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PROPOSED DECOMISSIONING OF CHROME DIRECT DUST (CDR) FACILITY

Basic Assessment Report, Environmental Management Programme and Closure Plan

Prepared for:	Samancor (Middelburg Ferrochrome)
Prepared by:	Knight Piésold (Pty) Ltd.
Proposal Number:	RI-301-00183/40
Revision Number:	C
Date:	14 June 2021

Knight Piésold CONSULTING

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Final Draft

PART A: BASIC ASSESSMENT REPORT
PROPOSED DECOMMISSIONING OF CHROME DIRECT DUST (CDR) FACILITY

Rev	Description	Date
A	Issued in Draft	April 23, 2021
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EXECUTIVE SUMMARY

The Samancor Middelburg Ferrochrome (MFC) facility is proposing to decommission a waste disposal facility known as the Chrome Direct Reduction (CDR) facility which was used up to the year 2000. The facility is licensed in terms of water use 21 (g) of the National Water Act (Licence Number 04/B12D/G/1193).

The CDR site is located on the farm Middelburg town and Townlands no 287 JS near Middelburg, Mpumalanga.

The CDR waste is heterogenous in nature (both vertically and horizontally). This leads to variations in the classification of the waste type. Although the majority of the samples were classified as Type 3, some sections of the CDR facility area exceeded the LCT2 threshold for Cr (VI) and should be considered as Type 1 waste. The waste material must be conclusively screened (classified) on a grid base and handled according to the worst-case sample result.

The Type 3 waste will be disposed on the existing slag disposal facility at MFC. This facility is licenced to receive Type 3 waste (Licence number 12 / 9 / 11 / L834 / 6). The trucks will make use of using existing roads.

The impounding walls of the slimes dam and the toe paddock bund walls will be dozed down over the area previously covered by CDR Slimes. The Return Water Dam (RWD) and Stormwater Dam (SWD) will be left *in situ*.

Once the waste has been removed, the site will be rehabilitated and revegetated with a seed mixture of *Hyparrhenia hirta*, *Themeda triandra* and Imperata c*ylindrica*.

African Grass-Owl (Tyto capensis) was confirmed within the Vaalbankspruit wetland area during the 2012 ecological survey. Suitable habitat for two other Red Data avifauna species (African Marsh-Harrier (*Circus ranivorus*) and Lesser Kestrel (*Falco naumanni*) were confirmed during the 2012 ecological survey.

The positive and negative impacts of the project can be summarised as per the table below:

Positive Impacts	Negative Impacts
Reinstatement of pre-disposal / natural topography	Temporary visual impact (disruption) during decommissioning activities
Change land use from disposal site to more natural	Temporary destruction of flora species and faunal habitat
Return ecological functioning	Potential increase of alien invasive species
Improve functioning of Vaalbankspruit wetland	Short term sediment mobilisation and deposition in watercourse
Remove pollution source and risk to groundwater	Potential hydrocarbon spills from vehicles and machinery
Work opportunities for local contractors	Temporary Increase in dust fallout rates during decommissioning activities
	Temporary increase in noise levels during decommissioning activities

It is estimated that the project to remove all contaminated material from site and rehabilitate the exposed area can be completed within a period of one year.

It is proposed that vegetation monitoring should be undertaken for a period of five years after re-vegetation of the site. Vegetation maintenance and water quality monitoring should continue for the life of the facility.

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ABBREVIATIONS

Al	Aluminium
BA	Basic Assessment
BAR	Basic Assessment Report
BoQ	Bill of Quantities
CA	Competent Authority
CBA	Critical Biodiversity Area
CDR	Chrome Direct Dust
Cl	Chloride
COD	Chemical Oxygen Demand
Cr	Chrome
Cr(VI)	Hexavalent chromium
DEA	Department of Environmental Affairs
DFFE	Department of Forestry, Fisheries and the Environment
DWAF	Department of Water Affairs and Forestry
EAP	Environmental Assessment Practitioner
EAPASA	Environmental Assessment Practitioners Association of South Africa
EC	Electrical Conductivity
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
EMC	Ecological Management Class
EMF	Environmental Management Framework
F	Fluoride
HGM	Hydrogeomorphic Units
I&AP	Interested and Affected Party
IDP	Integrated Development Plan
LCT	Leachable Concentration Threshold
m.a.s.l	metres above sea level
MFC	Middelburg Ferrochrome
Mn	Manganese
MPISF	Mpumalanga Provincial Integrated Spatial Framework
NO_2	Nitrogen Dioxide
NO_3	Nitrate
PES	Present Ecological State
PPP	Public Participation Process
RWD	Return Water Dam
SANS	South African National Standards
SDF	Spatial Development Framework
SMME	Small, Medium and Micro Enterprises
sms	short message service
STLM	Steve Tshwete Local Municipality
SWD	Stormwater dam
TSS	Total Suspended Solids
WML	Waste Management Licence
WWTW	Wastewater Treatment Works

1.0 INTRODUCTION

The Samancor Middelburg Ferrochrome (MFC) facility, situated in Middelburg, Mpumalanga, was established in 1964 to produce Ferrochrome for use in the production of steel.

A process known as Chrome Direct Reduction (CDR) was undertaken at MFC, whereby chrome ore is brought into contact with finely divided coal at high temperature. During the CDR process a dust is produced as waste, which is captured with water sprays producing a slimes material of high moisture content. In the 1990's to the year 2000, MFC disposed of this CDR dust, known as CDR slimes, at a constructed disposal area located to the west of the MFC production facility. The CDR Slimes facility is licensed in terms of water use 21 (g) of the National Water Act, and the facility has been out of commission since the year 2000.

MFC wishes to apply for the formal decommissioning / closure of this facility in line with legislation. There are no intentions to use the facility in the future.

This document represents Part A, the Basic Assessment Report (BAR). It should be read with Part B, the Environmental Management Programme (EMPr) and Closure Plan.

1.1 APPLICATION HISTORY

Between 2012 and 2014, MFC applied for the decommissioning of this facility. At that stage the (then) Department of Environmental Affairs (DEA) advised that it would not consider the application as there had been two Compliance Notices issued in December 2011. A pre-application meeting was held with the Department of Forestry, Fisheries and the Environment (DFFE) in March 2019 and a full documentation history was requested from MFC and sent to Ms Polljonker via courier on 30 May 2019. There are no pending Directives or Notices for this facility. As such, MFC is re-initiating the process for formal closure in order to reduce any potential impacts arising from this activity.

1.2 PROJECT LOCATION

The CDR site is located on the farm Middelburg town and Townlands no 287 JS near Middelburg, Mpumalanga. Table 1 below presents a summary of the pertinent location details for the site. Figure 1 Figure 2 and presents the regional and local setting.

Table 1: Summary of Project Location Details

Province	Mpumalanga
District Municipality	Nkangala District Municipality
Local Municipality	Steve Tshwete Local Municipality
Nearest Town	Middelburg
Property Name and Number	Portion 280 of Portion 155 Middelburg town and Townlands no 287 JS
SG Number:	TOJS00000000028700280
GPS Co-ordinates (relative centre point of CDR)	25° 48' 32.50" S
	29° 29' 7.35" E
Pre-Closure Land Use	Decommissioned waste facility on active industrial site
Final Land Use	Rehabilitated area on active industrial site

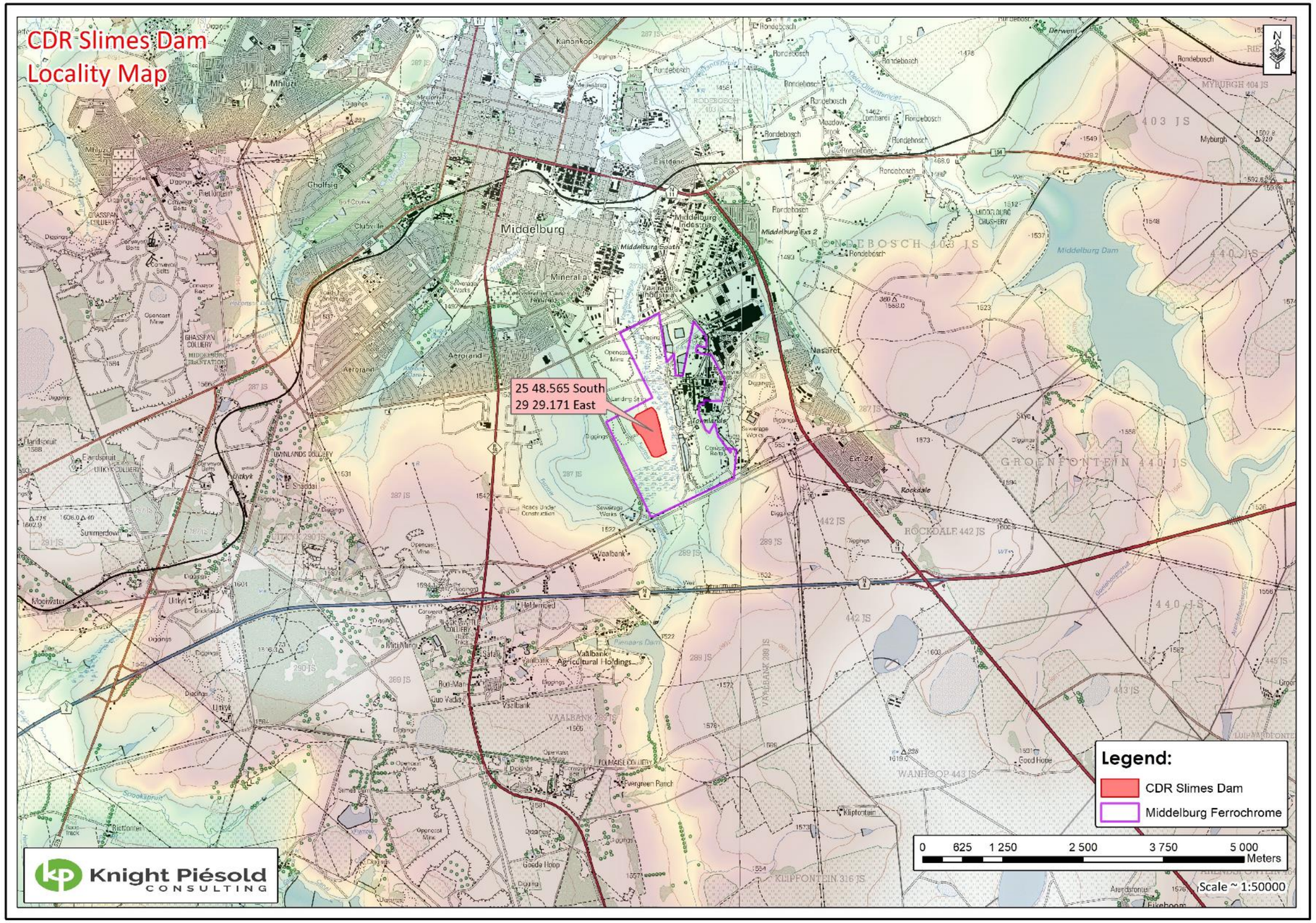

Figure 1: MFC Regional Locality

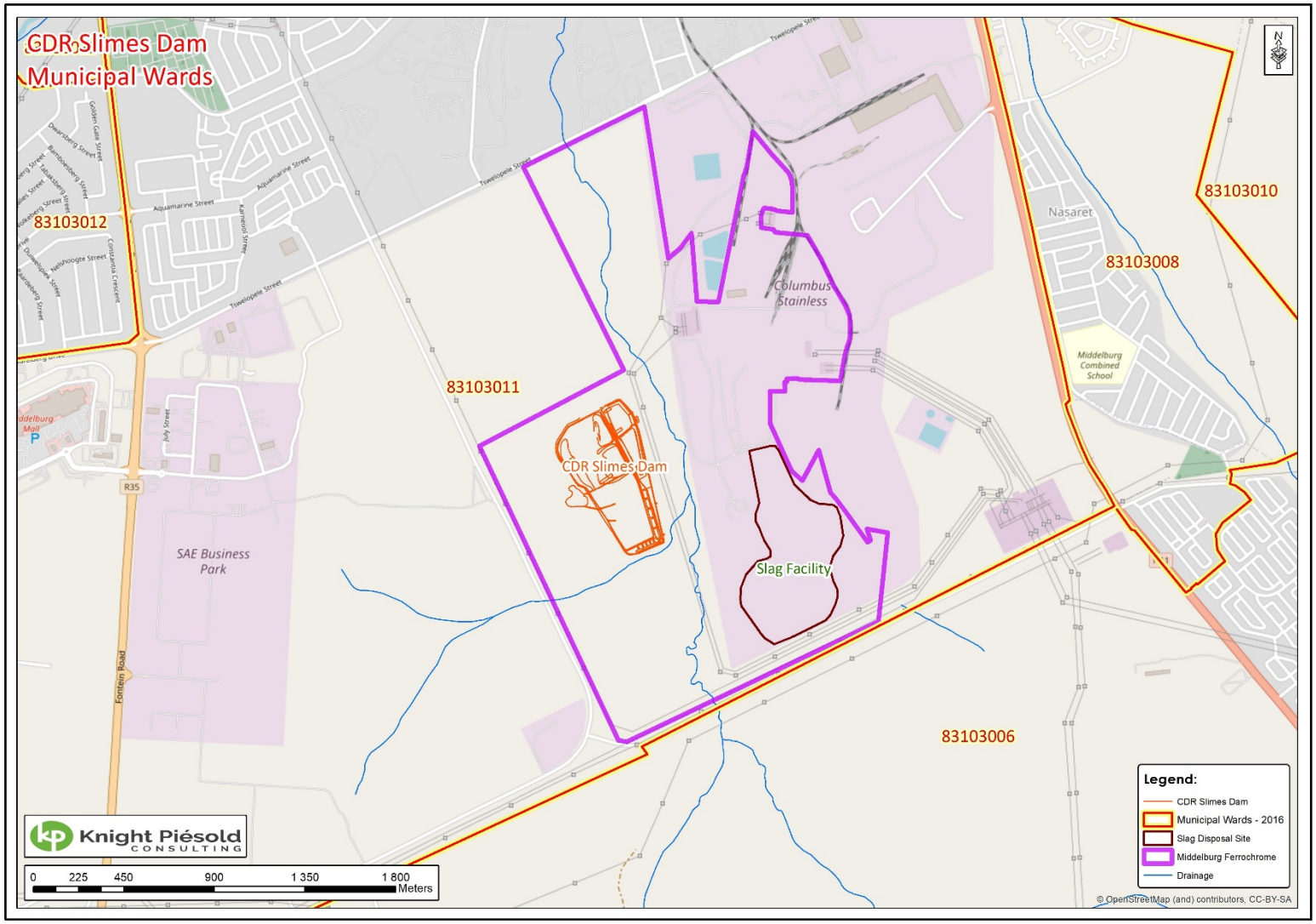

Figure 2: Local Setting in relation to Steve Tshwete Municipal Wards

1.3 STRUCTURE OF THE REPORT

This document has been prepared in accordance with Appendix 1 of the Environmental Impact Assessment (EIA) Regulations. Table 2 provides a summary of the requirements, with cross references to the report sections where these requirements have been addressed.

Table 2: Basic Assessment Report (BAR) roadmap as outlined in the 2014 EIA Regulations

Section	Description of EIA Regulations Requirements for EMPr and Closure Plan	Section of this Document
Appendix 1 (1)(a)	Details of – the **EAP** who prepared the report; and the expertise of the EAP, including a curriculum vitae.	2.0
Appendix 1 (1)(b)	the **location** of the activity, including: (i) the 21-digit Surveyor General code of each cadastral land parcel (ii) where available, the physical address and farm name (iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties	1.2
Appendix 1 (1)(c)	a **plan** which locates the proposed activity or activities applied for as well as associated structures and infrastructure at an appropriate scale or, if it is— (i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken (ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken.	Figure 3 Figure 4 Figure 5
Appendix 1 (1)(d)	a description of the **scope** of the proposed activity, including— (i) all listed and specified activities triggered and being applied for; and (ii) a description of the activities to be undertaken including associated structures and infrastructure	3.0
Appendix 1 (1)(e)	a description of the **policy and legislative context** within which the development is proposed including— (i) an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks, and instruments that are applicable to this activity and have been considered in the preparation of the report; and (ii) how the proposed activity complies with and responds to the legislation and policy context, plans, guidelines, tools frameworks, and instruments;	4.0
Appendix 1 (1)(f)	A motivation for the **need and desirability** for the proposed development including the need and desirability of the activity in the context of the preferred location;	5.0
Appendix 1 (1)(g)	a motivation for the preferred site, activity and technology **alternative**	6.1
Appendix 1 (1)(h)	a full description of the process followed to reach the proposed preferred alternative within the site, including— (i) details of all the alternatives considered	6.1
Cont'd	(ii) details of the **public participation process** undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs (iii) a summary of the **issues raised** by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons	6.2 0

Section	Description of EIA Regulations Requirements for EMPr and Closure Plan	Section of this Document
	for not including them	
Cont'd	(iv) the **environmental attributes** associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects	6.4
	(v) the **impacts and risks** identified for each alternative, including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts— a. Can be reversed b. may cause irreplaceable loss of resources c. can be avoided, managed or mitigated	7.2
	(vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives	7.1
	(vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects	7.2
	(viii) the possible mitigation measures that could be applied and level of residual risk	8.0
	(ix) the outcome of the site selection matrix	Table 23
	(x) if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such (xi) a concluding statement indicating the preferred alternatives, including preferred location of the activity	Table 23
Appendix 1 (1)(i)	a full description of the process undertaken to identify, assess and rank the **impacts** the activity will impose on the preferred location through the life of the activity, 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;	7.2
Appendix 1 (1)(j)	an assessment of each identified potentially significant impact and risk, including— (i) cumulative impacts (ii) the nature, significance and consequences of the impact and risk (iii) the extent and duration of the impact and risk (iv) the probability of the impact and risk occurring (v) the degree to which the impact and risk can be reversed (vi) the degree to which the impact and risk may cause irreplaceable loss of resources; and (vii) the degree to which the impact and risk can be avoided, managed or mitigated;	Table 22
Appendix 1 (1)(k)	where applicable, a summary of the findings and impact **management measures** identified in any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final report	8.1

Section	Description of EIA Regulations Requirements for EMPr and Closure Plan	Section of this Document
Appendix 1 (1)(l)	an environmental **impact statement** which contains— (i) a summary of the key findings of the environmental impact assessment (ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers (iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives	9.0
Appendix 1 (1)(m)	based on the assessment, and where applicable, impact **management measures from specialist reports**, the recording of the proposed impact management outcomes for the development for inclusion in the EMPr;	Table 24
Appendix 1 (1)(n)	any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation	N/A
Appendix 1 (1)(o)	a description of any **assumptions, uncertainties, and gaps** in knowledge which relate to the assessment and mitigation measures proposed	9.4
Appendix 1 (1)(p)	a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;	9.0
Appendix 1 (1)(q)	where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required, the date on which the activity will be concluded, and the post construction monitoring requirements finalised	10.0
Appendix 1 (1)(r)	an undertaking under **oath** or affirmation by the EAP in relation to— the correctness of the information provided in the reports (i) the inclusion of comments and inputs from stakeholders and I&APs (ii) the inclusion of inputs and recommendations from the specialist reports where relevant (iii) any 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	12.0
Appendix 1 (1)(s)	where applicable, details of any **financial provision** for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts	11.0
Appendix 1 (1)(t)	any specific information that may be required by the competent authority; and	N/A
Appendix 1 (1)(u)	any other matters required in terms of section 24(4)(a) and (b) of the Act.	N/A

Furthermore, Table 3 is a list of documents as received from the DFFE on 25 May 2021 that should be included in the report. Similarly, the applicable sections where these requirements are addressed are also provided.

Table 3: Requirements from DFFE

NO	Document	Section of this Document
1.	**Waste Management Licence Application Form**	Appendix K
2.	**Classification of waste**	Section 3.2 & Appendix C
3.	**Hydrogeological study**	Appendix C2 and Appendix C to the Design Report (Appendix B)
3.1	Hydro census	Section 6.4.3
3.2	Geophysical Investigation	Appendix L
3.3	Description of geology	Section 6.4.3
3.4	Aquifer type and aquifer classification	
3.5	Aquifer vulnerability assessment	
3.6	Aquifer characterisation	
3.7	Groundwater quality	
3.8	Groundwater flow	
3.9	Groundwater monitoring	
4.	**Stormwater management Plan**	**Appendix B Section 5.2**
5.	Wetland delineation report (if applicable)	Appendix M and summary in 6.4.6
5.1	Methodology	
5.1.1	Wetland identification and mapping	
5.1.2	Wetland delineation	
5.1.3	Wetland functional assessment	
5.1.4	Determining the ecological integrity of the wetlands	
5.1.5	Determining the Present Ecological State of wetlands	
5.1.6	Determining the Ecological Importance and Sensitivity of wetlands	
5.1.7	Ecological classification and description	
5.2	**Results**	
5.2.1	Wetland delineation	
5.2.2	Wetland unit identification	
5.2.3	Wetland unit testing	
5.2.4	Wetland soils	
5.2.5	Description of wetland type	
5.2.6	General functional description of wetland types	
5.2.7	Wetland ecological functional assessment	
5.2.8	The ecological health assessment of the opencast mining area	
5.2.9	The PES assessment of the remaining wetland areas	

5.2.10	The EIS assessment of the remaining wetland areas	
5.3	Impact assessment discussions	
5.3.1	Conclusions and Recommendations	
5.3.2	References	
6.	Design Report	Appendix B
6.1	Drawings Signed by Professional Engineer	Appendix A of Appendix B
6.2	Liner layers specified	N/A – waste to be removed to licenced sites
6.3	Construction Quality Assurance Plan (CQA)	Appendix E of Appendix B

2.0 DETAILS OF THE EAP

Knight Piésold (Pty) Ltd has been appointed as the environmental assessment practitioner (EAP) in line with Part 2, Regulation 12 and 13 of the EIA Regulations (2014), as amended. The contact details of the EAPs that were involved in the preparation of this BAR are provided in Table 4.

Table 4: EAP Contact Details

Name	Role on Project	Contact Details
Tania Oosthuizen	EAP	Email: toosthuizen2@knightpiesold.com Mobile: 083 504 9881
Neal Neervoort	Reviewer	Email: nneervoort@knightpiesold.com Mobile: 076 091 9247
Amelia Briel	Advisory	Email: abriel@knightpiesold.com Mobile: 084 701 3946

The expertise and qualifications of the EAP is provided in Table 5. Refer to Appendix A for their CVs.

Table 5: EAP Expertise

Name	Role on Project	Qualifications and Experience
Tania Oosthuizen	EAP	2010 Masters (Environmental Management), North West University Professional Natural Scientist, *Pr.Sci.Nat*. 114500 Environmental Assessment Practitioners Association of South Africa (EAPASA) Registered **16 years' experience**
Neal Neervoort	Reviewer	B.Sc. Hons. Biodiversity and Conservation (University of Johannesburg), 2007 Professional Natural Scientist, *Pr.Sci.Nat*. 115316 **11 years' experience**
Amelia Briel	Advisory	2001 MSc (Environmental Toxicology), RAU Professional Natural Scientist, *Pr.Sci.Nat*. 114335 **17 years' experience**

3.0 SCOPE OF WORK

MFC wishes to apply for the formal decommissioning / closure of the CDR facility in line with legislation. There are no intentions to use the facility in the future. The preferred alternative is that all the CDR slimes material is removed to appropriate waste facilities, and the footprint area rehabilitated. At an estimated *in-situ* density of 1.8 t/m³ (tonnes per cubic metre) this will entail removal of approximately 216 000 t of CDR waste. A design report is available in Appendix B.

3.1 STATUS QUO OF CDR FACILITY

As shown on Figure 3, the CDR slimes facility consists of two paddocks, two pollution control dams (PCD's) consisting of a return water dam and a storm water dam, and toe paddocks to contain runoff from the outer slopes of the facility. The toe paddocks are constructed around the east and south of the south paddock.

Only the south paddock was used during the operational phase of the facility and CDR Slimes did not cover the full footprint of the paddock.

The impoundment walls of the two paddocks are earthfill walls with a maximum height of 5 m and crest width of approximately 4 m.

Shortly after cessation of deposition into the south paddock, a 150mm thick capping layer of soil was placed over the CDR Slimes. This capping layer is now sparsely vegetated with grass.

A storm water cut-off channel was excavated around the western side (up gradient) of the CDR Slimes Dam to divert runoff from the catchment lying to the west around the north and south sides of the Slimes Dam (Figure 3).

3.2 WASTE CLASSIFICATION

Delta H (Delta-H Water System Modelling PTY Ltd) conducted a geochemical study and waste classification study according to SANS10234, GNR 635 and 636 in 2020 to identify barrier requirements for the CDR waste (Delta-H, 2020). The full report is available in Appendix C.

The geochemical assessment of five CDR Slimes profiles sampled from the disposal area confirmed vertical and horizontal heterogeneity, which leads to variations in the classification of the waste type. Although the majority of the samples were classified as Type 3 Waste, some sections of the CDR Slimes disposal area exceeded the LCT2 (Leachable Concentration Threshold) threshold for Cr (VI), which however cannot be referenced to a particular horizon throughout the dump. Due to the heterogeneous composition of the CDR Slimes material, the CDR Slimes storage facility therefore needs to be handled according to the worst-case sample result until conclusively screened (classified) during excavation.

(Delta-H, 2020) recommended to:

- Distinguish the CDR slimes dam into waste Class C and Class A areas, based on a sampling grid using initially only total Cr as a criteria to flag areas of concern
- A waste classification of the flagged areas should follow thereafter to confirm the classification. All Class A areas should then be excavated and disposed of at a licensed disposal facility. The remaining Class C material will be excavated and transported to existing licenced Slag Disposal Facility as part of the MFC plant (process) operations.
- Material should be excavated up to the (pre-deposition) host rock/soil.

- Initiate soil sampling after removal of the CDR slimes material to assess potential secondary sources and apply a risk-based approach to advice on future remediation (if required).
- The soil sampling results will be used to inform the further classification of the material and additional excavation specifications.

3.3 ACTIVITIES TO BE UNDERTAKEN AND ASSOCIATED STRUCTURES

The waste assessment has shown that both Type 1 and 3 wastes are present in the facility. The two types of waste will be disposed of at different facilities. The Type 1 waste will be taken off site and disposed at an appropriately licenced facility. The Type 3 waste will be disposed on the existing slag disposal facility at MFC. This facility is licenced to receive Type 3 waste (Licence number 12 / 9 / 11 / L834 / 6).

Figure 4 shows the CDR facility in relation to the slag dump where the Type 3 waste is proposed to be disposed. The Vaalbankspruit and associated wetlands occur between the CDR facility and the slag dump. To avoid any impacts to the Vaalbankspruit, the trucks should make use of the existing roads as shown in green and red in Figure 4. The truck transporting the Type 3 waste should make use of the existing crossing of the Vaalbankspruit (circled) and the trucks transporting the Type 1 waste should use the existing gate to get onto the public road.

The impounding walls of the slimes dam and the toe paddock bund walls will be dozed down over the area previously covered by CDR Slimes. The Return Water Dam (RWD) and Stormwater Dam (SWD) will be left *in-situ*. Refer to Figure 5.

Once the waste has been removed, the site will be rehabilitated and revegetated with a seed mixture of *Hyparrhenia hirta*, *Themeda triandra* and *Imperata cylindrica*, which has been identified as the dominant species occurring on the site (Yggdrasil Scientific Services, 2012).

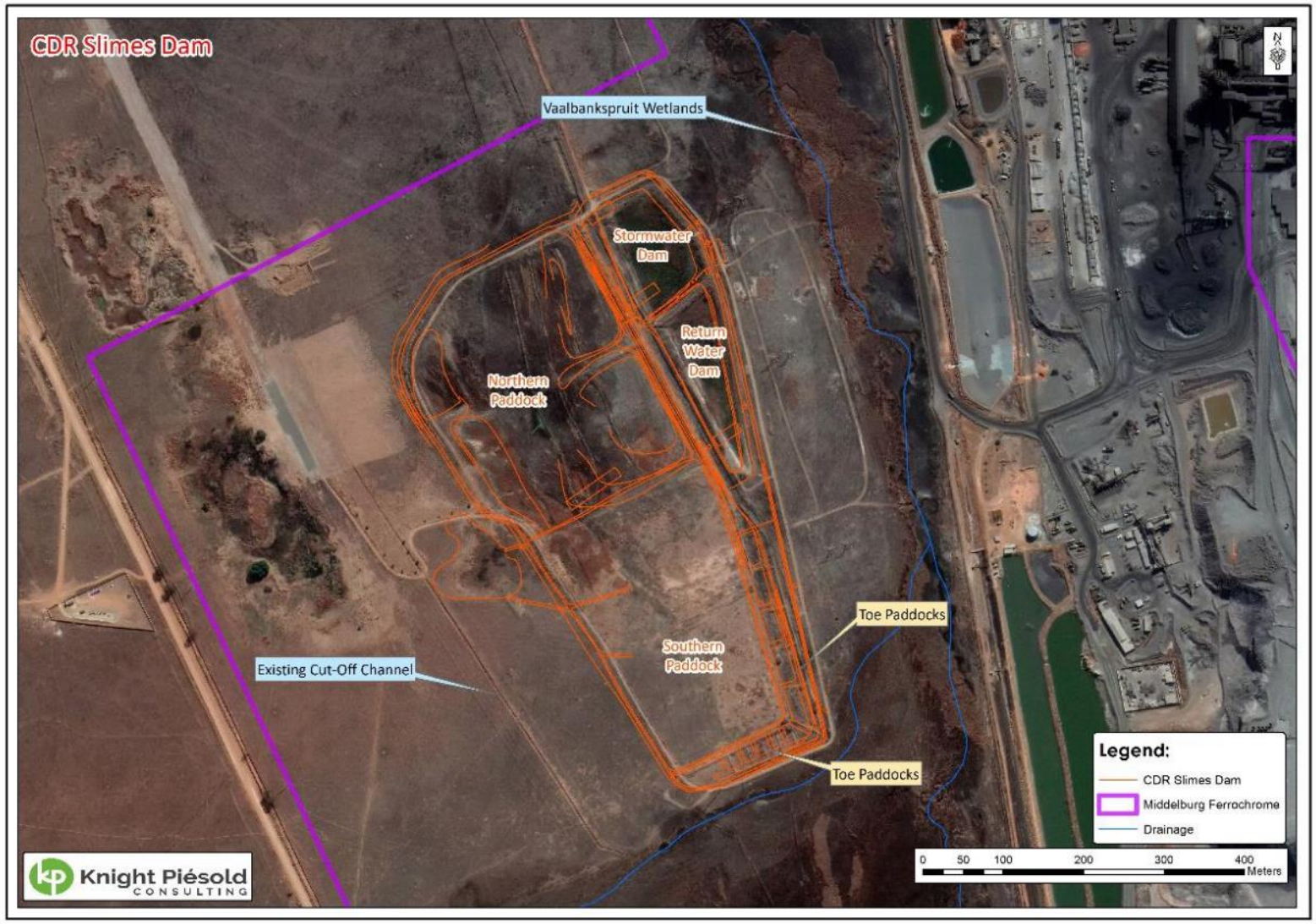

Figure 3: Aerial View of CDR Dump (status quo)

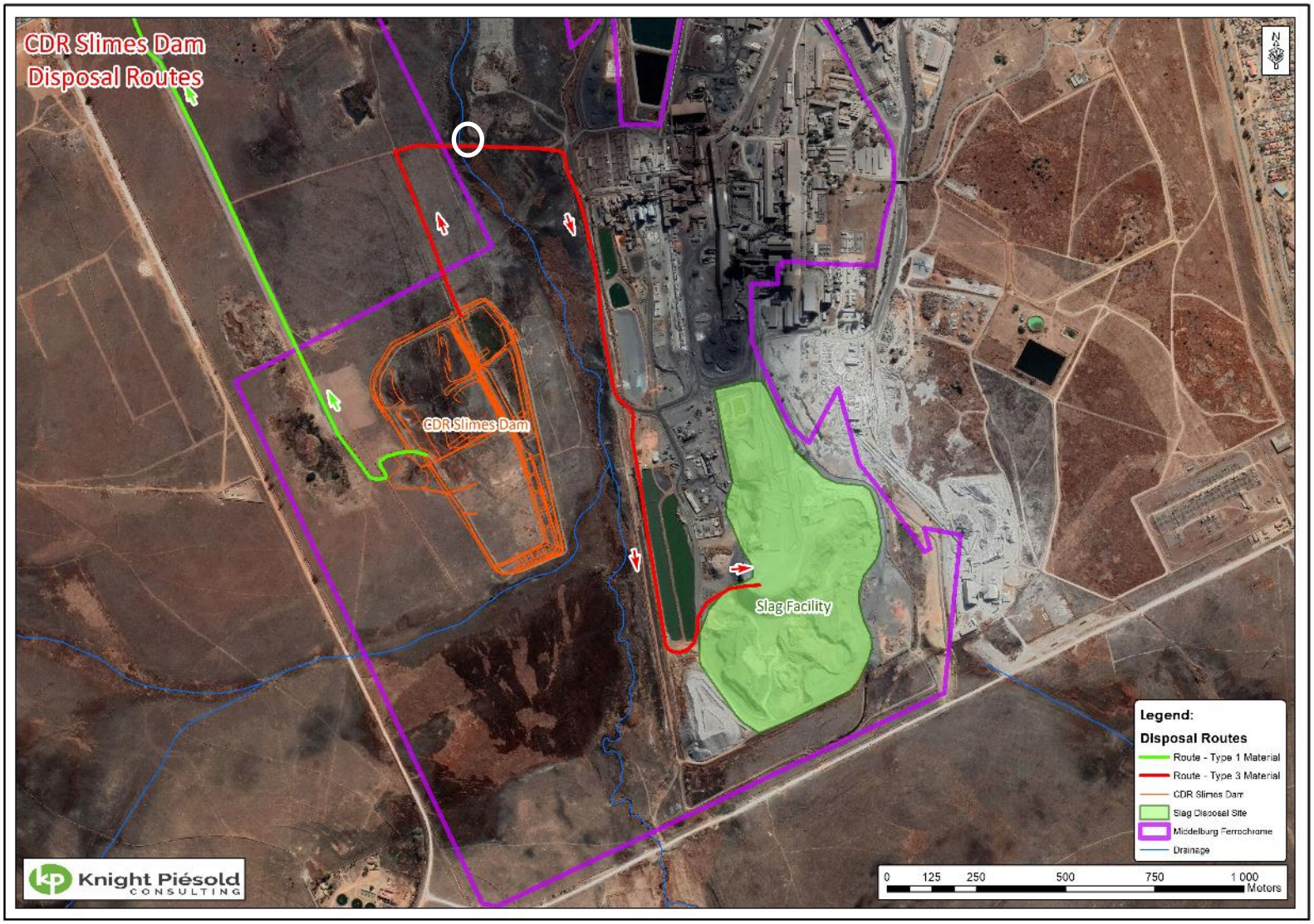

Figure 4: Routes to dispose waste types

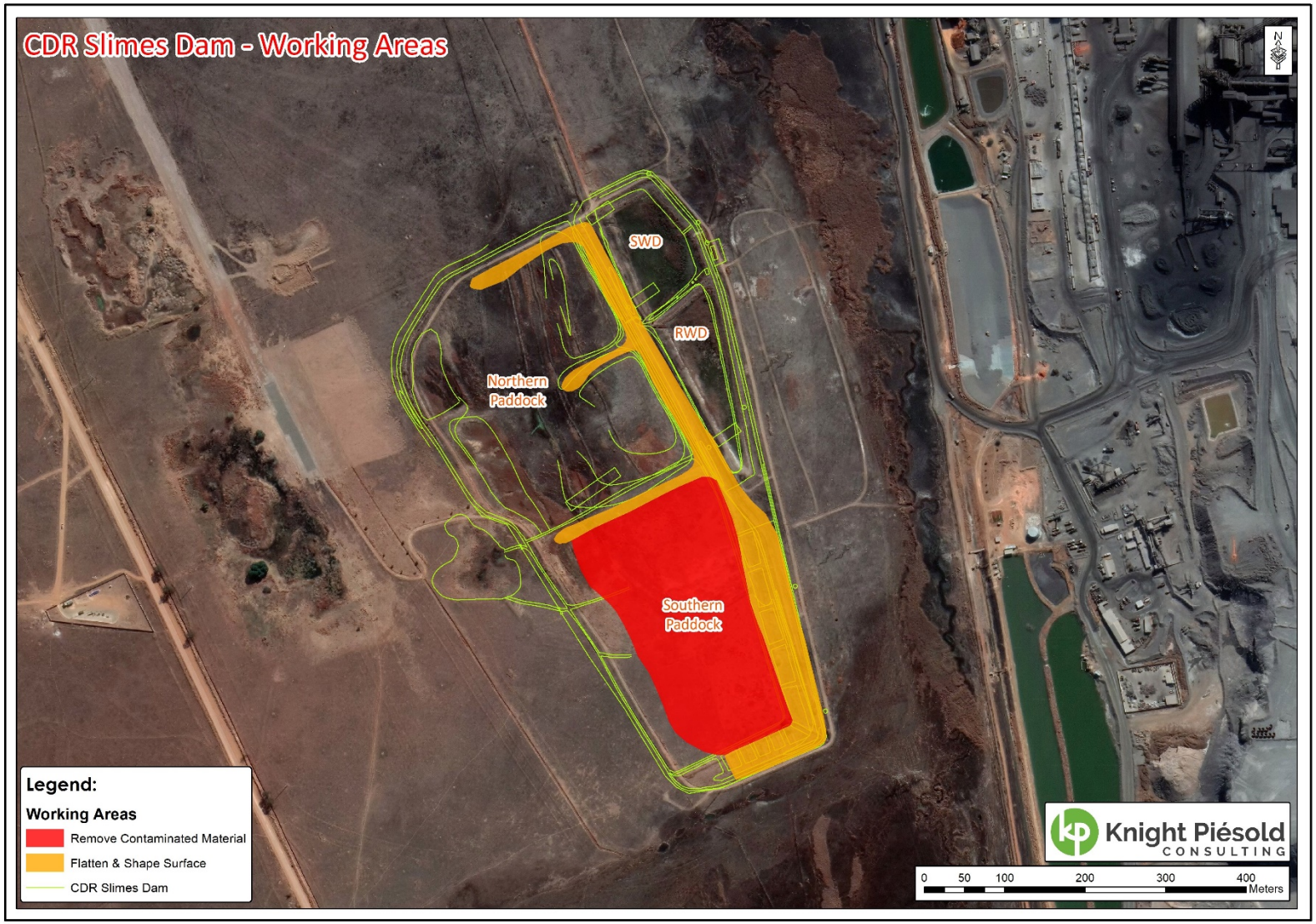

Figure 5: Earthworks proposed

3.4 CONTAMINATED (DIRTY) WATER MANAGEMENT DURING CONSTRUCTION

During construction, the waste will be opened for testing, excavating and removal. There is risk of stormwater could flood the works. The run-off water from the waste will be collected and temporarily stored in the RWD and SWD. The expected maximum water level in the dams are 60% of their capacity. The water level should be monitored during construction and if the level exceed 60% mark, the following should be implemented:

a. The removal should be done in a manner that run-off water is contained within the removal area, e.g., paddock / cells sequence. This will reduce run-off water from the waste into the RWD and SWD. Illustration of the paddocks be found in drawing 301-00183-40-101 (Appendix B), the idea is to remove waste from south to north as indicated by the arrows in the drawings.

b. If there is still more water, a pumps and pipeline must be available (max capacity of 1.5 m^3/s) to pump contaminated water from the pollution control dams back to the plant for re-use.

c. Contractor must manage ground/surface water that may seep/leachate from the waste during rainy season, they may create temporary trenches and sump collection points to pump this water into the pollution control dams,

d. No contaminated water must be allowed to enter the wetland and any trenches or areas that have been contaminated by dirty water must be excavated out of the facility before construction concludes,

e. When the decommissioning of the facility is complete the contaminated water retained in the SWD/RWD must be removed and emptied out and the PCD rehabilitated to receive clean water.

f. These areas will be tested and confirmed that there is no soil contamination.

3.5 POST CLOSURE STORM WATER MANAGEMENT CLEAN WATER MANAGEMENT

When construction completed and the CDR facility is decommissioned, rehabilitated, the impounding walls and paddocks that would have helped with stormwater management will be dosed over and spread across for rehabilitation. This leaves the area exposed and requires stormwater management. The dam capacities have shown in calculations that it can handle the design storm during rainy season. It is assumed that the water retained in the dams or from that which is originating upstream of the facilities is clean. The following stormwater management plan must be followed:

a. The water retained in the dam must be tested to check if is not contaminated.

b. The RWD and SWD must maintain 800 mm freeboard limits as per DHSWS regulations

c. There is an emergency spillway installed in this facility which may be used for unforeseen circumstances, but spillages must be avoided to maintain freeboard limits.

3.6 CLOSURE & REHABILITATION

When the waste is removed from the dams together with contaminated soil, testing will be done on all areas to ensure no contaminated soil as remained. Once this is confirmed closure and rehabilitation can commence which consists of the following:

a. Excavate and dose dam walls and toe paddock walls, spread material over surface of CDR northern and southern compartments.

b. Excavations along existing penstock outfall pipes to expose pipes.

c. Demolish existing reinforcement concrete foundation blacks and concrete outfall pipes.

d. Place and spread topsoil from borrow pit or commercial sources in 200 mm layer.

e. Supply and install seeding of rehabilitation areas.

3.7 LISTED AND SPECIFIED ACTIVITIES

The activity being applied for is GN 921 Category A (14): The decommissioning of a facility for a waste management activity listed in Category A or B of this Schedule. A Basic Assessment (BA) process will be followed, and the Competent Authority (CA) will be the DFFE because the waste is classified as hazardous (Type 1 (minority) and Type 3 (majority)).

In terms of Government N 961 of July 2019, a Screening Report generated through the DFFE web-based platform should be submitted with the application for environmental authorisation.

Also, GN 320 of March 2020 provides procedures for the assessment and reporting on identified environmental themes from the Screening Report generated. This notice allows for a “Site Sensitivity Verification Report” to be produced that:

a) confirms or disputes the current use of the land and the environmental sensitivity as identified by the screening tool, such as new developments or infrastructure ,the change in vegetation cover or status etc.
b) contains a motivation and evidence (e.g., photographs) of either the verified or different use of the land and environmental sensitivity; and
c) is submitted together with the relevant assessment report prepared in accordance with the requirements if the EIA Regulations.

This application is for a Waste Management Licence (WML) managed through the National Waste Act (Act 59 of 2008) and associated Regulations and is therefore not required in terms of GN 961. However, the Screening and Site Sensitivity Verification Report has been compiled for best practice and information purposes, and is available in Appendix D.

4.0 POLICY AND LEGISLATIVE CONTEXT

Table 6 outlines the applicable key legislative requirements being considered for the project.

Table 6: Policy and Legislative Framework

Aspect	Applicable legislation and guidelines used to compile the report	How does this development comply with and respond to the policy and legislative context
Framework (SA)	The South African Constitution, 1996	The decommissioning project must comply with South African constitutional and common law by conducting its construction and operational activities with due diligence and care for the rights of others. Section 24 (a) of the South African Constitution states that everyone has the right to an environment that is not harmful to their health and well-being. This provision supersedes all other legislation.
Framework (EIA)	National Environmental Management: Act, 1998 (Act No. 107 of 1998) (NEMA)	A NEM:WA application will be undertaken and submitted to the National DFFE
	Environmental Impact Assessment Regulations, 2014 (EIA Regulations 2014) and Listing Notices	
	National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) (NEM:WA)	
	List of Waste Management Activities published in terms of NEM:WA in Government Notice 921 of 29 November 2013 (as amended)	
Guidelines (EIA)	Guideline on the Need and Desirability, Department of Environmental Affairs, 2017	This guideline has been considered as part of project planning.
	Public Participation guideline in terms of NEMA EIA Regulations, Department of Environmental Affairs, 2017	This guideline has informed the public participation process for the project.
Waste Management	Waste Classification and Management Regulations published in terms of NEM:WA in Government Notice 634 of 2013	A waste assessment was undertaken, and the results thereof is described in Section 3.2.
	National Norms and standards for the assessment of waste for landfill disposal (GN R.635 of 2013)	
	Waste classification according to SANS 10234 (based on the Global Harmonised System);	
Water Management	National Water Act, 1998 (Act No. 36 of 1998) (NWA)	The CDR facility is licenced in licence 04/B12D/G/1193
Air Qualit y	National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) (NEM:AQA)	MFC undertakes monthly dust fallout monitoring and reports in terms of their Air Emissions Licence (Nr 17/04/AEL/MP313/11/03).

Aspect	Applicable legislation and guidelines used to compile the report	How does this development comply with and respond to the policy and legislative context
	List of Activities which Result in Atmospheric Emissions, published in terms of NEM:AQA in Government Notice 893 of 2013 (as amended)	The decommissioning of the CDR facility is expected to contribute some dust during the year of decommissioning activities, continue until vegetation re-establishment has been successful.
	National Dust Control Regulations, published in terms of NEM:AQA in Government Notice 827 of 2013	
Biodiversity	The National Environmental Management: Biodiversity Act (NEMBA; Act No. 10 of 2004)	The CDR facility is located within an area marked as “heavily modified” in terms of the Mpumalanga Biodiversity Sector Plan with an irreplaceable Critical Biodiversity Area (CBA) directly adjacent to it.
	National List of Ecosystems that are Threatened and in need of Protection (2011)	
	Alien and Invasive Species Regulations (2014)	The NEMBA Alien and Invasive Species Lists (2016) include national lists of invasive species to be read together with the Alien and Invasive Species Regulations (2014).
	Threatened or Protected Species Regulations (2015)	Certain activities, referred to as Restricted Activities, are regulated on listed species using permits by a special set of regulations published under the Act. Restricted activities regulated under the Act are keeping, moving, having in possession, importing, and exporting, and selling.
	Conservation of Agricultural Resources Act (CARA; Act No. 43 of 1983)	Regulations under CARA provide for the declaration and control of weeds and invader plants.
Heritage	National Heritage Resource Act, 1999 (Act No. 25 of 1999) (NHRA)	An application for exemption was submitted to the South African Heritage Resources Agency (SAHRA) and accepted.

5.0 NEED AND DESIRABILITY

5.1 NEED AND DESIRABILITY GUIDELINE INTRODUCTION

The (then) Department of Environmental Affairs (DEA) published an updated guideline on Need and Desirability in 2017 (DEA, 2017). The guideline provides that addressing the need and desirability of a development is a way of ensuring sustainable development – in other words, that a development is ecologically sustainable and socially and economically justifiable – and ensuring the simultaneous achievement of the triple bottom-line.

When considering how the development may affect or promote justifiable economic and social development, the relevant spatial plans must be considered, including Municipal Integrated Development Plans (IDP), Spatial Development Frameworks (SDF) and Environmental Management Frameworks (EMF). The assessment reports need to provide information as to how the development will address the socio-economic impacts of the development, and whether there would be any socio-economic impact resulting from the development on people's environmental rights. Considering the need and desirability of a development entails the balancing of these factors. Consistent with the aim and purpose of the environmental authorisation process, the concept of "need and desirability" relates to, amongst others, the nature, scale, and location of the development being proposed, as well as the wise use of land and natural resources.

The key components of the Need and Desirability Guideline are listed below and discussed in this section:

- Securing ecological sustainable development and use of natural resources
- Promoting justifiable economic and social development.

5.2 ECOLOGICAL SUSTAINABILE DEVELOPMENT AND USE OF NATURAL RESOURCES

The Mpumalanga Tourism and Parks Agency (MTPA) issued the Mpumalanga biodiversity sector plan Handbook in and spatial dataset in 2014 (MPTA, 2014). Figure 6 provides an overlay of the CDR facility onto this dataset. It shows that the CDR facility is located on an area marked as "highly modified" with an irreplaceable Critical Biodiversity Area (CBA) directly adjacent to it. The objective of the decommissioning and rehabilitation of this site is to remove the potential environmental risk posed by this non-operational facility and return it to a state that is as natural as possible.

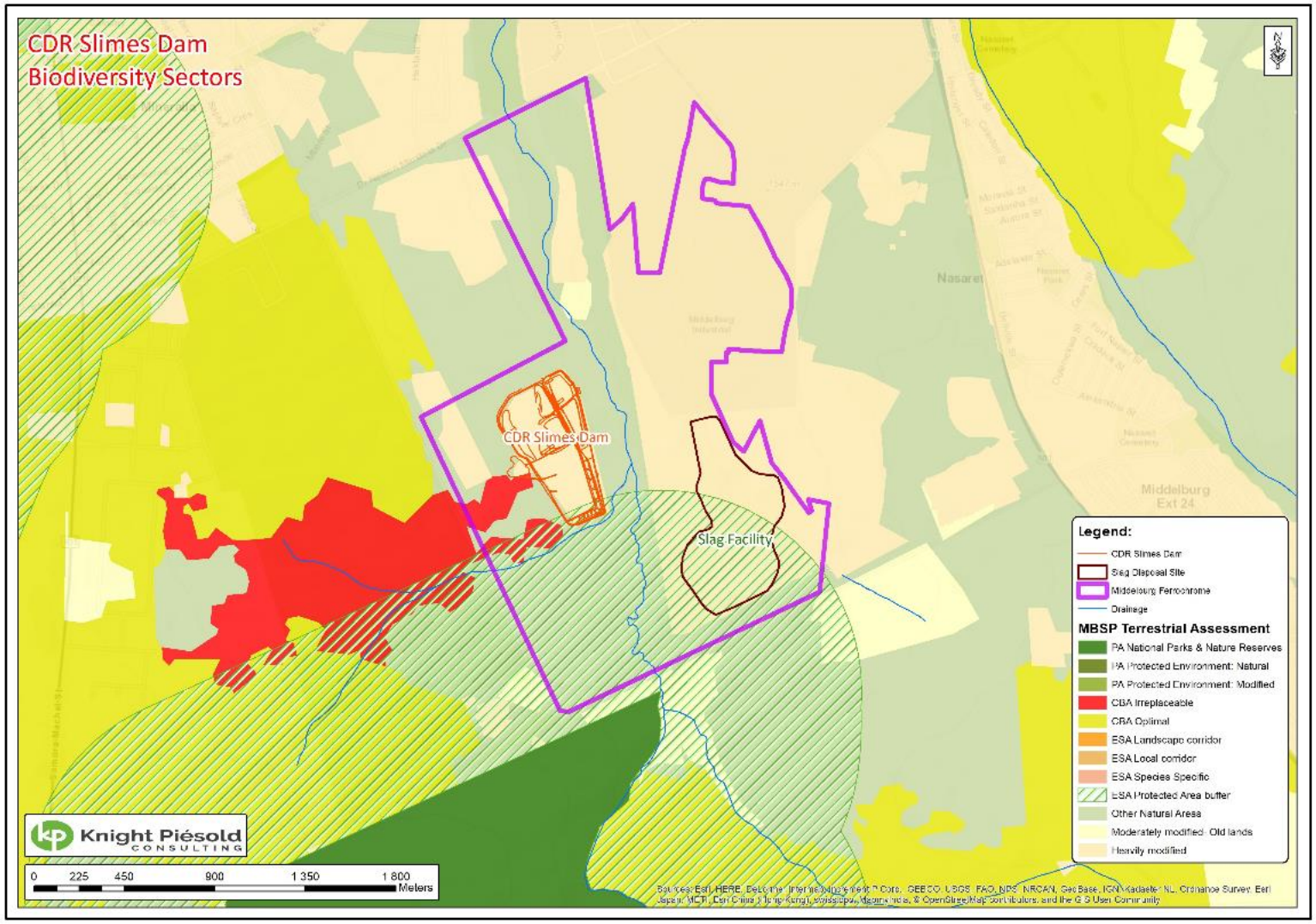

Figure 6: CDR Facility in Relation to Mpumalanga Biodiversity Sector Plan

5.3 PROMOTING JUSTIFIABLE ECONOMIC AND SOCIAL DEVELOPMENT

The decommissioning project is not expected to have any detrimental social and economic impacts. The decommissioning activities itself will be undertaken by locally sourced contractors, which will have a positive socio-economic impact during the decommissioning phase (approximately one year).

The context of the provincial and municipal framework within which the project is proposed is described below.

5.3.1 The Mpumalanga Provincial Spatial Development Framework

The Mpumalanga Provincial Integrated Spatial Framework (MPISF) does not provide a concrete spatial framework. Instead, the MPISDF provides: A provincial-wide perspective on social, environmental, economic, transport, settlement and land-use factors, and other development trends and impacts in the province (STLM, 2010). It strives to develop a spatial rationale of the scope and location of areas with economic (e.g., tourism, agriculture, petro-chemical) development potential, as well as the areas with the major challenges in terms of addressing challenges in the Province and for the various district municipal areas (STLM, 2010).

Provincial development and local government must play key roles in promoting sustainable economic development. One of the key priorities is maximising the provincial benefits from the mining and energy sectors while mitigating any environmental impacts. They should target (STLM, 2010):

- Beneficiation of mineral resources
- Mining transport infrastructure
- Clean technologies
- Natural resource optimisation model.

5.3.2 Steve Tshwete Local Municipality Spatial Development Framework

The Spatial Development Framework for the Steve Tshwete Municipality is based on several high level policy directives and development objectives (STLM, 2010). The framework seeks to achieve land use and transportation integration, which will also help with the sustainable social and economic integration and development of the area. Development is guided and directed by a range of national, provincial and local development policies. A number of policy directives were deduced from all the policies, for the Steve Tshwete Municipality Spatial Development Framework (STLM, 2010), which are:

- Settlement and investment should be encouraged in areas with high development and -economic growth potential
- Settlements of exclusion should be linked to areas with economic opportunity
- Promote the development of an integrated settlement pattern
- Growth and development should be socially and environmentally sustainable
- Key rural areas should be developed into sustainable economic entities
- Industrial development should focus on international markets
- Comparative and competitive advantages of regions should be exploited

5.3.3 Steve Tshwete Local Municipality Economic Development Strategy

The municipality seeks to achieve economic growth and poverty alleviation through ensuring a better life for the society by coordinating sustainable social and economic developmental programs. A

focused and targeted approach was developed to address the current economic challenges. The aim is to create a conducive environment for economic growth, business investments and job creation. The municipal focus areas in terms of Local Economic Development are (STLM, 2020):

- Agriculture/Agri processing
- Mining
- Manufacturing
- Tourism
- IT/Innovations
- Township economic development

The objectives of the strategy are (STLM, 2020):

- Job creation
- Alleviate poverty
- Skills development through incubation expansion program (steel incubation, tooling, and welding initiatives)
- Specific sector development and catalytic projects
- Small, medium, and micro enterprises (SMME) development in key sectors
- Promote private sector involvement and investment (attract more investment)
- Address inequality

6.0 PROCESS FOLLOWED TO REACH THE PREFERRED ALTERNATIVE

6.1 DETAILS OF ALTERNATIVES CONSIDERED

The options for final closure of the CDR Slimes Dam are:

- **Option 1:** Remove the CDR slimes from site and rehabilitate the disturbed ground, leaving the two PCD's *in situ*. This option will not require long term maintenance or monitoring as it will remove all waste material from the facility.
- **Option 2:** Leave the CDR Slimes undisturbed, and cap the material with a Class A capping, profiled to shed water. This will require that the cut-off trench must be maintained indefinitely to divert all uncontaminated runoff from the upstream catchment around the facility. It will also require ongoing monitoring of ground and surface water quality to ensure that the capping does not deteriorate with time.
- **Option 3:** Reduction of the hexavalent chromium to trivalent chrome by mixing with ferric iron. This will require disturbance of the CDR Slimes to allow for mixing of the reductant, which may lead to an increase of leaching from the slimes in the short term. This option will also require ongoing monitoring of ground and surface water quality to determine the effectiveness of the reduction reaction. After reduction, the CDR Slimes are likely to be classified as Type 3 Waste, which would require disposal in a Class C landfill.

Option 1 is the preferred option. Refer to Table 23 for a detailed comparison of the alternatives considered.

6.2 PUBLIC PARTICIPATION PROCESS

The following actions have been undertaken as part of the Public Participation Process (PPP):

- A database of Interested and Affected Parties (I&APs) was developed
- Emails and sms were sent to all I&APs (7 - 11 January 2021)
- Advertisements were placed in two local newspapers Witbank News and Middelburg Observer (30 October 2020)
- Place A2-site notices at two MFC entrances and at the Gerhard Sekoto Library (26 October 2020)
- The Draft BAR was made available for public review for 30 days on the Knight Piésold's website (7 January – 7 February 2021).

Feedback from the DFEE on 16 April 2021 were to repeat the public participation process following the submission of the application form. Regulation 40(3) of GN 982 was cited:

"Potential or registered interested and affected parties, including the competent authority, may be provided with an opportunity to comment on reports and plans contemplated in subregulation (1) prior to submission of an application but must be provided with an opportunity to comment on such reports once an application has been submitted to the competent authority."

Following the submission of the application form and receipt of the Ref Number (12/9/11/L210420155827/6/N), the following activities were undertaken:

- Sent emails and sms's to all I&APs (23 April 2021)
- Advertise in two local newspapers Witbank News and Middelburg Observer (30 April 2021)
- Place A2-site notices at MFC entrance and at the Gerhard Sekoto Library (23 April 2021)
- Make the Draft BAR available for public review for 30 days on the Knight Piésold's website (26 April – 27 May 2021).

Feedback from the DFEE on 9 June 2021 was to include a full wetland study. In order to ensure full compliance with Regulation 43(1) of the EIA Regulations, the document was once again made available for public review. In this regard, the following was done:

- Sent emails and sms's to all I&APs (14 June 2021)
- Make the Draft BAR available for public review for 30 days on the Knight Piésold's website (14 June – 15 July 2021).

Refer to Appendix E1 for the proof of public participation undertaken.

6.3 SUMMARY OF ISSUES RAISED BY I&APS

During the public review period of 26 April – 27 May 2021, comments were received from both the DFFE and DHSWS. Refer to Appendix E3 for the letter and email received. In summary, the following issues were raised:

1. Alignment of rehabilitation measures with approved Water Use Licence (WUL)
2. Quantification of total waste to be removed, and volume to be removed per day.
3. Need to amend WUL of receptor dump (if licenced size is exceeded)
4. Maximum period and seasons in which the rehabilitation project will be undertaken
5. Monitoring programme specific to rehabilitation project.
6. Advantages and Disadvantages of alternatives

7. Information requirements of the DFFE. Refer to Table 3.

6.4 ENVIRONMENTAL ATTRIBUTES ASSOCIATED WITH THE PROJECT AND ALTERNATIVES

6.4.1 Visual (Topography)

The site is about 1 500 to just below 1480 metres above sea level (m.a.s.l.) in terms of altitude (Galago Environmental (b), 2012). It has highly variable landscape with extensive sloping plains and ridges that are slightly elevated over undulating surrounding plains; it is characterised by hilltops and valley bottoms.

6.4.2 Land Use

The CDR facility is located within the active, industrial MFC Site. The Columbus Stainless Steel Plant lies immediately adjacent to Middelburg Ferrochrome. Several smaller contracting operations are located adjacent to the site. The Industria and Vaalrand industrial areas lie further to the north of the site. Several other industries have started construction and operation to the West of the MFC site on the newly re-zoned industrial 2 sites. Other properties in close vicinity include the Pienaar dam resort to the South and a sewerage treatment facility to southwest of the site.

The land uses of the areas adjacent or in close proximity to the site include residential, educational, industrial, commercial and a small area of undeveloped property and this impact on land use- and capability.

The Nazareth residential area and an informal village lie to the east of the site, alongside and east of the N11 National road. The informal village lies just to the south of Nazareth Township. The Mineralia and the Aerorand townships lie to the northwest. Two schools are located in the area north of Mineralia. A new residential area is being built northwest of Middelburg Ferrochrome south of Mineralia and east of Aerorand (Samancor, 2018-2019).

The Vaalbankspruit flows through the MFC site. The N4 highway runs from east to west, about 1 km south of the site.

The suburbs of Middelburg lie approximately 2 km north and north-west of MFC. The town of Middelburg is dominated by industry, with rail and road infrastructure servicing industrial developments in the region. The CBD of Middelburg lies 5 km to the northwest of the site (Samancor, 2018-2019).

6.4.3 Groundwater

Information in this section was primarily sourced from (Geo Pollution Technologies, 2012) and (Golder Associates Africa, 2018). Refer to Appendix C2 for the 2012 report and to Geohydrology Appendix C of the Design Report (Appendix B) for the full 2018 Geohydrology report.

Hydrocensus

A hydrocensus of boreholes and surface water bodies was carried out in May 2015, during which 88 boreholes were visited (Golder Associates Africa, 2018). Water levels were measured at 88 boreholes, 84 of which were reported to be static water levels. Statistics of the water levels can be seen in Table 7. The groundwater levels are shallow with an average of 2.3 mbgl. The groundwater levels range from artesian – 9.82 mbgl. Four wells were found to be artesian.

Table 7: Hydrocensus July 2015 - Water level statistics (Golder Associates Africa, 2018)

Summary of Static Water Level Data	Value
count	88
Min (mbgl)	0
Max (mbgl)	9.82
Average (mbgl)	2.30
Standard Deviation	1.72
Correlation of Elevation and Piezometric head	0.99

The piezometric head and topographical elevation display a correlation in the order of 0.99 from which it is inferred that groundwater flow directions are expected to mimic surface topography

Geophysics

A ground magnetic survey and collection of electromagnetic data was undertaken (Geofocus, 2021). Refer to Appendix L for the full report. Figure 7 shows the lines that were surveyed.

In conclusion, (Geofocus, 2021) notes that the ground magnetic survey identified dyke-like structures and geological contacts. It is a pity that both water and the high-voltage power line impeded the survey in the east and northeast. The ground EM survey was severely affected by the power lines but has shown that neither of the dykes appear to be significant groundwater conduits. The EM survey did strongly confirm the geological contact along EM line 3.

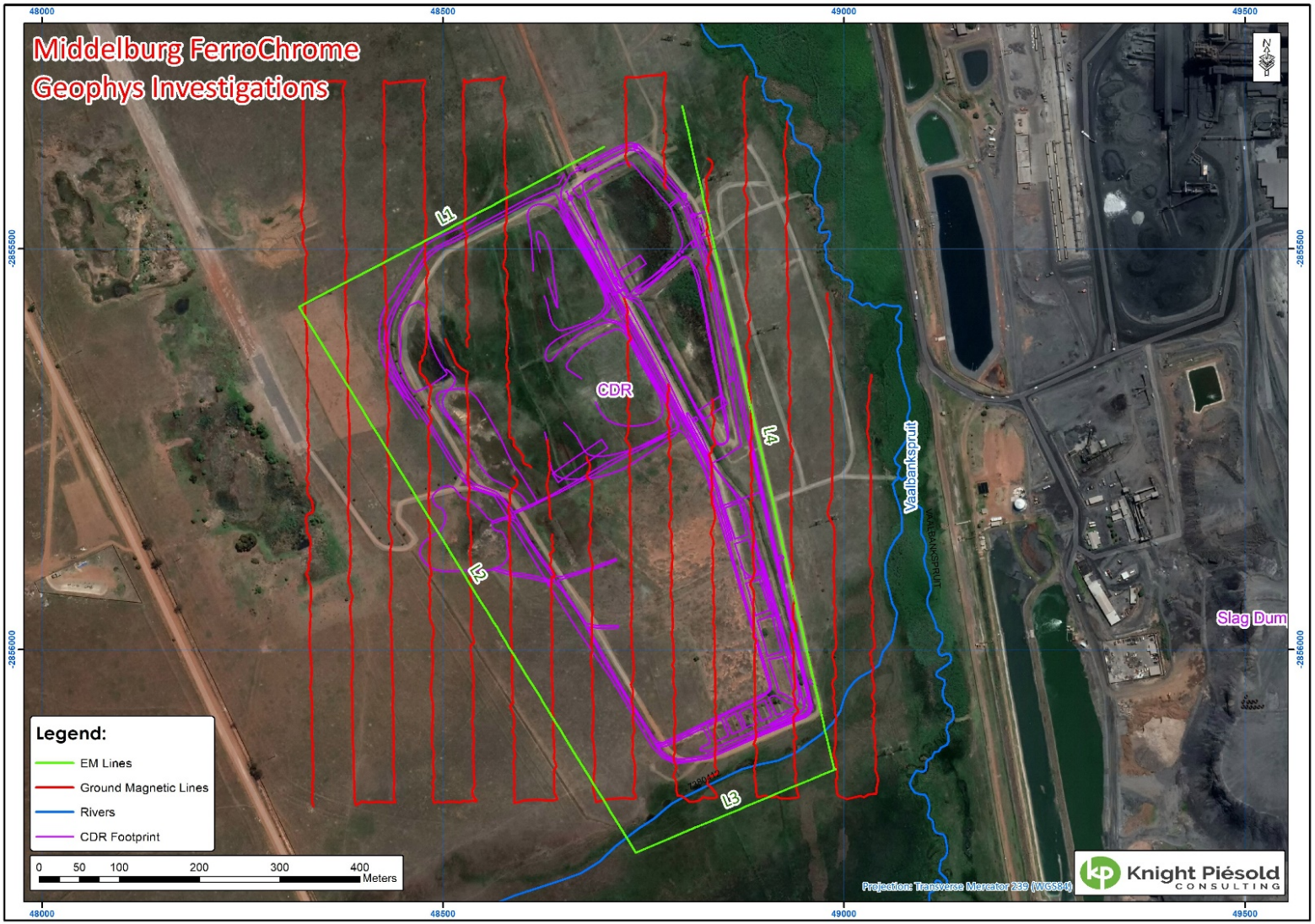

Figure 7: Ground magnetic lines shown in red and EM lines (adapted from (Geofocus, 2021)

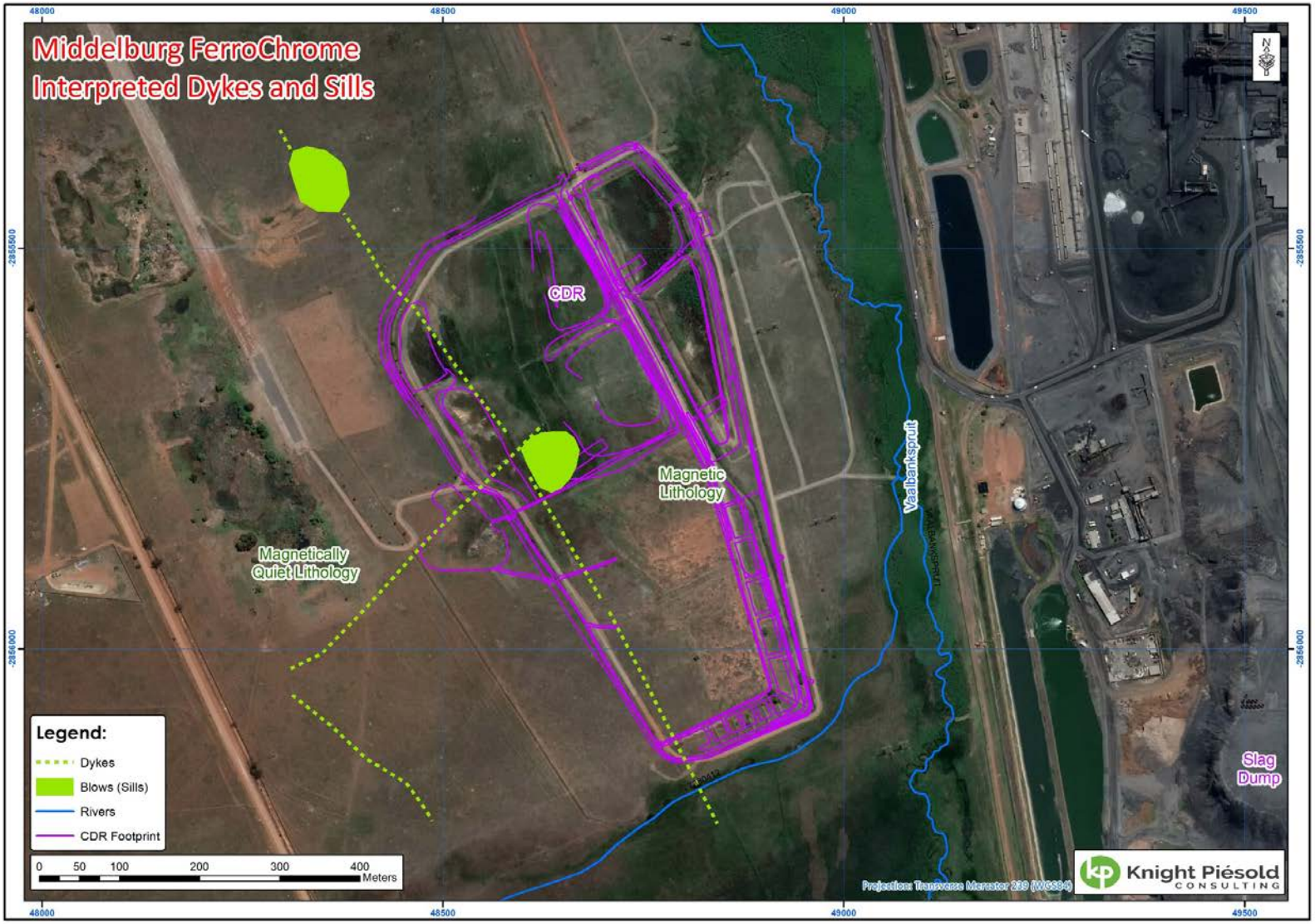

Figure 8: Interpreted dykes and blows shown (adapted from (Geofocus, 2021)

Geology

The surface geology underlying the CDR Slimes dam consists predominately of rhyolite (Vs) of the Selons River Formation, shales and quartzite (Vls) of the Loskop formation, tillite and shale of the Dwyka Formation and dolerite intrusions.

The majority of the northern area underlying the Slimes dam consists out of shales and quartzites while the southern part is underlain by rhyolites. In general rhyolites are resistant to erosion with little residual cover (Geo Pollution Technologies, 2012). Refer to Figure 12 for the geological map.

According to (Geo Pollution Technologies, 2012), two distinct superimposed groundwater systems are present within the MFC plant. They can be classified as the upper weathered shale, rhyolite and diabase aquifer and the fractured aquifers within the unweathered shale, rhyolite, and diabase deeper below.

- The upper weathered aquifer

  The shale, rhyolite and diabase are weathered to depths of 15 metres below surface throughout the site. The upper aquifer, typically perched, is associated with this weathered zone and water is often found within a few metres below surface. This aquifer is recharged by rainfall. The percentage recharge to this aquifer is estimated to be in the order of 1 - 3% of the annual rainfall.

  Rainfall that infiltrates into the weathered rock reaches an impermeable layer of shale/rhyolite or diabase underneath the weathered zone. The movement of groundwater on top of these layers is lateral and in the direction of the surface slope. This water reappears on surface at fountains where the flow paths are obstructed by a barrier, such as a dolerite dyke, paleo-topographic highs in the bedrock, or where the surface topography cuts into the groundwater level at streams such as the Vaalbank spruit.

- The fractured deeper aquifer

  The pores within the unweathered shales/rhyolites or diabase are too well cementated to allow any significant permeation of water. Bulk groundwater movement is therefore along secondary structures, such as fractures, cracks and joints in the sediments. These structures are better developed in competent rocks such as sandstone, hence the better water-yielding properties of the latter rock type.

  It should, however, be emphasised that not all secondary structures are water-bearing. Many of these structures are constricted because of compressional forces that act within the earth's crust. The chances of intersecting a water-bearing fracture by drilling decrease rapidly with depth. Scientific siting of water-supply boreholes is necessary to intersect these fractures.

Observations made by GPT (2012) suggest that seepage and migration of groundwater and potential pollution plumes occur predominantly within the weathered lithologies. This shallow groundwater discharges into the Vaalbank spruit to the east of the CDR Slimes dam. The shale/rhyolite or diabase underlying the weathered sediments or unconsolidated material tends to be relatively impermeable. However, there may be site specific areas where hydraulic continuity (vertical fractures) exists between the weathered zone and the underlying fractured aquifers. Pollution may migrate along these fractures or the contacts of igneous intrusions (dolerite dykes) to deeper levels within the fractured aquifer.

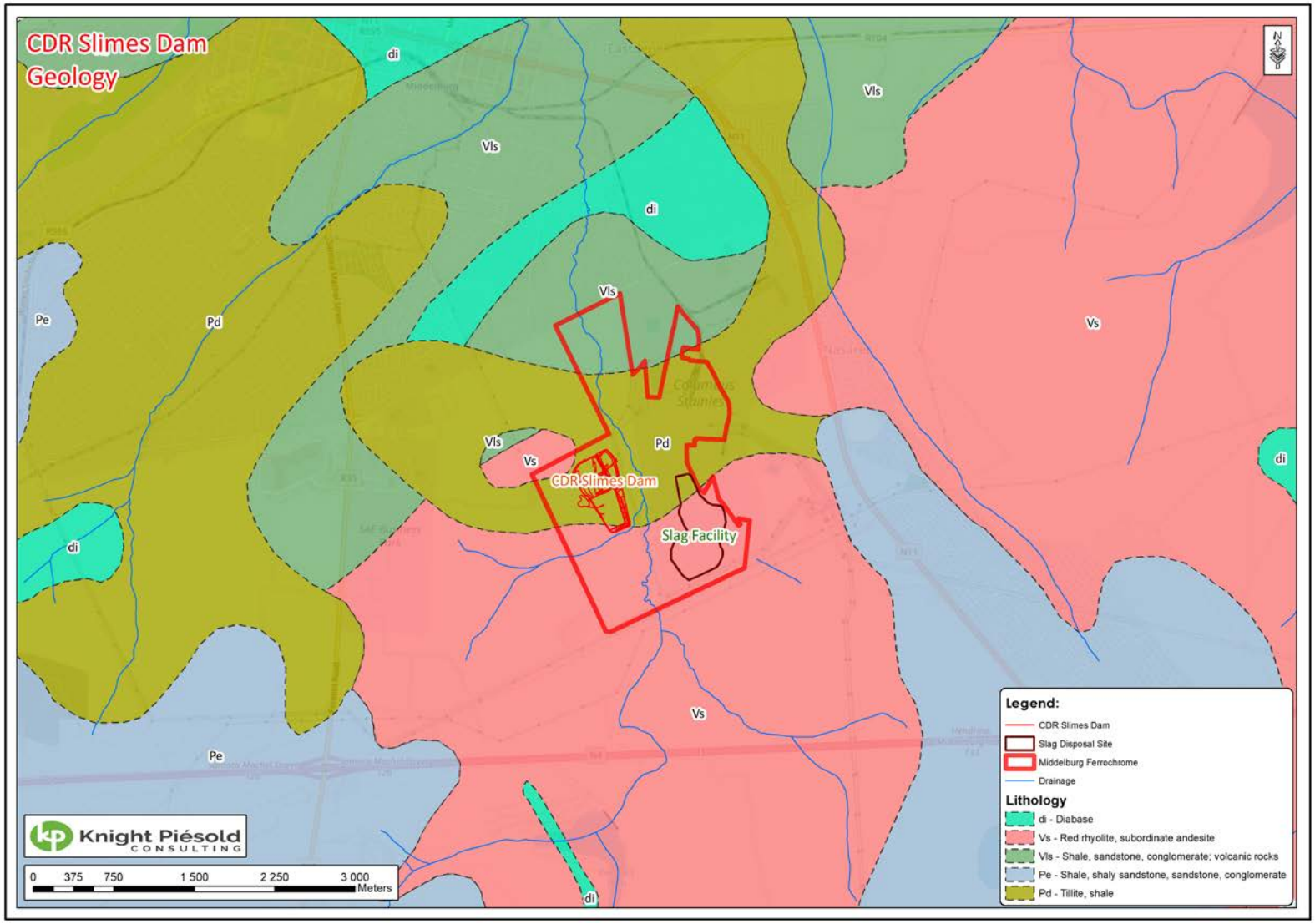

Figure 9: Geological Map

Aquifer Classification

Both the aquifers underlying the CDR Slimes dam could be classified as a Minor Aquifer System based on the following:

- The aquifer has a limited extent
- The groundwater quality is variable
- A portion of base flow of the Vaalbank spruit is dependent on the aquifer
- Shallow water table

In order to achieve the Aquifer System Management and Second Variable Classifications, as well as the Groundwater Quality Management Index, a points scoring system as presented in Table 8 and Table 9 was used.

Table 8: Ratings – Aquifer System Management and Second Variable Classifications

Aquifer System Management Classification		
Class	**Points**	**Study Area**
Sole Source Aquifer System:	6	2
Major Aquifer System:	4	
Minor Aquifer System:	2	
Non-Aquifer System:	0	
Special Aquifer System:	0 – 6	
Second Variable classification (Weathering / Fracturing)		
High:	3	2
Medium:	2	
Low:	1	

Table 9: Ratings – Groundwater Quality Management (GQM) Classification System

Aquifer System Management Classification		
Class	**Points**	**Study Area**
Sole Source Aquifer System:	6	2
Major Aquifer System:	4	
Minor Aquifer System:	2	
Non-Aquifer System:	0	
Special Aquifer System:	0 – 6	
Second Variable classification (Weathering / Fracturing)		
High:	3	2
Medium:	2	
Low:	1	

As part of the aquifer classification, a Groundwater Quality Management (GQM) Index is used to define the level of groundwater protection required. The GQM Index is obtained by multiplying the rating of the aquifer system management and the aquifer vulnerability. The GQM index for the study area is presented in Table 10.

The vulnerability, tendency or likelihood for contamination to reach a specified position in the groundwater system after introduction at some location above the uppermost aquifer, in terms of the above mentioned, is classified as medium.

The level of groundwater protection based on the Groundwater Quality Management Classification:

GQM Index = Aquifer System Management x Aquifer Vulnerability

= 2 x 3 = 6

Table 10: Ratings – GQM index for the study area

Class	Points	Study Area
<1	Limited	6
1 - 3	Low Level	
3 - 6	Medium Level	
6 - 10	High Level	
>10	Strictly Non-Degradation	

Groundwater Quality

This section contains a summary of the groundwater water quality around the CDR dump. The groundwater points are shown on Figure 10. Refer to Appendix H for the table of groundwater quality results.

Results from a total of 38 groundwater points were compared against the SANS 241:2015 guidelines and the Department of Water Affairs and Forestry (DWAF) South African Water Quality Guidelines for Domestic Use (1996) (Department of Water Affairs and Forestry, 1996). The dataset used covers results from 2018: Quarter 1 to 4 (Q1 – Q4), 2019 Quarter 1 to 4 (Q1 – Q4), and 2020 Quarter 1 to 3 (Q1 – Q3).

The parameters that were analysed are: Electrical Conductivity (EC), pH, Calcium (Ca), Chloride (Cl), Nitrate and Nitrite (NO_3 + NO_2), Sulphate (SO_4), Aluminium (Al), Hexavalent Chromium (Cr VI), Fluoride (F), Manganese (Mn) and Sodium (Na). There were no guidelines from these two standards for: Total Suspended Solids (TSS), Chemical Oxygen Demand (COD), Ammonia and Ammonium, therefore, they could not be analysed for exceedances.

The electrical conductivity (EC) was exceeded for both the SANS 241 guidelines and the DWAF guidelines. The SANS Aesthetic guideline limit of 170 mS/m was exceeded in more than half of the points. About 40 sites exceeded the EC DWAF guideline. The highest recorded electrical conductivity on the analysed data is 411 mS/m, obtained from point WD 8 in 2020 Q2.

The pH reading at seven sites exceeded the SANS 241 Operational guideline limit, and 3 of these sites also exceeded the DWAF guideline. The highest recorded pH is 9.92, obtained at WD 5 C in 2018 Q3. The SANS 241 standards do not have guidelines for calcium, therefore only the DWAF guidelines were used to analyse the results for calcium. The concentration of calcium exceeded the

DWAF guidelines in more than 35 points, of which more than 14 had exceedances recorded for all their quarterly results.

The concentration of chlorine did not exceed the SANS 241 Aesthetic guideline limit of ≤300 mg/l at any of the sites. However, 11 of the sites exceeded the DWAF's 100 mg/l guideline, and two of these sites exceeded for all their quarterly readings (for the received data). The highest chlorine concentration (235 mg/l) was recorded at WD 7 from 2018 Q1. The concentrations of nitrate also did not exceed the SANS 241 guideline (200 mg/l). However, the DWAF guideline was exceeded at 8 sites, and the highest concentration was measured at WD 19 as 37.5 mg/l in 2018 Q2.

The SANS 241 Acute and Aesthetic guidelines for sulphate were both exceeded at more than 20 sites, with the highest concentration recorded as 2 132 mg/l at WD 8 in 2020 Q2. The DWAF guidelines were exceeded in more than 25 sites. There no exceedances recorded for aluminium and hexavalent chromium.

The DWAF guidelines were exceeded in more than 15 sites for fluoride; the SANS 241 guidelines were exceeded in more than 10 sites. In terms of manganese, no exceedance was recorded for the SANS 241 guidelines, however exceedances from 21 sites were recorded for the DWAF guidelines. The concentration of sodium exceeded the SANS 241operational limit of ≤ 200 mg/l at 22 sites and exceeded the DWAF guidelines at more than 30 sites.

Figure 10: Groundwater Monitoring Points

Groundwater Flow

The regional flow direction is from south to north along the river; thus following the surface runoff direction and topography as indicated. The more local groundwater flow on site is towards the Vaalbankspruit (Figure 11).

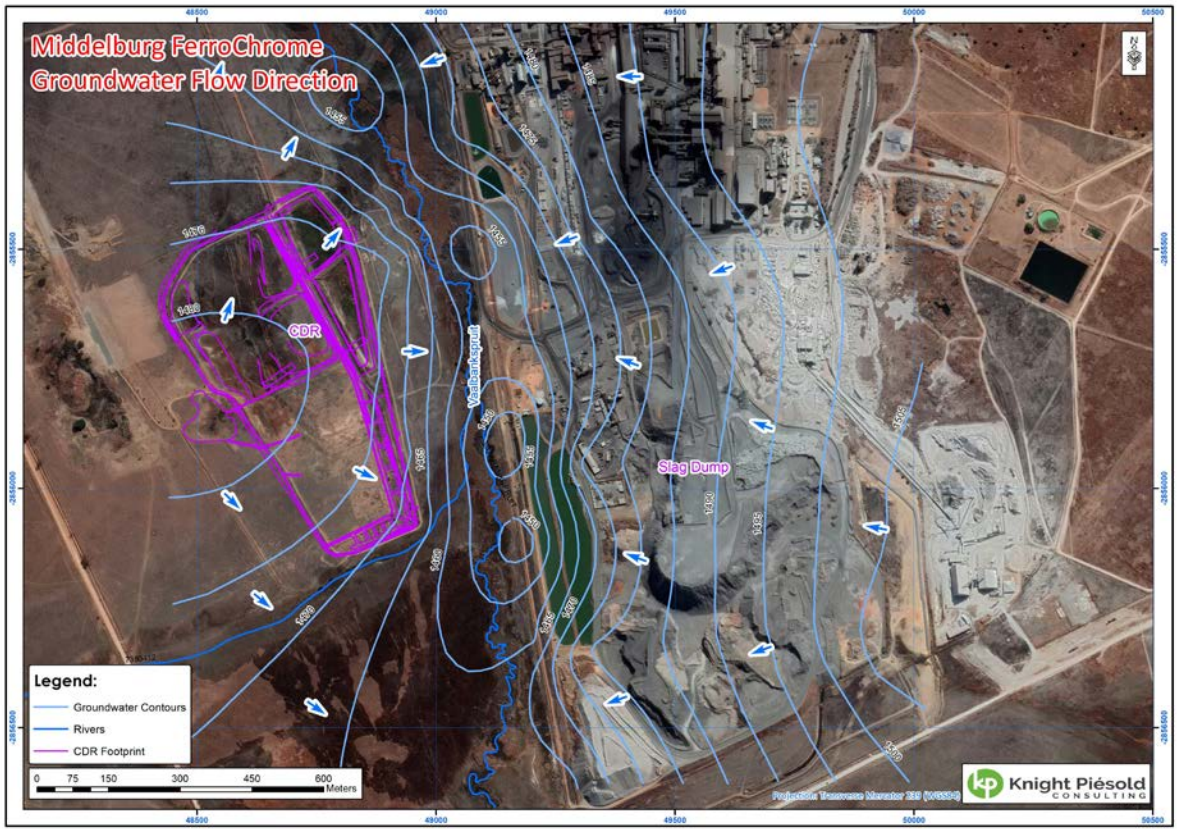

Figure 11: Groundwater Flow Directions (adapted from (Golder Associates Africa, 2018)

6.4.4 Terrestrial Ecology

The Mpumalanga Tourism and Parks Agency (MTPA) issued the Mpumalanga biodiversity sector plan Handbook in and spatial dataset in 2014 (MPTA, 2014). Figure 6 provides an overlay of the CDR facility onto this dataset. It shows that the CDR facility is located on an area marked as “highly modified” with an irreplaceable CBA directly adjacent to it.

A suite of ecology specialist studies were undertaken in 2012 by Yggdrasil Scientific Services & Galago Environmental. These are:

- Galago Environmental (2012). Mammal Habitat Assessment of Samancor Middelburg Ferrochrome Terrain.
- Yggdrasil Scientific Services (2012). Plant Ecologcical Report for the closure of the slimes dam (Samancor)
- Galago Environmental (2012). Avifaunal Habitat Assessment of Samancor Middelburg Ferrochrome Terrain.
- Galago Environmental (2012). Herpetofaunal Habitat Assessment of Samancor Middelburg Ferrochrome Terrain.

- Galago Environmental (2012). Aquatic Ecology Report for the closure of the slimes dam (Samancor)

Refer to Appendix I for the full reports. It should be noted that when these reports were compiled, MFC proposed to keep the CDR facility *in-situ*. Subsequently, MFC has proposed that the waste from the CDR facility be removed and the site completely rehabilitated.

This area falls within the Rand Highveld Grassland vegetation unit which is seen as endangered and has a conservation target of 24% (Yggdrasil Scientific Services, 2012). Two main plant communities have been identified in this site: *Phragmites mauritianus - Kniphofia porphyrantha* (wetland) and *Hyparrhenia hirta - Hypoxis hemerocallidea* (grassland) (Yggdrasil Scientific Services, 2012). Both these plant species have high sensitivity, the first one has a high conservation priority and the second one has a medium-high conservation priority (Yggdrasil Scientific Services, 2012).

Of the 167 bird species likely to occur at this site, only 60 were observed (Galago Environmental (b), 2012). African Grass-Owl (Tyto capensis) was confirmed in the MFC wetland areas (approximately 900 m from the CDR facility). The position of the roost site is shown in Figure 19). Suitable habitat for two other Red Data avifauna species (African Marsh-Harrier (*Circus ranivorus*) and Lesser Kestrel (*Falco naumanni*) were also confirmed during the 2012 ecological survey (Galago Environmental (b), 2012).

A total of 39 mammal species are expected to occur at this site (Galago Environmental (a), 2012). However, only 12 have been confirmed either through the testimony of the Samancor environmental officer direct observations (Table 11).

Table 11: Confirmed species at the site

Scientific Name	English Name	Observation Indicator	Habitat
L. saxatilis	Scrub hare	Faecal pellets	Short grass
C. hottentotus	African mole rat	Tunnel systems	Universal
H. africaeaustralis	Cape porcupine	Quills	Universal
O. angoniensis	Angoni vlei rat	Grass stem gnawings	Wetlands
O. irroratus	Vlei rat	Grass stem gnawings	Wetlands
G. sanguinea	Slender mongoose	Sight record	Good cover
A. paludinosus	Marsh mongoose	Tracts	Wetlands
A. capensis	Clawless otter	Tracts & faeces	Water bodies
P. larvatus	Bushpig	Reported	Near water
P. africanus	Common warthog	Reported	Plains
S. grimmia	Common duiker	Faecal pellets	Universal
R. arundinum	Southern reedbuck	Reported	Riparian zones

6.4.5 Aquatic Ecology

MFC operations may have an impact on the Vaalbankspruit as it is part of the drainage system. In order to determine this potential impact, aquatic bio-monitoring is undertaken during the dry and wet season at the upstream and downstream monitoring points of the Vaalbankspruit, relative to the MFC

operations. This bi-annual aquatic bio-monitoring is also used to determine any trends and seasonal variation on the receiving aquatic environment. Refer to Appendix G for the latest Biomonitoring Report.s

Aquatic bio-monitoring is the utilisation of methods that use living organisms as a proxy for deducing water quality and ecosystem health. Five sites were part of the bio-monitoring survey namely, Site 1 (Upstream Control Point), SWR 3 (Upstream), Z 08 (Drainage Channel), Site 2B (Mid-stream Point) and Site 3A (Downstream), as illustrated in Figure 12. The results of the August 2020 dry season survey, and November 2020 wet season survey is summarised as follows:

Table 12: Summary of Latest Biomonitoring

August 2020 dry season survey	November 2020 wet season survey
Site 1 (Upstream Control Point)	
The in-situ concentrations of free and total chlorine exceeded the DWAF guidelines. • Site 1 provided poor habitat availability, with an IHAS score of 43 % • The invertebrate PES was categorised as Category F (Critically Modified). • The general diatom-based water quality ecological category for Site 1 was A (High Quality)	The in-situ dissolved oxygen saturation and dissolved oxygen concentration fell below the DWAF guidelines. • Site 1 provided good habitat availability, with an IHAS score of 70 % • The invertebrate PES was categorised as Category E (Seriously Modified). • The general diatom-based water quality ecological category for Site 1 was A/B (High Quality)
SWR 3 (Upstream)	
The in-situ concentration of dissolved oxygen (%) exceeded the DWAF guidelines. • Poor habitat availability was provided at SWR 3, with an IHAS score of 52 % • The invertebrate PES was categorised as Category B (Largely natural with few modifications) • The general diatom-based water quality ecological category for SWR 3 was Category B (Good Quality)	The dissolved oxygen concentration and saturation values fell below the minimum threshold value stipulated within the DWAF guidelines. • Inadequate habitat availability was provided at SWR 3, with an IHAS score of 53 % • The invertebrate PES was categorised as E (Seriously Modified) • The general diatom-based water quality ecological category for SWR 3 was Category C (Moderate Quality)
Z 08 (Drainage Channel)	
• The point was dry, therefore there was no sample collected.	• The dissolved oxygen saturation and dissolved oxygen concentration fell below the DWAF guidelines. • The general diatom-based water quality ecological category for Site 2B was Category B (Good Quality)
Site 2B (Mid-stream Point)	
• The in-situ concentrations of free and total chlorine exceeded the DWAF guidelines. • This site was not suitable for bio-monitoring as there was no distinct channel • The general diatom-based water quality	This site was not suitable for bio-monitoring as there was no distinct channel • The dissolved oxygen concentration and saturation values fell below the minimum threshold • value stipulated within the DWAF

August 2020 dry season survey	November 2020 wet season survey
ecological category for Site 2B was Category B (Good Quality)	guidelines. • The general diatom-based water quality ecological category for Site 2B was Category B (Good Quality)
Site 3A (Downstream)	
• The in-situ concentrations of conductivity and dissolved oxygen (%) exceeded the DWAF guidelines. • Site 3A provided adequate habitat availability as it recorded an IHAS score of 60 % • The invertebrate PES was categorised as Category C/D (Moderately Modified to Largely Modified) • The general diatom-based water quality ecological category for Site 3A was Category C/D (Moderate Quality)	• This site is a wetland and there was no distinct channel making it unsuitable for bio-monitoring. • The previously surveyed site was covered by the reed bed which had grown dense. • The in-situ value of conductivity exceeded the DWAF guidelines, while the dissolved oxygen saturation and dissolved oxygen concentration fell below the DWAF guidelines. • The general diatom-based water quality ecological category for Site 3A was Category B (Good Quality)

The analysis of macroinvertebrates indicated that the Present Ecological State of the upstream point was categorised as Category B (Largely natural with few modifications), while the downstream point was Category C/D (Moderately Modified to Largely Modified). Diatom analysis indicated that the water quality was good upstream and moderate downstream. This suggested that the MFC operations may have an impact on the Vaalbankspruit. However, the habitat availability was poor upstream and adequate downstream.

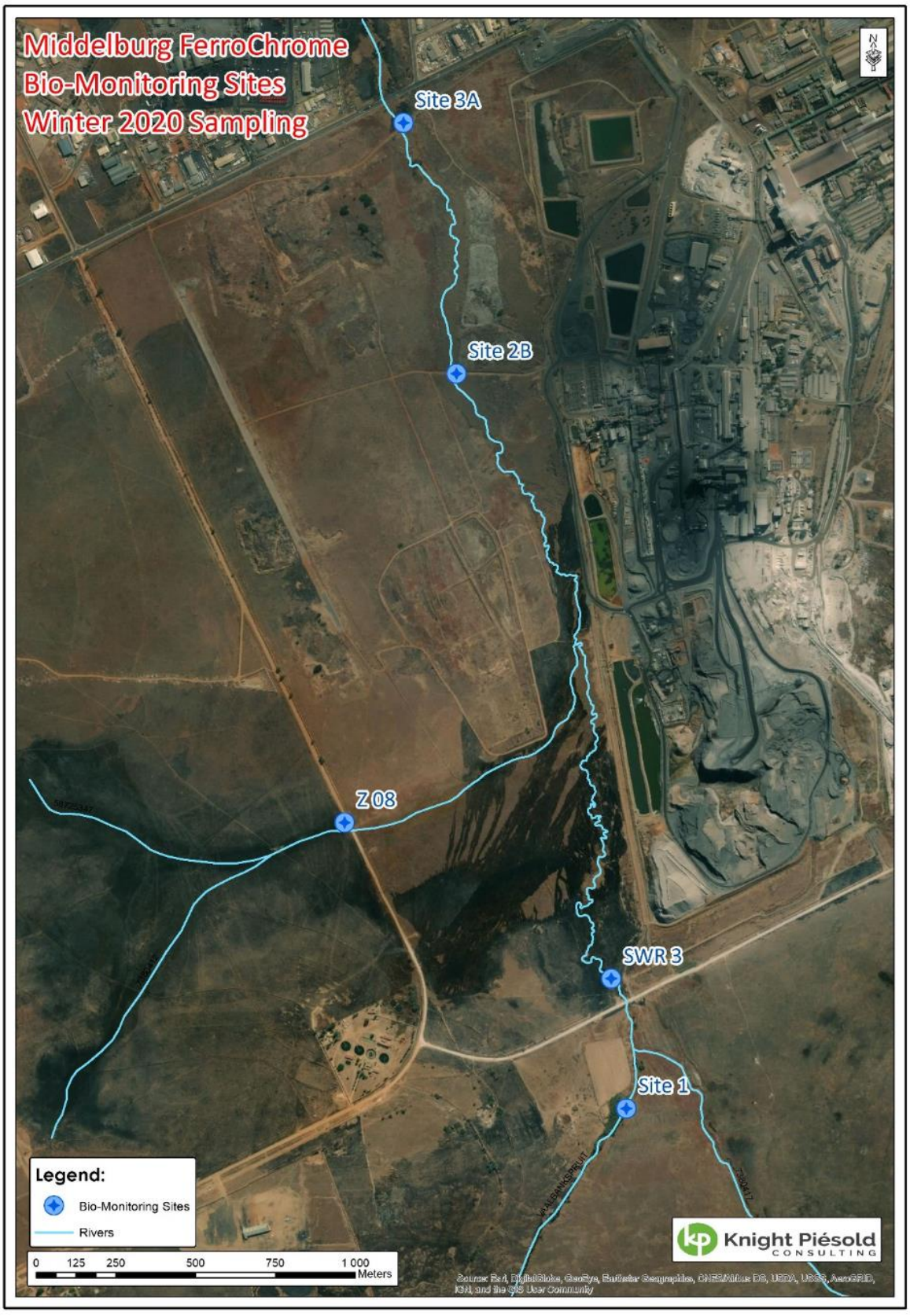

Figure 12: Locality of the Aquatic Bio-monitoring Sites

6.4.6 Wetlands

A Wetland Delineation and Assessment was undertaken (Knight Piesold, 2021). Refer to Appendix L for the full report.

Table 13 and Figure 13 indicate the HGM units identified on the project site and their relative sizes.

Table 13: Summary of HGM Units Identified

No	HGM Unit	Description	Size (Ha)
1	Seep 1	Located to the south of the CDR project area. The seep wetland receives water from the upstream catchment and water discharge from the Wastewater Treatment Works (WWTWs). The water then seeps towards the Vaalbankspruit downgradient	51.62
2	Seep 2	Small seep located at the south-eastern corner of the MFC project area that receives surface water run-off diverted around the MFC area	3.28
3	Seep 3	Small seep located to the north-east that receives runoff from the upstream area	10.73
4	Seep 4	Seep area north of the CDR project area that receives ground- and surface water from the upgradient catchment	5.26
5	Floodplain	The floodplain wetland stretches on the banks of the Vaalbankspruit that receives water during high rainfall events when the channel is overtopped. The floodplain wetland also receives water from the upgradient seepage wetlands and groundwater	37.53

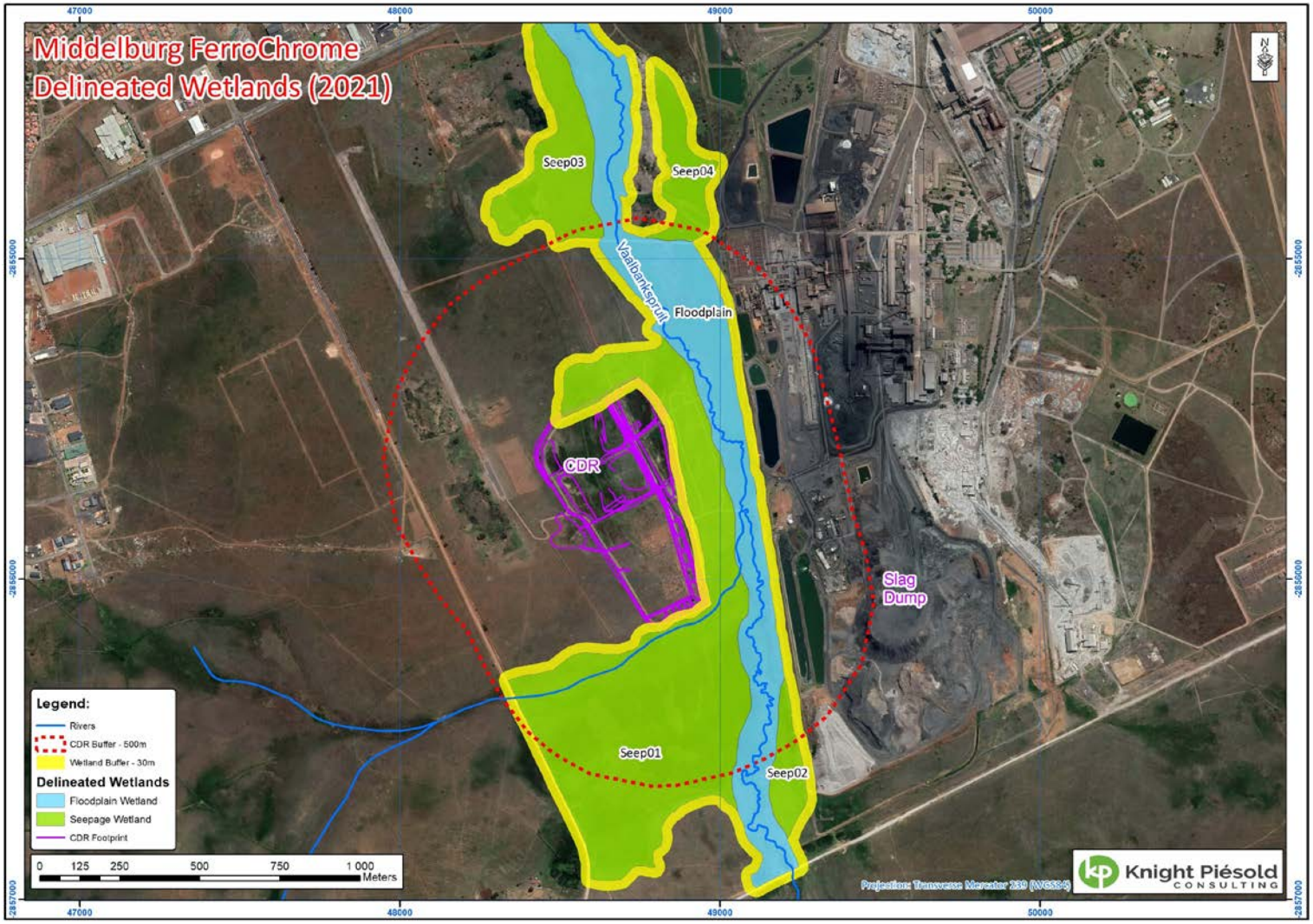

Figure 13: Delineated Wetland Areas

Wetland Unit – Seep 1

The wetland unit is the largest wetland system area with 51.62 Ha identified during the delineation process. The wetland is located to the south of the project area maintained by overland inflow, interflow and groundwater inflow from the upgradient catchment. The catchment area to the west drains towards the Vaalbankspruit. The WWTW located on the south-west corner of the MFC area discharges its final effluent into the receiving environment which creates a constant inflow of surface water. The wetland is characterised by loamy soils.

Plate 1: Seep Wetland Unit 1

Wetland Unit – Seep 2

The wetland unit is located to the south-eastern corner of the MFC operational area which receives overland inflow from the upstream stormwater channel that drains into the wetland area. The wetland is relatively small (3.28 hectares). The seep extends from the edge of the MFC property towards the Vaalbankspruit.

Plate 2: Wetland Unit -Seep 2

Wetland Unit – Seep 3

Located to the north of the CDR project area, the seep falls just within the 500 m buffer around the project area. The area upgradient of the seep has previously been excavated or utilised causing surface water to collect and sypher through the wetland towards the Vaalbankspruit. The seep (10.73Ha) receives overland inflow and interflow from the upgradient area.

Plate 3: Wetland Unit Seep 3

Wetland Unit – Seep 4

The seep wetland is located on the northern corner between the MFC process area fence and to the east of the Kloof Dump. The seep receives surface water inflow from surface water run-off from the MFC areas and some seepage and/or overspill from the dams on the Columbus Steel property.

Plate 4: Wetland Unit – Seep 4

Wetland Unit – Floodplain

The floodplain area is located on the banks of the Vaalbankspruit and extends from the south to the north of the MFC area. The Vaalbankspruit deposits sediments on the floodplain wetland during time of high flow or floods, the Pienaars Dam is located upstream of the wetland which could attribute to the sediments deposited during these high peak events.

The floodplain wetland is dominated by *Phragmites australis* (common reed) due to the availability of sediments on the banks and within the channel. The wetland is characterised by loamy /clayey soils being saturated throughout the year with the seep wetlands playing a role in providing interflow and overland flow to the floodplain wetland.

Present Ecological state of Wetlands

No activities are currently taking place on the western portion of the greater MFC area where the CDR facility is located. The wetlands have not been disturbed in recent times with the operation of the CDR facility halted in the year 2000. The wetlands have adapted to the environmental changes that have occurred upgradient in the catchment.

The wetlands within the CDR project area have not been altered significantly from the reference conditions, although some wetlands have been created by activities such as the WWTW discharge of the past years. The wetlands within the project area have not deteriorated due to these activities and the Present Ecological State (PES) is a Moderately modified state, with a PES category of C.

Plate 5: Floodplain Wetland

Table 14: Present Ecological State for Each HGM Unit

Wetland HGM Unit	Hydrology	Geomorphology	Vegetation	Overall PES
SEEP Wetland 1	C	C	B	C (Moderately Modified
SEEP Wetland 2	C	C	B	C (Moderately Modified

SEEP Wetland 3	C	C	B	C (Moderately Modified
SEEP Wetland 4	C	C	C	C (Moderately Modified
Floodplain Wetland	D	C	C	C (Moderately Modified

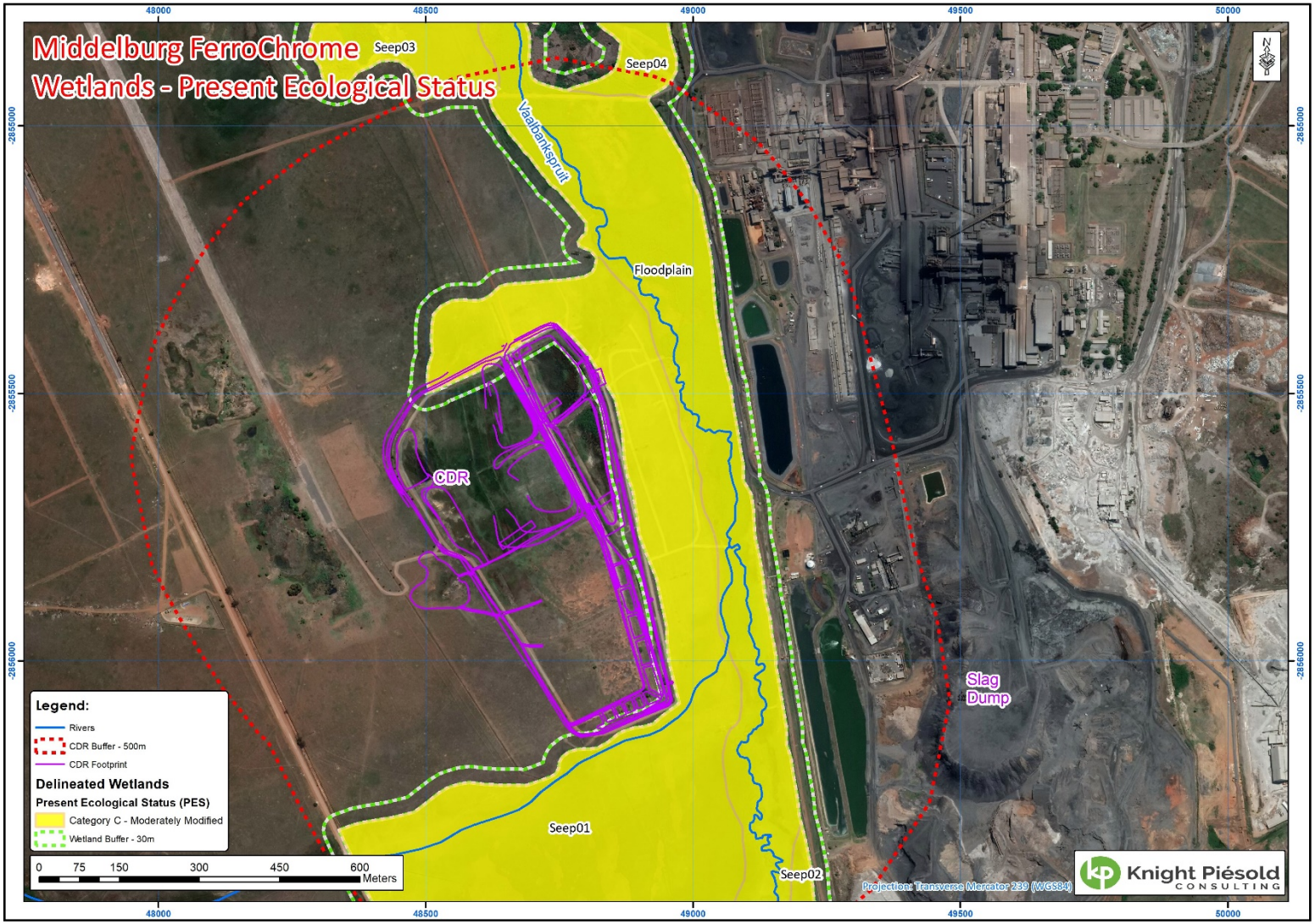

Figure 14: Wetland Present Ecological State

Ecological Importance and Sensitivity (EIS) Assessments

According to (DWAF, 1999), “ecological importance" of a water resource is an expression of its importance to the maintenance of ecological diversity and functioning on local and wider scales. "Ecological sensitivity" refers to the system’s ability to resist disturbance and its capability to recover from disturbance once it has occurred. The Ecological Importance and Sensitivity provides a guideline for determination of the Ecological Management Class (EMC).

The EIS was conducted according to the DWAF guidelines (DWAF, 1999) for the HGM units found in the wetland system. Results for the EIS are presented in Table 15 below.

Table 15: EIS for the wetland units

Determinant	Seep Wetland 1	Seep Wetland 2	Seep Wetland 3	Seep Wetland 4	Floodplain Wetland
PRIMARY DETERMINANTS					
Rare & Endangered Species	1	1	1	1	2
Populations of Unique Species	1	1	1	1	1
Species/taxon Richness	1	1	1	1	2
Diversity of Habitat Types or Features	1	1	1	1	2
Migration route/breeding and feeding site for wetland species	1	1	1	1	1
Sensitivity to Changes in the Natural Hydrological Regime	2	2	2	2	2
Sensitivity to Water Quality Changes	1	1	1	1	4
Flood Storage, Energy Dissipation & Particulate/Element Removal	3	2	2	2	3
MODIFYING DETERMINANTS					
Protected Status	0	0	0	0	0
Ecological Integrity	2	1	1	1	3
TOTAL	13	11	11	11	20
MEDIAN	1	1	1	1	2
OVERALL ECOLOGICAL SENSITIVITY AND IMPORTANCE	**Low/ Marginal**	**Low/ Marginal**	**Low/ Marginal**	**Low/ Marginal**	**Moderate**
Ecological Management Class	**D**	**D**	**D**	**D**	**C**

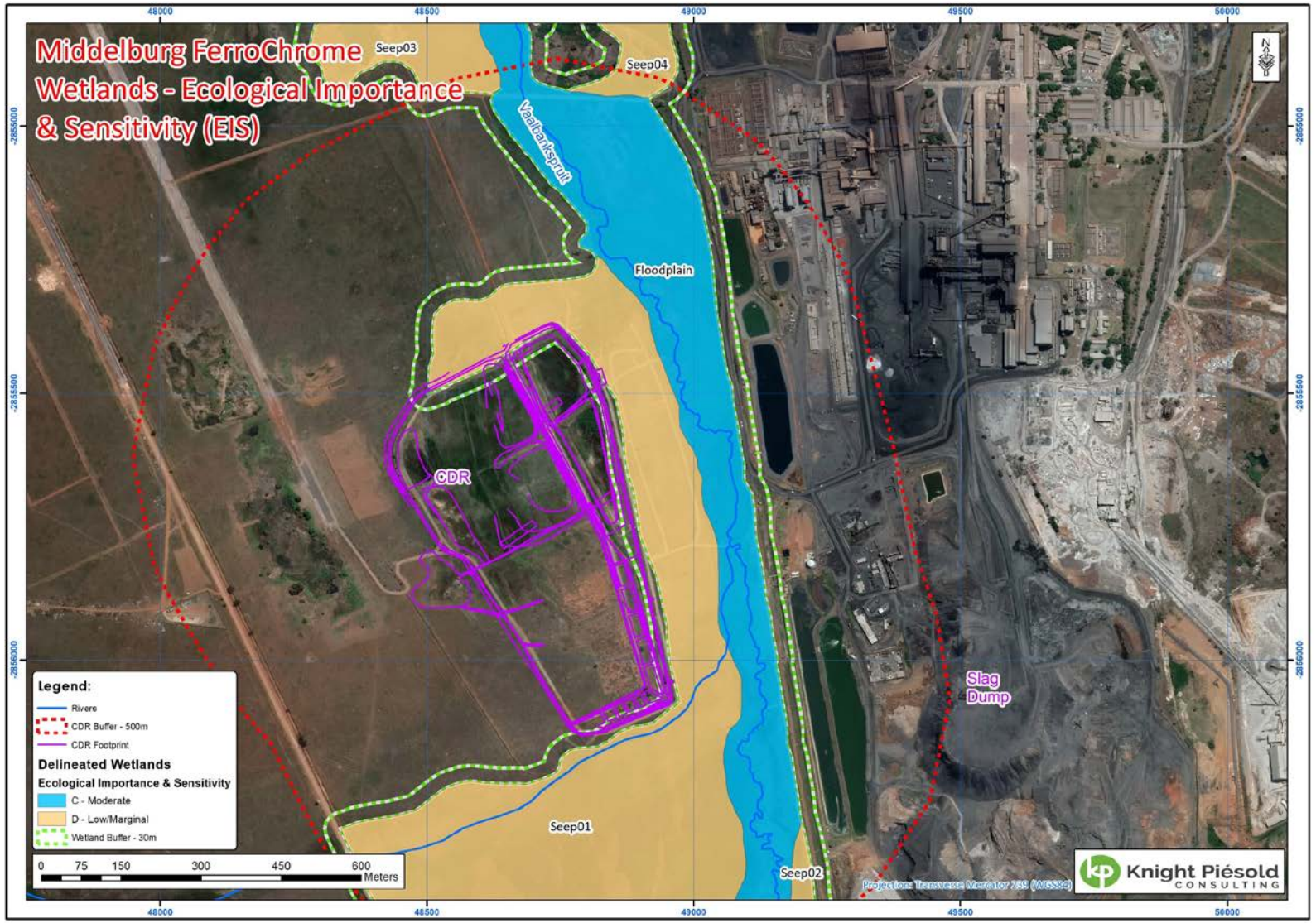

Figure 15: Wetland EIS

Wetland Functional Assessment

Wetlands are regarded as important components of the landscape in which they occur, as they are associated with several functions that are of value to society. These functions include water quality improvement, flood attenuation and biodiversity support.

To determine the function of the wetland, the broader catchment should be taken into consideration as the catchment plays a major role in the functionality of the wetland system. WET-EcoServices was used to assess the ecosystem services for the affected wetland systems. Based on the HGM unit identified, the position of the wetland within the landscape and the way the water flows, a representative functional assessment was undertaken for Seep 1 and the floodplain wetland.

Seep Wetland

Seep wetlands like other wetland types, support plants and associated insects, birds and small mammals adapted to the seasonal moisture regime. Wetlands of this nature are predominantly associated with the sandstone derived soils in the catchment and typically reflect presence of shallow interflow and overland inflow.

Seep wetlands, as seen in the figure below, also play a role in nitrate, phosphate and toxicant removal contributing to water quality improvement. Due to the average slope of 0.2% across the Seep wetland, the overland inflow is significantly slowed down assisting in erosion control in the catchment and reducing the possibility of sediment being washed into the floodplain wetland.

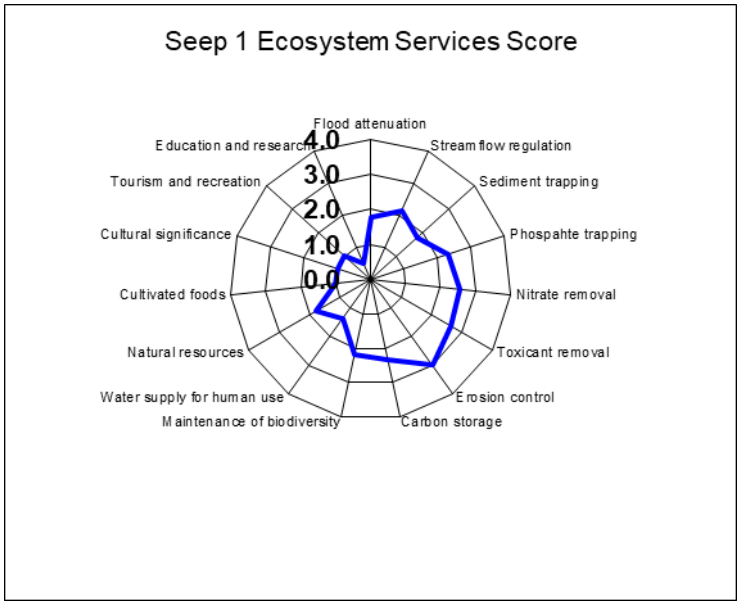

Figure 16: Seep 1 Ecosystem Services

Floodplain Wetland

Floodplain wetlands are a depositional surface formed by an alluvial river. Alluvial river channels are self-formed features meaning that they are shaped by magnitude and frequency of the floods that they experience and the ability of these floods to erode, deposit and transport sediment. The deposition of the sediment plays a role in erosion control and sediment trapping within the channel associated with the floodplain wetland.

The floodplain wetland also assists with the improvement of water quality as it tends to trap phosphate and remove nitrate and toxicants within the wetland.

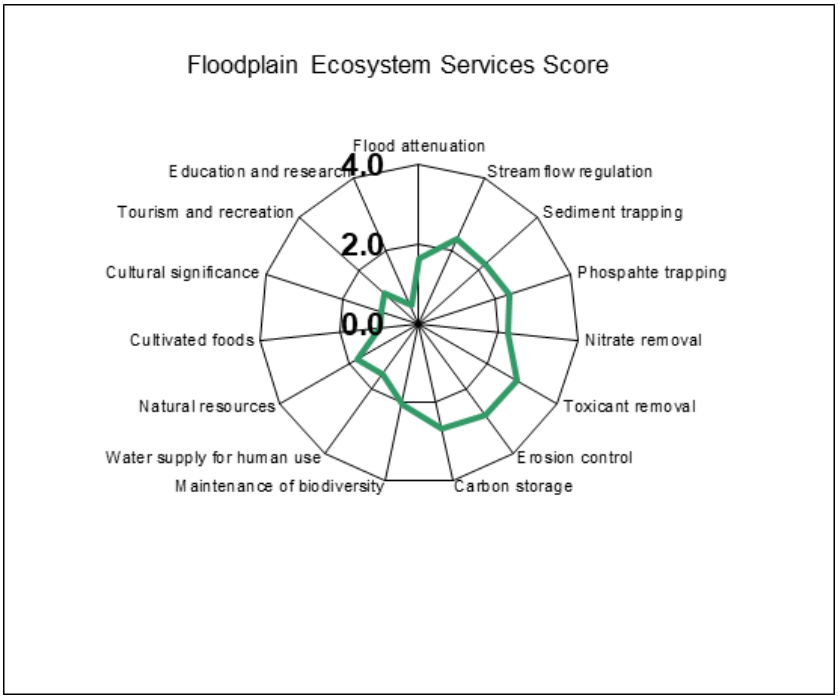

Figure 17: Floodplain Wetland Ecosystem Services

6.4.7 Climate

Samancor Middelburg Ferrochrome terrain is part of the Highveld, therefore from December to February it experiences warm summers and cold winters from June to August. The winters are very dry, however strongly seasonal summer rainfall occur. The mean annual precipitation from 2001 to 2009 was measured as 710.30 mm. The most rainfall occurs as short duration but high intensity thunderstorms during the warm summers, and there is also tornadoes and summer hailstorms that occur frequently. Incidences of frost range from 10 to 35 days per year (Yggdrasil Scientific Services, 2012).

The mean maximum temperature recorded in the hottest months (November and February) exceed 27°C and the mean maximum daily temperature recorded for the winter months (May to August) is below 1°C (Yggdrasil Scientific Services, 2012).

6.4.8 Air quality

MFC undertakes monthly dust fallout monitoring at four sites as shown below (EnviroNgaka, 2020). Since March 2020, all sample locations fell within acceptable levels. Refer to Appendix F for the full report.

Figure 18: Dust Fallout monitoring Points (EnviroNgaka, 2020)

Table 16: Location of Dust Fallout Monitoring Points (EnviroNgaka, 2020)

Key	Direction /Code	Description	Coordinates	
MFC-3	S	South of Site	25° 49' 2.719" S	29° 29' 29.479" E
MFC-4	SW	South West of Site	25° 48' 32.18" S	29° 29' 14.341" E
MFC-5	W	West of Site	25° 48' 9.112" S	29° 29' 1.439" E
MFC-7	NW	North West of Site	25° 47' 41.561" S	29° 29' 0.179" E

6.4.9 Heritage resources

According to (HCAC, 2021) the study area is of low heritage significance and has been impacted upon by the development of the CDR Facility. The impact of earth moving, and mining activities would have obliterated any surface indicators of heritage resources in the area. The current CDR facility was in use for ten years from the 1990's and therefore not older than 60 years and not under the ambit of the Heritage Act and the decommissioning of the CDR slimes dam will not impact on heritage resources of significance. HCAC (HCAC) recommends that the project be exempt from a phase 1 Heritage Impact Assessment. This recommendation has been accepted by the SAHRA. Refer to Appendix J for the heritage exemption and response.

6.4.10 Socio-economic environment

The project is located within the Mpumalanga Province, situated within Ward 11 of the Steve Tshwete Local Municipality within the Nkangala District Municipality. The information detailed below is provided from various sources identified during a desktop review of the social demographics for the project area, including the Census 2011 (Statistics South Africa, 2014), Steve Tshwete Local Municipality Spatial Development Framework (STLM, 2010), and the Steve Tshwete Local Municipality Integrated Development Plan (STLM, 2020).

Provincial Demographics

Table 17: Social Demographics the Mpumalanga Province

Aspect	Description
Population	In 2011 the population in the Mpumalanga province was 4 039 939, consisting of blacks (90.9 %), white (7.5 %), coloured (0.9 %), Indian (0.7 %) (Statistics South Africa, 2014).
Education	A proportion of only 10,2% of persons had a tertiary qualification, while 14,1% of its population was recorded as having no education in 2011 in the Mpumalanga Province (Statistics South Africa, 2014).
Language	SiSwati (27,7%) was the most spoken language in Mpumalanga, followed by IsiZulu (24,1%), whilst Sign language was the least spoken language with only 0,2% (Statistics South Africa, 2014).
Economy	A total of 54.8 % of the Mpumalanga population are economically active, while 45.2 % are not (Statistics South Africa, 2014).
Employment	A total of 68,4 % of the provincial population are employed, while 31.6 % are unemployed (Statistics South Africa, 2014).

Municipal Demographics

A desktop review of available information from online sources was used to populate a brief description of the social baseline for the Steve Tshwete Local Municipality, as well as Ward 11 thereof in which the proposed project is located.

Table 18: Social Baseline for the Steve Tshwete Local Municipality

Aspect	Description
Population	Steve Tshwete Local Municipality, had a population of 229 831 people, with 73.8 % black African, 21.9 % White, 2.6% Coloured and 1.6% Indian or Asian (Statistics South Africa, 2014).
Education	In 2016, only 14.4. % of the population had no schooling (Census 2011). Of the number of persons aged 5–24 years, 69.5% attend school, while 30.5% do not attend school. A total of 52 291 amongst persons aged 20 years and older have matriculates, while 52 291 had obtained higher education qualifications (Statistics South Africa, 2014).
Language	The dominant language within the municipality is IsiZulu (28.3 %), followed by Afrikaans (22.6 %) and IsiNdebele (14.9 %) (Statistics South Africa, 2014).
Economy	The local economy within the municipality is driven through three major economic activity areas, namely Mining, Manufacturing and the production of Electricity (STLM, 2010).
Employment	The employment rate within the municipality is 80.3 %, with unemployment at

Aspect	Description
	19,7 % (Statistics South Africa, 2014).
Services	Only approximately eleven percent (11%) of rural households have adequate housing, piped water, and acceptable sanitation. In 2007, a total of 39 198 households receive the service of regular removal of refuse (STLM, 2010).

7.0 IMPACT ASSESSMENT

7.1 IMPACT ASSESSMENT METHODOLOGY

An impact is essentially any change to a resource or receptor brought about by the presence of the proposed project component or by the execution of a proposed project related activity. The purpose of impact assessment is to identify and evaluate the likely significance of the potential impacts on identified receptors and resources according to defined assessment criteria, to develop and describe measures that will be taken to avoid, minimise, reduce or compensate for any potential adverse environmental effects, and to report the significance of the residual impacts that remain following mitigation.

7.1.1 Defining the Nature of The Impact

The terminology used to define the nature of an impact is detailed in the table below.

Table 19: Impact Nature

Term	Definition
Positive (+)	An impact that is considered to represent an improvement on the baseline or introduces a positive change.
Negative (-)	An impact that is considered to represent an adverse change from the baseline or introduces a new undesirable factor.
Direct impact (D)	Impacts that result from a direct interaction between a planned project activity and the receiving environment/receptors (e.g., between occupation of a site and the pre-existing habitats or between an effluent discharge and receiving water quality).
Indirect impact (I)	Impacts that result from other activities that are encouraged to happen as a consequence of the Project (e.g., in-migration for employment placing a demand on resources).
Cumulative impact (C)	Impacts that act together with other impacts (including those from concurrent or planned future third-party activities) to affect the same resources and/or receptors as the Project.

7.1.2 Significance Rating System

The significance of potential impacts has been determined using the rating scheme as described below.

Significance of Environmental or Social Impact = Consequence x Probability

The consequence of an impact can be derived from the following factors:

Severity / Magnitude – the degree of change brought about in the environment
Reversibility - the ability of the receptor to recover after an impact has occurred
Duration - how long the impact may be prevalent
Spatial Extent - the physical area which could be affected by an impact.

The **severity, reversibility, duration, and spatial extent** are ranked using the criteria indicated in Table 20 and then the overall consequence is determined by adding up the individual scores and multiplying it by the **overall probability** (the likelihood of such an impact occurring). Once a score has been determined, this is checked against the **significance** descriptions indicated in Table 21.

Table 20: Ranking Criteria

Severity / magnitude (M)	Reversibility (R)	Duration (D)	Spatial extent (S)	Probability (P)
5 – Very high – The impact causes the characteristics of the receiving environment/ social receptor to be altered by a factor of 80 – 100 %	**5 – Irreversible** – *Environmental* - where natural functions or ecological processes are altered to the extent that it will permanently cease. *Social* - Those affected will not be able to adapt to changes and continue to maintain-pre impact livelihoods.	**5 – Permanent** - Impacts that cause a permanent change in the affected receptor or resource (e.g., removal or destruction of ecological habitat) that endures substantially beyond the Project lifetime.	**5 – International** - Impacts that affect internationally important resources such as areas protected by international conventions, international waters etc.	**5 – Definite** - The impact will occur.
4 – High – The impact alters the characteristics of the receiving environment/ social receptor by a factor of 60 – 80 %		**4 – Long term** - impacts that will continue for the life of the Project but ceases when the Project stops operating.	**4 – National** - Impacts that affect nationally important environmental resources or affect an area that is nationally important/ or have macro-economic consequences.	**4 – High probability** – 80% likelihood that the impact will occur
3 – Moderate – The impact alters the characteristics of the receiving environment/ social receptor by a factor of 40 – 60 %	**3 – Recoverable** *Environmental* - where the affected environment is altered but natural functions and ecological processes may continue or recover with human input. *Social* - Able to adapt with some difficulty and maintain pre-impact livelihoods but only with a degree of support or intervention.	**3 – Medium term** - Impacts are predicted to be of medium duration (5 – 15 years)	**3 – Regional** - Impacts that affect regionally important environmental resources or are experienced at a regional scale as determined by administrative boundaries, habitat type/ecosystem.	**3 – Medium probability** – 60% likelihood that the impact will occur
2 – Low – The impact alters the characteristics of the receiving environment/ social receptor by a factor of 20 – 40 %		**2 – Short term** - Impacts are predicted to be of short duration (0 – 5 years)	**2 – Local** - Impacts that affect an area in a radius of 2 km around the site.	**2 – Low probability** - 40% likelihood that the impact will occur
1 – Minor – The impact causes very little change to the characteristics of the receiving environment/ social receptor and the alteration is less than 20 %	**1 – Reversible** *Environmental* - The impact affects the environment in such a way that natural functions and ecological processes are able to regenerate naturally. *Social* - People/ communities are able to adapt with relative ease and maintain pre-impact livelihoods.	**1 – Temporary -** Impacts are predicted to be intermittent/ occasional over a short period.	**1 – Site only** - Impacts that are limited to the site boundaries.	**1 – Improbable** - 20% likelihood that the impact will occur

Table 21: Significance Definitions

Score According to Impact Assessment Matrix	Significance Definitions	Colour Scale Ratings	
		Negative Ratings	Positive Ratings
Between 0 and 29 significance points indicate **Low Significance**	An impact of low significance is one where an effect will be experienced, but the impact magnitude is sufficiently small and well within accepted standards, and/or the receptor is of low sensitivity/value.	**Low**	**Low**
Between 30 and 59 significance points indicate **Moderate Significance**	An impact of moderate significance is one within accepted limits and standards. The impact on the receptor will be noticeable and the normal functioning is altered, but the baseline condition prevail, albeit in a modified state. The emphasis for moderate impacts is on demonstrating that the impact has been reduced to a level that is As Low as Reasonably Practicable (ALARP). This does not necessarily mean that "moderate" impacts have to be reduced to "low" impacts, but that moderate impacts are being managed effectively and efficiently to not exceed accepted standards.	**Moderate**	**Moderate**
60 to 100 significance points indicate **High Significance**	An impact of high significance is one where an accepted limit or standard may be exceeded, or large magnitude impacts occur to highly valued/sensitive resource/receptors. An impact with high significance will completely modify the baseline conditions. A goal of the ESIA process is to get to a position where the Project does not have any high negative residual impacts, certainly not ones that would endure into the long term or extend over a large area. However, for some aspects there may be high residual impacts after all practicable mitigation options have been exhausted (i.e. ALARP has been applied). It is then the function of regulators and stakeholders to weigh such negative factors against the positive factors, such as employment, in coming to a decision on the Project.	**High**	**High**

7.2 IMPACT PER ENVIRONMENTAL ASPECT

The impacts are described per environmental aspect below. The impact significance is provided in Table 22.

7.2.1 Visual

The decommissioning and closure of the CDR facility will have a negative, short-term visual impact while the excavation process is underway. This impact is rated as moderate before and low after mitigation.

After rehabilitation of the CDR facility there will be a positive, permanent impact on the visual character of the immediate area, as the pre-disposal / natural topography will have been re-instated. This positive impact is rated as moderate with no mitigation required.

7.2.2 Land Use

The area where the CDR facility is located continues to form part of an active industrial site, and therefore the land use cannot be changed until such time that the entire MFC site is decommissioned and closed. For Option 1 and 3, the site will be rehabilitated to a state as natural as possible, and the pollution risk removed. This should enable improved functioning of the wetland system. This positive impact is rated as moderate with no mitigation measures required.

7.2.3 Ecology

The decommissioning activities may have a short-term negative impact on the established flora and fauna habitat on and around the CDR facility. The existing vegetation will be removed together with a 100 mm layer of topsoil (which will be disposed as waste as it may have been in contact with the waste). Topsoil will be sourced for rehabilitation. (Galago Environmental (b), 2012) states that the decommissioning could result in disturbance to the red listed African Grass-Owls, either during the breeding season or during the nonbreeding season when this species roost in the area. The area to be rehabilitated is situated to the south of the wetland area where the African Grass-Owls were found (Figure 19). This impact is rated as moderate before and low after mitigation.

The removal of the existing vegetation and failure to successfully revegetate the CDR area, may cause the establishment of invasive plants or weeds. This negative impact is rated as low before and after mitigation.

The area where the CDR facility is located, is important from an ecological point of view. By removing the waste and rehabilitating the area, the ecological functioning can be improved. This positive impact is rated as moderate with no mitigation measures required.

7.2.4 Surface Water

The decommissioning activities may have a detrimental impact on surface water by causing the mobilisation and deposition of sediments in the nearby Vaalbankspruit. This impact is rated as moderate before and low after mitigation.

7.2.5 Wetlands

The proposed removal of the CDR facility (Options 1 and 3) will have a positive impact on the wetland units identified during the assessment. The CDR facility is currently classified as a Type 3 waste and the removal of the waste will benefit the wetland units. The removal of the waste and rehabilitation of the area could improve the ecological state of the wetland units and water quality within the Vaalbankspruit. The impact is rated as moderate with no mitigation measures required.

The removal of waste will be done by heavy machinery and trucks that will haul the slimes to the existing slag dump facility within the MFC area. The trucks will use established roads that will cross the floodplain wetland however no negative impact is envisaged as the road is existing and currently in-use. It is however recommended that the road conditions crossing the wetland be monitored and maintained during the operational phase. This positive impact is rated as moderate with no mitigation required.

7.2.6 Groundwater

The decommissioning activities may have a detrimental impact on groundwater because of hydrocarbon spillages from vehicles and machinery. This impact is rated as moderate before and low after mitigation.

By removing the waste and rehabilitating the CDR area (Options 1 and 3), the potential of environmental risk to groundwater is removed. This positive impact is rated as moderate with no mitigation required.

7.2.7 Air Quality

The decommissioning and transportation of waste from the CDR facility to the on-site slag facility (Type 3 waste) and off-site disposal facility (Type 1 waste) will result in an increase of dust fallout rates, because the material will be liberated. This negative impact is rated as moderate before and after mitigation.

7.2.8 Noise

The decommissioning activities will involve the operation of vehicles and machinery and will have a short-term negative impact on noise. However, MFC being an active industrial site, the relative increase of noise from the trucks will be insignificant. This impact is rated as low before and after mitigation.

7.2.9 Traffic

The decommissioning activities will cause an increase in vehicular movement. Based on the tonnage of waste it is estimated that 35 truck loads will be removed per day. However, only a minority of trucks will contain Type 1 waste and move off-site. Assuming the Type 1 waste is 20%, this will be a maximum of 7 truckloads per day. This impact is rated as low with no mitigation possible.

7.2.10 Heritage

An exemption application for doing a Heritage Impact Assessment (HIA) and Paleontological Impact Assessment was undertaken by Heritage Contracts and Archaeological Consulting (HCAC) and Prof Marion Bamford in February 2021. Refer to Appendix J for the reports and response from the SAHRA.

7.2.11 Socio-Economic

The decommissioning activities will create opportunities for local contractors. This positive impact is rated as moderate with no mitigation measures required.

Table 22: Impact Significance

Project activity or issue	Potential impact	Option	Nature of impact		Significance before mitigation							Significance after mitigation as per EMP						
			+ /-	D/I/C	M	R	D	S	P	TOTAL	SP	M	R	D	S	P	TOTAL	SP
Visual																		
Decommissioning activities	Visual disruption (active working area)	1 & 3	-	D	3	1	1	1	5	30	M	2	1	1	1	5	25	L
Rehabilitation of CDR site	Reinstatement of pre-disposal / natural topography	1 & 3	+	D	4	1	5	1	5	55	M	4	1	5	1	5	55	M
Land use																		
Rehabilitation of CDR site	Change landuse from disposal site to more natural	1 & 3	+	D	3	1	5	1	5	50	M	3	1	5	1	5	50	M
Ecology																		
Decommissioning activities	Destruction of flora species and faunal habitat	1 & 3	-	D	4	1	1	2	4	32	M	3	1	1	2	4	28	L
Removal of existing vegetation	Increase of alien invasive species	All	-	I	2	1	3	1	3	21	L	2	1	3	1	2	14	L
Rehabilitation of CDR site	Return ecological functioning	All	+	I	4	3	5	2	3	42	M	4	3	5	2	3	42	M
Surface water																		
Decommissioning activities	Sediment mobilisation and deposition in watercourse	1 & 3	-	D	4	3	2	2	4	44	M	4	3	2	2	2	22	L
Wetlands																		
Rehabilitation of CDR site	Improve functioning of Vaalbankspruit wetland	1 & 3	+	I	4	3	5	2	3	42	M	4	3	5	2	3	42	M
Groundwater																		
Decommissioning activities	Hydrocarbon spills from vehicles and machinery	1 & 3	-	D	4	3	5	2	3	42	M	3	3	5	2	2	26	L
Rehabilitation of CDR site	Remove pollution source and risk to groundwater	1 & 3	+	I	4	3	5	2	4	56	M	4	3	5	2	4	56	M
Air quality																		
Decommissioning activities	Increase in dust fallout rates	1 & 3	-	D	4	3	2	2	3	33	M	2	1	2	1	5	30	M
Noise																		
Decommissioning activities	Increase in noise levels	1 & 3	-	D	2	3	2	1	3	24	L	2	3	2	1	3	24	L
Traffic																		

Project activity or issue	Potential impact	Option	Nature of impact		Significance before mitigation							Significance after mitigation as per EMP						
			+ /-	D/I/C	M	R	D	S	P	TOTAL	SP	M	R	D	S	P	TOTAL	SP
Decommissioning activities	Increase in vehicular movement	1 & 3	-	D	1	3	2	2	3	24	**L**	1	3	2	2	3	24	**L**
Heritage																		
No impacts are expected										0	L						0	L
Socio-economic																		
Decommissioning activities	Opportunities for local contractors	1 & 3	-	I	3	3	2	2	3	30	**M**	3	3	2	2	3	30	**M**

Table 23: Comparative Assessment of Alternatives

1 = Preferred; 3 = Least preferred

	Criteria	Options Considered			Discussion
	Aspect/ Impact	**Option 1** Removal as is to appropriate facilities	**Option 2** Keep CDR facility in-Situ	**Option 3** On-site treatment prior to disposal	
1	Visual impact	1	3	2	Option 1 and 3 would have a similar visual impacts after closure, as both these options will return the site topography to a more natural / pre-disposal state. Option 3 would be more disruptive and take longer to complete and is therefore rated higher. In the case of Option 2, the topographical landscape will remain in an altered state and it is therefore scored the highest.
2	Impact on land use	1	2	1	The area where the CDR facility is located continues to form part of an active industrial site, and therefore the land use cannot be changed until such time that the entire MFC site is decommissioned and closed. For Option 1 and 3, the site will be rehabilitated to a state as natural as possible and the pollution risk removed. This should enable improved functioning of the wetland system. Option 1 and 3 is therefore rated lower than Option 2 in which a natural landform will not be achieved.
3	Impact on ecology	1	2	1	The area where the CDR facility is located, is important from an ecological point of view (refer to Figure 6), although it is currently highly disturbed. By removing the waste and rehabilitating the area (Options 1 and 3), the ecological functioning can be improved.
4	Impact on surface water and Wetland	1	2	1	By removing the waste and rehabilitating the CDR facility (Options 1 and 3), the functioning of the Vaalbankspruit wetland will be improved.
5	Impact on groundwater	1	3	2	By removing the waste (Options 1 and 3), any potential environmental risk to groundwater is removed. Option 3 may lead to an increase of leaching from the slimes in the short term and is therefore rated higher. In the case of Option 2, the pollution source will not be removed and will continue to pose a risk to the groundwater system.
6	Impact on air quality	2	1	3	Option 2 would have the least impact on air quality, as there will not be

	Criteria	Options Considered			Discussion
	Aspect/ Impact	**Option 1** Removal as is to appropriate facilities	**Option 2** Keep CDR facility in-Situ	**Option 3** On-site treatment prior to disposal	
					disturbance to the material. For Options 1 and 3, the material will be removed and may cause liberation of dust. Option 1 is scored lower because the decommissioning period will be shorter and therefore, the potential air quality impact will be less.
7	Increase in noise levels	2	1	2	Option 2 would have the least impact on noise, as it will not require the operation of trucks. However, being an active industrial site, the relative increase of noise from the trucks will be insignificant.
8	Effect on roads due to project related traffic	2	1	2	Option 2 would have the least impact on traffic, as it will not require the operation of trucks. Based on the tonnage of waste it is estimated that 35 truck loads will be removed per day. However, only a minority of trucks will contain Type 1 waste and move off-site. Assuming the Type 1 waste is 20%, this will be a maximum of 7 truckloads per day.
9	Loss or damage to heritage and/or palaeontological resources	1	1	1	None of the proposed site options would interfere with known existing heritage resources.
10	Positive and negative socio-economic impacts	1	2	1	Option 1 and 3 will be most labour-intensive and could provide opportunities for local contractors.
	Total	**13**	**18**	**16**	**Option 1 is the preferred option**

8.0 MITIGATION MEASURES

Table 24 provides a list of the impacts identified as well as the possible management and mitigation measures. The level of residual risk after management or mitigation is also estimated.

8.1 SUMMARY OF FINDINGS AND IMPACT MANAGEMENT MEASURES FROM SPECIALIST REPORTS

The following specialist studies have been undertaken for the project:

- Galago Environmental and Yggdrasil Scientific Services (2012). Plant Ecological and Fauna Habitat Assessment of Samancor Middelburg Ferrochrome Terrain (set of reports)
- Delta H (2020). Geochemical Analysis and Waste Classification of the CDR Slimes (Middelburg Ferrochrome)

The full reports are attached as Appendix B and I hereto.
The recommendations from these reports are summarised in the sections to follow. These recommendations have also been incorporated into Table 24.

8.1.1 Recommendations from Ecology Specialist Studies

It should be noted that in 2012, MFC proposed to keep the CDR facility *in-situ*. However, MFC has subsequently decided to remove the CDR waste and rehabilitate the area completely.

From a plant ecological perspective, the following recommendations were made:

- Control alien and invasive species.
- Check drainage lines of the rehabilitated slimes dam to ensure that they are free draining and institute corrective action if unnecessary impoundment or scouring is identified.

From a faunal perspective, it is proposed that:

- A delineated area should be left undeveloped to act as suitable breeding and foraging habitat for African Grass-Owls and the African Marsh-Harriers (Figure 20).
- Heavy vehicles that transport topsoil to the slimes dam should stay clear of the sensitive wetland area and use the shortest route over the wetland as possible.
- Implement proper veld management practises with respect to grazing, burning and control of woody invasions.
- Disallow vehicles to move in or across the wet areas or drainage lines and possibly get stuck. This leaves visible scars and destroys habitat, and it is important to conserve areas where there are tall reeds or grass, or areas where there is short grass and mud.
- Prevent heavy machines and trucks from working close to the drainage lines.

8.1.2 Recommendations from Geochemical Study

Since no distinct layering could be associated with elevated Cr and Cr(VI) concentrations of the waste samples, there exist opportunity to classify the CDR slimes spatially during excavation of the material. It is recommended to:

- Distinguish the CDR slimes dam into waste Class C and Class A areas, based on a sampling grid using initially only total Cr as a criteria to flag areas of concern.

- A waste classification of the flagged areas should follow thereafter to confirm the classification. All Class A areas should then be excavated and disposed of at a licensed disposal facility. The remaining Class C areas material will be excavated and transported to existing plant (process) operations.
- Material should be excavated up to the (pre-deposition) host rock/soil.
- o Initiate soil sampling after removal of the CDR slimes material to assess potential secondary sources and apply a risk-based approach to advice on future remediation (if required).
- o The soil sampling results will be used to inform the further classification of the material and additional excavation specifications.

8.1.3 Recommendation from the Wetland Assessment

The following mitigation and monitoring recommendations are proposed for the removal of the CDR facility associated to the delineated wetlands areas:

- A 30m wetland buffer is recommended to the northern side of the Seep 1 wetland. Due to the limitation on the working corridor, it is recommended that the wetland buffer to the south and east of the CDR facility is demarcated by physical barriers next to the access roads around the CDR facility to ensure that no construction activities occur within the wetland areas. The current access roads serve as a natural buffer around the wetland.
- The access road to be used by the trucks hauling the CDR material to the existing slag facility needs to be monitored and maintained to ensure that the haulage will not impact on the floodplain wetland
- Surface water run-off from the CDR facility should be controlled and contained within the CDR return water dams during construction. No spillage or release from the return water dams should be allowed
- A rehabilitation / closure plan should be established and implemented to ensure that the area is rehabilitated to not impact on the wetland areas
- Trucks and heavy machinery should not be allowed to use any other access roads to cross the wetland area except for the existing road.

Table 24: Mitigation Measures and Residual Risk

Project activity or issue	Potential impact	Possible mitigation	Potential for residual risk
Visual			
Decommissioning activities	Visual disruption (active working area)	• Limit transformation only to demarcated footprints. • Plan excavation activities optimally so as to minimise decommissioning period.	L
Rehabilitation of CDR site	Reinstatement of pre-disposal / natural topography	• Undertake decommissioning activities in-line with approved closure and rehabilitation plan	None
Land use			
Rehabilitation of CDR site	Change land use from disposal site to more natural	• Undertake decommissioning activities in-line with approved closure and rehabilitation plan.	M
Ecology			
Decommissioning activities	Destruction of flora species and faunal habitat	• Undertake an ecological survey prior to the clearing and removal of topsoil. Relocate any flora and fauna species as determined by the ecologist to areas of safety where possible. • Avoid activities within demarcated no-go zones (Figure 20). • A delineated area should be left undeveloped to act as suitable breeding habitat for African Grass-Owls and the African Marsh-Harrier as shown in green hatch in Figure 19. This area should not be developed following the rehabilitation of the CDR. • Heavy vehicles that transport topsoil to the slimes dam should stay clear of the sensitive wetland area and use the shortest route over the wetland as possible. • Implement proper veld management practises with respect to grazing, burning and control of woody invasions. • Use only existing roads • Prevent heavy machines and trucks from working close to the drainage lines. • Disallow vehicles to move in or across the wet areas or drainage lines and possibly get stuck. This leaves visible scars and destroys habitat, and it is important to conserve areas where there are tall reeds or grass, or areas where there is short grass and mud. • Working corridors should be demarcated to ensure that activities are restricted to designated area • Disallow any open flames and extinguish veld fires as quickly as possible.	L

Project activity or issue	Potential impact	Possible mitigation	Potential for residual risk
		• Staff should undergo environmental awareness training	
Removal of existing vegetation	Increase of alien invasive species	• Develop and implement an alien plant control programme for the study area	L
Rehabilitation of CDR site	Return ecological functioning	• Undertake decommissioning activities in-line with approved closure and rehabilitation plan	None
Surface water			
Decommissioning activities	Sediment mobilisation and deposition in watercourse	• Demarcate the wetland areas during construction to ensure that no construction activities occur within these areas • Check drainage lines of the rehabilitated slimes dam to ensure that they are free draining and institute corrective action if unnecessary impoundment or scouring is identified. • Implement the stormwater management system recommended to attenuate flood peak events • Designate a re-fuelling area and disallow refuelling within close proximity to any watercourse • Store hazardous materials in a hazardous material zone with a bunded area. • Working areas should be demarcated clearly during construction	L
Rehabilitation of CDR site	Improve functioning of Vaalbankspruit wetland	• Undertake decommissioning activities in-line with approved closure and rehabilitation plan • Continue with monthly water quality monitoring and bi-annual aquatic biomonitoring	None
Wetlands			
Rehabilitation of CDR site	Improve functioning of Vaalbankspruit wetland	• Undertake decommissioning activities in-line with approved closure and rehabilitation plan • Continue with monthly water quality monitoring and bi-annual aquatic biomonitoring • Contain surface water runoff from the CDR facility within the return water dams during the construction phase • Keep within designated working areas and remain outside of buffer zones from delineated wetlands • Monitor and maintain access road that crosses the floodplain wetland	None
Groundwater			
Decommissioning activities	Hydrocarbon spills from vehicles and machinery	• Designate a re-fuelling area and disallow refuelling within close proximity to any watercourse. • Store hazardous materials in a hazardous material zone with a bunded area.	L
Rehabilitation of	Remove pollution	• Distinguish the CDR slimes dam into waste Class C and Class A areas, based on a sampling grid	None

Project activity or issue	Potential impact	Possible mitigation	Potential for residual risk
CDR site	source and risk to groundwater	using initially only total Cr as a criteria to flag areas of concern. • A waste classification of the flagged areas should follow thereafter to confirm the classification. All Class A areas should then be excavated and disposed of at a licensed disposal facility. The remaining Class C areas material will be excavated and transported to existing plant (process) operations. • Material should be excavated up to the (pre-deposition) host rock/soil. • Initiate soil sampling after removal of the CDR slimes material to assess potential secondary sources and apply a risk-based approach to advice on future remediation (if required). • The soil sampling results will be used to inform the further classification of the material and additional excavation specifications. • Adhere to appropriate waste management protocols for the removal and transportation of waste. • Continue with monthly water quality monitoring and bi-annual aquatic biomonitoring.	
Air quality			
Decommissioning activities	Increase in dust fallout rates	• Implement dust suppression systems in the form of appropriate covers during the excavation and transportation of the waste. • Ensure that workers are provided with and wear appropriate Personal Protective Equipment (PPE). • Ensure vehicles and machinery is in good working condition.	M
Noise			
Decommissioning activities	Increase in noise levels	• Plan excavation activities optimally so as to minimise decommissioning period. • Ensure decommissioning activities to daytime working hours of 8:00am and 17:00pm • Regular inspection and maintenance of equipment • Establish and maintain a complaint register.	L
Traffic			
Decommissioning activities	Increase in vehicular movement	• Plan excavation activities optimally so as to minimise decommissioning period.	L
Heritage			
No impacts are expected			None
Socio-economic			
Decommissioning activities	Opportunities for local contractors	• Use local contractors where possible.	None

9.0 ENVIRONMENTAL IMPACT STATEMENT

9.1 KEY FINDINGS

The key findings from this BA are:

1. The CDR waste is heterogenous in nature (both vertically and horizontally). This leads to variations in the classification of the waste type. Although the majority of the samples were classified as Type 3, some sections of the CDR facility area exceeded the LCT2 threshold for Cr(VI) and should be considered as Type 1 waste. The waste material must be conclusively screened (classified) on a grid base and handled according to the worst-case sample result.
2. The Type 3 waste will be disposed on the existing slag disposal facility at MFC. This facility is licenced to received Type 3 waste (Licence number 12 / 9 / 11 / L834 / 6). The trucks will make use of using existing roads.
3. The impounding walls of the slimes dam and the toe paddock bund walls will be dozed down over the area previously covered by CDR Slimes. The RWD and SWD will be left *in-situ*.
4. Once the waste has been removed, the site will be rehabilitated and revegetated with a seed mixture of *Hyparrhenia hirta*, *Themeda triandra* and *Imperata cylindrica*.
5. African Grass-Owl (*Tyto capensis*) was confirmed on site during the 2012 ecological survey. The site where they were observed roosting is shown in Figure 19.
6. Suitable habitat for two other Red Data avifauna species (African Marsh-Harrier (*Circus ranivorus*) and Lesser Kestrel (*Falco naumanni*) were confirmed during the 2012 ecological survey.

9.2 SITE SENSITIVITY AND NO-GO AREAS

Figure 19 provides a map that the superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the site indicating any areas that should be avoided, including buffers.

Figure 20 provides a map of no-go areas with two levels. Complete no-go areas (indicated in red) and areas in which no development should take place (indicated in green hatch).

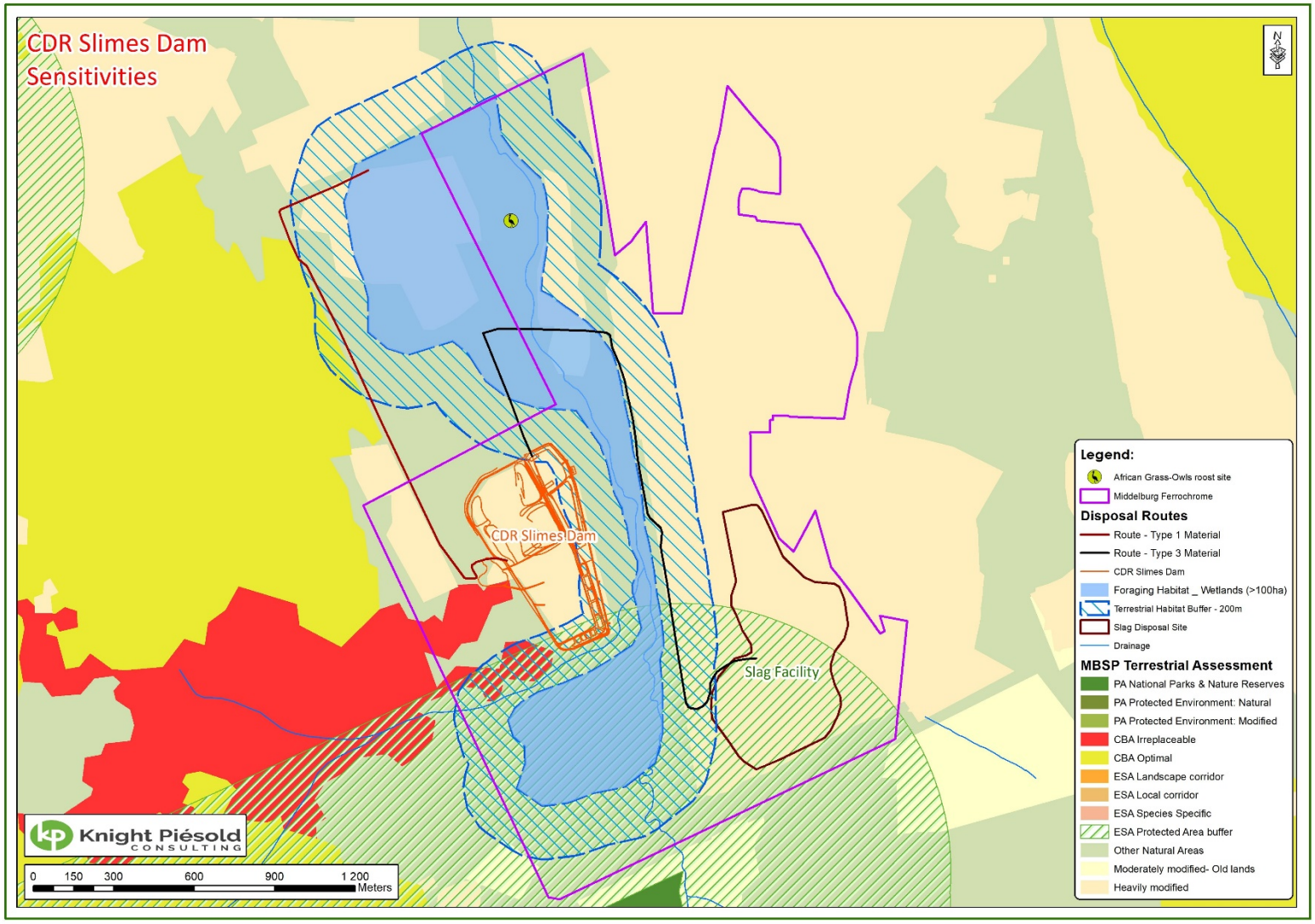

Figure 19: Site Sensitivities

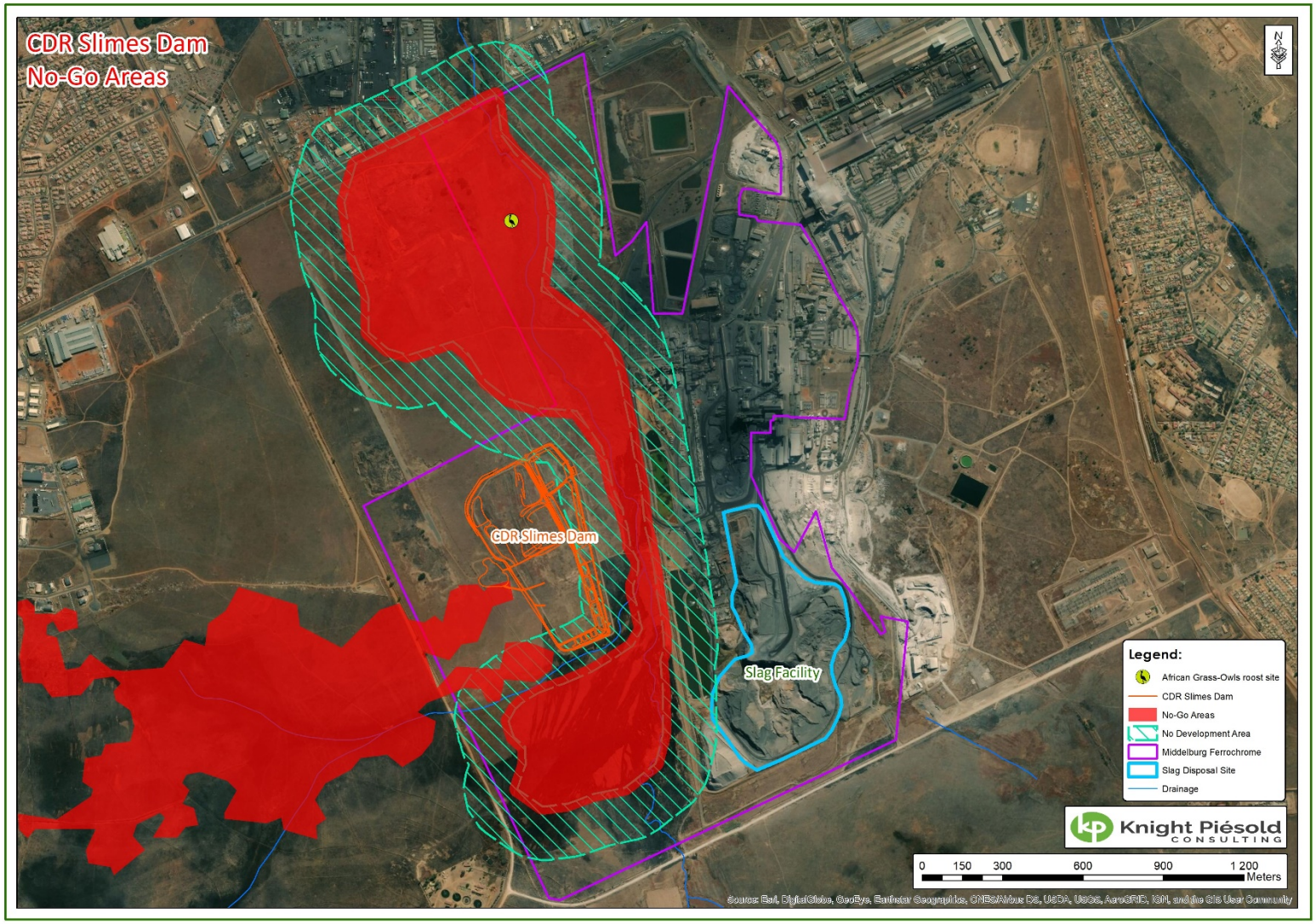

Figure 20: No-go Areas

9.3 SUMMARY OF POSITIVE AND NEGATIVE IMPACTS

Table 25 provides a short summary of the positive and negative impacts of the project.

Table 25: Summary of Positive and Negative Impacts

Positive Impacts	Negative Impacts
Reinstatement of pre-disposal / natural topography	Temporary visual impact (disruption) during decommissioning activities
Change land use from disposal site to more natural	Temporary destruction of flora species and faunal habitat
Return ecological functioning	Potential increase of alien invasive species
Improve functioning of Vaalbankspruit wetland	Short-term sediment mobilisation and deposition in watercourse
Remove pollution source and risk to groundwater	Potential hydrocarbon spills from vehicles and machinery
Work opportunities for local contractors	Temporary increase in dust fallout rates during decommissioning activities
	Temporary increase in noise levels during decommissioning activities

9.4 ASSUMPTIONS AND GAPS IN KNOWLEDGE

The following assumptions were made when conducting the BA:

- It is assumed that 20% of the total quantity of CDR slimes would be transported to a licenced landfill and 80% would be moved to MFC's slag dump. However, the exact ratio of waste types will be determined following the risk-based assessment.

9.5 EAP OPINION

Notwithstanding the assumptions provided above, the EAP is of the opinion that the information presented in various sections of this report, is adequate for the purposes of the current impact assessment.

Furthermore, the EAP is of the opinion that the positive impacts associated with the proposed decommissioning of the CDR facility will outweigh the negative impacts. The EAP therefore recommends that this WML be authorised.

10.0 PERIOD OF ENVIRONMENTAL AUTHORISATION AND MONITORING

It is estimated that the project to remove all contaminated material from site and rehabilitate the exposed area can be completed within a period of one year. Commencement of the decommissioning activity will depend on market conditions at the time.

It is proposed that vegetation monitoring should be undertaken for a period of five years after re-vegetation of the site. Vegetation maintenance and water quality monitoring should continue for the life of the facility.

11.0 FINANCIAL PROVISIONING

The estimated cost to carry out the scope of work as described above is R 80.23 million. This includes haulage of the Type 1 CDR slimes to a licensed landfill or dumping site based on the current rate of R 536.00 per tonne. For purposes of this estimate it has been assumed that 20% of the total quantity of CDR slimes would be transported to a licenced landfill and 80% would be moved to MFC's slag dump. The cost also includes the grid-based sampling and chemical analysis of the waste material as well as the hydroseeding of the site. The cost includes supply of material from commercial source because there is insufficient availability of material on the MFC plant.

This estimate is based on current contractor's rates in Middelburg and includes 25% Preliminary and General costs and a contingency of 5%.

12.0 UNDERTAKING BY THE EAP

I, **Tania Oosthuizen** , the Environmental Assessment Practitioner responsible for compiling this report, undertake that:

i. the information provided herein is correct

ii. the comments and inputs from stakeholders and I&APs have been correctly recorded

iii. information and responses provided to stakeholders and I&APs by the EAP is correct to the best of Knight Piésold's knowledge at the time of compiling the report

iv. the level of agreement with I&APs and stakeholders has been correctly recorded and reported.

Prepared:

Tania Oosthuizen, EAPASA, *Pr. Sci. Nat.*
Senior Environmental Scientist

Reviewed:

Neal Neervoort, *Pr. Sci. Nat.*
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Approval that this document adheres to Knight Piésold Quality Systems: T.M.O

13.0 REFERENCES

DEA. (2017). *Integrated Environmental Management Guideline on Need and Desirability.*

Delta-H. (2020). *Geochemical Analysis and Waste Classification of the CDR Slimes (Middelburg Ferrochrome).*

Department of Water Affairs and Forestry. (1996). *South African Water Quality Guidelines.*

DWAF. (1999). *Appendix W5: IER (Floodplain Wetlands) Determining the Ecological Importance and Sensitivity (EIS) and Ecological Management Class (EMC).*

EnviroNgaka. (2020). *August 2020 Dust Fallout Monitoring Results Report Samancor Middelburg Ferrocherome.*

Galago Environmental (a). (2012). *Mammal Habitat Assessment of Samancor Middelburg Ferrochrome Terrain.*

Galago Environmental (b). (2012). *Avifaunal Habitat Assessment of Samancor Middelburg Ferrochrome Terrain.*

Geo Pollution Technologies. (2012). *HYDROGEOLOGICAL REPORT FOR Samancor Chrome's 30CDR Slimes dam on the property Portion 280 of Portion 155 Middelburg town and Townlands no. 287 JS, Mpumalanga Province.*

Geofocus. (2021). *Middelburg Ferrochrome - CDR Slimes Geophysical Survey Report.*

Geofokus. (2021). *Middelburg Ferrochrome - CDR Slimes Geophysical Survey Report.*

Golder Associates Africa. (2018). *Samancor Chrome - Middelburg Ferrochrome. Integrated Geohydrology Study: Technical Report.*

HCAC. (2021). *Application for Exemption from a Heritage Impact Assessment for the proposed Decommissioning of the Chrome Direct Reduction (CDR) facility, Middelburg, Mpumalanga.*

Knight Piesold. (2021). *Proposed decomissioning of the CDR Facility. Wetland Delineation and Assessment Report.*

MPTA. (2014). *Mpumalanga Biodiversity Sector Plan.*

Samancor. (2018-2019). *Integrated Water and Waste Management Plan.*

Statistics South Africa. (2014). *Provincial Profile: Mpumalanga Census 2011.*

STLM. (2010). *Spatial Development Framework: Draft report.*

STLM. (2020). *IIntegrated Development Plan (IDP), 2017-2022 Cycle (2020/21).*

Yggdrasil Scientific Services. (2012). *Plant Ecological Report For the closure of the slimes dam (Samancor).*

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Project Number
RI 301-00183/40

Final Draft

PART B ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPR) AND CLOSURE PLAN

PROPOSED DECOMISSIONING OF CHROME DIRECT DUST (CDR) FACILITY

Rev	Description	Date
A	Issued in Draft	April 23, 2021
B	Issued in Final Draft	June 11, 2021

Knight Piésold CONSULTING

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TABLES

FIGURES

ABBREVIATIONS

BoQ ..... Bill of Quantities
CDR ..... Chrome Direct Dust
DEFF ..... Department of Environment Forestry and Fisheries
EAP ..... Environmental Assessment Practitioner
EIA ..... Environmental Impact Assessment
EMPr ..... Environmental Management Programme
EMS ..... Environmental Management Systems
I&APs ..... Interested and Affected Parties
MFC ..... Middelburg Ferrochrome
MS ..... Method Statement
MSDS ..... Material Safety Data Sheets
WML ..... Waste Management Licence
WMLO ..... Waste Management Licence Officer

1.0 INTRODUCTION

The Samancor Middelburg Ferrochrome (MFC) facility, situated in Middelburg, Mpumalanga, was established in 1964 to produce Ferrochrome for use in the production of steel.

A process known as Chrome Direct Reduction (CDR) was undertaken at MFC, whereby chrome ore is brought into contact with finely divided coal at high temperature. During the CDR process a dust is produced as waste, which is captured with water sprays producing a slimes material of high moisture content. In the 1990's to the year 2000, MFC disposed of this CDR dust, known as CDR slimes, at a constructed disposal area located to the west of the MFC production facility. The CDR Slimes facility is licensed in terms of water use 21 (g) of the National Water Act (NWA), and the facility has been out of commission since the year 2000.

MFC wishes to apply for the formal decommissioning / closure of this facility in line with legislation. There are no intentions to use the facility in the future.

This document represents Part B, the Environmental Management Programme (EMPr) and Closure Plan. It should be read with Part A, the Basic Assessment Report (BAR).

1.1 STRUCTURE OF THE REPORT

This document has been prepared in accordance with Appendix 4 and 5 of the Environmental Impact Assessment (EIA) Regulations. Table 1 provides a summary of the requirements, with cross references to the report sections where these requirements have been addressed.

Table 1: EMPr and Closure Plan roadmap as outlined in the 2014 EIA Regulations

Section	Description of EIA Regulations Requirements for EMPr and Closure Plan	Section of this Document
Appendix 4 (1)(a) Appendix 5 (1)(a)	Details of – the Environmental Assessment Practitioner (**EAP)** who prepared the report; and the expertise of the EAP, including a curriculum vitae.	Part A 3.0
Appendix 4 (1)(b)	a detailed **description** of the aspects of the activity that are covered by the EMPr as identified by the project description.	Part A 3.0
Appendix 5 (1)(b)	Closure objectives	2.0
Appendix 4 (1)(c)	a **map** 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 should be avoided, including buffers.	Figure 1
Appendix 4 (1)(d)	a description of the **impact management outcomes**, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including— (i) planning and design (ii) pre-construction activities (iii) construction activities	4.0 The project entails only a decommissioning and closure phase

Section	Description of EIA Regulations Requirements for EMPr and Closure Plan	Section of this Document
	(iv) rehabilitation of the environment after construction and where applicable post closure (v) where relevant, operation activities;	
Appendix 4 (1)(f)	a description of proposed impact management actions, identifying the manner in which the impact management outcomes contemplated in paragraph (d) will be achieved, and must, where applicable, include **actions** to— (i) avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation. (ii) comply with any prescribed environmental management standards or practices. (iii) comply with any applicable provisions of the Act regarding closure, where applicable. (iv) comply with any provisions of the Act regarding financial provision for rehabilitation, where applicable.	5.0 The project entails only a decommissioning and closure phase
Appendix 5 (1)(e)	information on any **proposed avoidance, management and mitigation measures** that will be taken to address the environmental impacts resulting from the undertaking of the closure activity	
Appendix 5 (1)(f)	a **description of the m**anner in which it intends to— (i) modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation during closure (ii) remedy the cause of pollution or degradation and migration of pollutants during closure (iii) comply with any prescribed environmental management standards or practices (iv) comply with any applicable provisions of the Act regarding closure;	5.2
Appendix 4 (1)(g)	the method of **monitoring** the implementation of the impact management actions contemplated in paragraph (f).	
Appendix 4 (1)(h)	the **frequency** of monitoring the implementation of the impact management actions contemplated in paragraph (f).	
Appendix 4 (1)(i)	an indication of the persons who will be **responsible** for the implementation of the impact management actions.	
Appendix 4 (1)(j)	the **time periods** within which the impact management actions contemplated in paragraph (f) must be implemented.	
Appendix 5 (1)(g)	**time periods** within which the measures contemplated in the closure plan must be implemented	
Appendix 4 (1)(k)	the mechanism for **monitoring compliance** with the impact management actions contemplated in paragraph (f);	6.0
Appendix 4 (1)(l)	a program for **reporting on compliance**, taking into account the requirements as prescribed by the Regulations	6.0
Appendix 4 (1)(m)	(m) an **environmental awareness plan** describing the manner in which—	0

Section	Description of EIA Regulations Requirements for EMPr and Closure Plan	Section of this Document
	(i) the applicant intends to inform his or her employees of any environmental risk which may result from their work (ii) risks must be dealt with in order to avoid pollution or the degradation of the environment	
Appendix 4 (1)(n)	any specific information that may be required by the competent authority.	N/A
Appendix 5 (1)(c)	proposed mechanisms for monitoring compliance with and **performance** assessment against the closure plan and reporting thereon	6.0
Appendix 5 (1)(d)	measures to **rehabilitate** the environment affected by the undertaking of any listed activity or specified activity and associated closure to its natural or predetermined state or to a land use which conforms to the generally accepted principle of sustainable development, including a handover report, where applicable	8.0
Appendix 5 (1)(h)	the process for managing any **environmental damage**, pollution, pumping and treatment of extraneous water or ecological degradation as a result of closure	N/A
Appendix 5 (1)(i)	details of all **public participation processes** conducted in terms of regulation 41 of the Regulations, including— (i) copies of any representations and comments received from registered interested and affected parties (ii) a summary of comments received from, and a summary of issues raised by registered interested and affected parties, the date of receipt of these comments and the response of the EAP to those comments (iii) the minutes of any meetings held by the EAP with interested and affected parties and other role players which record the views of the participants (iv) where applicable, an indication of the amendments made to the plan as a result of public participation processes conducted in terms of regulation 41 of these Regulations (j) where applicable, details of any financial provision for the rehabilitation, closure and on-going post decommissioning management of negative environmental impacts.	Part A 6.2

2.0 CLOSURE OBJECTIVES

The main objective of decommissioning and closure of CDR facility is to remove the risks to the environment caused by previous industrial activities and to restore land back to a satisfactory standard.

3.0 SITE SENSITIVITY AND NO-GO AREAS

Figure 1 provides a map that superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the site indicating any areas that should be avoided, including buffers.

Figure 2 provides a map of no-go areas with two levels. Complete no-go areas (indicated in red) and areas in which no development should take place (indicated in green hatch).

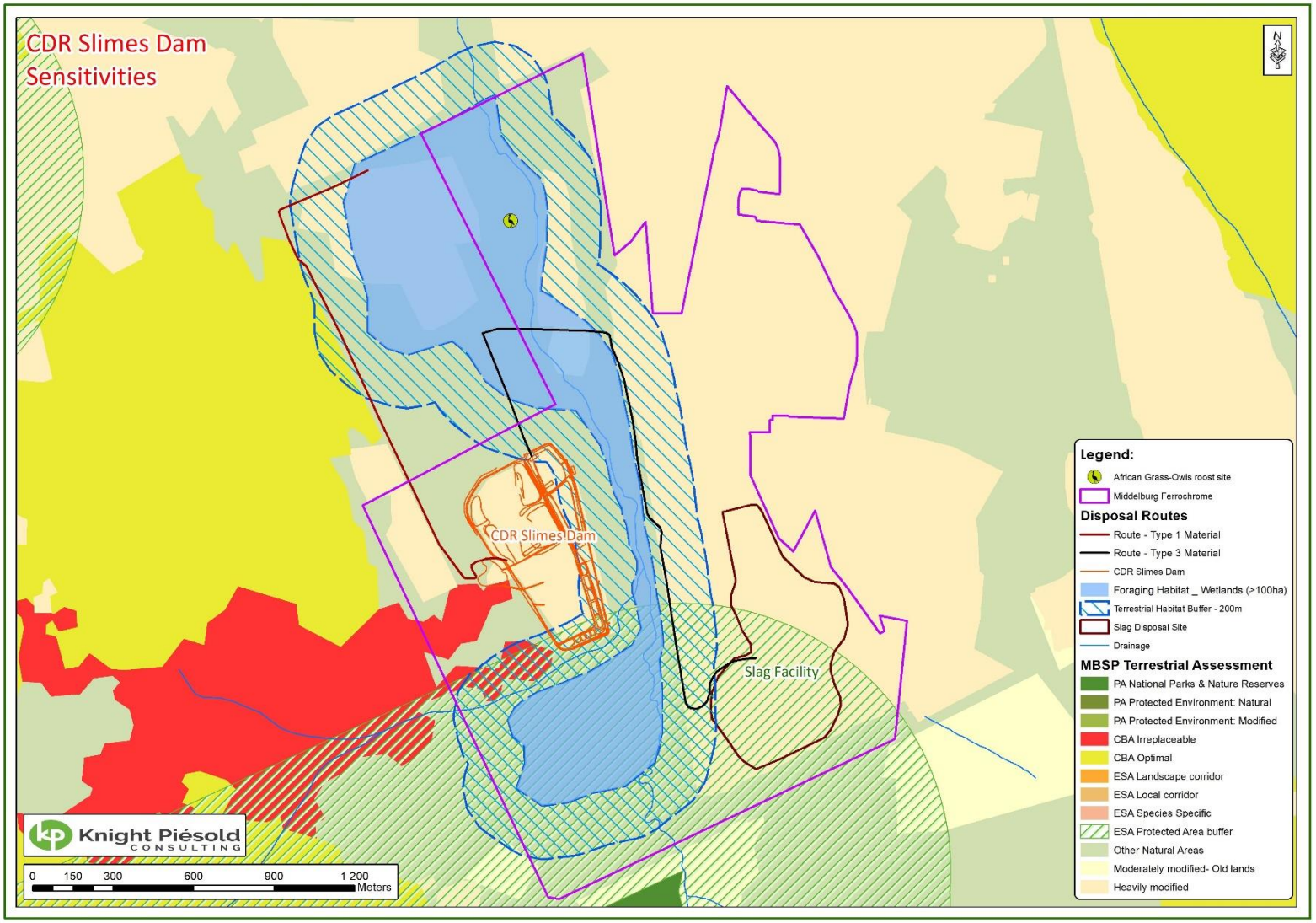

Figure 1: Site Sensitivities

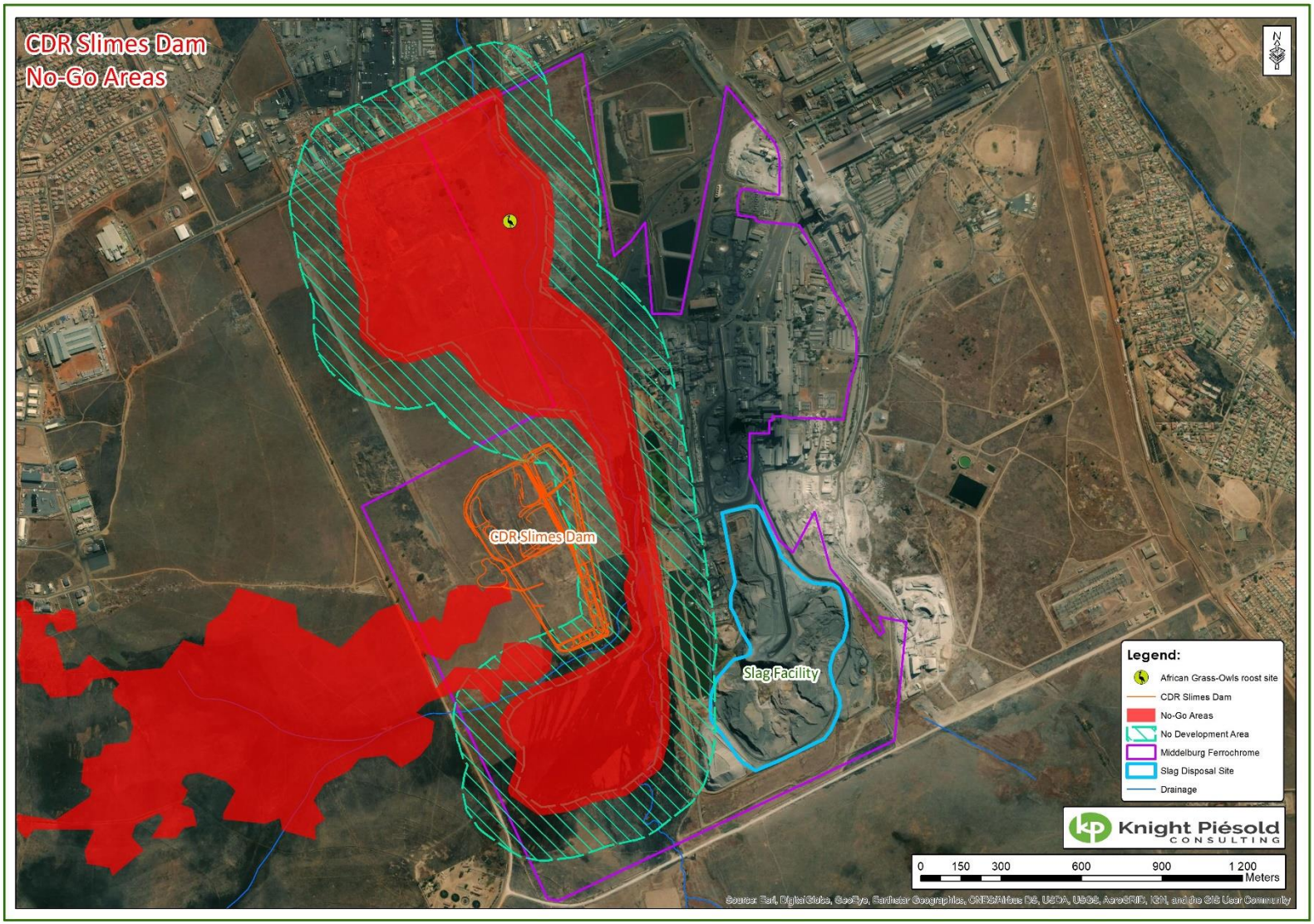

Figure 2: No-Go Areas

4.0 IMPACT MANAGEMENT OUTCOMES

Table 2 provides a description of the outcomes and objective of management actions in order to manage, remedy, control or modify potential impacts. The management actions identified to achieve these outcomes and objectives are described in Section 5.0.

Table 2: Description of Impact Management Outcomes

#	Activity	Potential impact	Aspects affected	Phase	Management actions type	Standard to be Achieved (Impact management outcome/objectives)
1	Decommissioning activities	Visual disruption (active working area)	Visual	Decommissioning	• Limit transformation only to demarcated CDR Slimes footprints. • Plan excavation activities optimally so as to minimise decommissioning period.	• To minimise visual disruption to neighbouring properties
2	Decommissioning activities	Reinstatement of pre-disposal / natural topography	Visual	Decommissioning	• Undertake decommissioning activities in-line with approved closure and rehabilitation plan	• To achieve pre-disposal, natural topography
3.	Rehabilitation of CDR site	Change land use from disposal site to more natural	Land-use	Decommissioning	• Undertake decommissioning activities in-line with approved closure and rehabilitation plan.	• To achieve more natural land-use
4.	Decommissioning activities	Destruction of flora species and faunal habitat	Ecology	Decommissioning	• Undertake an ecological survey prior to the clearing and removal of topsoil. Relocate any flora and fauna species as determined by the ecologist to areas of safety where possible. • Avoid activities within demarcated no-go zones, shown in red in Figure 2. • A delineated area should be left undeveloped to act as suitable breeding and foraging habitat for African Grass-Owls and the African Marsh-Harriers. Shown in green hatch in Figure 1. This area should not be developed following the rehabilitation of the CDR. • Heavy vehicles that transport topsoil to the slimes dam should stay clear of the sensitive wetland area and use the current crossing over the wetland. • Implement proper veld management practises with respect to grazing, burning and control of woody invasions. • Use only existing roads • Heavy machines and trucks should operate within the CDR footprint only.	• To avoid destruction of sensitive fauna and flora species

#	Activity	Potential impact	Aspects affected	Phase	Management actions type	Standard to be Achieved (Impact management outcome/objectives)
					• Working corridors should be demarcated to ensure that activities are restricted to designated area • Disallow any open flames and extinguish veld fires as quickly as possible. • Staff should undergo awareness training on the CDR Slimes environmental authorisation	
5	Removal of existing vegetation	Increase of alien invasive species	Ecology	Decommissioning	• Develop and implement an alien plant control programme for the study area	• To avoid the increase of alien invasive species
6.	Rehabilitation of CDR site	Return ecological functioning	Ecology	Decommissioning	• Undertake decommissioning activities in-line with approved closure and rehabilitation plan	• To improve the ecological functioning of the site
7.	Decommissioning activities	Sediment mobilisation and deposition in watercourse / wetland	Surface Water	Decommissioning	• A 30m wetland buffer is recommended to the northern side of the Seep 1 wetland. Due to the limitation on the working corridor, it is recommended that the wetland buffer to the south and east of the CDR facility is demarcated by physical barriers next to the access roads around the CDR facility to ensure that no construction activities occur within the wetland areas. • No go areas from the watercourse / wetland are shown in red in Figure 2. • Check drainage lines of the rehabilitated slimes dam to ensure that they are free draining and institute corrective action if unnecessary impoundment or scouring is identified. • Implement the stormwater management system recommended to attenuate flood peak events • Designate a re-fuelling area and disallow refuelling within close proximity to any watercourse • Store hazardous materials in a hazardous material zone with a bunded area and oil trap	• To avoid deterioration of surface water quality

#	Activity	Potential impact	Aspects affected	Phase	Management actions type	Standard to be Achieved (Impact management outcome/objectives)
					• Working areas should be demarcated clearly during construction	
8.	Decommissioning activities	Remove pollution source and risk to groundwater	Surface Water	Decommissioning	• Undertake decommissioning activities in-line with approved closure and rehabilitation plan • Continue with water quality monitoring and aquatic biomonitoring in line with water use licence.	To improve functioning of Vaalbankspruit wetland

5.0 IMPACT MANAGEMENT ACTIONS

Management actions identified to prevent, reduce, control or remedy the assessed impacts for the planning and design, construction, operational and decommissioning phase is presented in Table 3.

The action plans include the timeframes for implementing the management actions together with a description of how management actions comply with relevant standards. Management actions and recommendations identified by specialists have been summarised in the tables.

5.1 ADMINISTRATION AND REGULATION OF ENVIRONMENTAL OBLIGATIONS

5.1.1 MANAGEMENT STRUCTURE

Details of the management structure for the decommissioning phase are presented below. All official communication and reporting lines, including instructions, directives and information shall be channelled according to the organisational structure presented in Figure 3.

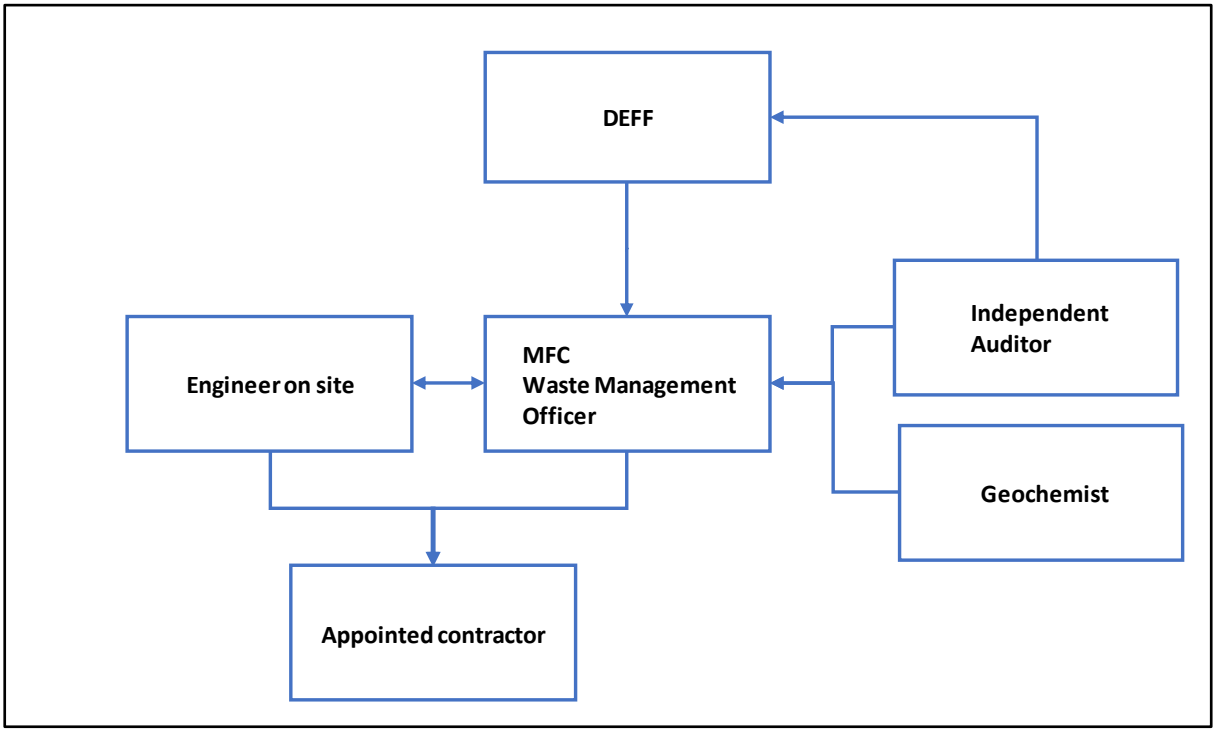

Figure 3: Decommissioning Phase Organisational Structure

5.1.2 ROLES AND RESPONSIBILITIES

The implementation of this EMPr requires the involvement of several stakeholders, each fulfilling a different but vital role to ensure sound environmental management during the planning and execution of the decommissioning project.

5.1.2.1 DEPARTMENT OF ENVIRONMENT, FORESTRY AND FISHERIES (DEFF)

The Department of Environment Forestry and Fisheries (DEFF) is the designated Competent Authority responsible for authorising this EMPr. The DEFF has the authority to enforce legal action if MFC does not comply with the relevant legislation, conditions of the Waste Management Licence (WML) and this EMPr.

The DEFF will need to approve any amendments to the project and may also perform inspections to assess compliance with the relevant legislation, the WML and the EMPr.

5.1.2.2 MFC

MFC is the applicant / developer and would ultimately be responsible for compliance with all conditions of the WML and EMPr. MFC is to:

- Implement all recommendations included in the EMPr that would minimise the total environmental impact of the decommissioning of the CDR facility
- Appoint required specialists (where relevant) to provide inputs as stipulated by the EMPr and WML
- Ensure that all relevant approvals and permits have been obtained prior to the start of construction activities on-site
- Ensure that the DEFF has been notified of the date on which decommissioning activities would be starting, prior to commencement of the activity
- Ensure that all conditions of approval have been complied with
- Appoint the Engineer, Geochemist and internal Waste Management Licence Officer (WMLO)
- Continuously seek to improve performance to minimise any negative environmental and social impacts and enhance the benefits which result from the operational phase.

5.1.2.3 ENGINEER

The Engineer shall oversee the decommissioning activities of the project. The on-site Engineer or Resident Engineer shall act as the on-site implementing agent.

The responsibilities of the Engineer will include the following:

- Ensure that the contractors contract contain relevant clauses requiring their compliance with this EMPr and all applicable environmental permits/ licences.
- Ensure that the requirements as set out in this EMPr and by the relevant Authorities are adhered to and implemented.
- Conduct regular site inspections
- Assist the WMLO in ensuring that the conditions of the EMPr are being adhered to and promptly issuing instructions requested by the WMLO, to the contractor. All site instructions relating to environmental matters issued by the Engineer are to be copied to the WMLO
- Assist the WMLO in making decisions and finding solutions to environmental issues that may arise during the decommissioning phase

- Review and approve construction Method Statements (MS) with input from the WMLO
- Recommend to MFC the issuing of fines for transgressions of the EMPr by the contractor
- Recommend to MFC the removal of person(s) and / or equipment not complying with the EMPr specifications
- Recommend to MFC delaying any activity if he/ she believes the integrity of the environment has been or is likely to be seriously jeopardised
- Provide input into the WMLO's ongoing internal review of the EMPr
- Monitor and verify that the EMPr and Method Statements are adhered to at all times and acting if specifications are not followed
- Keep a weekly photographic record of construction activities on-site
- Communicate any environmental issues to the WMLO.

5.1.2.4 GEOCHEMIST

A geochemist will be available to the project team to advise on sampling protocols and areas of concern for additional sampling.

5.1.2.5 WASTE LICENCE OFFICER

The WMLO will be a qualified and suitably experienced environmental specialist appointed by MFC to monitor the contractor's compliance objectively and regularly with the conditions of the WML issued and the approved EMPr. The WMLO shall undertake site inspections for the duration of the decommissioning project.

The WMLO's duties shall include, inter alia, the following:

- Implementing the WMLO responsibilities as outlined in the WML
- Implementing specific actions assigned to the WMLO in this EMPr
- Ensuring the necessary WMLs and permits, if any, have been obtained
- Advising the contractor and Engineer on environmental issues within defined construction areas
- Review all method statements by the contractor
- Undertake site visits to assess compliance with the EMPr and WML
- Keep a photographic record of progress on-site from an environmental perspective
- Develop and maintain a database of environmental incidents and non-compliances with the EMPr and to ensure that these are investigated and remediated within reasonable timeframes
- Report any significant environmental incidents to the DEFF
- Assist the Contractor and Engineer in finding environmentally acceptable solutions to issues
- Recommend additional environmental protection measures should this be necessary
- Provide a report back on the environmental issues at site meetings.

5.1.2.6 CONTRACTOR

The Contractor shall have the following responsibilities:

- To implement all provisions of the EMPr (if the Contractor encounters difficulties with specifications, they must discuss alternative approaches with the RE and the WMLO prior to proceeding)
- To ensure that all staff are familiar with the EMPr
- To monitor and verify that the environmental impacts are kept to a minimum

- To make personnel aware of environmental issues and ensure they show adequate consideration of the environmental aspects of the project
- To prepare the required method statements
- To report any incidences of non-compliance with the EMPr to the Engineer and WMLO
- To rehabilitate any sensitive environments damaged due to the Contractor's negligence (this shall be done in accordance with the Engineer's and WMLO's specifications).

Failure to comply with the EMPr may result in fines and reported non-compliance may result in the Engineer suspending the operation causing the non-compliance.

5.1.3 GRIEVANCE PROCEDURE

The existing grievance procedure should be reviewed and amended. The grievance procedure should be based on the following principles and commitments:

- It should be transparent
- It should seek to resolve all grievances timeously
- Full written records of each grievance case and the associated process of resolution, including the final outcome, should be maintained, and used to facilitate transparent, external reporting.

The grievance procedure should also:

- Require the development and maintenance of an up to date and comprehensive complaints register which would include the following information:
  - The date on which the complaint was raised or received
  - The name and contact details of the stakeholder/group who raised the complaint (if by group, then the names of all the group members should be included)
  - A brief description of the complaint
  - The manager responsible for the resolution of the complaint (dependent on the nature of the complaint); and
  - Due date for completion of the appropriate action, based on the time period specified in the procedure.
- The complaints register should also be updated with the following:
  - The date on which the action or decision was taken
  - All and any communication with the stakeholder (date, method, and purpose)
  - The person/s responsible for the action or decision
  - Nature of the action or decision
  - Date on which the complaint was escalated or finalised.

5.1.4 ENVIRONMENTAL AWARENESS TRAINING

Before the commencement of any work on-site, the Contractor's site management staff shall attend an environmental awareness training course, presented by the WMLO. No induction or course should be given until the Engineer has been afforded the opportunity to appraise it and provide comment.

The presentation shall be conducted in English. As a minimum, training shall include:

- Explanation of the importance of complying with the WML and EMPr
- Discussion of the potential environmental impacts of construction activities

- Explanation of the management structure of individuals responsible for matters pertaining to the EMPr.
- Employees' roles and responsibilities, including emergency preparedness
- Explanation of the mitigation measures that must be implemented when carrying out their activities
- Explanation of the requirements of the WML and EMPr.

The Contractor shall keep records of all environmental training sessions, including names of attendees, dates of their attendance and the information presented to them. Records of environmental training sessions shall be submitted to the Engineer and WMLO.

5.1.5 MEETINGS

The WMLO shall meet (or otherwise connect) with the Engineer and Contractor on a monthly basis, or more frequently as may be required during the initial stages of the project.

5.1.6 INSPECTION PROCEDURES

The regular monitoring and verification that the EMPr is being adhered to shall be undertaken by the Engineer and WMLO.

An audit by an independent auditor will be undertaken on an annual basis for a period of 5 years from the date of receipt of the environmental authorisation.

5.1.7 RECORD OF ACTIVITIES

The WMLO shall keep a record of activities on-site, including but not limited to:

- Meetings attended
- Site inspections
- Internal audits
- Monitoring results
- Method Statements
- Issues arising on-site, cases of non-compliance with the WML and EMPr
- Penalties issued
- Complaints received and corrective action taken; and
- Environmental incidents and corrective actions taken.

The Engineer shall undertake regular photographic monitoring of the site.

5.1.8 FINES

A system of fines/ contractual penalties shall be implemented to ensure compliance with the EMPr. Where the Contractor inflict damage on the environment or fail to comply with any of the environmental specifications of the WML or EMPr, they may be liable to pay a fine / incur penalties in terms of the contract. The Contractor is deemed to not have complied with the EMPr if:

- There is evidence of contravention of the EMPr specifications, including any non-compliance with an approved MS

- Construction activities take place outside the defined boundaries of the site
- Environmental damage ensues due to negligence
- The Contractor fails to comply with corrective or other instructions issued by the Engineer or WML within a specific time period
- The Contractor fails to respond adequately to complaints.

5.2 Decommissioning EMPr

The mitigation actions for the decommissioning and closure of the CDR are provided in Table 3.

Table 3: Management Measures/Plan

#	Aspect	Objective / Outcome	#	Mitigation and Management Actions	Responsible Parties	Compliance with Standards / Parameters for Monitoring	Time period for Implementation
1	Stakeholder engagement	Notify all registered Interested and Affected Parties of WML	1.1	Notify all registered I&APs and key stakeholders of the opportunity for appeal of the WML	EAP	Notices sent to relevant parties on the stakeholder database. List of those to whom it was sent on file.	Within 14 days from date of receipt of the WML
2	Permit requirements	Ensure that all relevant permits/ licences have been issued.	2.1	Meet all relevant legal requirements.	MFC Project Manager	Permits	Prior to and during decommissioning activities
3	Finalisation of EMPr	Update EMPr with WML conditions	3.1	Incorporate additional mitigation measures specified by DEFF in the WML into the EMPr	MFC Environmental Manager	EMPr	Prior to and during decommissioning activities
4	Authority notification	Notify DEFF of commencement date.	4.1	Notify DEFF prior to commencement of decommissioning activities	MFC Environmental Manager	Proof of communication	At least 14-days in advance of commencement of construction.
		Keep DEFF (Compliance Department) informed of any aspects of non-compliance with EMPr	4.2	Notify DEFF with reasons if any provisions of the EMPr or WML cannot be implemented, and provide alternative/s	MFC Environmental Manager	DEFF notification	Prior to decommissioning activities
		Keep DEFF informed of current contact details of applicant.	4.3	Notify DEFF of any change of contact details of the applicant	MFC Environmental Manager	DEFF notification	If and when required
		Keep DEFF informed of contact details of WMLO	4.4	Submit the name and contact details of the appointed WMLO prior to decommissioning activities	MFC Environmental Manager	DEFF notification	Prior to decommissioning activities
5.	Adherence to EMPr	EMPr included in Contractor(s) Contract	5.1	Include requirements of approved EMPr in all tenders for Contractor(s) and the adherence thereto must be written into the Contract.	MFC Environmental Manager	Proof of EMPr in Contract with Contractor	Prior to decommissioning activities
		Employees aware of environmental risks of their work	5.2	Ensure that all employees undergo awareness training on the CDR Slimes Environmental Authorisation and EMPr	Engineer, Contractor and WMLO	Training documentation and records	Prior to decommissioning activities
6	Subsidiary Plans	Develop Subsidiary Plans to minimise environmental and social risks	6.1	The following subsidiary plans should be developed prior to decommissioning activities: • Alien invasive and veld management plan • Archaeology - Chance find procedure	MFC Environmental Manager & Ecologist	Relevant Plans	Prior to decommissioning activities
7	Visual & Noise	To minimise visual and noise impact to neighbouring properties	7.1	Limit transformation only to demarcated footprints.	Contractor	Visual inspection	Throughout decommissioning process
8.	Visual, Noise & Traffic	To minimise the disturbance caused by the project	8.1	Plan excavation activities optimally so as to minimise decommissioning period.	Engineer and Contractor	Progress in relation to schedule	Throughout decommissioning process
9.	Visual, Land-use, Ecology, surface water	To achieve pre-disposal, natural topography, and land use	8.1	Undertake decommissioning activities in-line with approved closure and rehabilitation plan	Engineer and Contractor	Progress in relation to schedule and rehabilitation plan	Throughout decommissioning process
		To prevent impacts on wetlands	8.2	Use only existing roads	Engineer and Contractor	Visual inspection	Throughout decommissioning process
10.	Ecology	To avoid destruction of sensitive fauna and flora species	10.1	Undertake an ecological survey prior to the clearing and removal of topsoil.	MFC Environmental Manager & Ecologist	Proof that Ecological Survey was undertaken	Prior to decommissioning activities
			10.2	Relocate any flora and fauna species as determined by the ecologist to areas of safety where possible.		Proof that relocation process was undertaken	Prior to decommissioning activities

#	Aspect	Objective / Outcome	#	Mitigation and Management Actions	Responsible Parties	Compliance with Standards / Parameters for Monitoring	Time period for Implementation
			10.3	Avoid activities within demarcated no-go zones such as sensitive wetland areas and drainage lines.	Engineer and Contractor	Visual inspection	Throughout decommissioning process
			10.4	A delineated area should be left undeveloped to act as suitable breeding and foraging habitat for African Grass-Owls and the African Marsh-Harriers. Shown in green hatch in Figure 2. This area should not be developed following the rehabilitation of the CDR.	Engineer and Contractor	Visual inspection	Throughout decommissioning process
			10.5	Disallow any open flames and extinguish veld fires as quickly as possible.	Engineer and Contractor	Visual inspection	Throughout decommissioning process and ongoing
11.	Ecology	To successfully revegetate and maintain the rehabilitated area	11.1	Implement proper veld management practises such as grazing, burning and control of woody invasions to stimulate revegetation.	MFC Environmental Manager and WMLO	Visual inspection	Following revegetation of the rehabilitated CDR area and ongoing for life of MFC operations.
			11.2	Implement an alien plant control programme for the study area			
12.	Surface Water	To avoid deterioration of surface water quality			Engineer and Contractor	Visual inspection	During decommissioning activities
			12.1	Demarcate the wetland and buffer areas during decommissioning to ensure that no activities occur within these areas			
			12.2	Check drainage lines of the rehabilitated CDR area to ensure that they are free draining and institute corrective action if unnecessary impoundment or scouring is identified.			
			12.3	Implement the stormwater management system recommended to attenuate flood peak events			
13.	Surface and groundwater	To avoid deterioration of surface and groundwater quality	13.1	Designate a re-fuelling area and disallow refuelling within close proximity to any watercourse			
			13.1	Store hazardous materials in a hazardous material zone with a bunded area and oil trap.			
14.	Surface, groundwater, and aquatic environment	To monitor impacts to surface water and aquatic ecosystem	14.1	Continue with water quality monitoring and aquatic biomonitoring in terms of water use licence.	MFC Environmental Manager	Monitoring reports	Throughout decommissioning process and ongoing
15.	Air Quality	To prevent increase in dust fallout rates	15.1	Implement dust suppression systems and appropriate covers during the excavation and transportation of the waste where events of excessive dust generation is likely or occurring.	Engineer and Contractor	Visual inspection	During decommissioning activities
			15.2	Ensure that workers are provided with and wear appropriate Personal Protective Equipment (PPE).			
16.	Air quality & Noise	To prevent excessive emissions and noise from machines and vehicles in sub-optimal working condition.	16.1	Ensure vehicles and machinery is in good working condition.		Maintenance plan / records	
17.	Noise	To prevent increase in noise levels	17.1	Ensure decommissioning activities to daytime working hours of 8:00am and 17:00pm.	Engineer and Contractor	Visual inspection / complaints register	During decommissioning activities
		To ensure concerns of interested and affected parties are being attended to	17.2	Establish and maintain a complaint register.	Engineer and Contractor	Visual inspection / complaints register	During decommissioning activities

6.0 MONITORING

Environmental impacts requiring monitoring are listed in Table 4. It should be noted that the parameters, limits, frequency are based on MFCs existing Water Use Licence (WUL) 04/B12D/G/1193. Should amendments to the WUL occur, the monitoring programme in Table 4 should be adjusted accordingly.

As a general approach, MFC will ensure that the monitoring programmes comprise the following:

- A formal procedure
- Appropriately calibrated equipment
- Where samples require analysis, they would be preserved according to laboratory specifications
- An accredited, independent, commercial laboratory would undertake the sample analyses
- Parameters to be monitored should be agreed with the relevant authority
- If necessary, following the initial monitoring results, certain parameters may be removed from the monitoring programme in consultation with a specialist and/or the relevant authority
- Monitoring data would be stored in a structured database
- Data would be interpreted and reports on trends in the data would be compiled by an appropriately qualified person
- Both the data and the reports would be kept on record for the life of the operation

Table 4: Monitoring of Compliance and Performance in terms of the EMPr

<table>
<tr><th>No.</th><th>Activity</th><th>Impact requiring monitoring</th><th>Functional requirements for monitoring</th><th>Relevant Standards</th><th>Roles and responsibilities</th><th>Monitoring and reporting frequency and time period for management actions</th></tr>
<tr><td>1.</td><td rowspan="2">Decommissioning activities and rehabilitation of the CDR area</td><td rowspan="2">All impacts identified</td><td>Site inspection and verification of monitoring data against EMPr (including WML conditions). Include photographic record, incident register, complaints register.</td><td>EMPr</td><td>WMLO</td><td>Internal reports - Monthly</td></tr>
<tr><td>2.</td><td>Annual EMPr Compliance Audit</td><td>EMPr</td><td>Independent Auditor</td><td>External audit to DEFF - Annually</td></tr>
<tr><td>3.</td><td>Decommissioning activities and rehabilitation of the CDR area</td><td>Deterioration of groundwater quality</td><td>The table below provides the list of existing monitoring boreholes around the CDR facility that already form part of MFC’s groundwater monitoring programme. These are also represented spatially in Figure 4. The monitoring of these points should continue.
<table>
<tr><th>ID</th><th>Name</th><th>Longitude</th><th>Latitude</th></tr>
<tr><td>1</td><td>WD 1</td><td>29,486032</td><td>-25,807128</td></tr>
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<tr><td>4</td><td>WD 4A</td><td>29,486626</td><td>-25,806088</td></tr>
<tr><td>5</td><td>WD 4B</td><td>29,486606</td><td>-25,806079</td></tr>
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<tr><td>15</td><td>WD 6D</td><td>29,487271</td><td>-25,807684</td></tr>
<tr><td>16</td><td>WD 7</td><td>29,487416</td><td>-25,808866</td></tr>
<tr><td>17</td><td>WD 8</td><td>29,486996</td><td>-25,808642</td></tr>
<tr><td>18</td><td>WD 9</td><td>29,487951</td><td>-25,810444</td></tr>
<tr><td>19</td><td>WD 10</td><td>29,488295</td><td>-25,811715</td></tr>
<tr><td>20</td><td>WD 11A</td><td>29,486534</td><td>-25,805502</td></tr>
<tr><td>21</td><td>WD 11B</td><td>29,486534</td><td>-25,805502</td></tr>
<tr><td>22</td><td>WD 12A</td><td>29,486816</td><td>-25,806052</td></tr>
<tr><td>23</td><td>WD 12B</td><td>29,486856</td><td>-25,806043</td></tr>
<tr><td>24</td><td>WD 13A</td><td>29,487440</td><td>-25,807431</td></tr>
<tr><td>25</td><td>WD 13B</td><td>29,487440</td><td>-25,807431</td></tr>
<tr><td>26</td><td>WD 14A</td><td>29,487278</td><td>-25,806917</td></tr>
<tr><td>27</td><td>WD 14B</td><td>29,487278</td><td>-25,806917</td></tr>
<tr><td>28</td><td>WD 15A</td><td>29,486895</td><td>-25,805853</td></tr>
<tr><td>29</td><td>WD 15B</td><td>29,486905</td><td>-25,805853</td></tr>
<tr><td>30</td><td>WD 16A</td><td>29,487494</td><td>-25,806031</td></tr>
<tr><td>31</td><td>WD 16B</td><td>29,487494</td><td>-25,806058</td></tr>
<tr><td>32</td><td>WD 17A</td><td>29,487461</td><td>-25,805427</td></tr>
<tr><td>33</td><td>WD 17B</td><td>29,487461</td><td>-25,805427</td></tr>
<tr><td>34</td><td>WD 18A</td><td>29,487876</td><td>-25,806815</td></tr>
<tr><td>35</td><td>WD 18B</td><td>29,487946</td><td>-25,806806</td></tr>
<tr><td>36</td><td>WD 19</td><td>29,487853</td><td>-25,806039</td></tr>
<tr><td>37</td><td>H1</td><td>29,486263</td><td>-25,812435</td></tr>
<tr><td>38</td><td>H2</td><td>29,486273</td><td>-25,812435</td></tr>
</table></td><td>SANS 241:2015 guidelines as per table below.
<table>
<tr><th rowspan="2">Parameter</th><th colspan="4">SANS 241:2015</th></tr>
<tr><th>Acute</th><th>Chronic</th><th>Aesthetic</th><th>Operational</th></tr>
<tr><td>EC (mS/m)</td><td></td><td></td><td>170</td><td></td></tr>
<tr><td>pH</td><td></td><td></td><td></td><td>≥5 to ≤9.7</td></tr>
<tr><td>Ca (mg/l)</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Cl (mg/l)</td><td></td><td></td><td>≤300</td><td></td></tr>
<tr><td>N03 + NO2 (mg/l)</td><td></td><td></td><td>≤200</td><td></td></tr>
<tr><td>SO4 (mg/l)</td><td>≤500</td><td></td><td>250</td><td></td></tr>
<tr><td>Al (mg/l)</td><td></td><td></td><td></td><td>≤300</td></tr>
<tr><td>CrVI (mg/l)</td><td></td><td></td><td></td><td></td></tr>
<tr><td>F (mg/l)</td><td></td><td>≤1.5</td><td></td><td></td></tr>
<tr><td>Mn (mg/l)</td><td></td><td>≤400</td><td>≤100</td><td></td></tr>
<tr><td>Na (mg/l)</td><td></td><td></td><td>≤200</td><td></td></tr>
</table></td><td>MFC Environmental Manager</td><td>Quarterly</td></tr>
</table>

<table>
<tr><th>No.</th><th>Activity</th><th>Impact requiring monitoring</th><th>Functional requirements for monitoring</th><th>Relevant Standards</th><th>Roles and responsibilities</th><th>Monitoring and reporting frequency and time period for management actions</th></tr>
<tr><td></td><td></td><td></td><td>The parameters to be monitored are:
Electrical Conductivity
pH
Chemical Oxygen Demand
Fluoride
Sodium
Ammonia
Nitrate (as N)
Suspended solids
Temperature
Aluminium
Chromium VI (as Crvi)
Manganese
Sulphates
Chloride
Calcium</td><td></td><td></td><td></td></tr>
<tr><td>4.</td><td>Decommissioning activities and rehabilitation of the CDR area</td><td>Deterioration of surface water quality</td><td>The table below provides the list of existing surface water monitoring points that already form part of MFC’s surface water monitoring programme. These are also represented spatially in Figure 4. The monitoring of these points should continue.<table><tr><th>ID</th><th>Name</th><th>Latitude</th><th>Longitude</th></tr><tr><td>2</td><td>SPB</td><td>-25,79575922</td><td>29,48429924</td></tr><tr><td>3</td><td>SPC</td><td>-25,79770677</td><td>29,48522573</td></tr><tr><td>4</td><td>SPD</td><td>-25,80141572</td><td>29,48506968</td></tr><tr><td>5</td><td>SPE</td><td>-25,80367554</td><td>29,48689095</td></tr><tr><td>6</td><td>SPF</td><td>-25,80601132</td><td>29,48827791</td></tr><tr><td>7</td><td>SPG</td><td>-25,80887859</td><td>29,48902068</td></tr><tr><td>8</td><td>SPH</td><td>-25,81262292</td><td>29,48927005</td></tr><tr><td>9</td><td>SPJ</td><td>-25,81714687</td><td>29,48973066</td></tr><tr><td>10</td><td>SPK</td><td>-25,81954312</td><td>29,49089043</td></tr></table>The parameters to be monitored are:
Electrical Conductivity
pH
Sulphate
Chloride
Magnesium
Calcium
Nitrate
Fluoride</td><td>SANS 241:2015 guidelines as per table below.<table><tr><th rowspan="2">Parameter</th><th colspan="4">SANS 241:2015</th></tr><tr><th>Acute</th><th>Chronic</th><th>Aesthetic</th><th>Operational</th></tr><tr><td>EC (mS/m)</td><td></td><td></td><td>170</td><td></td></tr><tr><td>pH</td><td></td><td></td><td></td><td>≥5 to ≤9.7</td></tr><tr><td>Ca (mg/l)</td><td></td><td></td><td></td><td></td></tr><tr><td>Cl (mg/l)</td><td></td><td></td><td>≤300</td><td></td></tr><tr><td>N03 + NO2 (mg/l)</td><td></td><td></td><td>≤200</td><td></td></tr><tr><td>SO4 (mg/l)</td><td>≤500</td><td></td><td>250</td><td></td></tr><tr><td>Al (mg/l)</td><td></td><td></td><td></td><td>≤300</td></tr><tr><td>CrVI (mg/l)</td><td></td><td></td><td></td><td></td></tr><tr><td>F (mg/l)</td><td></td><td>≤1.5</td><td></td><td></td></tr><tr><td>Mn (mg/l)</td><td></td><td>≤400</td><td>≤100</td><td></td></tr><tr><td>Na (mg/l)</td><td></td><td></td><td>≤200</td><td></td></tr></table>Water Use Licence (WUL) specified standards:1
pH (6.68 pH units)
Electrical Conductivity (5.75 mS/m)
Chloride (8.8 mg/l)
Sodium (3,51 mg/l)
Calcium 4.73 (mg/l)
Nitrate 0.11 mg/l
Fluoride 0.22 mg/l</td><td>MFC Environmental Manager</td><td>Monthly</td></tr>
</table>

<table>
<tr>
<td>5.</td>
<td>Decommissioning activities and rehabilitation of the CDR area</td>
<td>Impact on aquatic ecosystems</td>
<td>Aquatic bio-monitoring is undertaken during the dry and wet season at the upstream and downstream monitoring points of the Vaalbankspruit, relative to the MFC operations. Monitoring points are provided below and represented spatially in Figure 6
<table>
<tr><th>Key</th><th colspan="2">Coordinates</th></tr>
<tr><td>Site 1</td><td>25°49'20.38"S</td><td>29°29'27.43"E</td></tr>
<tr><td>SWR 3</td><td>25°49'7.16"S</td><td>29°29'25.68"E</td></tr>
<tr><td>Z 08</td><td>25°48'51.37"S</td><td>29°28'55.62"E</td></tr>
<tr><td>Site 2B</td><td>25°48'5.64"S</td><td>29°29'7.99"E</td></tr>
<tr><td>Site 3A</td><td>25°47'40.14"S</td><td>29°29'1.95"E</td></tr>
</table></td>
<td>• In situ water quality
• Invertebrate Habitat Assessment System (IHAS)
• Aquatic Invertebrates
• Diatoms</td>
<td>MFC Environmental Manager</td>
<td>Monthly</td>
</tr>
<tr>
<td>6.</td>
<td>Decommissioning activities and rehabilitation of the CDR area</td>
<td>Increase in dust fallout rates</td>
<td>MFC undertakes monthly dust fallout monitoring at four sites as provided in table below and represented spatially in Figure 7.
<table>
<tr><th>Key</th><th colspan="2">Coordinates</th></tr>
<tr><td>MFC-3</td><td>25° 49' 2.719" S</td><td>29° 29' 29.479" E</td></tr>
<tr><td>MFC-4</td><td>25° 48' 32.18" S</td><td>29° 29' 14.341" E</td></tr>
<tr><td>MFC-5</td><td>25° 48' 9.112" S</td><td>29° 29' 1.439" E</td></tr>
<tr><td>MFC-7</td><td>25° 47' 41.561" S</td><td>29° 29' 0.179" E</td></tr>
</table></td>
<td>• National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) (NEM:AQA)
• National Dust Control Regulations, published in terms of NEM:AQA in Government Notice 827 of 2013</td>
<td>MFC Environmental Manager</td>
<td>Monthly</td>
</tr>
</table>

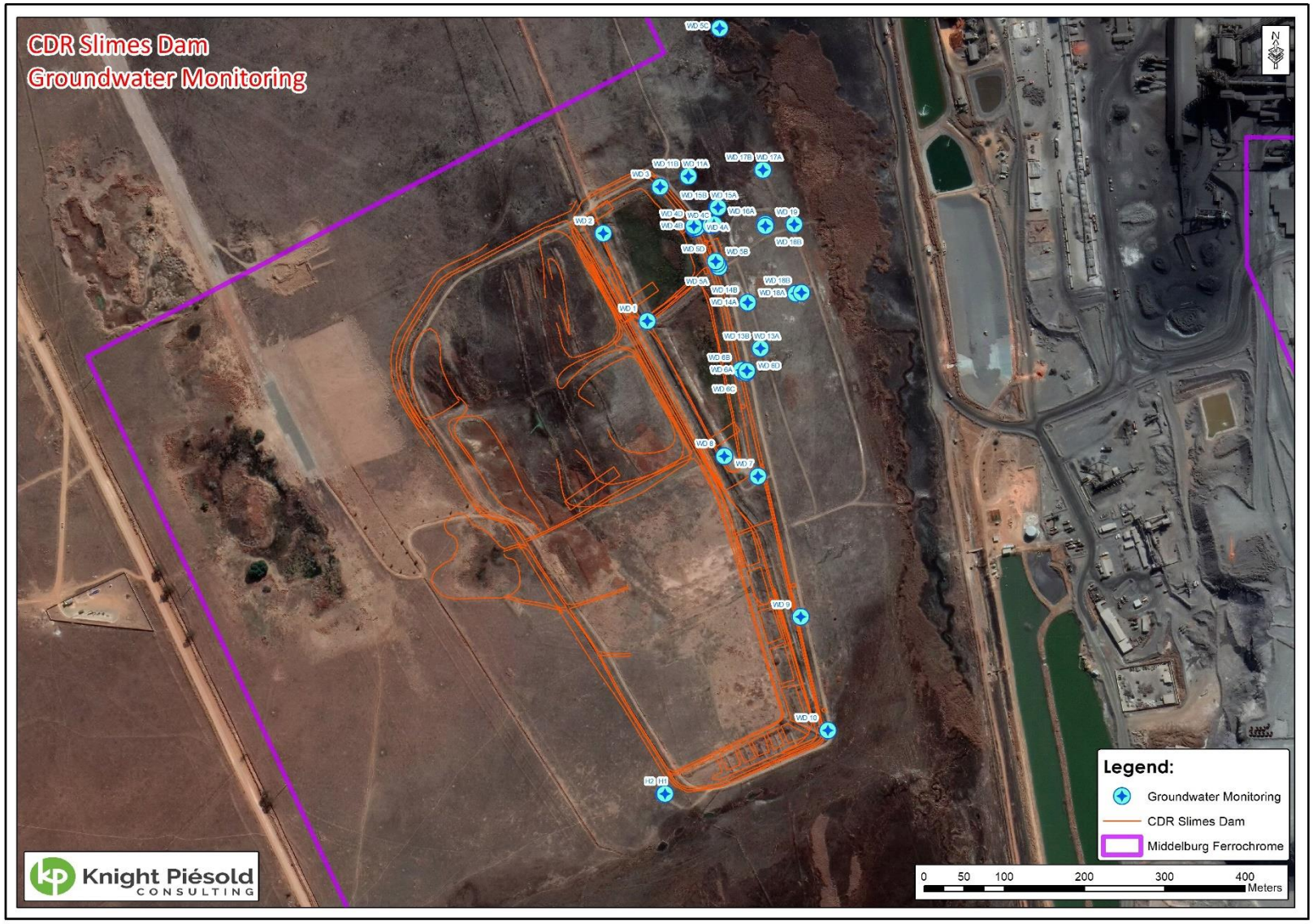

Figure 4: Groundwater monitoring points around CDR facility

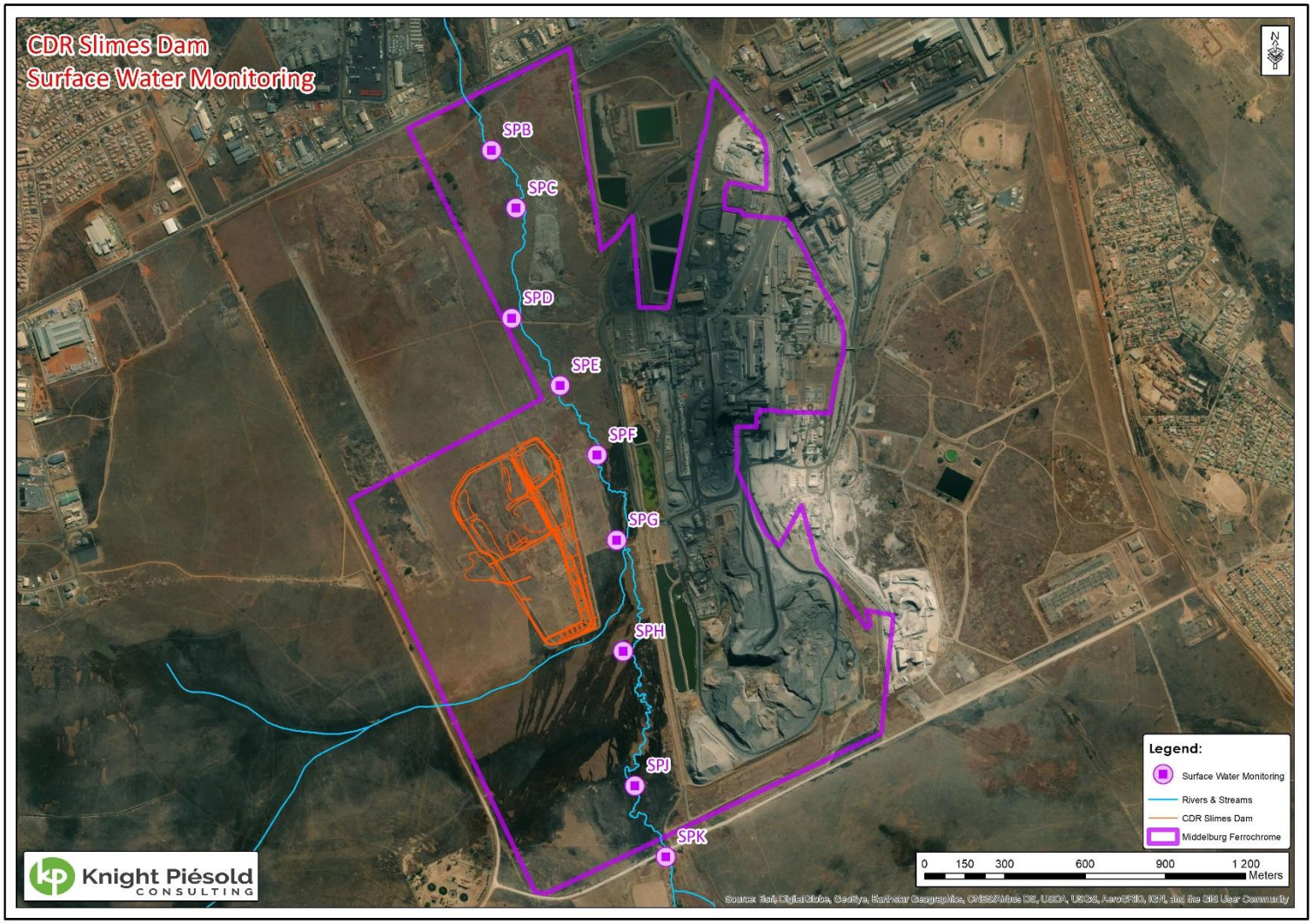

Figure 5: Surface water monitoring points

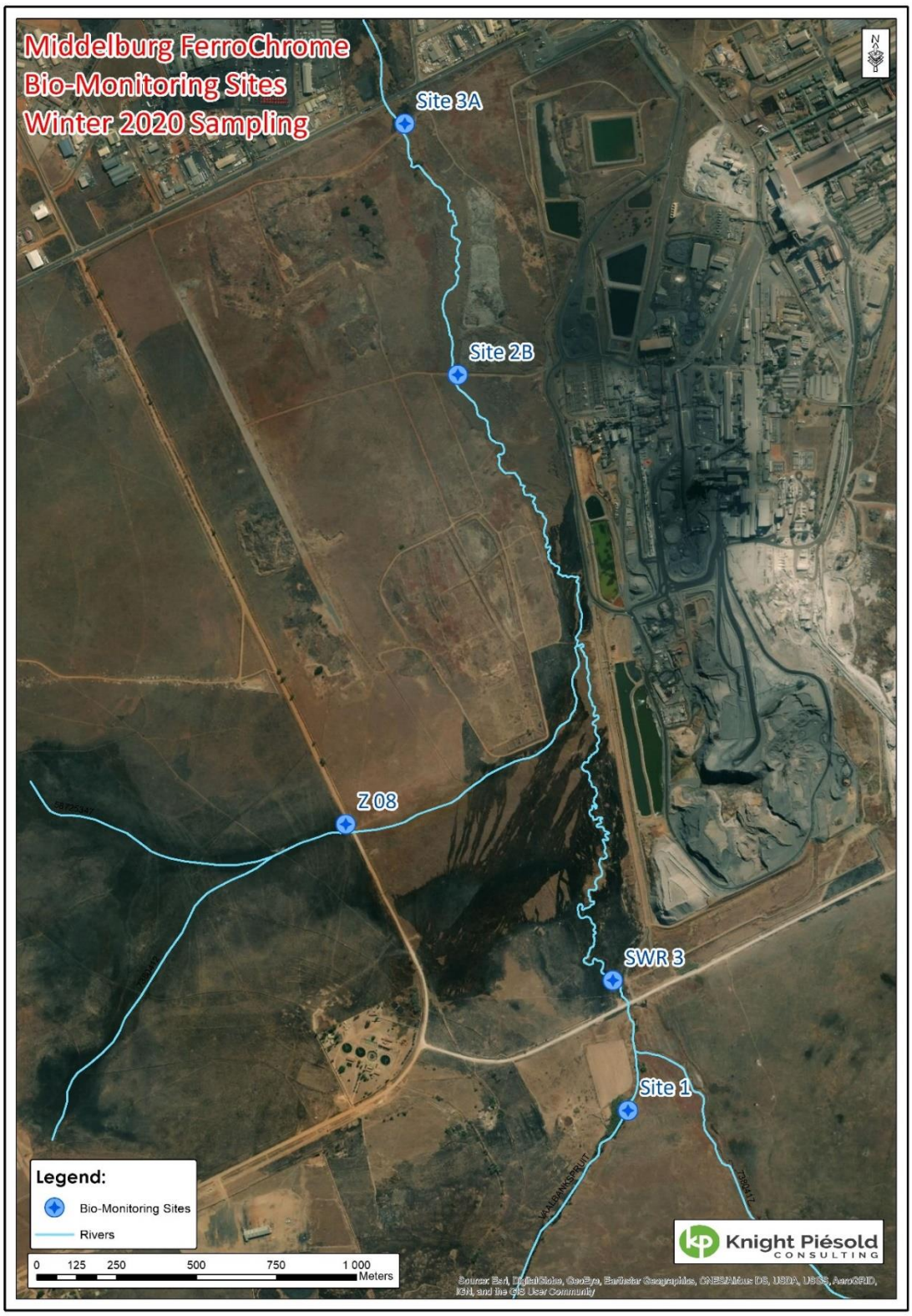

Figure 6: Aquatic monitoring points

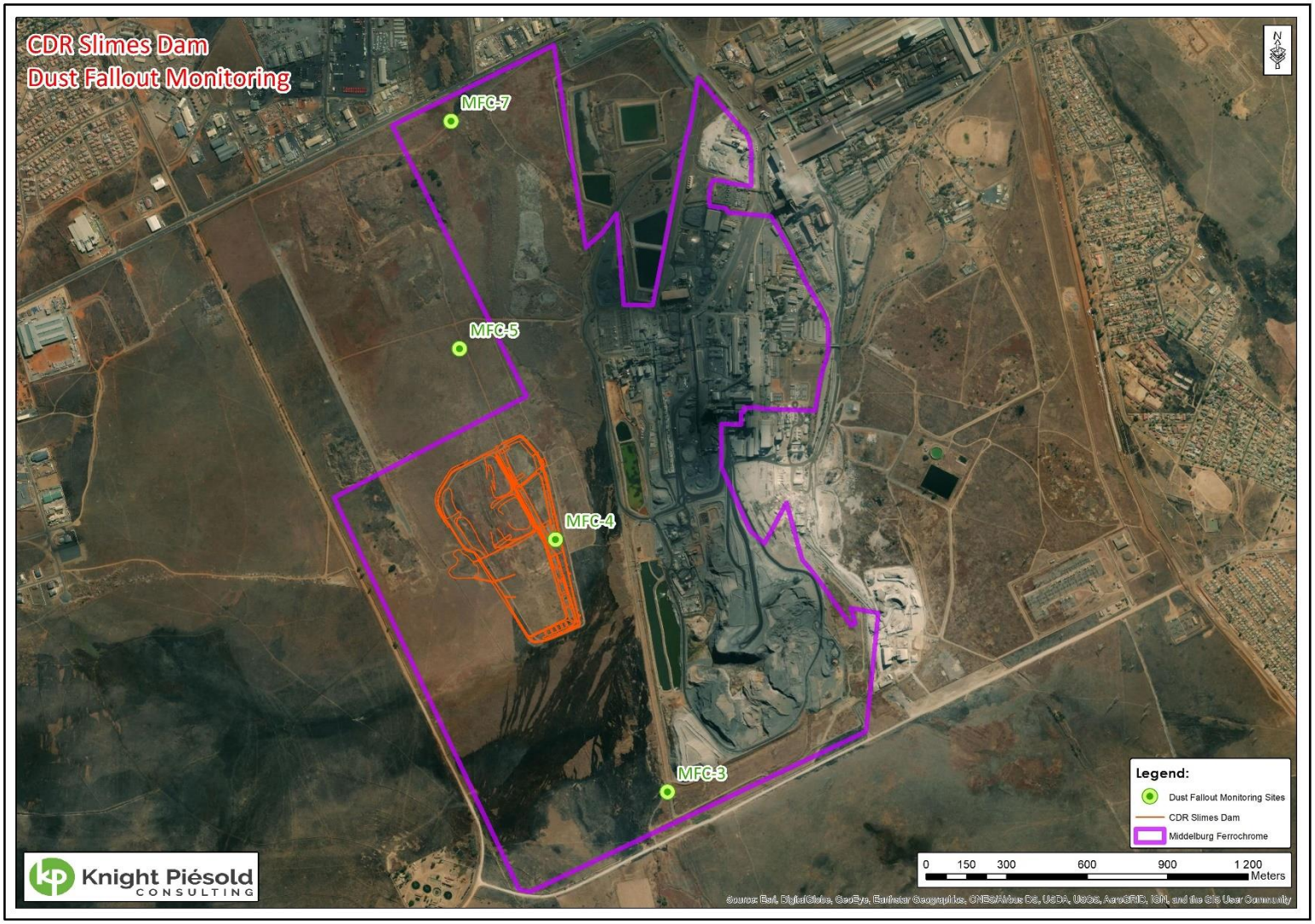

Figure 7: Dust fallout monitoring points

7.0 ENVIRONMENTAL AWARENESS PLAN

7.1 MANNER IN WHICH APPLICANT INTENDS TO INFORM EMPLOYEES OF THE ENVIRONMENTAL RISKS

The purpose of the Environmental Competence and Awareness Plan is to ensure that all personnel and management understand the general environmental requirements of the site. In addition, greater environmental awareness must be communicated to personnel involved in the decommissioning and closure of the CDR slimes dam which can have a significant impact on the environment. The aim is to ensure that the people involved are competent to carry out their tasks on the basis of appropriate education, training and/or experience. The objective of the Environmental Competence and Awareness Plan is to achieve environmental performance and fulfil compliance obligations by:

- Eliminating and/ or minimising environmental incidents
- Increase management and reaction of environmental incidents and audit results
- Increase awareness and knowledge on Environmental Management Systems (EMS)

The competence of employees to carry out their tasks is analysed by focussing on appropriate education, training and experience. In order to ensure that the relevant competence training is achieved the following requirements need to be met:

- Training needs for individuals to be identified
- A training plan and/ or programme needs to be developed to address identified needs
- Where training is conducted in-house a training delivery method must be in place.

The following sections look at the implementation of the Environmental Competence and Awareness Plan.

7.1.1 AWARENESS

Environmental awareness is a mine wide responsibility that is facilitated by the environmental unit. The following documents need to be communicated:

- Environmental Policy
- Significant aspects and related actual or potential impacts associated with a person’s tasks
- The contribution of an employee to the effectiveness of the EMS
- Implications of not conforming with the EMS and Compliance obligations.

7.1.2 TRAINING

The WMLO will be responsible for the development and updating of all environmental training material. Environmental training needs for each section are identified and addressed to ensure environmental management is part of day-to-day operations. The environmental risk responsibilities guide the training requirements of each individual based on their respective roles.

Records of all training attendance will be kept on-site.

7.1.3 MANNER IN WHICH RISKS WILL BE DEALT WITH TO AVOID POLLUTION OR DEGRADATION

The following aspects have the potential to become environmental emergencies and are addressed:

- Hydrocarbon spills
- Waste spills
- Other environmental emergencies requiring special services such as:
  - Power failures
  - Equipment malfunction
  - Site fires
  - Natural disaster such as a flash flood.

Emergency Management requires the following:

7.1.3.1 EMERGENCY PREVENTION

The emergency prevention procedures include:

- Manage Environmental Aspects to prevent emergencies
- Identification of Environmental Aspects (Risk Assessments) to prevent emergencies
- Training to prevent emergencies
- Managing incidents to prevent emergencies; and
- Maintenance of Equipment to prevent emergencies.

7.1.3.2 EMERGENCY PREPAREDNESS

Emergency preparedness is important for emergency management. The following on-site preparedness is required to minimize environmental impacts from potential emergency situations:

- The relevant Material Safety Data Sheets (MSDS) must be available, and the emergency response required on the MSDS should be implemented
- Spill kits must be kept on-site
- Maintenance of Emergency Preparedness Equipment:
- Equipment that is used to manage environmental emergencies needs to be monitored periodically for completeness, accessibility, operational condition and must be regularly maintained, to ensure the section is prepared for emergencies at any given time.
- Maintenance of Spill Kits include ensuring contents of the kit are replaced immediately after use and ensuring the kit is maintained and stored in a designated area accessible to all.

Potential emergency situations that have been identified for the proposed project are included in Table 5.

Table 5: Emergency Situations and Response

No.	Emergency Situation	Response in Addition to General Procedures
1	Contamination of surface water	• Personnel discovering the incident must inform their Supervisor of the location and contaminant source. • Absorbent booms will be used to absorb surface plumes of contaminants. • Contamination entering the surface water drainage system should be redirected into the dirty water system.
2	Groundwater contamination	• Investigate the source of contamination and implement control/mitigation measures.
3	Road traffic accidents (on- site)	• The individual discovering the accident (be it bystander or able casualty) must raise the alarm giving the location of the incident. Able personnel at the scene should shut down vehicles where it is safe to do so. • Access to the area should be restricted and access roads cleared for the emergency response team. • Vehicles must be made safe first by trained professionals (e.g. crushed or overturned vehicles). • Casualties will be moved to safety by trained professionals and provided with medical assistance. • Medical centres in the vicinity with appropriate medical capabilities will be notified if multiple seriously injured casualties are expected.

8.0 REHABILITATION MEASURES

The closure and rehabilitation of the CDR facility will also include the activities as described in Part A Section 3.

Table 6 provides provisional costs for post post-closure monitoring, most of which already form part of MFC's monitoring programme. It further includes an assessment of the vegetation cover establishment and site inspections by independent external consultants for an estimated period of 5 years.

The 5-year period is made up of decommissioning and rehabilitation of the site (1 year), active maintenance and aftercare (2 years) and passive maintenance and aftercare (2 years).

Table 6: Post-Closure Monitoring and Maintenance Costs

Description	Status	Period	Provisional Allowance
Surface and groundwater quality monitoring	Existing	Ongoing	R 0
Biomonitoring	Existing	Ongoing	R 0
Dust monitoring	Existing	Ongoing	R 0
Vegetation cover monitoring (5 years)	New	5 years	R 250 000

9.0 FINANCIAL PROVISION

The estimated cost to carry out the scope of work as described above is R 80.23 million. This includes haulage of the Type 1 CDR slimes to a licensed landfill or dumping site based on the current rate of R 536.00 per tonne. For purposes of this estimate it has been assumed that 20% of the total quantity of CDR slimes would be transported to a licenced landfill and 80% would be moved to MFC's slag dump. The cost also includes the grid-based sampling and chemical analysis of the waste material as well as the hydroseeding of the site. The cost includes supply of material from commercial source because there is insufficient availability of material on the MFC plant.

This estimate is based on current contractor's rates in Middelburg and includes 25% Preliminary and General costs and a contingency of 5%.

10.0 UNDERTAKING BY THE EAP

I, **Tania Oosthuizen** , the Environmental Assessment Practitioner responsible for compiling this report, undertake that:

i. the information provided herein is correct

ii. the comments and inputs from stakeholders and I&APs have been correctly recorded

iii. information and responses provided to stakeholders and I&APs by the EAP is correct to the best of Knight Piésold's knowledge at the time of compiling the report

iv. the level of agreement with I&APs and stakeholders has been correctly recorded and reported.

Prepared: 

Tania Oosthuizen, EAPASA, *Pr. Sci. Nat.*
Senior Environmental Scientist

Reviewed: 

Neal Neervoort, *Pr. Sci. Nat.*
Senior Environmental Scientist

Approval that this document adheres to Knight Piésold Quality Systems: T.M.O