, and current land use features

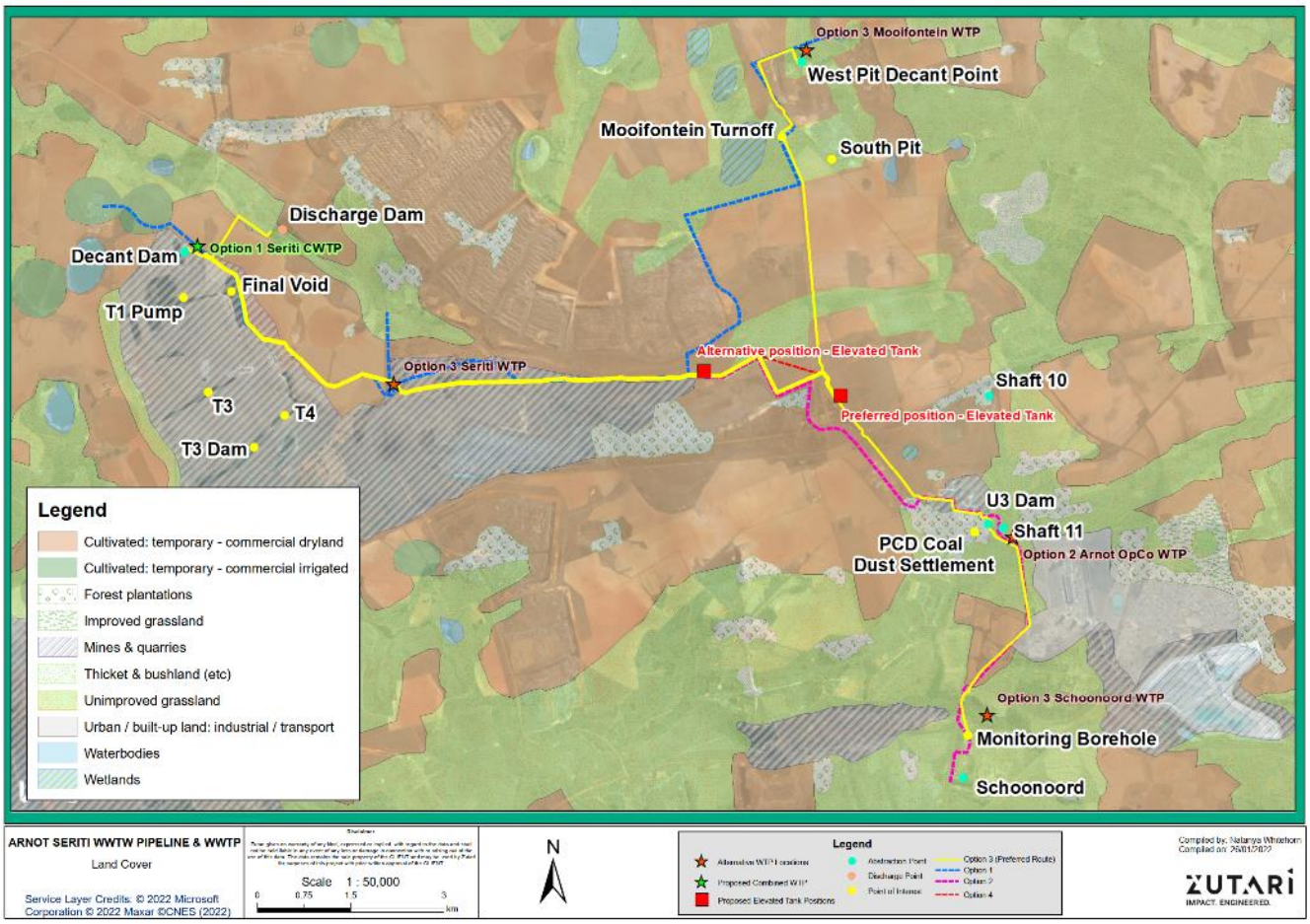


Figure 38: Land use map

(vii) Impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts

(Provide a list of the potential impacts identified of the activities described in the initial site layout that will be undertaken, as informed by both the typical known impacts of such activities, and as informed by the consultations with affected parties together with the significance, probability, and duration of the impacts. Please indicate the extent to which they can be reversed, the extent to which they may cause irreplaceable loss of resources, and can be avoided, managed or mitigated).

The anticipated impacts of the proposed facility during construction are shown below. Phases are shown in the tables below, before and after mitigation.

These impacts are based on typical known impacts of the proposed activity and will be amended according to issues and concerns received from affected parties, in the Final BA Report.

Impacts and risks identified are provided in terms of the extent to which they can be reversed, may cause irreplaceable loss of resources, can be avoided, managed or mitigated by showing their significance levels in two tables per phase as anticipated pre-mitigation and post-mitigation.

Note: A specific impact assessment has not been conducted for heritage impacts as no resources of heritage significance were found by the heritage specialist during either the desktop assessment or field assessments.

I. Construction phase

a) Pre-mitigation

Table 21 | Faunal Construction phase impacts before mitigation

Impact	Pre-mitigation:					
	Duration	Extent	Intensity	Consequence	Probability	Significance
Inconsiderate planning of pipeline option 1 within sensitive faunal habitats (e.g. within the Wetland Habitat Subunit)	Medium-term	Local	Moderate - negative	Moderately detrimental	Very likely	Moderate - negative
Inconsiderate planning of pipeline option 2 &3 within sensitive faunal habitats (e.g. within the Wetland Habitat Subunit)	Medium-term	Local	Moderate - negative	Moderately detrimental	Very likely	Moderate - negative
Loss of faunal SCC within the development footprint areas in the study area	Medium-term	Local	Moderate - negative	Moderately detrimental	Very likely	Moderate - negative
Spread of AIPs, leading to potential loss of suitable faunal habitat and forage resources	Long-term	Local	High - negative	Highly detrimental	Certain	High - negative
Loss of faunal habitat, diversity including potentially occurring faunal SCC.	Long-term	Site-specific	Moderate - negative	Moderately detrimental	Certain	Moderate - negative
Loss of sensitive faunal habitat, particularily the Freshwater Habitat)	Long-term	Site-specific	High - negative	Moderately detrimental	Certain	High - negative
Declines in faunal habitat, forage, species diversity and ecosystem functioning as a result of uncontrolled edge effects	Long-term	Local	Moderate - negative	Moderately detrimental	Very likely	Moderate - negative

Table 22 | Floral Construction phase impacts before mitigation

Impact	Pre-mitigation:					
	Duration	Extent	Intensity	Consequence	Probability	Significance
Potential poor planning of pipeline option 1 within sensitive habitats (e.g. Freshwater Habitat & CBA Optimal areas)	Long-term	Local	Moderate - negative	Moderately detrimental	Very likely	Moderate - negative
Potential poor planning of pipeline option 2 & 3 within sensitive habitats (e.g. Freshwater Habitat & CBA Irreplacebale areas)	Long-term	Local	High - negative	Highly detrimental	Certain	High - negative
Loss of floral SCC within the development footprint areas in the study area	Long-term	Site-specific	Moderate - negative	Moderately detrimental	Certain	Moderate - negative
Spread of AIPs, leading to potential loss of floral species diversity from surrounding natural habitat	Long-term	Local	High - negative	Highly detrimental	Certain	High - negative
Loss of floral habitat, diversity and potentially occurring floral SCC.	Long-term	Site-specific	High - negative	Moderately detrimental	Very likely	Moderate - negative
Loss of sensitive floral habitat, particularily the Freshwater Habitat)	Long-term	Site-specific	High - negative	Moderately detrimental	Certain	High - negative
Declines in floral habitat, species diversity and plant functioning as a result of uncontrolled edge effects	Long-term	Local	High - negative	Highly detrimental	Fairly likely	Moderate - negative

Table 23 | Freshwater Construction phase impacts before mitigation

Impact	Pre-mitigation:					
	Duration	Extent	Intensity	Consequence	Probability	Significance

*Increased runoff and erosion leading to sedimentation of the wetlands; *Smothering of wetland biota due to increased sedimentation and suspended solids altering the water quality within the wetlands; and *Decreased ecoservice provision.	Medium-term	Local	Moderate - negative	Moderately detrimental	Certain	Moderate - negative
*Disturbances of soil leading to increased sedimentation, and in turn to altered wetland habitat; *Loss and change of wetland habitat and ecological structure resulting in impacts on biota; *Potential impacts on water quality and contamination of soil within the wetlands; and *Potential changes to the ecoservice provision of the wetlands.	Medium-term	Local	High - negative	Moderately detrimental	Certain	High - negative
*Disturbances of soils leading to sedimentation and alien vegetation proliferation; *Compaction of soils as a result of movement of construction equipment leading to formation of preferential flow paths; *Loss of hydrological connectivity between the downgradient and upgradient portions of the wetland; *Incision and erosion of the wetland due to construction of wetland crossing; and *Potential impacts on water quality and contamination of soil within the wetland.	Medium-term	Local	High - negative	Moderately detrimental	Certain	High - negative
*Disturbance to soils resulting in potential sediment laden runoff into the wetlands; and *Potential impacts on water quality and contamination of soils within the wetland.	Medium-term	Local	High - negative	Moderately detrimental	Certain	High - negative
*Minor impacts to wetland vegetation, leading to exposed/compacted soils, leading to increased runoff and erosion; *Decreased ecoservice provision; *Further decreased ability to support biodiversity; *Potential flooding of wetlands along pipeline crossing and temporary change to hydrology of the freshwater system; and *Change in the water quality of the wetland due to impacted water entering (particularly increased salts).	Medium-term	Local	Moderate - negative	Moderately detrimental	Certain	Moderate - negative
*Possible sedimentation of downgradient areas.	Long-term	Regional	High - negative	Highly detrimental	Fairly likely	Moderate - negative
*Release of treated water into the Bosmanspruit.	Long-term	Local	High – positive	Highly beneficial	Fairly likely	Moderate - positive
*Potential erosion of Bosmanspruit beds and/or banks due to release of treated water.	Long-term	Local	High – negative	Highly detrimental	Very likely	High - negative

b) Post-mitigation

Table 24|Floral Construction phase impacts after mitigation

Impact	Post-mitigation:					
	Duration	Extent	Intensity	Consequence	Probability	Significance
Potential poor planning of pipeline option 1 within sensitive habitats (e.g. Freshwater Habitat & CBA Optimal areas)	Long-term	Site-specific	Low - negative	Slightly detrimental	Fairly likely	Low - negative
Potential poor planning of pipeline option 2 & 3 within sensitive habitats (e.g. Freshwater Habitat & CBA Irreplacebale areas)	Long-term	Site-specific	Moderate - negative	Moderately detrimental	Very likely	Moderate - negative
Loss of floral SCC within the development footprint areas in the study area	Medium-term	Site-specific	Low - negative	Slightly detrimental	Very likely	Low - negative

Spread of AIPs, leading to potential loss of floral species diversity from surrounding natural habitat	Long-term	Local	High - negative	Highly detrimental	Fairly likely	Moderate - negative
Loss of floral habitat, diversity and potentially occurring floral SCC.	Medium-term	Site-specific	Moderate - negative	Slightly detrimental	Fairly likely	Low - negative
Loss of sensitive floral habitat, particularly the Freshwater Habitat)	Medium-term	Site-specific	Moderate - negative	Slightly detrimental	Fairly likely	Low - negative
Declines in floral habitat, species diversity and plant functioning as a result of uncontrolled edge effects	Medium-term	Site-specific	Moderate - negative	Slightly detrimental	Unlikely	Very low

Table 25 |Freshwater Construction phase impacts after mitigation

Impact	Post-mitigation:					
	Duration	Extent	Intensity	Consequence	Probability	Significance
*Increased runoff and erosion leading to sedimentation of the wetlands; *Smothering of wetland biota due to increased sedimentation and suspended solids altering the water quality within the wetlands; and *Decreased ecoservice provision.	Medium-term	Site-specific	Low - negative	Slightly detrimental	Fairly likely	Low - negative
*Disturbances of soil leading to increased sedimentation, and in turn to altered wetland habitat; *Loss and change of wetland habitat and ecological structure resulting in impacts on biota; *Potential impacts on water quality and contamination of soil within the wetlands; and *Potential changes to the ecoservice provision of the wetlands.	Medium-term	Site-specific	High - negative	Moderately detrimental	Very likely	Moderate - negative
*Disturbances of soils leading to sedimentation and alien vegetation proliferation; *Compaction of soils as a result of movement of construction equipment leading to formation of preferential flow paths; *Loss of hydrological connectivity between the downgradient and upgradient portions of the wetland; *Incision and erosion of the wetland due to construction of wetland crossing; and *Potential impacts on water quality and contamination of soil within the wetland.	Medium-term	Site-specific	High - negative	Moderately detrimental	Very likely	Moderate - negative
*Disturbance to soils resulting in potential sediment laden runoff into the wetlands; and *Potential impacts on water quality and contamination of soils within the wetland.	Medium-term	Site-specific	High - negative	Moderately detrimental	Very likely	Moderate - negative
*Minor impacts to wetland vegetation, leading to exposed/compacted soils, leading to increased runoff and erosion; *Decreased ecoservice provision; *Further decreased ability to support biodiversity; *Potential flooding of wetlands along pipeline crossing and temporary change to hydrology of the freshwater system; and *Change in the water quality of the wetland due to impacted water entering (particularly increased salts).	Medium-term	Site-specific	Low - negative	Slightly detrimental	Fairly likely	Low - negative
*Possible sedimentation of downgradient areas.	Medium-term	Site-specific	Moderate - negative	Slightly detrimental	Fairly likely	Low - negative
*Release of treated water into the Bosmanspruit.	Long-term	Regional	High – positive	Highly beneficial	Certain	Very High - positive
*Potential erosion of Bosmanspruit beds and/or banks due to release of treated water.	Long-term	Site-specific	Low – negative	Slightly detrimental	Unlikely	Very low

Table 26 | Faunal Construction phase impacts after mitigation

Impact	Post-mitigation:					
	Duration	Extent	Intensity	Consequence	Probability	Significance
Inconsiderate planning of pipeline option 1 within sensitive faunal habitats (e.g. within the Wetland Habitat Subunit)	Short-term	Site-specific	Low - negative	Negligible	Fairly likely	Very low
Inconsiderate planning of pipeline option 2 &3 within sensitive faunal habitats (e.g. within the Wetland Habitat Subunit)	Short-term	Site-specific	Moderate - negative	Slightly detrimental	Fairly likely	Low - negative
Loss of faunal SCC within the development footprint areas in the study area	Short-term	Site-specific	Low - negative	Negligible	Fairly likely	Very low
Spread of AIPs, leading to potential loss of suitable faunal habitat and forage resources	Medium-term	Site-specific	Moderate - negative	Slightly detrimental	Fairly likely	Low - negative
Loss of faunal habitat, diversity including potentially occurring faunal SCC.	Medium-term	Site-specific	Low - negative	Slightly detrimental	Fairly likely	Low - negative
Loss of sensitive faunal habitat, particularly the Freshwater Habitat)	Medium-term	Site-specific	Moderate - negative	Slightly detrimental	Fairly likely	Low - negative
Declines in faunal habitat, forage, species diversity and ecosystem functioning as a result of uncontrolled edge effects	Medium-term	Site-specific	Low - negative	Slightly detrimental	Fairly likely	Low - negative

II. Operational phase

a) Pre-Mitigation

Table 27 | Faunal Operational; phase impacts before mitigation

Impact	Pre-mitigation:					
	Duration	Extent	Intensity	Consequence	Probability	Significance
Declines in faunal habitat, forage, species diversity and ecosystem functioning as a result of uncontrolled edge effects	Long-term	Local	Moderate - negative	Moderately detrimental	Very likely	Moderate - negative

b) Post-Mitigation

Table 28| Faunal Operational; phase impacts after mitigation

Impact	Post-mitigation:					
	Duration	Extent	Intensity	Consequence	Probability	Significance
Declines in faunal habitat, forage, species diversity and ecosystem functioning as a result of uncontrolled edge effects	Medium-term	Site-specific	Low - negative	Slightly detrimental	Fairly likely	Low - negative

(f) Methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks.

(Describe how the significance, probability, and duration of the aforesaid identified impacts that were identified through the consultation process was determined in order to decide the extent to which the initial site layout needs revision).

Methodology used in determining the significance of environmental impacts

For each predicted impact, criteria are applied to establish the significance of the impact based on likelihood (probability) and consequence, firstly in the case of no mitigation and then with the most effective mitigation measure(s) in place.

The criteria that contribute to the consequence of the impact are INTENSITY (the degree to which pre-development conditions are changed); the DURATION (length of time that the impact will continue); and the EXTENT (spatial scale) of the impact. The sensitivity of the receiving environment and/or sensitive receptors is incorporated into the consideration of consequence by appropriately adjusting the thresholds or scales of the intensity, duration and extent criteria, based on expert knowledge. For each impact, the specialist applies professional judgement to ascribe a numerical rating for each criterion according to the ratings provided.

The consequence is then established using the formula:

Consequence = intensity (duration + extent)

Duration

Rating	Criteria
2	**Long-term**: The impact will continue for 6-15 years.
1	**Medium-term:** The impact will continue for 2-5 years.
0	**Short-term:** The impact will continue for between 1 month and 2 years.

Extent

Rating	Criteria
2	**Regional:** The impact will affect the entire region
1	**Local:** The impact will extend across the site and to nearby properties.
0	**Site specific:** The impact will be limited to the site or immediate area.

Intensity

Rating	Criteria	
	Negative impacts (Type of impact = -1)	**Positive impacts** (Type of impact = +1)
Very high (-/+ 4)	Very high degree of damage to natural or social systems or resources. These processes or resources may restore to their pre-project condition over very long periods of time (more than a typical human life time).	Great improvement to ecosystem or social processes and services or resources.
High (-/+ 3)	High degree damage to natural or social system components, species or resources.	Intense positive benefits for natural or social systems or resources.
Moderate (-/+ 2)	Moderate damage to natural or social system components, species or resources.	Average, on-going positive benefits for natural or social systems or resources.
Low (-/+ 1)	Minor damage to natural or social system components, species or resources. Likely to recover over time. Ecosystems and valuable social processes not affected.	Low positive impacts on natural or social systems or resources.
Negligible (0)	Negligible damage to individual components of natural or social systems or resources, such that it is hardly noticeable.	Limited low-level benefits to natural or social systems or resources.

Depending on the numerical result of this calculation, the impact's consequence would be classified as one of the following:

Range	Consequence rating
-8	Extremely detrimental
-7 to -6	Highly detrimental
-5 to -4	Moderately detrimental
-3 to -2	Slightly detrimental
-1 to 1	Negligible

2 to 3	Slightly beneficial
4 to 5	Moderately beneficial
6 to 7	Highly beneficial
8	Extremely beneficial

To determine the significance of an impact, the probability (or likelihood) of that impact occurring is also taken into account. In assigning probability, the specialist must take into account the likelihood of occurrence and the degree of uncertainty and detectability of the impact.

Significance is calculated according to the following formula:

Significance = consequence x probability

Probability

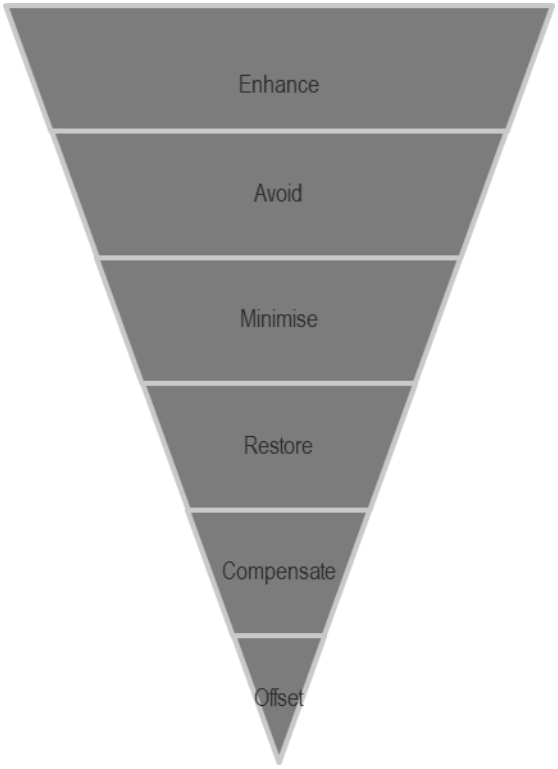
Rating	Criteria
4	**Certain/ Definite:** There are sound scientific reasons to expect that the impact will definitely occur.
3	**Very likely:** It is most likely that the impact will occur.
2	**Fairly likely:** This impact has occurred numerous times here or elsewhere in a similar environment and with a similar type of development and could very conceivably occur.
1	**Unlikely:** This impact has not happened yet but could happen.
0	**Very unlikely:** The impact is expected never to happen or has a very low chance of occurring.

Depending on the numerical result of this calculation, the impact would fall into a significance category of one of the following:

1. Rating	2. Significance rating	3. Colour code
4. -4	**5.** Very high - negative	**6.**
7. -3	**8.** High - negative	**9.**
10. -2	**11.** Moderate - negative	**12.**
13. -1	**14.** Low - negative	**15.**
16. 0	**17.** Very low	**18.**
19. 1	**20.** Low - positive	**21.**
22. 2	**23.** Moderate - positive	**24.**
25. 3	**26.** High - positive	**27.**
28. 4	**29.** Very high - positive	**30.**

Methodology for identification of mitigation measures

The mitigation hierarchy below illustrates the actions which can be undertaken to respond to negative impacts and the preference give to mitigation measures. The topmost measures are preferred, and the preference for mitigation measures decreases the further one moves down the hierarchy.



Impact avoidance: This step is most effective when applied at an early stage of project planning. It can be achieved by:

- Not undertaking certain projects or elements that could result in adverse impacts;
- Avoiding areas that are environmentally sensitive; and
- Putting in place preventative measures to stop adverse impacts from occurring.

Impact minimisation: This step is usually taken during impact identification and prediction to limit or reduce the degree, extent, magnitude, or duration of adverse impacts. It can be achieved by:

- Scaling down or relocating the proposal;
- Redesigning elements of the project; and
- Taking supplementary measures to manage the impacts.

Impact compensation: This step is usually applied to remedy unavoidable residual adverse impacts. It can be achieved by:

- Example, by habitat enhancement;
- Restoration of the affected site or environment to its previous state or better; and
- Replacement of the same resource values at another location (off-set), for example, by wetland engineering to provide

The mitigation described in the above diagram represents the full range of plausible and pragmatic measures that can be implemented to mitigate identified impacts.

For each impact assessed, mitigation measures have been proposed to reduce and/ or avoid negative impacts and enhance positive impacts. The mitigation measures identified by the specialists have been reviewed for feasibility and incorporated into the EMPr to ensure that they are implemented throughout the lifecycle of the proposed project. The EMPr would become a legally binding document should this project receive an EA.

The potential impacts identified, as well as the methodology employed in determining their nature, significance, consequences, extent, duration and probability, is provided in this report. Affected parties are encouraged to peruse these sheets and raise comments, issues and concerns therewith.

Rating	Criteria	
	Negative impacts (Type of impact = -1)	**Positive impacts** (Type of impact = +1)
7	Complete destruction (irreversible and irreplaceable loss) of natural or social systems, resources (e.g. species) and human health. No chance of these processes or resources ever being restored to their pre-impact condition.	Noticeable, sustainable benefits that improve the quality and extent of natural or social system or resources, including formal protection.
6	Very high degree of damage to natural or social systems or resources. These processes or resources may restore to their pre-project condition over very long periods of time (more than a typical human life time).	Great improvement to ecosystem or social processes and services or resources.
5	Serious damage to components of natural or social systems or resources and the contravention of legislated standards.	On-going and widespread benefits to natural or social systems or resources.
4	High degree damage to natural or social system components, species or resources.	Average to intense positive benefits for natural or social systems or resources.
3	Moderate damage to natural or social system components, species or resources.	Average, on-going positive benefits for natural or social systems or resources.
2	Minor damage to natural or social system components, species or resources. Likely to recover over time. Ecosystems and valuable social processes not affected.	Low positive impacts on natural or social systems or resources.
1	Negligible damage to individual components of natural or social systems or resources, such that it is hardly noticeable.	Limited low-level benefits to natural or social systems or resources.

(g) The positive and negative impacts that the proposed activity (in terms of the initial site layout) and alternatives will have on the environment and the community that may be affected.

(Provide a discussion in terms of advantages and disadvantages of the initial site layout compared to alternative layout options to accommodate concerns raised by affected parties)

The alternative options for the project (as detailed in above sections) were considered from an environmental, social and technical feasibility perspective. The specialist assessments included all alternative options and concluded that the preferred options as mentioned in this report can be considered favourably. These comparisons are summarised in Table 29.

It is important to note that the proposed activity will mostly take place on an existing mining area. No communities will be directly affected as none are in the area, apart from farm residents on neighbouring properties. Nevertheless, any issues raised by I&APs, will be addressed in the final BA report.

According to the requirements of the NEMA, the EAP and applicant has reviewed project alternatives and contemplated various potential environmental impacts associated with the project resulting, in the selection of the Best Practicable Environmental Option. It is worth mentioning that the applicant and engineering team have taken cognisance of the study area's sensitivities and, where possible, have strived to avoid any undue environmental impact while meeting the objective of improving the area's water quality.

This section will be updated once comments have been received from stakeholders during the upcoming commenting period.

To summarise, the following alternatives have been considered:

- Water Treatment Plant Locations
- Technology alternatives for water treatment

- Pipeline infrastructure layout alternatives

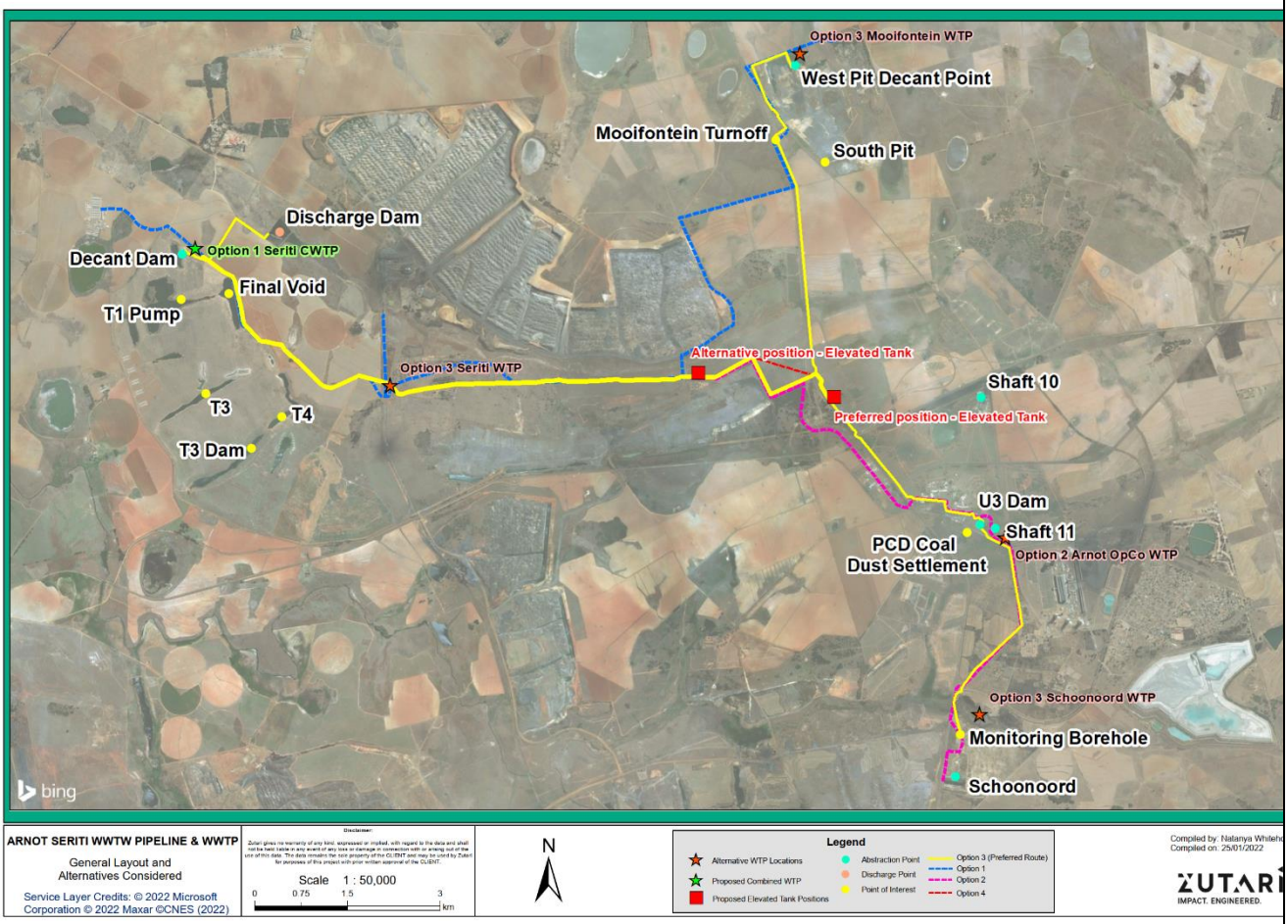


Figure 39: Map of project alternatives

Table 29| Positive and negative impacts that the proposed wastewater treatment plant and associated conveyancing infrastructure may have on the environment and communities potentially affected, for all alternatives considered for the project.

Water treatment plant locations – Option 1	
Positive Impacts	**Negative Impacts**
Treatment of mining affected water which currently poses environmental and potential health risks to the neighbouring environment. The water will be discharged to the Bosmanspruit catchment and other end users like farm owners to use for irrigation or agribusiness activities. Creation of employment through the operation of the treatment plant. The CWTP minimises the development footprint to what is absolutely required when compared to the other alternatives, thereby reducing the area of disturbance. Furthermore, it reduces development costs by only constructing a single WTP to which the mine water is conveyed via a pipeline.	The CWTP at Seriti is proposed in moderately modified and heavily modified areas which lowers the negative impact when compared other alternatives. Furthermore, white the CWTP is proposed to be constructed near a water feature (the decant dam), the aquatic assessment conducted by the specialists confirmed that this is an artificial feature. The Whole Effluent Toxicity (WET) assessment results show ➢ Daphnia pulex mortality was 100%, resulting in the overall Class 4 (high acute hazard) for water contained at the Decant Dam; ➢ An insignificant bacterial growth inhibition (2.5%) was measured; and ➢ Algal growth stimulation exceeded 100% and this indicated a severe risk of eutrophication to the receiving freshwater environment. Water from the Decant Dam should not be allowed to enter the receiving environment. While these results confirm a very low negative impact expected for the decant dam as an aquatic feature, it

	also indicated that it is therefore that the water be treated as per the project description. Nuisance impacts to neighbouring landowners, such as noise, dust and a temporary increase in traffic during the construction period. Site clearing, dust generation and potential risk of vehicle movement through wetlands during construction of the CWTP may lead to increased runoff and erosion leading to sedimentation of the surrounding water features.
Water treatment plant locations – Option 2	
Positive Impacts	**Negative Impacts**
Treatment of mining affected water which currently poses environmental and potential health risks to the neighbouring environment. The water will be discharged to the Bosmanspruit catchment and other end users like farm owners to use for irrigation or agribusiness activities. Creation of employment through the operation of the treatment plant. **As with Option 1, the Arnot OpCo CWTP is also a combined WTP thereby also** minimising the development footprint to what is absolutely required, in turn reducing the area of disturbance. Furthermore, it reduces development costs by only constructing a single WTP to which the mine water is conveyed via a pipeline.	This CWTP is proposed to be located within Eastern Highveld Grassland which will result in the removal of vegetation. According to the MBSP this site is classified as “other natural areas” as opposed to the moderately and modified areas of Option 1. Nuisance impacts to neighbouring landowners, such as noise, dust and a temporary increase in traffic during the construction period. Site clearing, dust generation and potential risk of vehicle movement through wetlands during construction of the CWTP may lead to increased runoff and erosion leading to sedimentation of the surrounding water features.
Pipeline route layout – Option 2	
Positive Impacts	**Negative Impacts**
Treatment of mining affected which currently poses environmental and potential health risks to the neighbouring environment. The treated water will be discharged to the Bosmanspruit catchment and other end users like farm owners to use for irrigation or agribusiness activities. This alternative reduces the length of the pipeline and related pumping costs. Creation of employment through the operation of the treatment plant.	The proposed development will result in the clearance of vegetation, which will lead to a loss of floral habitat and diversity within the Grassland and Freshwater Habitat Units. Crossing larger sections of sensitive habitat than that of Pipeline Option 3. A section near Schoonoord is located within areas identified as irreplaceable CBA. Nuisance impacts to neighbouring landowners, such as noise, dust and a temporary increase in traffic during the construction period. Site clearing, dust generation and potential risk of vehicle movement through wetlands during construction of the pipeline may lead to increased runoff and erosion leading to sedimentation of the surrounding water features.
Pipeline route layout – Option 3	
Positive Impacts	**Negative Impacts**
Treatment of mining affected which currently poses environmental and potential health risks to the neighbouring environment. The treated water will be discharged to the Bosmanspruit catchment and other end users like farm owners to use for irrigation or agribusiness activities.	The proposed development will result in the clearance of vegetation, which will lead to a loss of floral habitat and diversity within the Grassland and Freshwater Habitat Units. A section near Schoonoord is located within areas identified as irreplaceable CBA

This alternative reduces the length of the pipeline and related pumping costs when compared to Option 2. Creation of employment through the operation of the treatment plant.	Nuisance impacts to neighbouring landowners, such as noise, dust and a temporary increase in traffic during the construction period. Site clearing, dust generation and potential risk of vehicle movement through wetlands during construction of the pipeline may lead to increased runoff and erosion leading to sedimentation of the surrounding water features.
Pipeline route layout – Option 4	
Positive Impacts	**Negative Impacts**
Treatment of mining affected which currently poses environmental and potential health risks to the neighbouring environment. The treated water will be discharged to the Bosmanspruit catchment and other end users like farm owners to use for irrigation or agribusiness activities. This alternative reduces the length of the pipeline and related pumping costs when compared to Options 2 and 3. Creation of employment from construction activities and operation of the CWTP.	The proposed development will result in the clearance of vegetation, which will lead to a loss of floral habitat and diversity within the Grassland and Freshwater Habitat Units. A section near Schoonoord is located within areas identified as irreplaceable CBA Nuisance impacts to neighbouring landowners, such as noise, dust and a temporary increase in traffic during the construction period. Site clearing, dust generation and potential risk of vehicle movement through wetlands during construction of the pipeline may lead to increased runoff and erosion leading to sedimentation of the surrounding water features.
Alternative 4 ***No-go alternative* – The status quo remains and the WTP is not constructed. which means no development of the wastewater treatment plant for the mine affected water as part of the rehabilitation of the closed mining operations in Seriti and sections of Arnot Opco**	
Positive Impacts	**Negative Impacts**
No environmental disturbance of the proposed project site areas. No impact on the irreplaceable CBA near Schoonoord. Nuisance impacts related to construction of the proposed project will be avoided. Impacts related to site clearing within terrestrial and wetland habitats will be avoided.	Water pollution, surface and groundwater contamination from the mine affected water which is detrimental to the environment. The current pumps may not have the required capacity to continue pumping and recycling decant water to the existing earth dams, which may affect the neighbouring catchment and downstream users. No creation of employment from construction activities and operation of the CWTP.

(ii) The possible mitigation measures that could be applied and the level of risk.

(With regard to the issues and concerns raised by affected parties provide a list of the issues raised and an assessment/ discussion of the mitigations or site layout alternatives available to accommodate or address their concerns, together with an assessment of the impacts or risks associated with the mitigation or alternatives considered).

No issues have been raised to date. Note that this is the draft BA Report which is yet to be distributed for public review and comment.

See Part B, section (1) (e) for a discussion on proposed mitigation measures of each impact.

(ii) Motivation where no alternative sites were considered.

Alternatives have been considered. This section is therefore not applicable. Note that due to the nature of the activity, alternative sites outside the study area are not considered feasible as it will lead to the treatment of mine water outside of the mining area.

(iii) Statement motivating the alternative development location within the overall site. (Provide a statement motivating the final site layout that is proposed)

Option 3 is the preferred alternative for the pipeline infrastructure route, although Option 4 can also be considered favourably in the EAPs opinion.

Option 1 is the preferred alternative for the location of the CWTP as the CWTP minimises the development footprint to what is absolutely required. Furthermore, it reduces development costs by only constructing a single WTP to which the mine water is conveyed via a pipeline. The decant dam at Seriti is also the largest of the mine water sources so it is sensible to develop the CWTP at this location as opposed to the Arnot Opco site.

The location options for both the pipeline and treatment plant were also based on land to which the project principals (Seriti and Arnot Opco) own the surface rights.

The water treatment plant was located close to the single largest abstraction point on the project site in order to minimise the pipe infrastructure, pumping costs and storage volumes.

Technology alternative Option 1 (Hollow fibre + Nanofiltration) is the preferred option as the treatment technology is fit for purpose and designed to approach ZLD and to comply with the desired treated water quality.

(iii) Full description of the process undertaken to identify, assess and rank the impacts and risks the activity will impose on the preferred site (In respect of the final site layout plan) through the life of the activity.

a) (Including (i) a description of all environmental issues and risks that were identified during the environmental impact assessment process and (ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures.)

The EAP, a heritage specialist, and ecological (terrestrial and freshwater biodiversity) specialists conducted field assessments to identify and determine the environmental attributes and associated impacts during the proposed activity. By understanding the necessity of the proposed CWTP, and the context of the project in the greater socio-economic and environmental context, issues, risks and potential impacts were identified.

Complete lists of the impacts anticipated during all phases of the project are provided in part ATable 21, section eTable 22, subsection viiTable 23. Impacts are ranked according to their ratings obtained in these tables and are further discussed below.

A. **FLORAL IMPACT ASSESSMENT:**

i. Impact on floral diversity and habitat:

The impact assessment was undertaken on all aspects of floral ecology deemed likely to be affected by the proposed infrastructure development. The proposed development will result in the clearance of vegetation, which will lead to a loss of floral habitat and diversity within the Grassland and Freshwater Habitat Units. No significant loss of floral habitat and diversity is anticipated for the U3 Dam Survey Area as the remaining vegetation has already been altered, and where present mainly consists of alien vegetation habitats (as is found in the Transformed Habitat that is located within this area). The impacts associated with the remaining three survey

areas (Namely the Decant Dam, Mooifontein West Pit and Schoonoord Survey Areas) are anticipated to vary between Medium-Low and Low prior to the implementation of mitigation measures. Medium-Low impacts within these areas are attributed to sensitive habitat that is located within them (e.g., the intermediately sensitive *Hypparhenia*-rich Grassland Subunit, and the Moderately high sensitive Wetland Habitat). With strict mitigation measures, these impacts can be reduced to low to very-low impacts.

The pipeline will receive the greatest impact in terms of size of the habitat lost. Overall, the impacts on the floral assemblages prior to the implementation of mitigation measures are anticipated to vary between Medium-High to Very Low. With the implementation of appropriate mitigation measures, these impacts are anticipated to be reduce to low and very low impacts.

The proposed development will greatly impact on the habitat and diversity of habitats crossed. However, given that the habitat found along the pipeline options and throughout the study area is no longer a true representation of the reference state in terms of both structure and function, the proposed development will result in the loss of indigenous species, but the impact will be localised within the footprint area and no regional impacts on floral communities are anticipated. Provided that strict mitigation measures are implemented, the impact on floral communities associated with this habitat unit can remain localised. All the assessed pipeline options crossed sensitive habitat (e.g. *Hyparrhenia*-rich Grassland Subunit and Wetland Habitat) and as such, strict mitigation measures are to be implemented so to reduce the level of impact that associated with the proposed development.

ii. Impact on floral SCC:

Placement of development infrastructure is likely to have an unfavourable impact on floral SCC such as *Crinum* sp., of which all species within the *Crinum* genus are protected under Schedule 11 of the Mpumalanga Nature Conservation Act, 1998 (Act No. 10 of 1998) (MNCA). This species was identified within the Degraded Grassland and *Hyparrhenia*-rich Grassland Subunits (within the Grassland Habitat) which are located along all pipeline options, and within the Mooifontein West Pit, U3 Dam and Schoonoord Survey Areas. Other SCC species, (e.g. *Crinum bulbispermum*, *Hypoxis hemerocallidea* and *Boophone disticha*) although not recorded on site, have a high POC of being found within the Grassland Habitat.

The study area is not associated with a high diversity of SCC, nor were a high abundance of individuals observed. Loss of *Crinum* sp., individuals is however considered definite. Activities which are likely to negatively affect the flora of conservation concern within and around the study area include, but are not limited to, the following:

➢ Placement of infrastructure within sensitive floral habitat or habitat favoured by the recorded SCC;

➢ Irreversible destruction of favourable floral habitat during construction and operational activities;

➢ Poorly managed Alien Invasive Plants (AIP) proliferation with subsequent displacement of floral SCC; and

➢ Increased harvesting pressure on protected floral communities by mining personnel.

Should any other floral SCC be encountered during any phase of the proposed development, these species should be rescued and relocated by a suitably qualified specialist and either relocated to suitable habitat within the study area outside of the development footprint, utilised within the landscaping of the mine, or moved to registered nurseries such as the Agricultural Research Council (ARC) or the South African National Biodiversity Institute (SANBI). Any other floral SCC encountered during the construction phase of the proposed development should also be relocated by a suitably qualified specialist and, where required, the necessary permits should be applied for.

iii. Impact on Critical Biodiversity Areas, Ecological Sensitive Areas, Threatened Vegetation and Protected Areas:

The study area is located within the vulnerable Eastern Highveld Grassland vegetation type. Furthermore, the proposed development will impact on small sections identified as CBA Irreplaceable areas as well as CBA Optimal Areas. CBA Irreplaceable areas were identified along the proposed pipeline immediately north of the Schoonoord Survey Area (Figure 40). CBA areas are of high biodiversity value and need to be maintained in a natural state. These areas were identified as CBA based on their location within a vulnerable vegetation unit as well as suitable habitat for protected species. The CBA irreplaceable Category includes

i) areas required to meet targets and with irreplaceability values of more than 80%,
ii) critical linkages or pinch-points in the landscape that must remain natural, and
iii) Critically endangered ecosystems.

As such, the freshwater assessment report (Appendix D) includes the recommendation that the proposed pipeline within the area identified as a CBA irreplaceable area be rerouted so to circumvent both the CBA as well as the

Wetland Habitat that is located within the area. Although this recommendation is not technically unfeasible, rerouting the pipeline will not eliminate the need to cross a CBA Optimal, nor the Rietkuilspruit and will result in a much larger disturbance footprint due to the extended length of the pipeline that will be required to avoid the CBA Irreplaceable (Figure 41).

With stringent mitigation measures as proposed by the freshwater specialist, keeping the pipeline to the narrower section of the CBA Irreplaceable with construction being done in the winter season (dry months), it is the EAPs opinion that the proposed pipeline layout route for Option 3 be considered the preferred option.

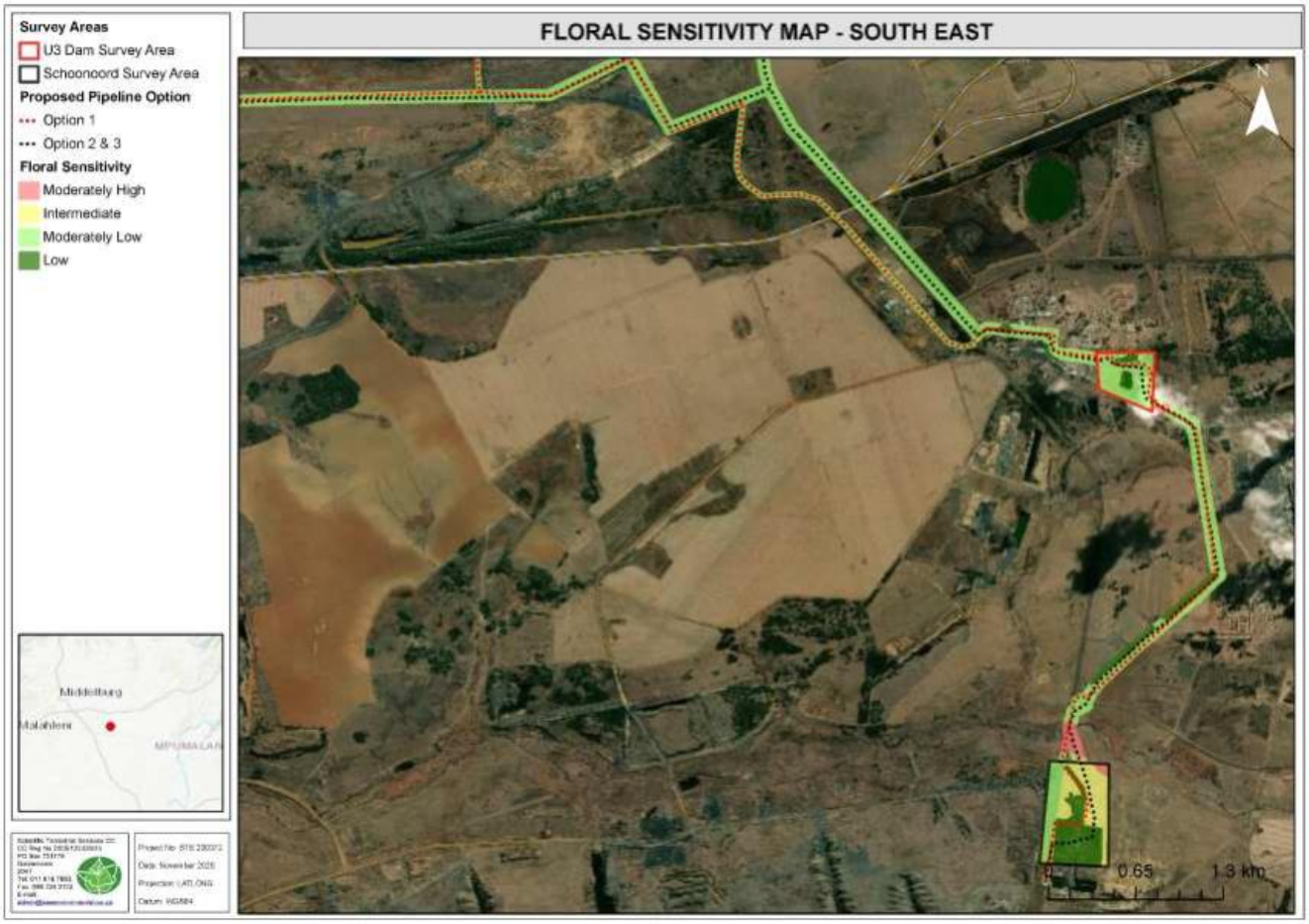


Figure 40: Sensitivity map for the south-eastern section of the study area (Schoonoord)

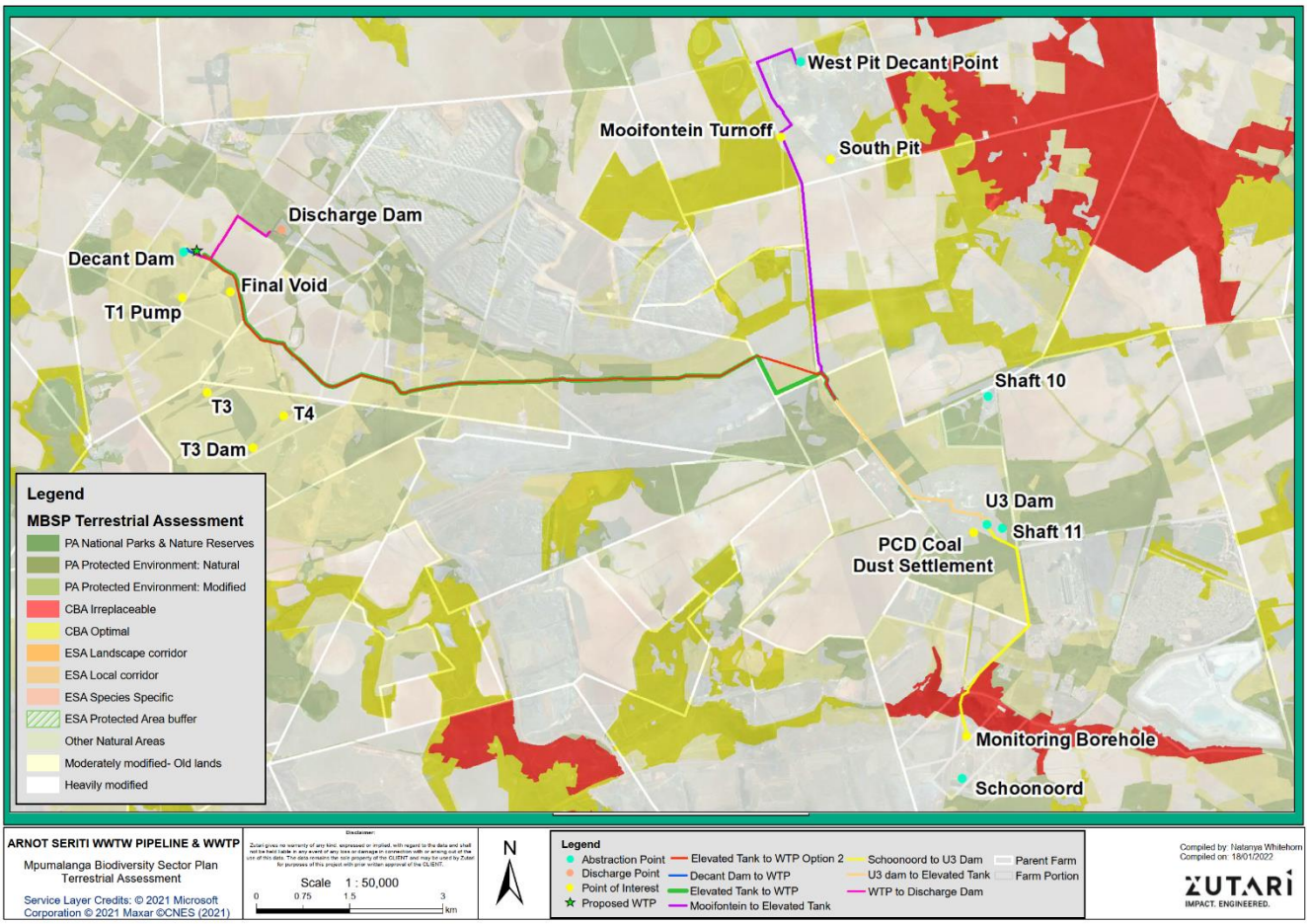


Figure 41: Map indicating the terrestrial sensitivities. Refer specifically to the Schoonoord abstraction point.

The northern portion of the proposed development is located within a CBA Optimal Area. These include areas that are optimally located to meet various biodiversity targets. Although these areas are not "irreplaceable" they are the most effective land configuration to meet all biodiversity targets and design criteria. As such, development within these areas should be minimised where possible.

The study area falls mostly with the following areas:

iv) Heavily or moderately modified areas, these areas are modified to the extent that any valuable biodiversity and ecological functions have been lost;

v) Heavily or Moderately Modified: Old Lands, include old, cultivated land that have been allowed to recover (within the last 80 years) and supports some natural vegetation. Although biodiversity patterns and ecological functioning may have been compromised, the areas may still play a role in supporting biodiversity and providing ecosystem services,

vi) Other Natural Areas, include areas that have not been identified as priority in the current systematic biodiversity plan but retain most of their natural character and perform a range of biodiversity and ecological infrastructural functions.

iv. Probable Latent Impacts on Floral ecology

Even with extensive mitigation, latent impacts on the receiving floral ecological environment are deemed likely. The following points highlight the key residual impacts that have been identified:

➢ Permanent loss of and altered floral species diversity;

➢ Edge effects such as further habitat fragmentation and AIP proliferation;

➢ Permanent loss of protected floral species and suitable habitat thereof;

➢ Disturbed areas are highly unlikely to be rehabilitated to pre-development conditions of ecological functioning and loss of floral habitat, species diversity and SCC/protected floral species will most likely be permanent; and

➢ Continued proliferation of AIP species within the study area and surrounding areas.

v. Cumulative impacts on floral ecology

Apart from the proposed development and its impact on floral habitat and diversity, the greatest threat to the floral ecology within the study area is the continued proliferation of AIP species, resulting in the overall loss of native floral communities within the local area. The proposed development is unlikely to result in large increases of human movement within the study area due to strict access control of the mine.

Conclusion:

The study area is located within the mining area of the Seriti and Arnot Opco Mines. Furthermore, much of the adjacent areas are currently being used for agricultural purposes.

During the field assessment, four broad habitat units were identified within the study area, namely Transformed Habitat, Grassland Habitat (which comprised of four subunits: Degraded Grassland, Modified Grassland, *Hyparrhenia*-rich Grassland and Wattle-invaded Grassland), Freshwater Habitat (which comprised of two subunits: Artificial Dams and Wetland Habitat), and lastly Cultivated Habitat.

The Transformed and Cultivated Habitat Units were of low sensitivity, and thus are not deemed important to support floral communities given the level of transformation within these units.

The Degraded Grassland, the Modified Grassland and the Wattle-invaded Grassland subunits are of a moderately low sensitivity, which is attributed to the degraded nature of the habitats, lower species richness and level of AIP proliferation within these subunits.

The Artificial dam Subunit of the Freshwater Habitat unit was of intermediate sensitivity. Although an artificial feature, enough time has passed since its establishment that a variety of non-terrestrial plants are supported within these areas. Lastly, the Wetland Habitat Subunit scored a Moderately high sensitivity.

Impacts associated with the proposed development within the study area are anticipated to vary from Medium-High to Very low prior to the implementation of mitigation measures. Provided that strict mitigation measures are followed; the impacts can be reduced to Medium-Low to Very Low levels. The construction of the Pipelines is deemed to have the greatest impact on the receiving environment. All Pipeline options will result in the destruction and impact of sensitive habitat. As discussed above, Pipeline Option 1 was considered the preferred option by the specialist. However, due to the unfeasibility of constructing localised water treatment plants when compared to the feasibility of a CWTP, and the fact that the Pipeline Option 1 is related to these localised water treatment plants, Pipeline Option 1 is subsequently not considered a favourable alternative for the proposed project.

No SANBI Red Data Listed species or any NFA species were observed during the field assessment. However, a Protected species, *Crinum* sp., as per Schedule 11 of the MNCA was identified within the Degraded Grassland and *Hyparrhenia*-rich Grassland Subunits. It is recommended that a summer season walkdown be undertaken and all potentially occurring protected floral species within the final development footprint be marked by means of GPS. Permits from the MTPA and the DFFE (in the case that any NFA listed tree species are recorded) should be obtained to remove, cut, or destroy the above-mentioned protected species before any vegetation clearing may take place.

B. <u>FAUNAL IMPACT ASSESSMENT:</u>

i. Impact on faunal habitat and diversity:

<u>Pipeline Option 1</u>: The development impact of pipeline option 1, without mitigation, is considered to be Medium - Low and Low – Very Low, with mitigation, in the habitats that it will traverse. This pipeline will have a “Low” impact on faunal habitat units considered to be of low and moderately low sensitivity, which include the Cultivated, Wattle-Invaded Grassland, Transformed and northern *Hyparrhenia*-rich grassland habitats. These areas are already disturbed, offering limited habitat to faunal species, therefore further disturbance herein is not likely to cause significant faunal loss. This inference is further validated by the fact that this linear development’s footprint will be relatively small, extending over approximately 20 metres with 10 metres on each side and it is assumed that the pipeline will be trenched, thus the largest impact will occur during construction.

Impacts are, however considered “Medium” in the Degraded Grassland and Wetland habitat subunits, in which this pipeline is situated, running north, in the mid-western side of the study area. The fauna sensitivity in this area was considered intermediate due to the higher faunal abundances observed, albeit observations were restricted largely to commonly occurring faunal species Scat of SCC, *Leptailurus serval* (Serval, NT) was also observed herein during the field assessment which indicates that this species does use the area whilst foraging. As such,

it is imperative that all mitigation measures as stipulated in Section 5.4 be implemented to ensure impacts are reduced as far as feasibly possible.

Due to the lower levels of impact to sensitive habitat units, it is recommended that pipeline option 1 be considered as the preferred route.

Pipeline Options 2 & 3: The development impact of pipeline option 2 & 3, without mitigation, is considered to be Medium – Low and Low – Very low with mitigation. This pipeline route is located in sections of degraded habitat in the study area and will therefore have a low impact on fauna diversity in these areas, which include the Cultivated Fields, areas of the Degraded Grassland subunit and the Wattle-Invaded Grassland subunit. It is noted that pipeline option 2 & 3, will have a greater potential impact on faunal diversity than pipeline option 1. These routes deviate from existing roads into the Wetland Habitat (in the north Mooifontein West and just before Schoonoord survey area in the south). These pipeline options therefore have potential to cause greater disturbance to areas considered of moderately high sensitivity. Furthermore, pipeline option 2, includes a discharge route that will run along an area where fauna sensitivity was considered intermediate. During the field assessment, this discharge route area had a higher avifauna abundance and is where a higher abundance of mammal signs were observed, including the scat and spoor of the SCC: Leptailurus serval (Serval, NT) also being observed here.

Development and its related activities that are placed along the discharge route and sensitive wetland areas will therefore likely lead to the loss of the fauna abundance and SCC that occur here. Due to the location of pipeline options 2 & 3 may within the more sensitive habitats, it is recommended that these options not be selected as the preferred options and remain as alternatives only.

Decant dam survey area: the development of water treatment facilities (such as the Arnot Water Treatment Plant) in this area, without mitigation will have a Medium – Low impact and with mitigation, with have a Low impact, on faunal habitat and diversity. The Artificial Dam habitat in this area was assigned an intermediate fauna sensitivity, as such any development in this habitat will result in an increased impact to both the receiving environment and faunal species therein. The freshwater habitat provides potential habitat for a variety of water-dependent fauna, which was reflected by higher species abundance observed near the dams during the field assessment. However, observed fauna was restricted to that of largely common species, that are widespread in the landscape and are able to move to similar habitat available in the adjacent areas outside of the disturbance footprints. Impacts on the remainder of Decant dam survey area are considered Low as the survey area consist of the Modified Grassland subunit and Cultivated Fields which are of low importance to faunal communities due to lack of habitat and low levels of food resources.

Schoonoord survey area: the development of pipelines without mitigation, will have a Medium – Low impact on faunal habitat and diversity in this area through the various project phases. With mitigation measures, these impacts can be reduced to a Low – Very Low impact significance. A low or very low impact is expected in the Transformed Habitat unit, as this area has been excavated and is thus considered unsuitable for most fauna species. A Medium-Low impact (without mitigation) to very low impact (with mitigation) is expected in the Hyparrhenia-rich Grassland subunit that represents the remainder of this survey area as this habitat was assigned an intermediate faunal sensitivity. An increased abundance of insects and avifauna were observed in this grassland subunit, which indicates that of the higher floral diversity herein is providing increased food resources and habitat availability for faunal species.

U3 Dam survey area: This area consists of the degraded grassland habitat and is situated directly between existing human developments in a highly disturbed area. It was noted to have low faunal diversity and habitat suitability. Therefore, the development of water pipelines without mitigation will have a Low impact and Very Low impact, with mitigation in in this area, as it is already highly disturbed and altering it will not cause high loss of fauna diversity.

Mooifontein West Pit Survey Area: the development of a decant point and other water treatment facilities without mitigation in this area, will have a Medium-High impact and with mitigation, will have a Medium-Low impact on faunal habitat and diversity. The wetland habitat located within the area is considered of Intermediate to Moderately High importance predominantly due to its high floral sensitivity and diversity (see Part B – Floral Report). This habitat will be well utilised by both common faunal species as well as SCC due to the increased floral diversity (food resources and vegetation cover) as well as increased water resources .

ii. **Impacts on faunal SCC**:

The only faunal SCC that was identified during the site visit was Leptailurus serval (Serval, NT). Spoor and scat of this species was found in the wetland and degraded grassland habitats associated with pipeline option 1. Serval spoor were also found along the discharge route of pipeline option 2. Other SCC that may occur within the study area are:

- ➢ *Ourebia ourebi* (Oribi, VU),
- ➢ *Atelerix frontalis* (Southern African Hedgehog, NT)
- ➢ *Orycteropus afer* (Antbear, NE)
- ➢ *Chrysospalax villosus* (Rough-haired Golden Mole, EN)
- ➢ *Poecilogale albinucha* (Striped Weasel, NE)
- ➢ *Crocidura mariquensis* (Swamp Musk Shrew)
- ➢ *Hydrictis maculicollis* (Spotted-Necked Otter, NT)
- ➢ *Tyto capensis* (African Grass Owl, VU)
- ➢ *Eupodotis caerulescens* (Blue Korhaan, NT)
- ➢ *Circus macrourus* (Pallid Harrier, NT)
- ➢ *Eupodotis senegalensis* (White-bellied Korhaan, VU)
- ➢ *Neotis denhami* (Denham's bustard, VU)
- ➢ *Sagittarius serpentarius* (Secetarybird, VU)
- ➢ *Phoenicopterus ruber* (Greater Flamingo, NT)
- ➢ *Oxyura maccoa* (Maccoa Duck, VU)
- ➢ *Pyxicephalus adspersus* (Giant Bullfrog, VU)
- ➢ *Metisella meninix* (Marsh Sylph, NYBA)

These faunal species may occur within the wetland habitats in the Mooifontein West Pit Survey Area and the wetland located in the southeast of the study area, just north of Schoonoord Survey Area. A Medium – High impact significance is expected should mitigatory measures not be implemented. It is recommended therefore, that the best construction and operation practices must be employed alongside the recommended mitigation measures to ensure no further habitat degradation occurs. This is important to assist in future rehabilitation activities, ensuring that that SCC will in future be able to move through and utilise the areas.

iii. Probable residual impacts:

Even with extensive mitigation, residual impacts on the receiving faunal ecological environment are likely. The following points highlight the key residual impacts that have been identified:

- ➢ Potential loss of natural habitat adjacent to the proposed sites as a result of edge effects;
- ➢ Potential continued loss or altered faunal species diversity and abundance in the local area;
- ➢ Continued loss of faunal habitat through disturbances;
- ➢ Potential loss of faunal SCC; and
- ➢ Further alien floral invasion.

iv. Cumulative impacts:

The local area has already been subjected to extensive impacts as a result of historic mining and agricultural activities, and much of the habitat that the proposed pipelines are situated in is of low importance to faunal communities. However, there are areas with intermediate and moderately high importance to fauna, where on-going losses may occur. The proposed development will lead to common faunal species being displaced from the proposed sites into the adjacent habitats. This may lead to increased competition for space and food resources, however, given the homogeneity of the landscape surrounding the study area and the relatively small footprint of the proposed development, the impact on common species is not expected to be significant, as there is sufficient habitat adjacent to the study area for the faunal species to disperse to.

The loss of potential SCC in the more sensitive wetland areas, edge effects and AIP proliferation are more concerning. The impact on sensitive wetland habitat will further threaten faunal SCC populations that, unlike common species, are often more restricted to a particular habitat type. AIP proliferation and insufficient rehabilitation will ultimately lead to loss of viable habitat in the surrounding areas, displacing faunal species further as indigenous floral species (faunal habitat and food resources) are displaced and lost.

C. **HERITAGE IMPACT ASSESSMENT:**

i. Assessment of Impact of Proposed Development on Identified Heritage Sites:

Despite an intensive walkthrough of the project area, no evidence for any archaeological or heritage sites could be identified. As a result, no impact is expected from the proposed development on heritage.

ii. Assessment of Impact of Proposed Development on Previously Identified Heritage Sites

A total of 37 heritage sites were identified within the wider surroundings of the present study area during the heritage surveys for the Kwagga North Project. Only one of these sites, labelled as Site 16 in the previous reports, is located closer than 50m from the development footprints currently proposed. This site, which is located approximately 16m from the closest point alongf the proposed development footprint area, was comprised of a cemetery. The cemetery was successfully relocated in 2017. With the site already relocated, no impact is expected on the site from the proposed development.

Conclusion and recommendation:

Despite the intensive desktop study work and fieldwork undertaken for the purposes of this study, no evidence for any archaeological or heritage sites could be identified within the study area. As a result, and on the condition that the development does not extend beyond the development footprint currently assessed, the authors of this report can provide no heritage reasons for the proposed development not to continue. From a heritage perspective, both Option 2 and Option 3 are acceptable as the routes are located within areas that have previously been disturbed and which are of low heritage sensitivity.

The following general recommendations are made:

- An archaeological watching brief must be undertaken during all excavations undertaken as part of the project; and
- Should the development footprints change or be altered in any way, these changes must be assessed in the field by a heritage specialist/archaeologist before construction commences.

b) Assessment of each identified potentially significant impact and risk

(This section of the report must consider all the known typical impacts of each of the activities (including those that could or should have been identified by knowledgeable persons) and not only those that were raised by registered interested and affected parties).

NAME OF ACTIVITY **(E.g. For prospecting -** drill site, site camp, ablution facility, accommodation, equipment storage, sample storage, site office, access route **etc…etc…etc** **E.g. For mining**,- excavations, blasting, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and boreholes, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc…etc…etc.)	**POTENTIAL IMPACT** (Including the potential impacts for cumulative impacts) (e.g. dust, noise, drainage surface disturbance, fly rock, surface water contamination, groundwater contamination, air pollution etc….etc…)	**ASPECTS AFFECTED**	**PHASE In which impact** is anticipated (e.g. Construction, commissioning, operational Decommissioning, closure, post-closure)	**SIGNIFICANCE** if not mitigated	**MITIGATION TYPE** (modify, remedy, control, or stop) through (e.g. noise control measures, storm-water control, dust control, rehabilitation, design measures, blasting controls, avoidance, relocation, alternative activity etc. etc) E.g. Modify through alternative method. Control through noise control Control through management and monitoring through rehabilitation.	**SIGNIFICANCE** if mitigated
• Site clearance • Site establishment • Establishment of construction camp • Excavation • Storage and Handling of Hazardous Substances • Movement of machinery • Backfilling of trenches • Construction of pipeline and WTP	Soil pollution	Soils	Construction Phase	Moderate - negative	Control through implementation of stormwater control and rehabilitation measures in a phased approach.	Very low negative
	Soil compaction	Soils	Construction Phase	Moderate - negative	Remedy soil compaction by implementing adequate soil preparation prior to rehabilitation	Very low negative
	Topsoil loss	Soils Ecological functioning structure	Construction Phase	Moderate - negative	Control through stockpiling of topsoil, implementation of stormwater control and rehabilitation measures in a phased approach.	Very low negative

	Surface and groundwater pollution	Surface and groundwater	Construction Phase	High - negative	Control through hydrocarbon management. Remedy by proper clean-up after spills.	Low negative
	Loss of faunal and floral habitat	Soils Ecological structure and diversity	Construction Phase	High - negative	Control of keeping to minimal footprint of disturbance and managing wastes and pollution	Moderate negative
	Dust nuisance	Ambient air	Construction Phase	Moderate - negative	Control through dust suppression measures	Very low negative
	Alien invasive species proliferation	Ecological functioning structure	Construction Phase	High - negative	Monitoring and control of alien and invasive proliferation	Moderate negative
	Noise pollution	Ambient noise	Construction Phase			
Operation and maintenance of the WTP and pipeline	Soil erosion	Soil	Operation Phase	Table ***27*** negative	All vehicles should keep to designated haul roads which should be communicated to the affected landowners who might also make use of these roads on a daily basis.	Table 28 low negative
	Traffic Impacts	Ambient noise Ambient air				
WTP and pipeline decommissioning	Soil pollution	Soil	Decommissioning	Moderate - negative	Decommissioning mitigation measures are consistent with that of construction.	Table 28 low negative
	Surface- and groundwater pollution	Ecological functioning structure	Decommissioning Phase	Moderate - negative	Decommissioning mitigation measures are consistent with that of construction.	Table 28 low negative
	Alien invasive species proliferation	Ecological functioning structure	Decommissioning Phase	Moderate - negative	Decommissioning mitigation measures are consistent with that of construction.	Table 28 low negative

The supporting impact assessment conducted by the EAP must be attached as an appendix, marked **Appendix G**

Please refer to **Appendix G** for the EAPs Impact Assessment Report for a thorough description of impacts and mitigation measures

c) Summary of specialist reports.

(This summary must be completed if any specialist reports informed the impact assessment and final site layout process and must be in the following tabular form):-

LIST OF STUDIES UNDERTAKEN	**RECOMMENDATIONS OF SPECIALIST REPORTS**	**SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT** (Mark with an X where applicable)	**REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.**
Biodiversity and Ecological Assessment The reports are attached as appendix D	**The specialist made the following recommendations:** • Prior to the commencement of construction activities, an Alien Invasive Plant (AIP) Management/Control Plan should be compiled for implementation. • Removal of AIPs should preferably commence during the pre-construction phase and continue throughout the construction and operational phases. AIPs should be cleared within the study area before any vegetation clearing activities commence, thereby ensuring that no AIP propagules are spread with construction rubble, or soils contaminated with AIP seeds during the construction phase. • An AIP Management/Control Plan should be implemented by a qualified professional. No chemical control of AIPs to occur without a certified professional or within the Wetland Habitat. • A permit should be obtained for removal or relocation of species protected under Schedule 11 of the MNCA that were recorded on site. Suitable habitat for the relocation of such species is present, particularly within the Degraded Grassland and *Hyparrhenia*-rich Grassland Subunits of the Grassland Habitat Unit. • The construction footprint must be kept as small as possible to minimise impact on the surrounding environment (edge effect management). As far as is feasible, where pipelines are to cross the Wetland Habitat, it is recommended that support structures be used to allow the pipeline to cross over the wetland and not through it, i.e., no digging of trenches through the Wetland Habitat to lay pipelines below ground. • No additional habitat is to be disturbed during the Construction and Rehabilitation of the project. • Throughout the construction and operational phases, vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the construction activities. Additional road construction should be limited to what is absolutely necessary, and the footprint thereof kept to a minimal.	All the recommendations proposed by the ecologist were deemed applicable to the application and therefore included as mitigation measures in this report.	Part A(1)(h)(viii) The possible mitigation measures that could be applied and the level of risk.

	• No collection of indigenous floral species must be allowed by construction personnel, especially with regards to floral SCC (if encountered). • Care should be taken during the construction and operation of the proposed development to limit edge effects to surrounding natural habitat. This can be achieved by: – Demarcating all footprint areas during construction activities. – No construction rubble or cleared alien invasive species are to be disposed of outside of demarcated areas and should be taken to a registered waste disposal facility. – All soils compacted as a result of construction activities should be ripped and profiled and reseeded. – Manage the spread of AIP species, which may affect remaining natural habitat within surrounding areas. Specific mention in this regard is made to Category 1b and 2 species identified within the development footprint areas. • No dumping of litter, rubble or cleared vegetation on site should be allowed Infrastructure and rubble removed as a result of the construction activities should be disposed of at an appropriate registered dump site away from the development footprint. No temporary dump sites should be allowed in areas with natural vegetation. Waste disposal containers and bins should be provided during the construction phase for all construction rubble and general waste. Vegetation cuttings must be carefully collected and disposed of at a separate waste facility. • If any spills occur, they should be immediately cleaned up to avoid soil contamination that can hinder floral rehabilitation. • Upon completion of construction activities, it must be ensured that no bare areas remain, and that indigenous species be used to revegetate the disturbed area • No illicit fires must be allowed during the construction of the proposed development. • No additional habitat is to be disturbed during the operational phase of the development. • Following heavy rains, access roads and areas adjacent to the mining footprints, specifically those in close proximity to the wetland habitat, are to be inspected for signs of erosion, which if found must be immediately rectified through appropriate erosion control measures; and • All rehabilitated areas should be rehabilitated to a point where natural processes will allow the ecological functioning and biodiversity of the area to be re-instated. • Monitoring of relocation success for any floral SCC should continue for at least three years after the completion of the construction phase, or until it is evident that the species have established self-sustaining populations.		
Integrated Freshwater Ecological Assessment The report is attached as Appendix D	• It is strongly recommended that, as far as possible, all construction phase activities be undertaken in the dry winter season when surface flow is absent or limited. This will decrease the severity of impacts expected. This would warrant the manual amendment of the risk rating from 'Medium' to 'Low' for all construction phase activities. • Sediment control devices must be in place prior to the start of the excavation activities. Impacts to the wetlands can be mitigate through the use of bidum geotextiles or geotextile wrapped haybales. Sediment traps must be installed every 20 m for 100 m downstream of the excavation works and any sediment build up must be manually removed.	All the recommendations proposed by the ecologist were deemed applicable to the application and therefore included as mitigation measures in this report.	Part A(1)(h)(viii) The possible mitigation measures that could be applied and the level of risk.

	• Since trenching for the pipeline is a short-term activity (no more than four weeks) temporary stockpiling of soil is considered acceptable in the wetland, as transporting of soil to stockpile areas outside of the wetland and setback area is not deemed feasible and will likely result in a larger impact to the wetland. • Stockpiled soil must, however, be located upgradient of the trench to ensure that no additional sedimentation to the wetland occurs. • These temporary stockpiles may not exceed 2m in height and should be covered with geotextile fabric on windy days to prevent excessive dust generation that may impact on the sediment load of the wetlands. • The excavated trenches must be backfilled to the same level as the surrounding soil and compacted to ensure that the trench does not become a preferential surface flow path for stormwater and lead to erosion. • Proper handling and disposal should minimise or eliminate discharges into the wetlands. The following recommendations must be adhered to: – Mixing of cement must be done in the construction camp/laydown area, may not be mixed on bare soil, and must be within a lined, bound or bunded portable mixer. – No mixed concrete shall be deposited directly onto the ground in the wetland whilst it awaits placing. A batter board or other suitable platform/mixing tray is to be provided onto which any mixed concrete can be deposited whilst it awaits placing. – A washout area should be designated outside of the wetland, and wash water should be treated on-site or discharged to a suitable sanitation system. – Cement bags must be disposed of in the demarcated hazardous waste receptacles and the used bags must be disposed of at a registered facility-Spilt or excess concrete must be disposed of at a suitably registered landfill site. Chain of custody documentation must be provided. • The duration of impacts must be minimised as far as possible by ensuring that the duration of time in which flow alteration and impediment will take place is minimised. • All construction vehicles must remain within the pipeline servitude. It is recommended that no more than 5 m on either side of the pipeline be disturbed. • Monitoring and control of alien and invasive proliferation is mandatory to ensure no further encroachment into the wetland that could result in further deterioration of the PES of the wetland. • Regular (quarterly) monitoring of water quality at the dams must be conducted as well as any proposed decant points. • Sections of the wetlands directly impacted by pipeline installation activities must be rehabilitated with indigenous wetland vegetation, thus reinstating wetland habitat. This will ensure that the current levels of ecological service provision and ecological integrity of the wetlands are maintained and where feasible, improved; and • Implement an alien vegetation control program and ensure the establishment of indigenous species in the footprint of the pipeline until suitable indigenous basal cover is established and ensure alien plants do not proliferate and outcompete indigenous species that have been reinstated.		
Phase 1 HIA	**The Heritage specialist recommended the following:**	While no heritage resources were found	N/A

The report is attached as appendix D	• An archaeological watching brief must be undertaken during all excavations undertaken as part of the project; and • Should the development footprints change or be altered in any way, these changes must be assessed in the field by a heritage specialist/archaeologist before construction commences.	during the field assessment, all the recommendations proposed by the ecologist were deemed applicable to the application and therefore included as mitigation measures in this report.	

(d) Environmental impact statement

(i) Summary of the key findings of the environmental impact assessment.

No significant loss of **faunal** habitat and diversity is anticipated for the Transformed Habitat (low sensitivity), Cultivated Habitat (low sensitivity), Modified and Degraded Grassland, that are associated with the pipelines Decant Dam, U3 Dam, parts of Schoonoord and Mooifontein West Pit survey areas. Due to the remaining vegetation being already altered or largely absent, and where present mainly consists of alien vegetation (as is found in the Transformed Habitat), the impact associated with the construction and operation of the infrastructure is expected to be low.

Medium – Low, without mitigation and Low –Very Low impact is anticipated in areas where pipeline options 2 & 3 and other developments infringe on the Hyparrhenia-rich grassland in Schoonoord survey area, Artificial Dam subunit (intermediate sensitivity) in Decant Dam Survey Area and wetland habitat long along the mid-western portion of pipeline option 1. The impact is considered higher here, as suitable habitat (although disturbed) remains in these areas where fauna diversity, especially mammals, were higher than the rest of the study area.

No SANBI Red Data Listed species or any protected species under the NFA were observed during the field assessment. However, a Protected species, *Crinum* sp., as per Schedule 11 of the MNCA was identified within the Degraded Grassland and
Hyparrhenia-rich Grassland Subunits. It is recommended that a summer season walkdown be undertaken and all potentially occurring protected floral species within the final development footprint be marked by means of GPS. Permits from the MTPA and the DFFE (in the case that any NFA listed tree species are recorded) should be obtained to remove, cut, or destroy the above-mentioned protected species before any vegetation clearing may take place.

In terms of the most preferred option from a **freshwater** perspective, pipeline option 1 was considered the most ideal option for combined water treatment plant. Although all the pipeline options traverse the delineated wetlands at some point, option 1 mostly crosses wetlands within areas where significant disturbance has already occurred historically and the sensitivity of the wetland along such areas is considered to be limited. Should the construction activities associated with the selected option be conducted during the dry winter season, it is considered likely that the overall risk significance can be reduced to a low impact for some of the activities.

The **heritage** assessment concluded that, while an extensive field assessment was conducted, no evidence for any archaeological or heritage sites could be identified within the study area.

(i) Final Site Map

Provide a map at an appropriate scale which superimposes the proposed overall activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers. Attach as **Appendix C**

Please refer to Appendix C for the site sensitivity map.

(i) Summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;

POTENTIAL POSITVE IMPACTS

Treatment of mining affected water which currently poses environmental and potential health risks to the neighbouring environment. The water will be discharged to the Bosmanspruit catchment and other end users like farm owners to use for irrigation or agribusiness activities. Creation of employment through the operation of the treatment plant.

(d) Proposed impact management objectives and the impact management outcomes for inclusion in the EMPr;

Based on the assessment and where applicable the recommendations from specialist reports, the recording of proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation.

The objective of impact management will be to manage all the significant environmental aspects associated with the project with a view to address, manage and control the environmental impacts of the project, to ensure continuous monitoring of environmental performance, and continual improvement in environmental performance throughout the duration of the project through:

- Implementing the EMPr with its requirements to manage significant aspects.
- Measuring, controlling and monitoring relevant construction activities, significant aspects and mitigation measures.
- Prevention, minimisation and control of pollution and environmental degradation, and
- Regular compliance and efficiency auditing and management review for continual improvement.

Impact management outcomes

The key impact management outcomes would be the efficient and environmentally responsible construction of the CWTP and its associated infrastructure. With the successful implementation of the recommended mitigation measures, the CWTP could benefit the environment by allowing discharge of treated water into the catchment and distribution to other end users.

(d) Aspects for inclusion as conditions of Authorisation.

- A thorough floral and faunal walkdown must be conducted prior to construction commencement to search for and rescue any SCCs in the proposed project footprint. This should be done by a specialist and the SCCs relocated based on the specialist's recommendations at that time.
- Any changes to, or deviations from the project description set out in this application must be approved, in writing, by the competent authority before such deviations may be implemented.
- A suitably qualified Environmental Compliance Officer (ECO) must monitor compliance with specifications of the EMPr for the duration of construction activities.
- Any work within the freshwater ecosystem should preferably be undertaken during dry months (May to August) as far as possible. Work affecting the CBA1 area near Schoonoord may only be done during dry months.

(d) Description of any assumptions, uncertainties and gaps in knowledge.
(Which relate to the assessment and mitigation measures proposed)

This report is based on the following assumption(s):

- The information provided by the applicant is accurate, sufficient and unbiased, and no information that could change the outcome of the authorisation process has been withheld.
- The information obtained from the specialist baseline studies, undertaken for proposed project is accurate and unbiased.
- The applicant will follow the conditions of the EA, EMPr and applicable legislation for the duration of the project.

(d) Reasoned opinion as to whether the proposed activity should or should not be authorised

(i) Reasons why the activity should be authorized or not.

The objective of this project is the treatment of mine water which currently poses environmental and potential health risks to the neighbouring environment. Once treated to the acceptable water quality standard, the treated water will be discharged to the Bosmanspruit catchment and other end users like farm owners to use for irrigation or agribusiness activities.

This project is also expected to contribute to the creation of employment through the construction and operation of the treatment plant, pipeline and associated infrastructure.

Although the project is expected to impact on various ecological aspects from both a floral and faunal perspective, it is the EAPs opinion that, with the implementation of mitigation measures as recommended by the specialists, these impacts can be reduced to an acceptable level. Furthermore, by ensuring adequate rehabilitation of the construction area, specifically the pipeline footprint, these predicted impacts can be further reduced in the operational phase. As the infrastructure requires relatively minimal maintenance and disturbance once completed, the rehabilitation measures are expected to contribute largely to the long-term reduction of impacts from the construction phase.

Taking this into account together with the benefits of the proposed project in efficiently treating the current mine affected water for these two mining companies, it is the EAPs opinion that the activity be authorised.

(i) Conditions that must be included in the authorisation

- A thorough floral and faunal walkdown must be conducted prior to construction commencement to search for and rescue any SCCs in the proposed project footprint. This should be done by a specialist and the SCCs relocated based on the specialist's recommendations at that time.
- Any changes to, or deviations from the project description set out in this application must be approved, in writing, by the competent authority before such deviations may be implemented.
- A suitably qualified ECO must monitor compliance with specifications of the EMPr for the duration of construction activities.
- Any work within the freshwater ecosystem should preferably be undertaken during dry months (May to August) as far as possible. Work affecting the CBA1 area near Schoonoord may only be done during dry months.

(d) Period for which the Environmental Authorisation is required.

The EA should be valid for a period of 5 years before construction is required to commence.

(d) Undertaking

Confirm that the undertaking required to meet the requirements of this section is provided at the end of the EMPr and is applicable to both the Basic assessment report and the Environmental Management Programme report.

Yes, the abovementioned aspects are provided at the end of this report and apply to the full content of both the BA and EMPr report.

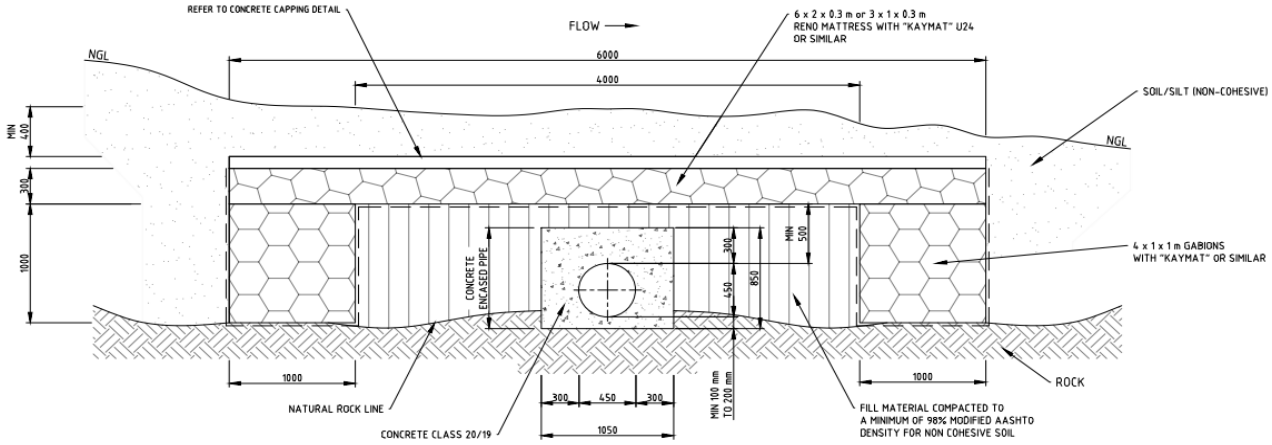
(d) Financial Provision

State the amount that is required to both manage and rehabilitate the environment in respect of rehabilitation.

R5,753,000.00

i) Explain how the aforesaid amount was derived.

The majority of the amount was derived by considering rehabilitation costs for topsoiling all areas disturbed by the pipeline, storage tanks, CWTP and associated infrastructure construction works. In addition to this, rehabilitation of the stream crossings for the section from Schoonoord to the U3 Dam and Mooifontein to the Elevated Tank at Bosmansspruit were included into the costing calculations. These stream crossings include erosion protection methods such as gabions, reno mattresses and geotextiles (see figure below).



TYPICAL TRENCH CROSS-SECTION:
ENCASEMENT, GABIONS AND RENO MATTRESS

ii) Confirm that this amount can be provided for from operating expenditure.

(Confirm that the amount, is anticipated to be an operating cost and is provided for as such in the Mining work programme, Financial and Technical Competence Report or Prospecting Work Programme as the case may be).

The financial provision for the rehabilitation is confirmed to be an operating cost as part of the mine's closure objectives and has been provided for in the mining work programme.

(d) Specific Information required by the competent Authority

(iii) Compliance with the provisions of sections 24(4)(a) and (b) read with section 24 (3) (a) and (7) of the National Environmental Management Act (Act 107 of 1998). the EIA report must include the:-

(1) Impact on the socio-economic conditions of any directly affected person. (Provide the results of Investigation, assessment, and evaluation of the impact of the mining, bulk sampling or alluvial diamond prospecting on any directly affected person including the landowner, lawful occupier, or, where applicable, potential beneficiaries of any land restitution claim, attach the investigation report as an **Appendix**.

The following potential impacts were identified that may impact on socio-economic conditions of directly affected persons:

- The potential impact of noise and increased traffic on the site during construction.
- Dust nuisance caused by general construction activities
- Potential positive socio-economic impacts include the following:
  - Local employment opportunities during construction and operation.
  - Local economy opportunities and economic empowerment.
  - Improved water quality for surrounding downstream users.

Note, however, that as this project is not a mining, bulk sampling or alluvial diamond prospecting activity, a full social impact assessment was not conducted by a social specialist.

(2) Impact on any national estate referred to in section 3(2) of the National Heritage Resources Act. **(**Provide the results of Investigation, assessment, and evaluation of the impact of the mining, bulk sampling or alluvial diamond prospecting on any national estate referred to in section 3(2) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) with the exception of the national estate contemplated in section 3(2)(*i*)(vi) and (vii) of that Act, attach the investigation report as **Appendix 2.19.2** and confirm that the applicable mitigation is reflected in 2.5.3; 2.11.6.and 2.12.herein).

Not applicable as the HIA found no resources of value in the study area. The HIA is attached in Appendix D.

(d) Other matters required in terms of sections 24(4)(a) and (b) of the Act.

(the EAP managing the application must provide the competent authority with detailed, written proof of an investigation as required by section 24(4)(b)(i) of the Act and motivation if no reasonable or feasible alternatives, as contemplated in sub-regulation 22(2)(h), exist. The EAP must attach such motivation as **Appendix 4)**.

Not applicable

PART B
ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

1) Draft environmental management programme.

(a) Details of the EAP,

(Confirm that the requirement for the provision of the details and expertise of the EAP are already included in PART A, section 1(a) herein as required).

Yes, Details of EAP have been provided in PART A, section 1(a) of this document.

(b) Description of the Aspects of the Activity

(Confirm that the requirement to describe the aspects of the activity that are covered by the draft environmental management programme is already included in PART A, section (1)(h) herein as required).

Yes, description of the activities to be undertaken as part of the proposed CWTP construction have been provided in PART A of this document.

(c) Composite Map

(Provide a map **(Attached as an Appendix**) at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that any areas that should be avoided, including buffers)

Please refer to Appendix C for the sensitivity map

(d) Description of Impact management objectives including management statements

i) **Determination of closure objectives.** (ensure that the closure objectives are informed by the type of environment described)

The closure objectives have been identified below:

- The rehabilitation of land and to leave the area in the best possible state for continuous use of land by future generations.
- Maintain a functioning ecosystem.
- Preservation of current environment (rural / urban where applicable).
- Maintain groundwater quality.
- Minimise environmental damage to the extent acceptable to all parties.
- Ensure rehabilitation takes place to achieve a condition approximating its natural / current state.
- Ensure removal of surface infrastructure upon completion of project.
- Ensure that mine closure is achieved efficiently, cost effectively and in compliance with Regulations; and
- Ensure that the social impacts resulting from the proposed project are managed in such a way that negative impacts are minimised and positive impacts are enhanced.

(e) Volumes and rate of water use required for the operation.

The CWTP itself will have a capacity of 12.3 ML/day to treat all the mine water and ensure it meets an acceptable discharge quality suitable for irrigation and environmental discharge after treatment. While the objective of the project is to treat the mine water, the operation itself will not use water.

(i) Has a water use licence has been applied for?

An Integrated Water Use License Application (IWULA) is currently underway and will be submitted on the EWULAAS system in due process.

(ii) Impacts to be mitigated in their respective phases

Measures to rehabilitate the environment affected by the undertaking of any listed activity

ACTIVITIES **(E.g. For prospecting -** drill site, site camp, ablution facility, accommodation, equipment storage, sample storage, site office, access route **etc…etc…etc** **E.g. For mining**,- excavations, blasting, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and boreholes, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc…etc…etc.)	**PHASE** (of operation in which activity will take place. State; Planning and design, Pre-Construction' Construction, Operational, Rehabilitation, Closure, Post closure).	**SIZE AND SCALE of disturbance** (volumes, tonnages and hectares or m²)	**MITIGATION MEASURES** (describe how each of the recommendations in herein will remedy the cause of pollution or degradation and migration of pollutants)	**COMPLIANCE WITH STANDARDS** (A description of how each of the recommendations herein will comply with any prescribed environmental management standards or practices that have been identified by Competent Authorities)	**TIME PERIOD FOR IMPLEMENTATION** Describe the time period when the measures in the environmental management programme must be implemented Measures must be implemented when required. With regard to Rehabilitation specifically this must take place at the earliest opportunity. .With regard to Rehabilitation, therefore state either:- Upon cessation of the individual activity or. Upon the cessation of mining, bulk sampling or alluvial diamond prospecting as the case may be.
Vegetation clearing	Pre-construction	5 ha	• Vegetation shall only be cleared in areas where the pipeline and WTP infrastructure shall be constructed	EMPr	Prior to the construction of the CWTP, pipeline and storage infrastructure.
Excavations of pipeline route, WTP and storage dams	Construction	5 ha	• Topsoil removal and storage shall be conducted as per guidelines. • Materials excavated should be placed on disturbed areas as far as possible.	EMPr Seriti Rehabilitation Guideline	Throughout construction phase.
Infilling of excavated areas with appropriate materials	Construction	5 ha	• Materials used for infilling shall be safe and non-hazardous.	EMPr	Throughout construction phase.
Topsoil removal, temporary handling, and storage	Construction, Decommissioning	2 ha	• The handling shall be limited as far as possible.	EMPr	Throughout construction phase. As and when topsoil is reused within the construction site

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			• Topsoil should not be driven over, and spillages and leakages from vehicles or equipment onto topsoil should be avoided. • Topsoil stripping and storage shall be carried out according to guidelines.		
General site management	Construction	2 ha	• Alien invasive species shall be regularly removed to prevent its spread. • Adequate portable ablution facilities must be provided, maintained, and regularly emptied. • Windblown litter shall be regularly cleared from the site. • Adequate storm water and erosion control measures on bare soil shall be implemented and maintained. • Access to the site shall be controlled. • Application of dust suppressants in areas prone to dust generation if required.	EMPr	Throughout construction phase.

ACTIVITIES **(E.g. For prospecting -** drill site, site camp, ablution facility, accommodation, equipment storage, sample storage, site office, access route **etc…etc…etc** **E.g. For mining**,- excavations, blasting, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and boreholes, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc…etc…etc.)	**PHASE** (of operation in which activity will take place. State; Planning and design, Pre-Construction' Construction, Operational, Rehabilitation, Closure, Post closure).	**SIZE AND SCALE of disturbance** (volumes, tonnages and hectares or m²)	**MITIGATION MEASURES** (describe how each of the recommendations in herein will remedy the cause of pollution or degradation and migration of pollutants)	**COMPLIANCE WITH STANDARDS** (A description of how each of the recommendations herein will comply with any prescribed environmental management standards or practices that have been identified by Competent Authorities)	**TIME PERIOD FOR IMPLEMENTATION** Describe the time period when the measures in the environmental management programme must be implemented Measures must be implemented when required. With regard to Rehabilitation specifically this must take place at the earliest opportunity. .With regard to Rehabilitation, therefore state either:- Upon cessation of the individual activity or. Upon the cessation of mining, bulk sampling or alluvial diamond prospecting as the case may be.
			• Ensure that the use of machines do not disrupt any services (e.g. electricity, water supply, and telephone lines). • All machinery and equipment must be maintained in good working order, and fitted with approved and specified muffler systems. • Compliance with local by-laws and regulations regarding noise, hours of operation, and speed limits shall be adhered to. • If necessary, a fence shall be constructed to keep game out of the construction site.		
Use and storage of hazardous materials, cement, hydrocarbons and other chemicals on site	Construction	1 ha	• The storage and handling of any hazardous substances, cement, or concrete shall occur in bunded or on lined areas to prevent soil, surface, and groundwater contamination.	EMPr	Throughout construction phase.

ACTIVITIES **(E.g. For prospecting -** drill site, site camp, ablution facility, accommodation, equipment storage, sample storage, site office, access route **etc…etc…etc** **E.g. For mining**,- excavations, blasting, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and boreholes, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc…etc…etc.)	**PHASE** (of operation in which activity will take place. State; Planning and design, Pre-Construction' Construction, Operational, Rehabilitation, Closure, Post closure).	**SIZE AND SCALE of disturbance** (volumes, tonnages and hectares or m²)	**MITIGATION MEASURES** (describe how each of the recommendations in herein will remedy the cause of pollution or degradation and migration of pollutants)	**COMPLIANCE WITH STANDARDS** (A description of how each of the recommendations herein will comply with any prescribed environmental management standards or practices that have been identified by Competent Authorities)	**TIME PERIOD FOR IMPLEMENTATION** Describe the time period when the measures in the environmental management programme must be implemented Measures must be implemented when required. With regard to Rehabilitation specifically this must take place at the earliest opportunity. .With regard to Rehabilitation, therefore state either:- Upon cessation of the individual activity or. Upon the cessation of mining, bulk sampling or alluvial diamond prospecting as the case may be.
Generation and storage of domestic waste	Construction	0,5 ha	• Domestic waste should be disposed of in dedicated bins or skips, emptied on a regular basis by a registered/ authorised waste facility.	EMPr NEM: WA	Throughout construction phase.
Generation and storage of hazardous waste	Construction	0,1 ha	• Contaminated materials (wash water, rags, soil etc.) shall be disposed of as such. • The storage and handling of any hazardous substances shall occur in bunded or on lined areas to prevent soil, surface, and groundwater contamination.	EMPr NEM: WA Hazardous Substances Act of 1973 (Act No. 15 of 1973)	Throughout construction phase.
Generation and storage of construction waste	Construction	0,5 ha	• Construction material (e.g. steel, wood, rubble) shall be removed from site regularly to an authorised waste handling facility or re-used, recycled where possible.	EMPr NEM: WA	Throughout construction phase.
Transportation of construction (e.g. infilling) materials to and from site	Construction	-	• Dust-prone materials should be covered during transportation thereof.	EMPr	Throughout construction phase.

ACTIVITIES **(E.g. For prospecting -** drill site, site camp, ablution facility, accommodation, equipment storage, sample storage, site office, access route **etc…etc…etc** **E.g. For mining**,- excavations, blasting, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and boreholes, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc…etc…etc.)	**PHASE** (of operation in which activity will take place. State; Planning and design, Pre-Construction' Construction, Operational, Rehabilitation, Closure, Post closure).	**SIZE AND SCALE of disturbance** (volumes, tonnages and hectares or m²)	**MITIGATION MEASURES** (describe how each of the recommendations in herein will remedy the cause of pollution or degradation and migration of pollutants)	**COMPLIANCE WITH STANDARDS** (A description of how each of the recommendations herein will comply with any prescribed environmental management standards or practices that have been identified by Competent Authorities)	**TIME PERIOD FOR IMPLEMENTATION** Describe the time period when the measures in the environmental management programme must be implemented Measures must be implemented when required. With regard to Rehabilitation specifically this must take place at the earliest opportunity. .With regard to Rehabilitation, therefore state either:- Upon cessation of the individual activity or. Upon the cessation of mining, bulk sampling or alluvial diamond prospecting as the case may be.
			• Dangers associated with the movement of large vehicles shall be clearly sign-posted and vehicles shall comply with speed limits. • Vehicle movement shall be limited to pre-existing roads and the area adjacent to existing and new pipeline during installation. • Speed limits shall be adhered to at all times.		
Removal and rehabilitation of CWTP and associated infrastructure	Rehabilitation post construction Post closure	1 ha	• Pipeline trenches shall be backfilled, levelled and topsoil replaced. • CWTP footprint to be levelled and topsoil replaced. • Disturbed and infilled areas should be shaped to ensure the area is gently sloping, free draining and that no preferential flow paths during rainfall events are created which could lead to scour and sedimentation. • It is of particular importance that any steep slopes created are flattened out so that the	EMPr	During closure and decommissioning.

ACTIVITIES **(E.g. For prospecting -** drill site, site camp, ablution facility, accommodation, equipment storage, sample storage, site office, access route **etc…etc…etc** **E.g. For mining**,- excavations, blasting, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and boreholes, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc…etc…etc.)	**PHASE** (of operation in which activity will take place. State; Planning and design, Pre-Construction' Construction, Operational, Rehabilitation, Closure, Post closure).	**SIZE AND SCALE of disturbance** (volumes, tonnages and hectares or m²)	**MITIGATION MEASURES** (describe how each of the recommendations in herein will remedy the cause of pollution or degradation and migration of pollutants)	**COMPLIANCE WITH STANDARDS** (A description of how each of the recommendations herein will comply with any prescribed environmental management standards or practices that have been identified by Competent Authorities)	**TIME PERIOD FOR IMPLEMENTATION** Describe the time period when the measures in the environmental management programme must be implemented Measures must be implemented when required. With regard to Rehabilitation specifically this must take place at the earliest opportunity. .With regard to Rehabilitation, therefore state either:- Upon cessation of the individual activity or. Upon the cessation of mining, bulk sampling or alluvial diamond prospecting as the case may be.
			area grades more gently with the surrounding topography. • In steep areas ensure that energy dissipation takes place to ensure that water leaving the site does so without reaching critical levels which would lead to erosion. • Ensure that runoff does not lead to excessive sedimentation by providing erosion control measures such as, sandbags, Soil Saver® and silt fences prior to commencement of revegetation. • Careful planning of all levels must take place to ensure the revegetated areas allow for a free draining landscape that allows water to drain towards the watercourses in a natural manner with specific mention of the following: ensure that runoff occurs in a natural diffuse manner with no unnatural concentration of flow. Ensure that no areas of unnatural ponding occur due to a lack of runoff potential.		

ACTIVITIES	PHASE	SIZE AND SCALE of disturbance	MITIGATION MEASURES	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
(E.g. For prospecting - drill site, site camp, ablution facility, accommodation, equipment storage, sample storage, site office, access route **etc…etc…etc** **E.g. For mining**,- excavations, blasting, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and boreholes, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc…etc…etc.)	(of operation in which activity will take place. State; Planning and design, Pre-Construction' Construction, Operational, Rehabilitation, Closure, Post closure).	(volumes, tonnages and hectares or m²)	(describe how each of the recommendations in herein will remedy the cause of pollution or degradation and migration of pollutants)	(A description of how each of the recommendations herein will comply with any prescribed environmental management standards or practices that have been identified by Competent Authorities)	Describe the time period when the measures in the environmental management programme must be implemented Measures must be implemented when required. With regard to Rehabilitation specifically this must take place at the earliest opportunity. .With regard to Rehabilitation, therefore state either:- Upon cessation of the individual activity or. Upon the cessation of mining, bulk sampling or alluvial diamond prospecting as the case may be.
			• Soil compaction must be alleviated by ripping the soils to approximately 60 cm below ground surface to physically loosen the soil, using appropriate tillage implements.		

(b) Impact Management Outcomes

(A description of impact management outcomes, identifying the standard of impact management required for the aspects contemplated in paragraph ();

ACTIVITY (whether listed on not) (E.g. Excavations, blasting, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and boreholes, accommodation, offices, ablution, stores, workshops, processing plant, storms water control, berms, roads, pipelines, power lines, conveyors, etc…etc…etc)	POTENTIAL IMPACT (e.g. dust, noise, drainage surface disturbance, fly rock, surface water contamination, groundwater contamination, air pollution etc…etc…)	ASPECTS AFFECTED	PHASE In which impact is anticipate (e.g. construction, commissioning, operational Decommissioning, closure, post-closure)	MITIGATION TYPE (modify, remedy, control, or stop through (e.g. noise measures, storm-water control, dust control, rehabilitation, design measures, blasting controls, avoidance, relocation, alternative activity etc. etc.) E.g. • Modify through alternative method. • Control through noise control • Control through management and monitoring • Remedy through rehabilitation.	STANDARD TO BE ACHIEVED (Impact avoided, noise levels, dust levels, rehabilitation standards, end use objectives etc.)
Vegetation clearing	Loss of floral and faunal habitat	Ecological structure	Pre-construction; Construction; Operation	**Control**: Minimise the removal of vegetation and confining vehicular traffic to existing roads/tracks. Weeds and other alien invasive species to be removed regularly from the site footprint. Any chemical substances for the control of weeds and alien invasive species shall only be done with the prior approval of the ECO.	Vegetative cover is similar to pre-project condition after construction is completed.
	Soil erosion	Soils			No excessive soil erosion during construction.
	Dust generation	Ambient air quality			No excessive dust nuisance or complaints.
	Establishment / proliferation of alien invasive species in areas disturbed during construction	Ecological structure			No alien and invasive species established.
Excavations of WTP, pipeline infrastructure and associated storage facilities	Loss of topsoil	Soils Ecological structure	Construction	**Control & Remedy**: Ensure efficient and thorough management of soil stockpiles, dust suppression, silt management and containment and prevention of hydrocarbons on site.	No loss of topsoil or seedbank.
	Dust generation	Ambient air quality			No excessive dust nuisance or complaints.

	Soil contamination	Soils			No soil contamination through accidents, spillage or leakage.
	Soil compaction	Soils			Soil compaction limited only to construction area area.
	Surface- and groundwater contamination	Surface- and groundwater			No surface- and groundwater contamination
Infilling of excavated areas with appropriate materials	Soil contamination	Soils	Construction	**Control & Remedy**: Proper housekeeping and implementation of an emergency response plan	No soil contamination through accidents, spillage or leakage.
	Soil compaction	Soils			Soil rehabilitated to Seriti standards or as prescribed by specialist at decommissioning phase.
Topsoil removal, temporary handling, and storage	Loss of topsoil	Soils Ecological structure	Construction, Decommissioning	**Control & Remedy**: Proper housekeeping and implementation of an emergency response plan	No loss of topsoil or seedbank.
General site management	Soil contamination	Soils	Construction, operation, decommissioning	**Control & Remedy**: Proper housekeeping, dust suppression measures and implementation of an emergency response plan	No soil contamination through accidents, spillage or leakage.
	Soil erosion	Soils			No loss of soil. No signs of soil erosion (gullies, rills, etc.)
	Dust generation	Ambient air quality			No excessive dust nuisance or complaints.

	Air pollution	Ambient air quality			Air pollution standards and local bylaws adhered to. No excessive air pollution nuisance or complaints of odours or emissions.
	Noise pollution	Ambient noise			Noise kept at levels safe for humans.
	Surface- and groundwater pollution	Surface- and groundwater			No contaminants or litter in surface or groundwater resources.
	Alien invasive species establishment / spread	Ecological structure			Alien invasive species do not establish or spread.
Use and storage of hazardous materials, cement, hydrocarbons and other chemicals on site	Soil contamination	Soils	Construction	**Control & Remedy**: Proper housekeeping and implementation of an emergency response plan	No soil contamination through accidents, spillage or leakage.
	Dust generation	Ambient air quality			Air pollution standards and local bylaws adhered to. No complaints of dust, odours, or emissions.
	Surface- and groundwater contamination	Surface- and groundwater			No contaminants in surface or groundwater resources.
	Litter	Aesthetics	Construction		No litter on site.

Generation and storage of domestic waste				**Control & Remedy**: Proper housekeeping and implementation of an emergency response plan	Bins/ skips not overflowing.
	Soil contamination	Soils			No soil contamination caused by domestic waste.
	Surface- and groundwater contamination	Surface- and groundwater			No contaminants or litter in surface or groundwater resources.
Generation and storage of hazardous waste	Soil contamination	Soils	Construction	**Control & Remedy**: Proper housekeeping and implementation of an emergency response plan. Proof of safe disposal of hazardous waste to a registered landfill site.	No soil contamination caused by hazardous waste.
	Surface- and groundwater contamination	Surface- and groundwater			No contaminants in surface or groundwater resources.
Generation and storage of construction waste	Litter	Aesthetics	Construction	**Control & Remedy**: Proper housekeeping and implementation of an emergency response plan	Construction waste disposed of in designated skips or bins.
	Soil contamination	Soils			No soil contamination caused by domestic waste.
	Surface- and groundwater contamination	Surface- and groundwater			No hazardous contaminants in surface or groundwater resources.
Transportation of construction (e.g. infilling) materials to and from site	Dust generation	Ambient air quality	Construction	**Control:** Confining the activities to the smallest possible area.	No excessive dust nuisance. No complaints of dust or emissions.

					Speed limits adhered to at all times.
Removal and rehabilitation of CWTP and associated infrastructure.	Loss of topsoil	Soils Ecological structure	Post construction Decommissioning	**Remedy through rehabilitation:** Commence with rehabilitation in a phased approach – rehabilitate each section once it is completed.	No loss of topsoil or seedbank.
	Loss of floral and faunal habitat	Ecological structure			Floral and faunal habitat restored within appropriate time period after rehabilitation.
	Establishment / proliferation of alien invasive species in areas disturbed during construction	Ecological structure			No alien or invasive plant species on rehabilitated site.

(b) Impact Management Actions

(A description of impact management actions, identifying the manner in which the impact management objectives and outcomes contemplated in paragraphs (c) and (d) will be achieved).

ACTIVITY whether listed or not listed (E.g. Excavations, blasting, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and boreholes, accommodation, offices, ablution, stores, workshops, processing plant, storms water control, berms, roads, pipelines, power lines, conveyors, etc.)	POTENTIAL IMPACT (E.g. dust, noise, drainage surface disturbance, fly rock, surface water contamination, groundwater contamination, air pollution etc.)	MITIGATION TYPE (modify, remedy, control, or stop through (e.g. noise measures, storm-water control, dust control, rehabilitation, design measures, blasting controls, avoidance, relocation, alternative activity etc.) E.g. • Modify through alternative method. • Control through noise control • Control through management and monitoring • Remedy through rehabilitation.	TIME PERIOD FOR IMPLEMENTATION Describe the time period when the measures in the environmental management programme must be implemented Measures must be implemented when required. With regard to Rehabilitation specifically this must take place at the earliest opportunity. With regard to Rehabilitation, therefore state either:- Upon cessation of the individual activity or. Upon cessation of mining, bulk sampling or alluvial diamond prospecting as the case may be.	COMPLIANCE WITH STANDARDS (a description of how each of the recommendation in 2.11.6 read with 2.12 and 2.15.2 herein will comply with any prescribed environmental management standards or practices that may have been identified by Competent Authorities)
Vegetation clearing	• Loss of floral and faunal habitat • Soil erosion • Dust generation • Establishment / proliferation of alien invasive species in areas disturbed during construction	Vegetation shall only be cleared in areas where the WTP, pipeline and storage facilities shall be located	Prior to construction	EMPr
• Excavations of WTP, pipeline and storage facilities	• Loss of topsoil • Dust generation • Soil contamination • Soil compaction • Surface- and groundwater contamination	• Topsoil removal and storage shall be conducted as per Seriti guidelines. • Materials excavated should be placed on disturbed areas as far as possible.	Throughout construction phase.	EMPr Seriti Rehabilitation Guideline

Infilling of excavated areas with appropriate materials	• Soil contamination • Soil compaction	Materials used for infilling shall be safe and non-hazardous.	Throughout construction phase.	EMPr
Topsoil removal, temporary handling, and storage	• Loss of topsoil	• The handling shall be limited as far as possible. • Topsoil should not be driven over, and spillages and leakages from vehicles or equipment onto topsoil should be avoided. • Topsoil stripping and storage shall be carried out according to Seriti guidelines.	Throughout construction phase. As and when topsoil is reused within the construction site.	EMPr Seriti Guidelines
General site management	• Soil contamination • Soil erosion • Dust generation • Air pollution • Noise pollution • Surface- and groundwater pollution • Alien invasive species establishment / spread	• Alien invasive species shall be regularly removed to prevent its spread. • Adequate portable ablution facilities must be provided, maintained, and regularly emptied. • Windblown litter shall be regularly cleared from the site. • Adequate storm water and erosion control measures on bare soil shall be implemented and maintained, such as revegetation of disturbed areas. • Access to the site shall be controlled. • Application of dust suppressants in areas prone to dust generation. • Ensure that the use of machines do not disrupt any services (e.g. electricity, water supply, and telephone lines). • All machinery and equipment must be maintained in good working order, and fitted with approved and specified muffler systems.	Throughout construction phase.	EMPr

		• Compliance with local by-laws and regulations regarding noise, hours of operation, and speed limits shall be adhered to.		
Use and storage of hazardous materials, cement, hydrocarbons and other chemicals on site	• Soil contamination • Dust generation • Surface- and groundwater contamination	The storage and handling of any hazardous substances, cement, or concrete shall occur in bunded or on lined areas to prevent soil, surface, and groundwater contamination.	Throughout construction phase.	EMPr
Generation and storage of domestic waste	• Litter • Soil contamination • Surface- and groundwater contamination	• Domestic waste should be disposed of in dedicated bins or skips, emptied on a regular basis by a registered/ authorised waste facility.	Throughout construction phase.	EMPr NEM: WA
Generation and storage of hazardous waste	• Soil contamination • Surface- and groundwater contamination	• Contaminated materials (wash water, rags, soil etc.) shall be disposed of as such. • The storage and handling of any hazardous substances shall occur in bunded or on lined areas to prevent soil, surface, and groundwater contamination. • The dewatered sludge (solid waste) must be disposed of at a licensed hazardous waste landfill site. Proof of safe disposal must be kept on site.	Throughout construction phase.	EMPr NEM: WA Hazardous Substances Act of 1973 (Act No. 15 of 1973)
Generation and storage of construction waste	• Litter • Soil contamination • Surface- and groundwater contamination	• Construction material (e.g. steel, wood, rubble) shall be removed from site regularly by an authorised waste handling facility, reused, or recycled.	Throughout construction phase.	EMPr NEM: WA
Transportation of construction (e.g. infilling) materials to and from site	• Dust generation	• Dust-prone materials should be covered during transportation thereof. • Dangers associated with the movement of large vehicles shall be clearly sign-posted and vehicles shall comply with speed limits.	Throughout construction phase.	EMPr

		• Vehicle movement shall be limited to pre-existing roads and along the pipeline • Speed limits shall be adhered to at all times.		
Removal and rehabilitation of WTP and associated infrastructure.	• Loss of topsoil • Loss of floral and faunal habitat • Establishment / proliferation of alien invasive species in areas disturbed during construction	• All waste materials shall be removed and re-used, recycled or disposed of appropriately. • The site soils should be ripped to alleviate soil compaction. Topsoil must be spread over all disturbed areas and regrowth monitored.	During post construction, closure and decommissioning phase of CWTP.	EMPr Mineral and Petroleum Resources Development Act (Act. No. 28 of 2002)

(ii) Financial Provision

(1) Determination of the amount of Financial Provision.

(a) Describe the closure objectives and the extent to which they have been aligned to the baseline environment described under the Regulation.

(b)

Rehabilitation measures have been designed to meet closure objectives:

- The main closure objective is to ensure that the site is left as close as possible to the pre-mining/water treatment operation state after decommissioning activities.
- Surface infrastructure will be demolished.
- Foundations will be removed.
- Building rubble will be used as backfill or disposed of at a nearby suitable site.
- All areas cleared of surface infrastructure will be rehabilitated by placement of topsoil and revegetated.
- All roads that will not be used by the local population in the will be ripped and vegetated.
- Any soil contamination will be removed during demolition activities prior to topsoil replacement and revegetation.
- Invasive plant species will be controlled on the reinstated areas

(c) Confirm specifically that the environmental objectives in relation to closure have been consulted with landowner and interested and affected parties.

This report includes all the environmental objectives in relation to closure and will be made available for review by the landowners, registered I&AP's and stakeholders over a 30-days commenting period.

(d) Provide a rehabilitation plan that describes and shows the scale and aerial extent of the main mining activities, including the anticipated mining area at the time of closure.

Please refer to table ii in Part B for rehabilitation measures compiled as part of the EMPr. As the proposed project is not a mining activity but is proposed as part of the mines' closure objectives, the rehabilitation measures have been prescribed for post-construction to rehabilitate the construction footprint of the CWTP, pipelines and associated infrastructure.

(e) Explain why it can be confirmed that the rehabilitation plan is compatible with the closure objectives.

The main closure objective is to ensure that the area is restored as close as possible to the pre-activities state in terms of shaping and spreading of topsoil to allow for the establishment of natural vegetation over time.

The rehabilitation measures are deemed to be compatible with the main closure objective as it would ensure that facility is restored as close as possible to its pre-activity state in terms of spreading and shaping of topsoil and reseeding in order to allow for the establishment of natural vegetation. This would eventually allow natural ecosystems to re-establish, such that the surrounding area is not severely affected by any activities associated with the CWTP, pipeline infrastructure and storage facilities.

(f) Calculate and state the quantum of the financial provision required to manage and rehabilitate the environment in accordance with the applicable guideline.

This project forms part of the requirements to manage and rehabilitate the Seriti and Arnot OpCo mines as per their mine closure objectives and as such, this project in itself will not require further rehabilitation.

(g) Confirm that the financial provision will be provided as determined.

This project is proposed as part of the Seriti and Arnot OpCo mines' commitment to achieve their closure objectives after supplying Eskom with coal. Eskom will carry the financial liability for development and operation of this Project and therefore the capital costs will be funded by Eskom only.

Mechanisms for monitoring compliance with and performance assessment against the environmental management programme and reporting thereon, including

b) Monitoring of Impact Management Actions

c) Monitoring and reporting frequency

d) Responsible persons

e) Time period for implementing impact management actions

f) Mechanism for monitoring compliance

SOURCE ACTIVITY	IMPACT REQUIRING MONITORING PROGRAMMMES	FUNCTIONAL REQUIREMENT FOR MONITORING	ROLES AND RESPONSIBILITIES (FOR THE EXECUTION OF THE MONITORING PROGRAMMES)	MONITORING AND REPORTING FREQUENCY AND TIME PERIODS FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS
All construction activities	All environmental impacts potentially occurring during the construction phase.	• Appointment upon commencement of project. • Seriti appointment	Environmental Officer The Environmental Control Officer (ECO) is a person responsible for monitoring the implementation of the EMPr and complied with on site on a daily basis. The ECO will report to Seriti and the Department of Mineral Resources and Energy (DMRE). The ECO has the authority to stop any works if, in his/her opinion, there is or may be a serious threat to or impact on the environment; caused directly by Seriti or the Contractor's actions or activities during all phases of the proposed project. In all such work stoppage situations, the ECO is to inform Seriti or the Contractor of the reasons for the stoppage within 24 hours. Upon failure by Seriti or the Contractor, or their employees, to show adequate consideration to the EMPr, the ECO may recommend to Seriti or the Contractor to have their representative(s) or any employee(s) removed from the site, or work suspended until the matter is resolved.	The purpose of a monitoring programme is to ensure that mitigation measures identified and described in the EMPr are implemented. Construction, operation and decommissioning activities shall be monitored and recorded by the ECO and audited against the EMPr on a monthly basis. A report must be submitted at the end of each month prior to progress meetings, where they will form part of the agenda. The target is to achieve 100% compliance with the EMPr. Impact management actions shall be implemented as prescribed in the EMPr or as advised by the ECO. The ECO shall also review and approve all Contractor method statements related to the implementation of the EMPr.
All construction and operation activities	All environmental impacts potentially	Seriti appointment	Engineer (Seriti) Oversee the overall implementation of the project compliance to the EMPr and incorporation of any	Throughout construction activities.

SOURCE ACTIVITY	IMPACT REQUIRING MONITORING PROGRAMMMES	FUNCTIONAL REQUIREMENT FOR MONITORING	ROLES AND RESPONSIBILITIES (FOR THE EXECUTION OF THE MONITORING PROGRAMMES)	MONITORING AND REPORTING FREQUENCY AND TIME PERIODS FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS
	occurring during the construction phase.		potential environmental aspects mentioned, into designs.	
Construction, operation, and decommissioning activities	All environmental impacts potentially occurring during construction, operation, and decommissioning phases	Seriti appointment	Seriti and the Contractor As part of being responsible for the construction, operation, and decommissioning of the proposed activities, Seriti or the Contractor will be responsible for the overall implementation of the EMPr. The Contractor will nominate a representative on site as his environmental representative, known as the Contractor's Environmental Control Officer (CECO). The Contractor must issue site instructions to rectify any environmental noncompliance, based on the CECO's findings. The Seriti Site Manager can also issue site instructions.	Monthly reporting to the PM shall take place.
All construction activities	All environmental impacts potentially occurring during construction	Contractor should appoint a CECO	Contractor's Environmental Control Officer The CECO will be responsible, on behalf of the Contractor, to ensure that the EMPr is implemented and complied with on site daily. The CECO will liaise with the ECO in all matters relating to the implementation of the EMP. The CECO needs a certain amount of environmental management experience in an appropriate field.	Inspections as per method statement requirements. Monthly reporting to the PM shall take place.

g) Indicate the frequency of the submission of the performance assessment/ environmental audit report.

The Environmental Audit Report in accordance with Appendix 7 as prescribed in Regulation 34 of the EIA Regulations, 2014 (as amended) will be submitted annually to DMR for compliance monitoring purposes or in accordance with the time period stipulated by the EA

h) Environmental Awareness Plan

(1) Manner in which the applicant intends to inform his or her employees of any environmental risk which may result from their work.

Before the commencement of any activities, the appointed Contractor's site management staff should familiarise themselves with the EMPr. All site on staff must regularly undergo awareness training and/ or toolbox talks to understand the requirements of the EMPr.

(2) Manner in which risks will be dealt with in order to avoid pollution or the degradation of the environment.

The following documents will be used as reference for identifying and managing impacts:

- Approved EMPr.
- Approved EA; and
- Seriti`s Environmental Management System.
- Seriti and its contractors will be responsible for the implementation of the required mitigation measures in order to avoid pollution or degradation of the environment. Appropriate implementation of the recommended mitigation measures specified in the EMPr will be monitored through regular site audits by an ECO.

i) Specific information required by the Competent Authority

(Among others, confirm that the financial provision will be reviewed annually).

This project is proposed is an operating cost as part of the Seriti and Arnot OpCo mines' closure objectives. Financial provision is thus linked to the mine's overall financial provision.

2) UNDERTAKING

The EAP herewith confirms

a) the correctness of the information provided in the reports ☒

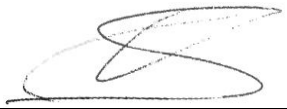
b) the inclusion of comments and inputs from stakeholders and I&APs ; ☒

Note that comments and inputs will be obtained during the upcoming public participation period.

c) the inclusion of inputs and recommendations from the specialist reports where relevant; ☒ and

d) that the information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested and affected. parties are correctly reflected herein. ☒

Note that comments and inputs will be obtained during the upcoming public participation period.



Signature of the environmental assessment practitioner:

Zutari (Pty) Ltd

Name of company:

04 March 2022

Date:

-END-

APPENDIX A

EAP CV

APPENDIX B

DESIGN DRAWINGS

APPENDIX C

MAPS

APPENDIX D

SPECIALIST STUDIES:

- Terrestrial Biodiversity Assessment – Flora and Fauna
- Freshwater Assessment
- Heritage Impact Assessment

APPENDIX E

PUBLIC PARTICIPATION DOCUMENTS

- Public Participation Plan
- Newspaper advert
- Background Information Document
- Site Notice
- Notification letters
- Stakeholder database
- Site photos
- Comments and Response Report

APPENDIX F

BASIS OF DESIGN REPORT

APPENDIX G

IMPACT ASSESSMENT REPORT