mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

Environmental Impact Assessment And Environmental Management Plan

NEMA REGULATION 31 AMENDMENT REPORT

for Amendments to Licenced Activities Associated with the Sibanye-Stillwater Limited Cooke and Millsite Operations

SUBMITTED FOR ENVIRONMENTAL AUTHORISATIONS IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 (ACT NO. 107 OF 2008) (NEMA) AND THE NATIONAL ENVIRONMENTAL MANAGEMENT: WASTE ACT, 2008 (ACT NO. 59 OF 2008) (NEM:WA) IN RESPECT OF LISTED ACTIVITIES THAT HAVE BEEN TRIGGERED BY APPLICATIONS IN TERMS OF THE MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT, 2002 (ACT NO. 28 of 2008) AS AMENDED (MPRDA).

Name of Applicant:	Sibanye-Stillwater Rand Uranium Cooke Operations
Tel no:	011 278 900
Fax no:	011 278 9863
Postal Address:	Private Bag X5, Westonaria, 1780
Physical Address:	Libanon Business Park, 1 Hospital Street, Libanon, Westonaria
File Reference Number SAMRAD:	**GP 30/5/1/2/2 (173)**

This document has been prepared by Digby Wells Environmental.

Report Type:	**NEMA Regulation 31 Amendment**
Project Name:	**Amendment to Include Reclamation of Millsite TSF Complex into Cooke Operations**
Project Code:	**SIB4276**

Name	**Responsibility**	**Signature**	**Date**
Xanthe Taylor	Compilation		November 2017
Lucy Koeslag	Exco Review		December 2017

IMPORTANT NOTICE

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

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

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

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

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

OBJECTIVE OF THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

The objective of the environmental impact assessment process is to, through a consultative process: -

- determine the policy and legislative context within which the activity is located and document how the proposed activity complies with and responds to the policy and legislative context;
- describe the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location;
- identify the location of the development footprint within the preferred site based on an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment;
- determine the: -
  - nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives; and
  - degree to which these impacts: -
  - can be reversed;
  - may cause irreplaceable loss of resources, and
  - can be avoided, managed or mitigated.
- identify the most ideal location for the activity within the preferred site based on the lowest level of environmental sensitivity identified during the assessment;
- identify, assess, and rank the impacts the activity will impose on the preferred location through the life of the activity;
- identify suitable measures to manage, avoid or mitigate identified impacts; and
- identify residual risks that need to be managed and monitored.

EXECUTIVE SUMMARY

Introduction

Sibanye-Stillwater is the holder of two converted Mining Rights with reference numbers: GP 30/5/1/2/2 (173) MR and 30/5/1/2/2 (07) MR to mine gold, uranium, silver, nickel, sulphides and pyrite. Together these Mining Rights make up the Rand Uranium/Cooke Operations situated in Randfontein and Westonaria, in the West Rand District Municipality, Gauteng Province. The operations consist of underground shafts (Cooke 1, 2 and 3) as well as surface reclamation activities of residual gold from historic sand and slime tailings, namely Dump 20 and Lindum Dump. Sibanye-Stillwater intends to further extend the life span of its Rand Uranium/Cooke operation surface activities through toll treating of material containing gold at the Cooke Gold Plant as well as the reclamation of the Millsite Tailings Storage Facility (TSF) Complex which is located adjacent to its current Dump 20 operation and a decommissioned railway line berm that traverses the project area between the Cooke Shaft 3 and Dump 20. The Millsite TSF Complex consists of five TSFs; 38, 39, 40, 41 and Valley Dam.

Sibanye-Stillwater utilises the reprocessed tailings in the underground workings to improve geotechnical stability as well as to seal the mining voids of several open pits associated with the Cooke Operations. The use of the reprocessed tailings for stability and backfilling is approved in the Amendment to Rand Uranium's EMP for the Proposed Millsite Interim Disposal Component of the Cooke Uranium Project Pit Deposition (Permit 3a) (*Addendum to Clidet EMP*). Sibanye-Stillwater therefore requires an additional tailings resource to continue backfilling the historic final voids. The Millsite Complex consists of five tailings dams, and has been identified as a resource to be included for reclamation in the Cooke Operations. The Millsite Complex has previously been utilised as part of the Cooke Operations for the deposition of processed tailings residue and this activity was authorised under the Cooke Mining Right GP 30/5/1/2/2 (173) MR.

This report is in support of an application to amend the Cooke Operations Environmental Management Programme (EMP), titled *Clidet No 726 (Proprietary) Limited*, compiled by Shangoni Management Services (Pty) Ltd in March 2008. This amendment therefore includes the proposed reclamation of the Millsite Complex and the decommissioned railway berm for continued operations. This report adheres to the National Environmental Management Act, 1998 (Act No 107 of 1998) (NEMA) Environmental Impact Assessment (EIA) Regulation 982 (GN R 982[1]), promulgated on 08 December 2014, and specifically to the Regulation 31 Amendment process contained therein.

[1] Government Notice Regulation 982

Project applicant

Company name:	Sibanye-Stillwater
Contact person:	Lauren Dell
Physical address:	Libanon Business Park, 1 Hospital Street, Libanon, Westonaria
Telephone:	011 278 900
Cell phone:	-
Email:	lauren.dell@sibanyegold.co.za

Project overview

Sibanye-Stillwater's (formerly Sibanye Gold) Rand Uranium (Pty) Ltd has existing operations supplying its Cooke Plant with ore, both from reclaimed sand and tailings and fresh underground ore. This ore feed currently comes from reclamation of Dump 20 and Lindum Dump, as well as the Cooke Shafts 1, 2 and 3.

Gold mined from underground is currently treated on a toll basis at the Harmony Doornkop Gold Plant. Subsequent to being re-processed, approximately 86 400 m^3 of tailings material is backfilled into underground workings per annum to improve the geotechnical stability, and the remainder is placed into various open pits.

For the surface operations, Sibanye-Stillwater is currently reclaiming gold from Dump 20 which consists of a mixture of sand and slimes material. The project entails the mechanical reclamation of sand which is transported by train to the Cooke Plant as well as the hydraulic reclamation of the Dump 20 slimes tailings residue and hydraulic transportation of the mixture from the existing Dump 20 booster station to the existing Cooke Plant for gold recovery, via a dedicated pipeline. The resultant residue tailings are backfilled into several open cast mining pits, namely the Millsite, Battery 1 & 2, Porges, SRK 2 & 3 and Training open pits. Theses open pits formed part of the historical Lindum Reefs Operations which were previously dormant and required rehabilitation, which is approved under the Amendment to Rand Uranium's EMP for the Proposed Millsite Interim Disposal Component of the Cooke Uranium Project Pit Deposition (Permit 3a) (*Addendum to Clidet EMP*).

Currently, Dump 20 and Lindum Dump are being reclaimed and processed for extraction of the residual gold at the Cooke Plant. The Dump 20 resource is nearing its end and Sibanye-Stillwater now intends to reclaim the Millsite TSF Complex which is located adjacent to Sibanye-Stillwater's Water Treatment Plant and Dump 20. The focus of this document is on the inclusion of the Millsite TSF Complex and decommissioned rail berm into the existing Cooke Operations and the specific activities to be undertaken.

Purpose of this report

The purpose of this report is to amend the Clidet EMP (2008) to include the Millsite TSF Complex into the Cooke Operations mining schedule. This report presents the existing, approved activities and associated infrastructure pertaining to both the Cooke Operations and the Millsite TSF Complex. The Clidet EMP was approved in July 2009, and includes the following:

- Cooke Section;
- Old Randfontein Section;
- Lindum Reefs; and
- Old No. 4 dump at Ezulwini Shaft, and
- All associated mining and processing infrastructure; Under Lindum Reefs Porges SRK, CPS, Middelvlei Pits
- Open Pit Millsite
- Open Pit Middelvlei Rehab areas
- North Battery 1 and 2 Udder Old Randfontein Section Millsite Plant including U308 Plant
- Millsite Slimes Dams 38, 39, 40, 41
- Valley Slimes Dam
- Sand dump 20
- Core Yard Sand Dump
- Central Vent Rock Dump
- Hostel Rock Dump Footprint (2 North)
- Duck pond
- Tweelopies Spruit and Robertson Lake Under Cooke Section
- Cooke Plant, Cooke 1, 2, 3 -Shafts
- Cooke 3 Backfill Plant and associated Infrastructure

The Regulation 31 Amendment Process allows for an amendment to an existing authorisation provided no additional Listed Activities are triggered. All infrastructure required to facilitate the reclamation of the Millsite TSF Complex and transportation of the Millsite slurry for processing at the Cooke Plant is either approved (sections of pipeline need to be replaced) or in place and operational. The table below includes a list of all the EMPs associated with the Cooke Operations and the activities approved for each EMP.

Document Title	Activities
Dump 20	
Addendum to the Environmental Management Programme: Reclamation of Sand Dump 20 (formerly Clidet Operations)	▪ Two 10km pipelines (for process water and slurry) from site to Metallurgical Plant; ▪ Eskom-supplied electricity; ▪ Transportation of residue from metallurgical plant to Cooke TSF or Millsite Tailings Complex; ▪ Operation of existing storm water infrastructure as well as the construction and operation of clean and dirty water separation at the reclamation site; ▪ Operation of solution trenches at Cooke and Millsite TSFs; ▪ Construction and operation of solid waste facilities for management of domestic, industrial and hazardous waste; ▪ Construction and operation of waste water management facilities including portable toilets, pollution control dams / paddocks / evaporations dam, and discharge or disposal of water or effluent; ▪ Potable water supply from Rand Water Board reticulation system; ▪ Process water from Cooke Shaft fissure water and TSF return water; ▪ Processing Dump 20 material at Cooke Plant; and ▪ Construction and operation of booster pump with a footprint of 1,134m^2.
Clidet No 726 (Proprietary) Limited Environmental Management Plan	No new activities.

Document Title	Activities
Lindum Operation	
Addendum to EMPR to Crushing of Lindum Overburden Dumps	▪ Loading and hauling; ▪ Crushing and screening; ▪ Stockpiling; ▪ Dispatch; ▪ Water management on site; ▪ Power supplied by Eskom; ▪ Maintenance activities; ▪ Fuel / diesel storage; ▪ Sanitation; and ▪ Waste management.
Amendment of the EMP for the Proposed Reclamation of the Lindum TSF	▪ Construction and operation of sump (to contain 10,136.5m^3), berms and trenches; ▪ Hydraulic reclamation of Lindum TSF at 60,000 tonnes per month; ▪ Slurry pumped through existing 200mm pipeline to Cooke plant; ▪ Potable and process water pipeline; ▪ Tailings deposited initially on Cooke TSF, currently into open pits; ▪ Process water sourced from excess fissure water at Cooke Shafts and return water from TSFs and pits;

Document Title	Activities
	▪ 5km access road from Lindum TSF to Cooke plant; ▪ Electricity from mine substation via 6.6kV line; ▪ Solid industrial waste collected at Cooke 2 salvage yard; ▪ Screened waste either disposed on Lindum TSF (plant material), in adjacent pits or licenced waste disposal facility; ▪ Portable toilets on site; and ▪ Steel process waster surge/holding tank on site.
EMPR Alignment with New Minerals and Resources Development Act with Regards to the Railway Extension	▪ Transport material from Dump 20 to Cooke plant via rail; ▪ Operation of a railway loop 536m long and 204m loop; ▪ Drainage pipes along the track area; ▪ Stormwater drainage; ▪ Shaping of high walls as per specification; ▪ Mining in south-easterly direction; and ▪ Relocation of loading zone.
Cooke Uranium Project	
EIA for the Proposed Uranium Plant And Cooke Dump Reprocessing Infrastructure	▪ Hydraulic reclamation and processing of Cooke dump to feed to uranium plant; ▪ De-capping Cooke dump (Dump 20 tail sands removal); ▪ Uranium plant with two boilers;

Document Title	Activities
	▪ Water recovery from uranium plant for re-use in slurrying process; ▪ 20,000 m^3/day water to convey tonnages; ▪ Water storage facility north of Cooke Dump to receive mine water Cooke Shafts 1, 2 and 3, and return water from uranium and gold plants; ▪ Process water will consist of water from the re-slurried tailings; mine water from the Cooke mines will be used as make-up water for the slurrying of tailings; ▪ Clean/demineralised water for the more sensitive chemical sections of the plant. A water treatment plant will provide water at the required standards; ▪ Centralised cooling towers and a centralised cooling waste water distribution system will be installed; clean demineralised water will be used as make-up water in this circuit; ▪ Vegetated berms, and drains; ▪ Bunded storage areas; ▪ Clean run-off into the natural environment; ▪ Acid plant; ▪ Pipelines between Millsite TSF and open pits; ▪ Pipelines to link Cooke Dump to plants; and ▪ Sewage linked to existing infrastructure at Cooke Gold Plant.
EIA for the Proposed Pyrite Storage Facility (PFS)	▪ Hydro-sluicing method; ▪ Stormwater management at facility must accommodate 1:200 year 24 hour rainfall event (204.5mm/d); ▪ Pyrite holding capacity 134,990m^3;

Document Title	Activities
	▪ Process and potable water pumped form uranium plant (includes booster pump); ▪ Thickened pyrite to either feed acid plant or be stored temporarily in pyrite storage facility; ▪ The walls of each of the modules will be approximately 12m high and 10m wide. The internal dimensions of each module approximately 145m x 145m and the operating volume of each module will be in the order of 200 000m³; ▪ Temporary subsoil and topsoil from uranium plant stored in berms around PFS and uranium plant; ▪ Portion of stockpile material used to backfill bunker walls if subsoil geotechnical characteristics are suitable; ▪ Triple liner system to prevent leachate; ▪ Acid used to leach uranium; and ▪ Access road via existing road which connects to R559.
Amendment to Rand Uranium's EMP for the Proposed Millsite TSF	▪ Existing 400mm diameter pipeline to pump tailings from Cooke plant to Dump 20 BPS; ▪ Pumping system to pump return water back to reservoir at Dump 20 BFS, then to Cooke Plant and uranium plant for reuse; ▪ Replacement 450mm pipelines from Cooke Plant to Dump 20 BPS; ▪ Additional 400mm diameter pipeline from Dump 20 BPS to Millsite TSF; ▪ Return water from Millsite TSF to gravitate to existing return water dam north of Millsite TSF; and ▪ Balance of monthly processed tailings disposed of in open cast mining pits.
Amendment to Rand Uranium's EMP for the Proposed Millsite Interim	▪ Pit deposition in order: Millsite, Battery 1, Battery 2; Training Centre Pit; SRK 2, SRK 3; RTR North; RTR South, Porges Main and Stubbs.

Document Title	Activities
Disposal Component of the Cooke Uranium Project Pit Deposition (Permit 3a)	▪ Pipeline to each pit teeing off from tailings pipelines; ▪ Ring feed around pits; ▪ Cushion layer in pits from inert Cooke cap material, ▪ Catenary geofabric nets placed above cushion layer; and ▪ Tailing placed at 250ktpm, density of 1.5t/m^3.
Geluksdal Operation	
Geluksdal TSF and Pipeline EIA/EMPR	▪ 150Mt TSF with potential increase to 350-400Mt; ▪ 450mm carbon steel tailings pipeline with wear resistant liner from Cooke plant to TSF; ▪ 300mm carbon steel return water pipeline epoxy lining from Cooke Plant to TSF; ▪ 11kV transmission line; and ▪ Soil stockpiles located to the south of the TSF.
Cooke Optimisation Project (COP)	
Amendment of the EMP for COP	No additional activities.
WRTRP	
Amendment of the Main/COP EMP	Cooke ▪ Pipeline from Cooke 4 Shaft to the Cooke 4 South (C4S) TSF (1.22km);

Document Title	Activities
	▪ Transmission line; ▪ Cooke thickener and C4S thickener; and ▪ Bulk water storage facility.
	Ezulwini ▪ Concentrated tailings pipeline from the Central Processing Plant to Ezulwini plant.
	Kloof ▪ Abstracting water from K10 shaft; ▪ Construction of pipelines; ▪ Construction of transmission lines; ▪ Construction and operation of pump stations; the CPP; the AWTF; the RTSF; and the RWD.
	Driefontein ▪ The hydraulic mining infrastructure at the Driefontein 3 and 5 TSFs and the C4S TSF, including slurry and water pump stations; ▪ Driefontein and Cooke Mining Right area overland inter connecting pipe works and thickeners; ▪ Process water supply and storage; ▪ The CPP Module 1 comprising: Gold Plant; Floatation Plant; Uranium Plant, Acid Plant; and a roaster; and ▪ The RTSF, RWD and AWTF.

Environmental consultants

Digby Wells and Associates (SA) (Pty) Ltd (Digby Wells) has been appointed to undertake the EMP amendment.

Company name:	Digby Wells Environmental
Contact person:	Barbara Wessels
Physical address:	Digby Wells House, Turnberry Office Park, 48 Grosvenor road, Bryanston
Telephone:	011 789 9495
Cell phone:	-
Email:	barbara.wessels@digbywells.com

Approach and methodology for the Public Participation Process

Digby Wells has compiled an Interested and Affected Parties' (I&AP) database and all registered I&APs were informed of the Project on 15 November 2017. The notification to I&APs described the amendment process being undertaken, methods of communication with Digby Wells, as well provided a comments sheet to raise concerns or provide information to Digby Wells pertaining to the Project. Site notices will be placed around the Project site to alert the broader community of the Project and provided information regarding registering as an I&AP, the process being undertaken, as well as communication with Digby Wells. An English advertisement will be placed in the Randfontein Herald newspaper on 06 January 2018 containing the same information as the notification and site notices. This Regulation 31 Amendment report will be subject to a 30-day public review period and all comments and concerns received from the public will be captured and addressed in the Comments and Responses Report which will be submitted to the Department of Mineral Resources with the final Regulation 31 Report.

Project alternatives

This project does not trigger additional activities in terms of the NEMA and therefore no alternatives apply. Infrastructure required for the proposed reclamation of the identified resources is approved and in place (with the exception of a few sections of pipeline that will be replaced as these sections have been vandalised or completely removed).

Conclusions and recommendations

The overall effect of removing the Millsite TSF Complex will positively impact the surrounding environment mostly through reducing acid generating materials. Furthermore, the footprint will be rehabilitated, further positively contributing to improved water quality in the area. The Rand Uranium Cooke operations will be able to continue employment through continued supply of material to the Cooke Plant, thereby retaining employment at this operation. Should the recommended mitigation measures be implemented effectively, it is the opinion of the EAP that this application be approved by the DMR.

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Part A: Scope of Assessment and Environmental Impact Assessment Report

1 Introduction

Sibanye-Stillwater is the holder of two converted Mining Rights reference number: GP 30/5/1/2/2 (173) MR and reference number: 30/5/1/2/2 (07) MR to mine gold, uranium, silver, nickel, sulphides and pyrite. Together these Mining Rights make up the Rand Uranium/Cooke Operations. Sibanye-Stillwater intends to amend the Environmental Management Programme (EMP), titled *Clidet No 726 (Proprietary) Limited*, compiled by Shangoni Management Services (Pty) Ltd in March 2008. The EMP Amendment pertains to the proposed reclamation of five Tailings Storage Facilities (TSFs), collectively known as the Millsite TSF Complex, as well as a decommissioned rail berm, into their mining schedule. The Cooke Operations is currently reclaiming a TSF known as Dump 20 as part of this Mining Right. Dump 20 is being processed at the Cooke Plant and an existing Booster Pump Station (BPS) is located on site at Dump 20. Dump 20 is nearing its end of life and therefore Sibanye-Stillwater intend to include the Millsite Complex into the Mining Right.

The application process adhered to for the proposed amendment to the Cooke Operations (GP 30/5/1/2/2 (07) MR) has been undertaken in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) and the Environmental Impact Assessment (EIA) Regulations, 2014. This amendment application is conducted in terms of Regulation 31 of the NEMA EIA Regulation 982, which states the following:

"31 An environmental authorisation may be amended by following the process prescribed in this Part if the amendment will result in a change to the scope of a valid environmental authorisation where such change will result in an increased level or nature of impact where such level or nature of impact was not –

(a) Assessed and included in the initial application for environmental authorisation; or

(b) Taken into consideration in the initial environmental authorisation

And the change does not, on its own, constitute a listed or specified activity."

The impacts associated with the Rand Uranium/Cooke Operations mining activities have previously been assessed and therefore the inclusion of the Millsite Complex would merely result in a change of scope which results in an increased extent of the impacts which was not assessed and included in the original applications. Accordingly, the Regulation 31 Amendment process is deemed relevant to the proposed project.

Sibanye-Stillwater has authorisation for tailings deposition onto the Millsite Complex in terms of a separate Mining Right GP 30/5/1/2/2 (173) MR. Sibanye-Stillwater will be required to reconstruct pipelines along previously approved pipeline routes between the Millsite Complex to the Dump 20 BPS, and continue using the existing pipelines from the BPS to Cooke Plant for processing.

The relevant Mining Rights and associated EMPs to which this amendment pertains are listed in Table 1-1 below, and the EMP Approvals from the DMR are attached as **Appendix 1**.

Table 1-1: Authorisations and Associated EMPs

Authorisation	EMP Title
30/5/1/2/2 (173) MR	Amendment To Rand Uranium's Environmental Management Programme For The Proposed Millsite Tailings Storage Facility, Golder Associates, 2010
09/2008	Addendum To The Environmental Management Programme: Reclamation of Sand Dump 20, Sarel Keller, 2008
30/5/1/2/2 (173) MR	▪ Amendment to Rand Uranium's Environmental Management Programme for the proposed Millsite Interim Disposal Component of the Cooke Uranium project – Pits Depositions (Permit 3A), Digby Wells and Associates, 2012; and ▪ Environmental Impact and Environmental Management Plan Amendment for the Cooke Optimisation Project, Digby Wells and Associates, 2012

2 Item 3: Project applicant

The Cooke operations were established and operated as part of the Randfontein Estates Gold Mining Company Limited and its predecessors. Randfontein Estates Limited has been mining the Randfontein section since the late 1800s which consisted of the Cooke Section, Doornkop (JV) Section, Old Randfontein Operations, a section of the No. 4 Shaft and the decommissioned Lindum Reef Section. Lindum Reefs Gold Mining Company Limited was established as a separate company which mined blocks of ore left behind by previous mining operations undertaken on the Randfontein section. When underground operations ceased the company commenced with reclamation of sand and slimes dump material. In August 1992, Lindum Reefs started opencast mining at the reef outcrops within the Randfontein area, which was decommissioned in 1998. Mining operations on the West Rand continued under various companies for many years. Sibanye-Stillwater was formed as a result of the unbundling of the Gold Fields Group's Kloof Driefontein Complex and Beatrix gold mines in the Free State to create a separate entity in Sibanye-Stillwater. Sibanye-Stillwater is now listed as a fully independent company on both the Johannesburg Stock Exchange and the New York Stock Exchange.

2.1.1 Contact Details for the Applicant

Details of the Applicant, Sibanye-Stillwater, are contained in Table 2-1.

Table 2-1: Applicant Details

Company name:	Rand Uranium (Pty) Ltd
Contact person:	Lauren Dell
Physical address:	Libanon Business Park 1 Hospital Street Libanon, Westonaria 1780
Telephone:	011 278 9600
Cell phone:	
Email:	Lauren.Dell@sibanyegold.co.za

2.2 Item 3(a)(i): Details of the EAP

Digby Wells is experienced in environmental management and assessment and is familiar with the EIA requirements of the NEMA and other legislation relevant to this Project. The EAP's details are contained in Table 2-2.

Table 2-2: Contact details of the EAP

Name of Practitioner:	Ms Barbara Wessels
Telephone:	011 789 9495
Fax:	011 069 6801
Email:	barbara.wessels@digbywells.com

2.3 Item 3(a)(ii): Expertise of the EAP

2.3.1 The qualifications of the EAP

Barbara Wessels, the lead Environmental Assessment Practitioner (EAP) completed her B.Sc. in Geography and Environmental Management in 2005.

2.3.2 Summary of the EAP's past experience

Ms Wessels has compiled numerous EIAs and EMPs, and managed the associated multi-disciplinary processes. Ms Wessels has been involved in projects which include due diligence, EMP auditing, closure cost assessments, water use licensing, waste management, aquatic assessments and biomonitoring, as well as the compilation of rehabilitation plans. Ms Wessels has worked in various African countries, including secondments to Anglo Platinum (Rustenburg), Anglogold Ashanti Iduapriem Mine (Ghana), and Randgold Resources Loulo Gold Mine (DRC) as acting Environmental Superintendent. Ms Wessels' Curriculum Vitae is attached in **Appendix 2**.

3 Item 3(b): Description of the property

Details pertaining to the farm portions on which the Millsite Complex lies are contained in Table 3-1.

Table 3-1: Property Details

Farm Name:	▪ Remaining Extent of the Farm Rietfontein 162IQ; ▪ Remaining Extent of the Farm Waterfal 174IQ; ▪ Remaining Extent of the Farm Randfontein 247IQ; and ▪ Portion 108 of the Farm Elandsvlei 249IQ
Application Area (Ha):	Inclusion of 453ha (Millsite TSF Complex footprint)
Magisterial District:	West Rand District Municipality; infrastructure is within the Mogale City Local Municipality as well as the Randfontein Local Municipality, extending into the Johannesburg Local Municipality
Distance and direction from nearest town:	▪ 4km north of Randfontein; and ▪ 5km south west of Krugersdorp
21 digit Surveyor General Code for each farm portion:	▪ T0IQ00000000016200000; ▪ T0IQ00000000017400001; ▪ T0IQ00000000024700000; and ▪ T0IQ00000000024900108

The location of Cooke Operations' infrastructure which will continue to be utilised to facilitate reclamation of the Millsite TSF Complex is contained in Table 3-2 below.

Table 3-2: Directly Affected Properties

Component	Farm Name	Portion	Title Deed	Owner
Cooke Gold Plant	Luipaardsvlei 243 IQ	14	T42378/2011	Rand Uranium (Pty) Ltd
Dump 20	Uitvalfontein 244 IQ	RE	T91617/2012	Rand Uranium (Pty) Ltd
Porges Pit	Randfontein 247 IQ	RE	T79926/2012	Rand Uranium (Pty) Ltd
Millsite Pit	Uitvalfontein 244 IQ	RE	T91614/2012	Rand Uranium (Pty) Ltd
Battery Pits	Rietvalei 241 IQ	RE	T37678/2013	Rand Uranium (Pty) Ltd
SRK Pit 2 North	Rietvalei 241 IQ	2	T96423/2014	Rand Uranium (Pty) Ltd

Component	Farm Name	Portion	Title Deed	Owner
SRK Pit 2 South	Rietvalei 241 IQ	RE	T37678/2013	Rand Uranium (Pty) Ltd
SRK Pit 3	Rietvalei 241 IQ	RE	T37678/2013	Rand Uranium (Pty) Ltd
Training Pit	Rietvalei 241 IQ	RE	T37678/2013	Rand Uranium (Pty) Ltd
Wonderfonteinspruit Pipeline Crossing	Luipaardsvlei 243 IQ	88	T10134/2011	Rand Uranium (Pty) Ltd
Magazine Pan	Gemsbokfontein 290 IQ	5	T20962/2011	Rand Uranium (Pty) Ltd

*RE: Remaining Extent

4 Item 3(c) of Appendix 3: Locality map

A project Locality Map has been attached hereto as **Appendix 3** and shown in Figure 5-1 below.

5 Item 3(d) of Appendix 4: Description of the scope of the proposed overall activity

The Infrastructure Layout Plan associated with the proposed Project is attached as **Appendix 4** and shown in Figure 5-2.

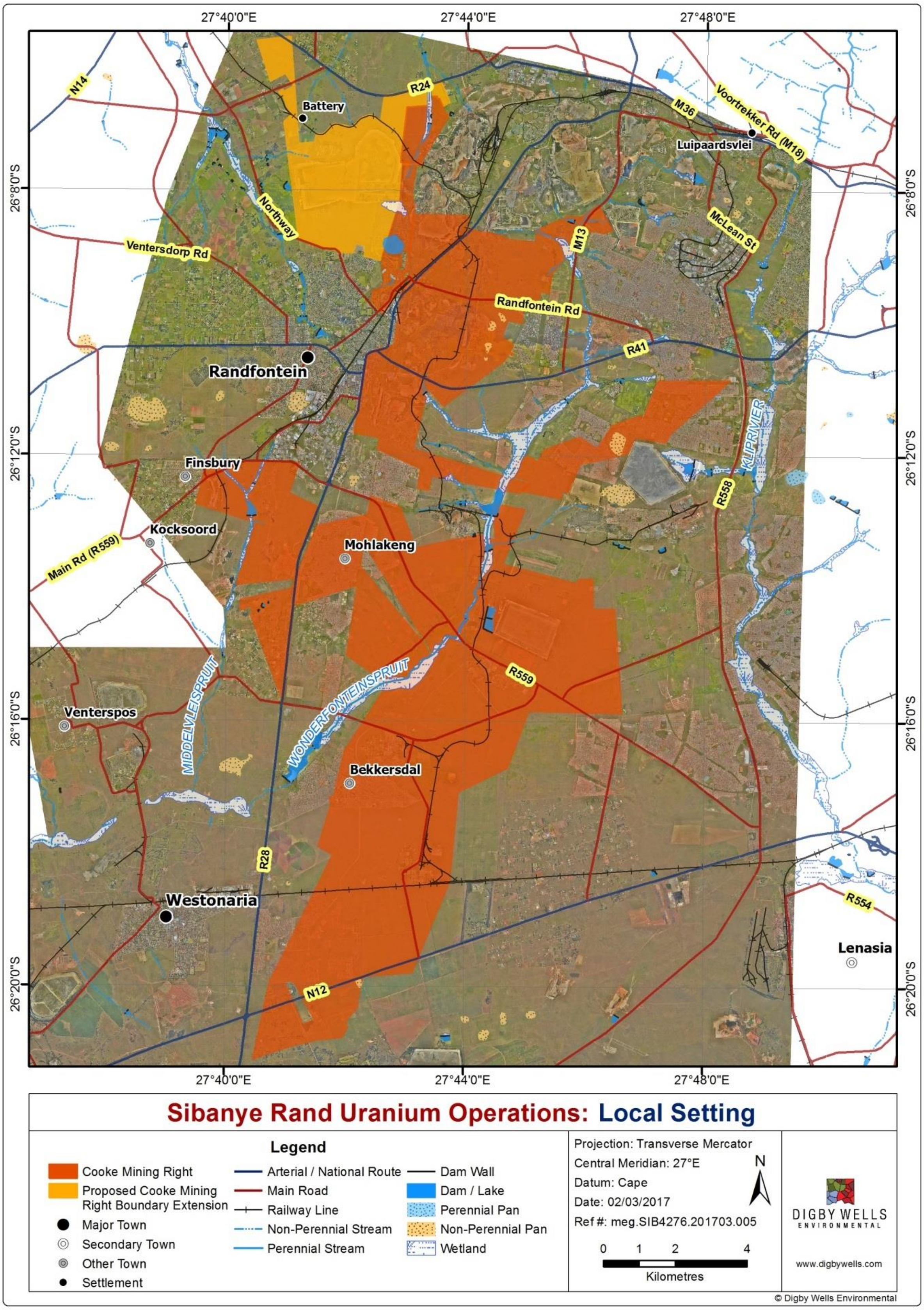

Figure 5-1: Locality Map

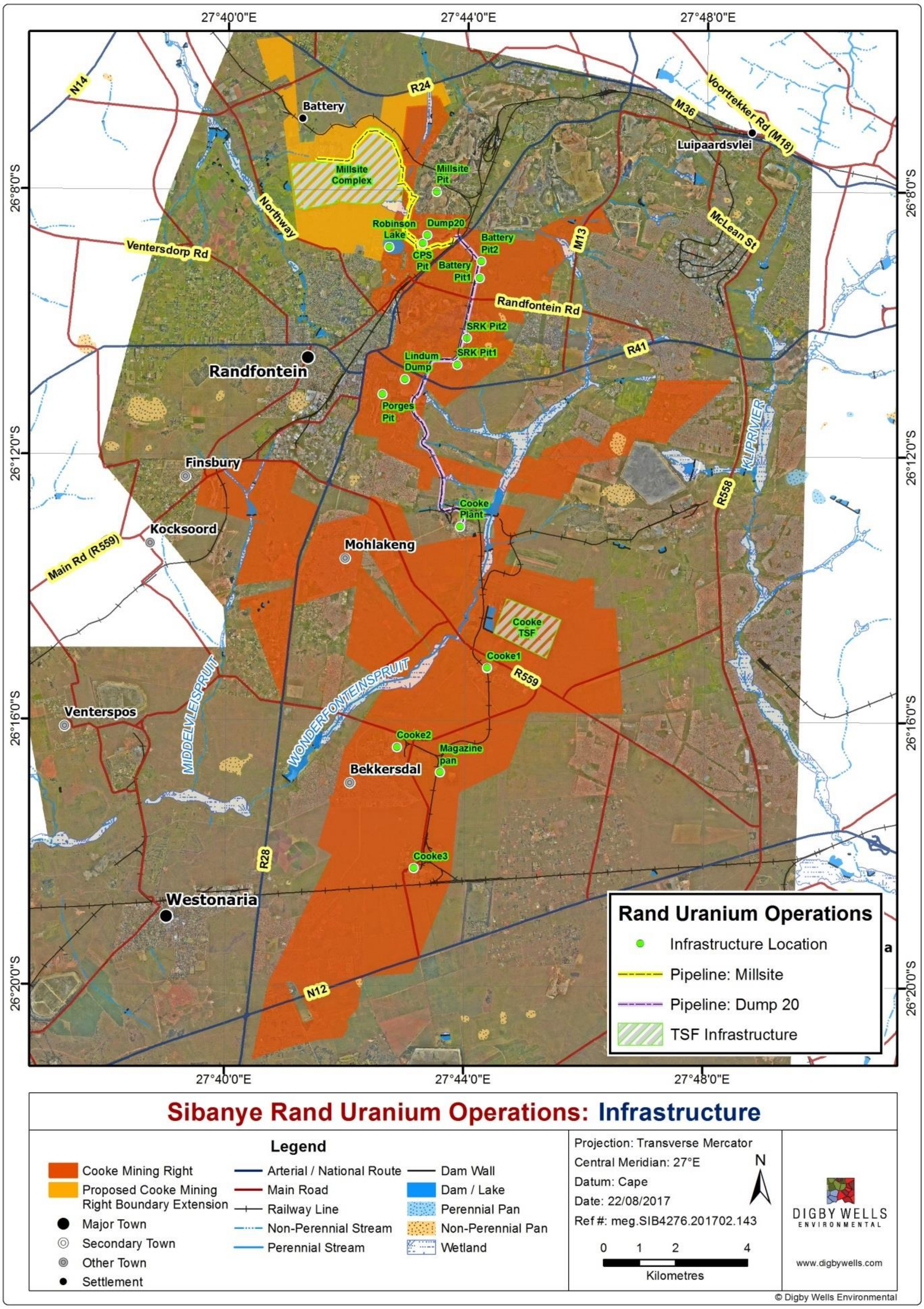

Figure 5-2: Infrastructure Layout Plan

5.1 Item 3(d)(i): Listed and specified activities

No Listed Activities in terms of the NEMA EIA Regulations are being applied for in this application.

5.1.1 Activities per Project Phase

The overall reclamation activity of the Millsite Complex will be divided into specific activities during the Construction, Operation and Decommissioning phases as discussed below.

5.1.1.1 *Construction Phase*

The Construction Phase consists of activities performed in preparation of the project, as well as the construction of supporting infrastructure which includes the following:

- Laying of the finger screen at the toe of the dump;
- Construction of the sump at the TSF base, within the walls of the TSF;
- Construction of a tank and pump after the vibrating screen;
- Laying a water pipeline to the TSF and construction of a water tank; and
- Laying of the slurry pipeline to the BPS at Dump 20 (an existing culvert will need to be reopened for the slurry pipeline to traverse a road between the Millsite Complex and Dump 20). The water and slurry pipelines will follow existing pipeline routes approved under 30/5/1/2/2 (173) MR.

5.1.1.2 *Operational Phase*

The Operational Phase is the commencement of the reclamation activities. All related operations, including water pumping, slurry pumping and tailings disposal form part of this phase and includes:

- Mixing the slimes and water to create a slurry;
- Hydraulic conveying of the slurry to the Cooke Plant via the BPS at Dump 20 and approved under the Cooke Optimisation Project; and
- Final deposition of the residue material into the open pits and approved under the Cooke Optimisation Project.

5.1.1.3 *Decommissioning Phase*

The Decommissioning Phase involves the cessation of mining activities. During this phase, all remaining infrastructure will be removed and disturbed areas are rehabilitated. The following activities are defined as part of the decommissioning phase:

- Rehabilitation of the Millsite Complex footprint;
- Removal of structures and infrastructure (pipelines, screens, berms); and
- Rehabilitation of the pits should they have been successfully sealed and filled.

The rehabilitation of these areas will be undertaken as per the approved rehabilitation and closure plan at the time.

5.1.1.4 *Residual and Post Closure Phase*

The Post-closure Phase is the final phase and continues after mining and decommissioning activities have ceased. This phase will entail post-closure final rehabilitation and monitoring.

Environmental monitoring is done post-closure to determine the efficacy of rehabilitation. Post-closure monitoring will assist in identifying additional measures should the suggested methods of rehabilitation not be successful. This includes, but may not be limited to, monitoring of the groundwater seepage plume, soil fertility and erosion scars, natural vegetation and alien invasive species.

5.2 Item 3(d)(ii): Description of the activities to be undertaken

The hydraulic reclamation activity to be followed for the reclamation of the Millsite Complex is identical to the current approved activities for Dump 20. An existing BPS is currently in place at Dump 20 which will remain and be utilised for the reclamation of the Millsite Complex and pumping slurry to the Cooke plant. A finger screen will be put in place at the toe of the Millsite Complex from where the slurry material will enter a sump. A drain pipe will be put in place from the sump to a vibrating screen prior to entering tank from where it will be pumped in a slurry pipeline that will convey the tailings to the BPS at Dump 20. This slurry pipeline will be a 450 millimetre (mm) diameter pipeline with a 6 mm rubber lining (compliant with the authorised specifications).

Water for this process will be obtained from 8 Shaft which has approved water abstraction authorisation in place (Water Use Licence No. 03/A21D/AFGJ/2382). Water from 8 Shaft will be stored in a tank at the Water Treatment Plant adjacent to the Millsite Complex. The water pipeline will be utilised to convey water to the Millsite Complex.

From the BPS, slurry will be pumped to the Cooke Plant for processing. The resultant tailings material will be disposed into the open pits utilising the existing pipelines which are currently in use. Three pipelines are in place for this process which includes one 450 mm diameter water line, one 400 mm feed slurry line and one 450 mm tailings pipeline. The 450 mm pipe is a multidirectional water line between the Cooke Plant and BPS at Dump 20; the 450 mm is for the sand and residue tailings being reclaimed and pumped to the plant; the 450 mm pipe is to pump residue from the plant to the pits for final deposition. Initially 200 000 tonnes per month (t/m) of the tailings from the Millsite TSF will be reclaimed, ramping up to 450 000 t/m. It is anticipated that the ramp-up period will take 10 months. This tonnage will merely be a replacement for what is currently being reclaimed from Dump 20 and Lindum Dump

Based on the plant capacity, the residue from the Millsite TSF reclamation is to be deposited into the open pit voids at the rate of 400 000 t/m. Cyanide destruction will take place in the Cooke Plant before the residue is deposited and will be below 20 parts per million (ppm) as per mining guidelines. Figure 5-3 below provides an illustration of the process to be followed.

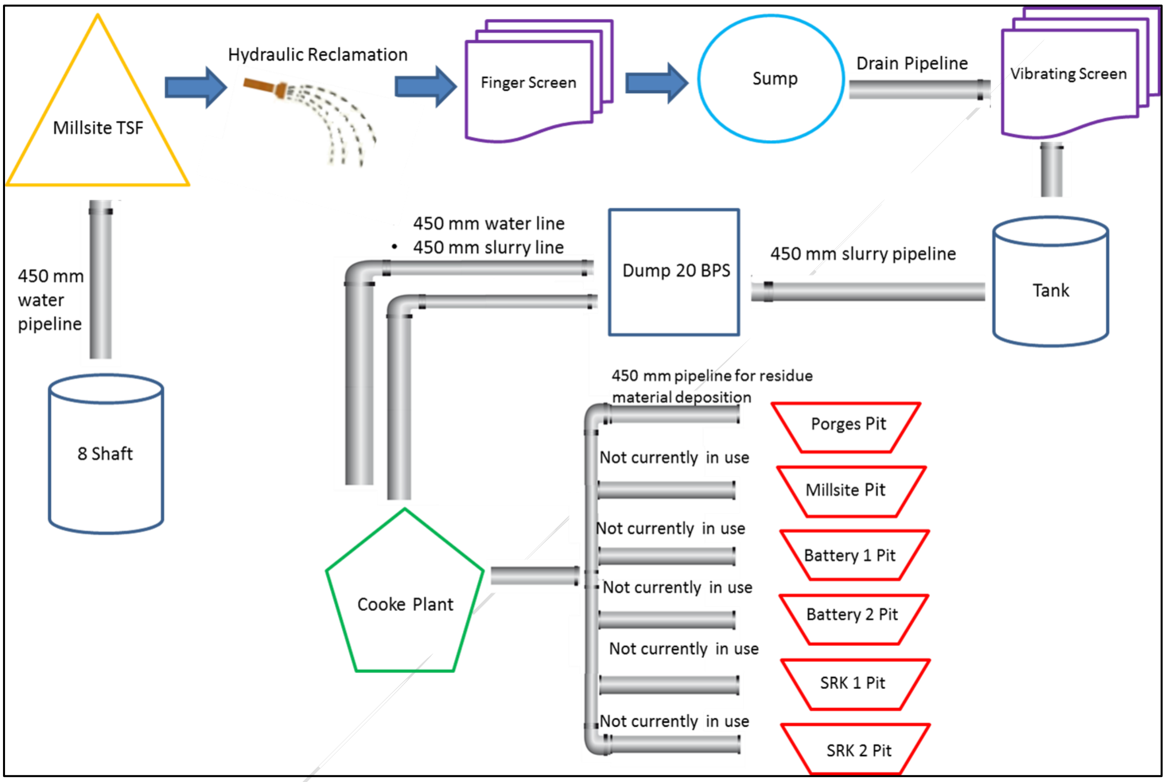

Figure 5-3: Millsite TSF Reclamation Process

5.2.1 Disposal of Residue Tailings into Open Pits

Several open pits/final voids exist as a result of the historical Lindum Reefs Operations which were previously dormant and required rehabilitation. The residue is deposited into the open pit voids at the rate of 150 000 tons/month and at a density of approximately 1.5 tonnes/m^3. The final voids include seven pits, namely Millsite pit, Battery 1 pit, Battery 2 pit, Porges pit, SRK 2 pit, SRK 3 pit and Training pits, and are labelled in Figure 5-2 above.

5.2.2 Water Consumption

Sibanye-Stillwater has an approved Water Use Licence (WUL), namely the Rand Uranium (Pty) Ltd, licence number 03/A21D/AFGJ/2382, dated 22 November 2013. This licence authorises the following Water Uses as stipulated in Section 21 of the National Water Act, 1998 (Act No. 36 of 1998) (NWA):

- Abstraction of extraneous water from Cooke Shaft 1, 2 and 3 for use in tailing reclamation and underground mining processes;
- Abstraction of groundwater from Cooke Shaft 1, 2 and 3 boreholes for domestic purposes (potable water);
- Discharge of extraneous underground water to the Wonderfonteinspruit and the Magazine Pan;
- Disposal of residue tailings material into the open pits; and

- Removing of extraneous underground mine water at Cooke Shaft 1 and 2 for efficient continuation of the mining activity.

These Water Uses will be applicable to the reclamation of the Millsite Complex; however, a WUL Application associated with the proposed mine amendments has been submitted to the DWS to increase the approved volumes of water applicable to the current operations.

Water quality standards associated with water discharged into the Wonderfonteinspruit and Magazine Pan, and groundwater quality standards associated with the disposal of residue tailings into the open pits are specified.

6 Item 3(e): Policy and legislative context

South African national legislation which is applicable or considered relevant to this application is summarised in Table 6-1.

Table 6-1: Applicable Legislation

Applicable legislation and guidelines used to compile the report	Reference where applied
<u>The Constitution of the Republic of South Africa, 1996</u> Under Section 24 of the Constitution of the Republic of South Africa, 1996 (the Constitution) it is clearly stated that: *Everyone has the right to (a) an environment that is not harmful to their health or well-being; and* *(b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that -* *(i) Prevent pollution and ecological degradation;* *(ii) Promote conservation; and* *(iii) Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.*	Mitigation measures recommended will aim to ensure that the potential impacts are managed to acceptable levels to support the rights as enshrined in the Constitution.
<u>National Environmental Management Act, 1998 (Act No 107 of 1998) and EIA Regulations (December 2014)</u> The NEMA, as amended, was set in place in accordance with Section 24 of the Constitution. Certain environmental principles under NEMA have to be adhered to, to inform decision making for issues affecting the environment. Section 24 (1)(a) and (b) of NEMA state that: *The potential impact on the environment and*	This amendment application is informed by the NEMA and Regulation 31 of GN R 982.

Applicable legislation and guidelines used to compile the report	Reference where applied
socio-economic conditions of activities that require authorisation or permission by law and which may significantly affect the environment, must be considered, investigated and assessed prior to their implementation and reported to the organ of state charged by law with authorising, permitting, or otherwise allowing the implementation of an activity. The EIA Regulation, 2014 was published under GN R 982 on 4 December 2014 (EIA Regulations) and promulgated on 08 December 2014. Together with the EIA Regulations, the Minister also published GN R 983 (Listing Notice No. 1), GN 984 (Listing Notice No. 2) and GN R 985 (Listing Notice No. 3) in terms of Sections 24(2) and 24D of the NEMA, as amended. The EIA Regulations have been made applicable to mining activities.	
National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) On 29 November 2013, the list of waste management activities published under GN R 718 of 3 July 2009 was repealed and replaced with a new list of waste management activities under GN R 921 of 29 November 2013. Included in the new list are activities listed under Category A, B and C. These activities include *inter alia* the following: ▪ Category A describes waste management activities requiring a Basic Assessment process to be carried out in accordance with the EIA Regulations supporting an application for a waste management licence; ▪ Category B describes waste management activities requiring an Environmental Impact Assessment process to be conducted in accordance with the EIA Regulations supporting a waste management licence application; and ▪ Category C describes waste management activities that do not require a WML but these activities will have to comply with the prescribed requirements and standards as	The reclamation activities do not trigger a new waste activity as defined in GN R718 and accordingly a Waste Management Licence is not required.

Applicable legislation and guidelines used to compile the report	Reference where applied
prescribed by the Minister, which includes the Norms and Standards for Storage of Waste, 2013. These activities include the storage of general waste at a facility with a capacity to store in excess of 100 m3 and storage of hazardous waste in excess of 80 m3. The Waste Classification and Management Regulations published under GN R 634 of November 2013 require that all wastes be classified according to SANS10234 and managed according to its classification.	
<u>Mineral and Petroleum Resource Development Act. 2002 (Act No. 28 of 2002) (MPRDA)</u> The MPRDA sets out the requirements relating to the development of the nation's mineral and petroleum resources. It also aims to ensure the promotion of economic and social development through exploration and mining related activities. The MPRDA requires that mining companies assess the socio-economic impacts of their activities from start to closure and beyond. Companies must develop and implement a comprehensive Social and Labour Plan (SLP) to promote socio-economic development in their host communities and to prevent or lessen negative social impacts.	All amendments pertaining to the proposed project must adhere to the MPRDA.

Applicable legislation and guidelines used to compile the report	Reference where applied
<u>National Water Act, 1998 (Act No. 36 of 1998)</u> The NWA provides for the sustainable and equitable use and protection of water resources. It is founded on the principle that the National Government has overall responsibility for and authority over water resource management, including the equitable allocation and beneficial use of water in the public interest, and that a person can only be entitled to use water if the use is permissible under the NWA. GN R 704 was published in June 1999 and aims to regulate the use of water for mining and related activities for the protection of water resources and states the following: ▪ Regulation 4: No residue deposit, reservoir or dam may be located within the 1:100 year flood line, or less than a horizontal distance of 100 m from the nearest watercourse. Furthermore, person(s) may not dispose of any substance that may cause water pollution; ▪ Regulation 5: No person(s) may use substances for the construction of a dam or impoundment if that substance will cause water pollution; ▪ Regulation 6 is concerned with the capacity requirements of clean and dirty water systems, and ▪ Regulation 7 details the requirements necessary for the protection of water resources.	Sibanye-Stillwater has applied for authorisation for new water uses associated with the reclamation of the Millsite TSF Complex. The Integrated Waste and Water Management Plan (IWWMP) has been submitted to the DWS.

Applicable legislation and guidelines used to compile the report	Reference where applied
<u>DWS[2] Best Practice Guideline – G1: Storm Water Management Plan (SWMP)</u> These are guidelines provided by the DWS for the development of a SWMP. The following will be undertaken to develop the conceptual SWMP: ▪ Delineate the clean and dirty area contributing to runoff (based on the final layout plans) and site specific hydrological assessments to determine volumes to be handled. The SWMP should ensure that temporary drainage installations should be designed, constructed, and maintained for recurrence periods of at least a 25-year, 24-hour event, while permanent drainage installations should be designed for a 50-year, 24-hour recurrence period; and ▪ Site specific assessments to establish the appropriate mitigation measures and surface water monitoring programme.	All water management infrastructure will be designed for a 50 year, 24 hour rainfall event.
<u>DWS Best Practice Guideline – G4: Impact Prediction</u> The impacts of mine activities on the groundwater environment must be assessed as part of the Regulation 31 Amendment, as well as for the IWULA. The baseline conditions must be assessed to define the current aquifer systems, groundwater use and groundwater conditions before mine commencement and to determine the extent of possible future impacts on the groundwater resources.	An IWULA and an associated IWWMP are required in terms of Section 21 of the NWA. The IWULA and IWWMP has been compiled and submitted to the DWS as the decision making authority. A Groundwater Impact Assessment has been undertaken as part of the Regulation 31 Amendment Process.

7 Item 3(f): Need and desirability of the proposed activities

Historic mining and ore processing methods in South Africa, and specifically around Johannesburg, have produced vast volumes of tailings or residues, resulting in many mine tailings facilities scattered around Gauteng. These historical tailings facilities still contain gold, uranium and other valuable metals which may be economically recoverable. Recent technological advances make it possible for more gold, uranium and sulphur to be recovered through reclaiming old tailings facilities. Sibanye-Stillwater has successfully undertaken

[2] Previously the Department of Water Affairs (DWA)

reclamation of Dump 20 as well as numerous other sand dumps and tailings facilities. Similarly, the reclamation of the Millsite TSF Complex will result in the recovery of remaining gold material as well as remove the voluminous (157 million tonnes of material) structure from the Randfontein landscape.

Sibanye-Stillwater currently uses residue tailings material to backfill and seal several open pits surrounding the Cooke Operations. The motivating factor for this is that currently four of the six pits have an underground mining connection and are contributing to the Acid Mine Drainage (AMD) problem in the Western Basin. Filling the pits with tailings would therefore reduce the groundwater recharge thereby reducing decant and subsequent water treatment costs. The filling of the pits is also a good closure alternative for an area which would otherwise represent a hazard. The initial intent was rotational filling of the pits to allow the pits to be filled in a manner which guarantees geotechnical stability by allowing the tailings some time to settle and consolidate after filling. This has proven to be difficult to maintain due to vandalism and theft of the pipelines and pumping equipment. Some residue tailings material has been deposited into each of the pits; however, the majority of the tailings material has been placed into Porges pit. Porges pit has yet to seal completely and requires more tailings material than originally assessed, and the Millsite Complex will thus provide additional material to fill and seal the open pits.

8 Item 3(g): Motivation for the preferred development footprint within the approved site including a full description of the process followed to reach the proposed development footprint within the approved site

As described in Section 7 above, Sibanye-Stillwater requires additional material to continue operations at the Cooke Plant as well as supply material to backfill the historic open voids. With Dump 20 nearing its end of life, Sibanye-Stillwater has identified a resource which has been considered previously, to be reclaimed with minimal infrastructure requirements. Sibanye-Stillwater has approved pipeline routes to connect the Millsite TSF to the Dump 20 BPS and the Cooke Plant, as well as pipeline routes which connect to each of the pits which require backfilling. To expedite the process in as short a time as possible, Sibanye-Stillwater has identified a resource which does not trigger additional Listed Activities in terms of the NEMA 2014 Regulations and can therefore be included in the Cooke Operations through an amendment process.

Furthermore, samples were taken from the Millsite Complex TSFs and analysed to ensure that there is no changed impact on water quality from the material currently being deposited into the various pits. The Millsite Complex has similar geochemical characteristics to the Dump 20 material currently being deposited into the historic open pits.

Based on the above, reclamation of the Millsite Complex is the preferred and most viable option for Sibanye-Stillwater.

8.1 Item 3(g)(i): Details of the development footprint alternatives considered

The Millsite Complex dictates the footprint layout as it is an existing structure. Sibanye-Stillwater has previously considered the Millsite Complex as a future resource due to its proximity to the current Cooke Operations reclamation activities. Furthermore, the deposition activities previously undertaken at the Millsite Complex allows Sibanye-Stillwater to utilise existing and approved infrastructure thereby not triggering additional Listed Activities in terms of the NEMA EIA Regulations 2014, thus allowing for a Regulation 31 Amendment process to be followed. Item 3(g)(i) therefore does not apply.

9 Item 3(g)(ii): Details of the public participation process followed

The Public Participation Process (PPP) has been developed to ensure compliance with Section 32 (a)(i) and (ii) of GN R 982 under the NEMA. This report must be subject to a PPP and bring the proposed changes to the attention of potential Interested and Affected Parties (I&APs). This report will undergo a 30-day public review process and all comments received from I&APs pertaining to this application will be captured and submitted to the DMR for consideration.

9.1 Identification of Stakeholders

Existing stakeholder databases from previous PPP undertaken for the Sibanye-Stillwater Cooke Operations were utilised to identify I&APs. The Project was announced to the public through a newspaper advertisement and the distribution of the Background Information Letter (BIL) to registered I&APs.

Stakeholders are grouped into the following categories:

- Government: National, Provincial, District and Local authorities;
- Landowners: Directly affected and adjacent landowners;
- Communities: Surrounding communities;
- Non-Governmental Organisations (NGOs): Environmental and social organisations;
- Agriculture: Associations or organisations focussed on agricultural activities; and
- Business: Private businesses.

A stakeholder database has been compiled which will be updated throughout the PPP. Proof of the various Public Participation materials used to announce the Project have been included as **Appendix 5**.

9.2 Consultation with Stakeholders

The aforementioned stakeholders have been informed about the Project by means of a formal BIL containing a Registration Form which was sent by email on 13 December 2017.

The location and a description of the Project, the legislative processes and requirements that will be followed, the competent authority(ies), the consultation and registration process including contact details of the Public Participation Practitioner was provided in the BIL (**Appendix 5**). Stakeholders were encouraged to register as I&APs and to submit comments or concerns about the proposed project, using the Registration and Comment Form provided.

An advert will be placed on 06 January 2018. The newspaper advert provided details of the proposed Project, Project location, legislative requirements, the competent authority, and details of the independent environmental practitioner.

This Regulation 31 Amendment Report will be made available for public comment from 14 December 2017 to 05 February of 2017 (30 days which excludes 15 December to 05 January) on the Digby Wells website (www.digbywells.com).

After the comment period, a Comments and Responses Report (CRR) will be finalised and made available to the public on the Digby Wells website (www.digbywells.com) at the same time the CRR will be submitted to the DMR. This will provide I&APs the opportunity to verify that their comments were captured correctly and responded to.

9.3 Summary of Public Participation Activities

A summary is provided of the PPP activities undertaken thus far, together with referencing materials included as **Appendix 5**.

Table 9-1: Public Participation Activities

Activity	Details
Identification of stakeholders	The existing stakeholder database which, includes I&APs, from various sectors of society including directly affected and adjacent landowners in and around the project area was utilised to communicate with stakeholders.
Distribution of proposed project announcement materials, including Public Review Period details	BIL, announcement letter with Registration and Comment Form was emailed to stakeholders on 13 December 2017. This included the dates the Regulation 31 Amendment Report is available for Public Review.
Placing of advertisements	An advertisement will be placed on 06 January 2018 in the Randfontein Herold newspaper
Placement of Regulation 31 Report	The Draft Regulation 31 Report will be made available for public comment from 14 December 2017 to 05 February 2018 on the Digby Wells website (www.digbbywells.com)
CRR	All comments received from stakeholders will be captured in the CRR.

Activity	Details
Announcement of Final Regulation 31 Amendment Report	The Final Regulation 31 Amendment Report will be placed on the Digby Wells website for a public comment period of 14 days. An announcement letter will be sent to all registered I&APs on the stakeholder database.

9.4 Decision-making

With completion of the Public Comment Period for the Final Report, the report will be updated and submitted to the Authorities for consideration and decision. All registered I&APs will be notified of the decision within 14 days of the DMR's Record of Decision.

9.5 Item 3(g)(iii): Summary of issues raised by I&APs

All comments received from the public regarding this application will be tabulated in this section, including responses to each comment.

10 Item 3(g)(iv): The environmental attributes associated with the development footprint alternatives (Baseline environment)

10.1 Geology

The geological information presented below is summarised from Truswell (1977), Digby Wells (2012), Golder (2009) and Rison (2008).

A regional geological map of the project site is given in Figure 10-2 below. In chronological order (oldest first) the site geology is composed of:

- Witwatersrand Supergroup;
- Ventersdorp Supergroup;
- Transvaal Supergroup; and
- Karoo Supergroup.

10.1.1 Witwatersrand Supergroup

The Witwatersrand Basin is a thick sequence of shale, quartzite and conglomerate. The average dip of the strata varies between 10º and 30° south, although localised dips of up to 80° have been encountered in mine workings closer to the reef outcrop. There are two main divisions, a lower predominantly argillaceous unit, known as the West Rand Group and an upper unit, composed almost entirely of quartzite and conglomerates, known as the Central Rand Group. The West Rand Group is divided into three subgroups namely the Hospital Hill, Government Reef and Jeppestown. These rocks comprise mainly shale, but quartzite, banded ironstones, tillite and intercalated lava flows are also present. The rocks were subjected to low - grade metamorphism causing the shale to become more indurated and slaty. The original sandstone was recrystallized to quartzite.

10.1.2 Ventersdorp Supergroup

The younger Ventersdorp Supergroup overlies the Witwatersrand rocks. Although acid lavas and sedimentary intercalations occur, the Ventersdorp is composed largely of andesitic lavas and related pyroclastics. The Ventersdorp Supergroup consists of the Platberg Group and the Klipriviersberg Group.

The Alberton Formation is composed of green – grey amygdaloidal andesitic lavas, agglomerates and tuffs. The thickness amounts to 1 500 m. The lack of sediments in this sequence indicates a rapid succession of lava flows, which probably came from fissure eruptions. Material of similar composition forms the oldest dykes that have intruded the Witwatersrand rocks. The abundant agglomerates provide indications of periodic explosive activity. The removal of huge volumes of volcanic material from an underlying magma chamber gave rise to tensional conditions and as a result a number of faulted structures, horst and grabens, were formed.

10.1.3 Transvaal Supergroup

Overlying the Ventersdorp Lavas are the Black Reef Quartzite and dolomites of the Transvaal Supergroup. The Black Reef quartzite comprises coarse to gritty quartzite with occasional economically exploitable conglomerates (reefs). The entire area was peneplained in post-Ventersdorp time and it was on this surface that the Transvaal Supergroup was deposited, some 2 200 million years ago. The deposition commenced with the Kromdraai Member with the Black Reef at its base. The Black Reef is formed from material that has been eroded from the Witwatersrand outcrop areas. As a result the Black Reef contains zones (reefs) in which gold is present. The occurrence of the gold is not as widespread as in the Witwatersrand and is mainly restricted to north-south trending channels. The Black Reef is overlain by a dark, siliceous quartzite with occasional grits or small pebble bands. The quartzite grades into black carbonaceous shale. The shale then grades into the overlying dolomite through a transition zone approximately 10 m thick.

Overlying the Kromdraai Member is the dolomite of the Malmani Subgroup of the Chuniespoort Group. The dolomites that are 1 500 m thick are known for their huge water storage potential.

The dolomite also contains lenses and layers of chert. The dense, hard and fine-grained chert tends to stand out in relief. Chert (silica) replaces carbonate material.

The dolomites are overlain in the south by the Pretoria Group rocks. The Rooihoogte Formation forms the basal member of the Pretoria Group, consisting predominantly of shale and quartzite.

10.1.4 Karoo Supergroup

The Karoo Supergroup was deposited approximately 345 million years ago. It commenced with glacial period during which most of South Africa was covered by a thick sheet of ice. This ice cap slowly moved towards the south, causing extensive erosion of the underlying rocks. The erosion debris was eventually deposited as the Dwyka tillite. The latter is only partially preserved in the study area, as are the younger sedimentary deposits of the Karoo Supergroup comprising mudstone, shale and sandstone.

10.2 Groundwater

The Groundwater Impact Assessment Report is attached hereto as **Appendix 6**.

10.2.1 Aquifer Characterisation

Groundwater occurrences in the study area are predominantly restricted to the following types of terrains.

- Weathered rock aquifer in the Witwatersrand, Ventersdorp and Transvaal Formations;
- Fractured rock aquifer in the Witwatersrand, Ventersdorp and Transvaal Formations;
- Dolomitic and Karst Aquifers; and
- Mine void aquifer.

10.2.1.1 *Weathered and Fractured Aquifers*

Groundwater occurs in the weathered sedimentary deposits (quartzite and shale) of the Witwatersrand and Transvaal strata as well as in the lavas of the Ventersdorp Supergroup. Both rock types (sedimentary and igneous) have similar weathering characteristics and therefore aquifer characteristics. These formations are not considered to contain economic and sustainable aquifers, but localised high yielding boreholes may, however, exist where significant fractures are intersected. Groundwater occurrences are mainly restricted to the weathered formations, although fracturing in the underlying “fresh” bedrock may also contain water. Experience has shown that these open fractures seldom occur deeper than 60 m. The base of the aquifer is the impermeable quartzite, shale and lava formations, whereas the top of the aquifer would be the surface topography. The groundwater table is affected by seasonal and atmospheric variations and generally mimics the topography. These aquifers are classified as semi-confined. The two aquifers (weathered and fractured) are mostly hydraulically connected, but confining layers such as clay and shale often separates the two. In the latter instance the fractured aquifer is classified as confined. The aquifer parameters, which includes transmissivity and storativity is generally low and groundwater movement through this aquifer is therefore also slow.

10.2.1.2 *Dolomite Aquifers*

The Millsite TSF Complex is located in close proximity to the Sterkfontein Dolomite Aquifer, and the Cooke tailings dam is located on the Zuurbekom Dolomitic Groundwater Compartment, whereas a portion of the Millsite TSF Complex (Sterkfontein Dolomite) straddles dolomitic inliers. The most prominent and potentially affected dolomite aquifers associated with this study is the Zuurbekom and Zwartkranz dolomite compartments.

DWS (1986) provides the description of the Sterkfontein Dolomite and in particular the Zwartkrans groundwater compartment: Carbonate rocks are practically impermeable and therefore devoid of any effective primary porosity. During its geological history, the dolomite strata have been subjected to at least four periods of karstification and erosion (tertiary to recent). The potential for large-scale groundwater exploitation depends solely on the extent to which the dolomite has been leached by percolating rainfall and groundwater drainage, and the degree to which it has been transformed into aquifers capable of yielding significant quantities of water and sustaining high abstraction capacities.

During dissolution processes, the carbonate is removed from the dolomite and residual products such as silica, iron and manganese oxides and hydroxides are left behind. This residuum is called “wad”, which is a geological term meaning “weathered and altered dolomite”. The residual mass is spongy, compressible, of low density and has a high void volume. Fissures and caves also develop. Faults are preferential zones for weathering and are transformed into groundwater conduits.

There is almost certainly a lithostratigraphical control on the leaching of dolomite, and the subsequent development of high storage and permeable horizons. The aquifer therefore comprises an extensive cover of residual solution debris, and younger sediments in places. Underlying this is karstified dolomite, which is irregular and heterogeneous, with hydraulic conditions varying from phreatic to confined. The karstified superficial zone of the strata acts as the main aquifer although fractures could extend to considerable depths. Storage of as much as 8.5 x 106 m^3/km^2 and transmissivities as high as 29 000 m^2/day have been reported (DWAF, 1986) although fluctuating widely.

The area south of the Doornkop fault is covered by the Malmani Dolomite, which is locally known as the Zuurbekom Dolomite Compartment. The Kliprivier Dyke in the east, the Panvlakte Dyke in the south and the Magazine Dyke in the west mark the boundaries of the Zuurbekom-East Compartment. The northern boundary is marked by the sub-outcrop of the dolomite against the Doornkop fault. The Zuurbekom-East Groundwater Compartment, which underlies the largest part of the study area, is a non-dewatered compartment, although significant abstraction is taking place via a Rand Water borehole. The latter is used to supplement the water supply to the greater Johannesburg.

Only the lowermost Oaktree Formation is present in the study area due to extensive erosion. This formation consists of chert-poor homogeneous dark-grey dolomite with interbedded carbonaceous shale. The dolomite has a gentle regional dip to the south and attains a total thickness of approximately 200m (Parsons, 1990) in the study area. As a result of superficial deposits, the dolomites are not visible on surface.

About 1 300 million year (Ma) ago the region was subjected to tension resulting in the formation of a number of large north to north-easterly striking faults. Many of the faults penetrated the full Transvaal sequence as well as the underlying Ventersdorp and Witwatersrand Supergroups. Some of the faults were filled by Pilansberg age dykes, which subdivided the dolomite into the abovementioned watertight compartments. The Zuurbekom-East groundwater compartment is further divided into sub-compartments by a number of smaller dykes, identified during an aeromagnetic geophysical investigation. The weathered dolomite, together with its dissolution products (wad) forms the main aquifer in the area. The extent of the aquifer was determined through a regional gravity survey, which clearly illustrates areas of deeper weathering or paleo-karst valleys.

10.2.1.3 *Mine Void Aquifer*

Over 100 years of gold mining in the Randfontein and Krugersdorp area created an underground mine void, referred to as the West Rand Basin Mine Void. Pumping as much as 40 Megalitres per day (Ml/d) during mining was reported to lower the water levels at Randfontein and West Rand Consolidated Mines. When mining was discontinued, the defunct workings started to flood and, in September 2002, the mine water started to decant from a previously unknown Black Reef Shaft next to the Tweelopiespruit East. The decant point, referred to as the Black Reef Incline (BRI), is at an elevation of 1662.98 metres above mean sea level (mamsl).

The water level in the mine void continued to rise even after the decant level was reached. This indicated that the BRI is restricted and that the outflow at that point does not represent the inflow into the void.

10.2.2 Groundwater Flow Direction

In the weathered and fractured sedimentary rocks the groundwater table generally mimics the topography and the groundwater flow will be similar to the surface water flow.

Groundwater levels are measured in the monitoring boreholes shown in Figure 6-1**Error! Reference source not found.** in Part B, Section 6.1.1 below and used to assess groundwater flow direction. A groundwater level database was also compiled using information obtained from the National Groundwater Archive (NGA) and previous reports completed for this study area. Regional groundwater contours for the study area is shown in Figure 10-2 below. It is evident that the groundwater level divide is similar to the surface watershed areas.

The regional groundwater elevations vary from approximately 1,670 m amsl on the watershed to 1,600 m amsl at the Cooke TSF in the south and lower than 1,450 m amsl approximately 7 km north of the Millsite and West Wits pits.

Groundwater flow in the mine voids is predominantly in a northerly direction towards the decant point at the Black Reef Incline (BRI) and Winze 17 and 18. The hydrogeological profile showing the piezometric head adapted from Hobbs (2007) is presented in Figure 10-1.

Although the groundwater flow direction is generally towards the topographic lows, it will vary between the different aquifers as indicated in Figure 10-3, which shows the localised flow map around the Millsite TSF (Rison, 2008). In the fractured aquifer the groundwater flow will generally mimic the topography, as stated above. In the dolomite inliers the groundwater table is expected to be much flatter, but flow is also expected to be towards the surface streams.

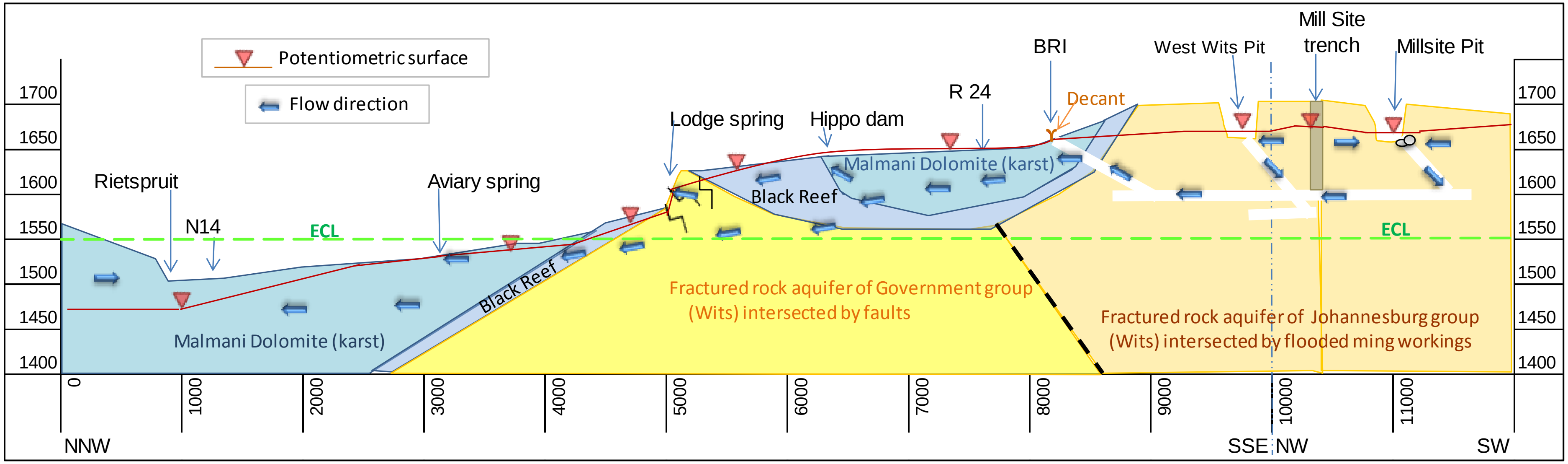

Figure 10-1: Conceptual hydrogeological profile

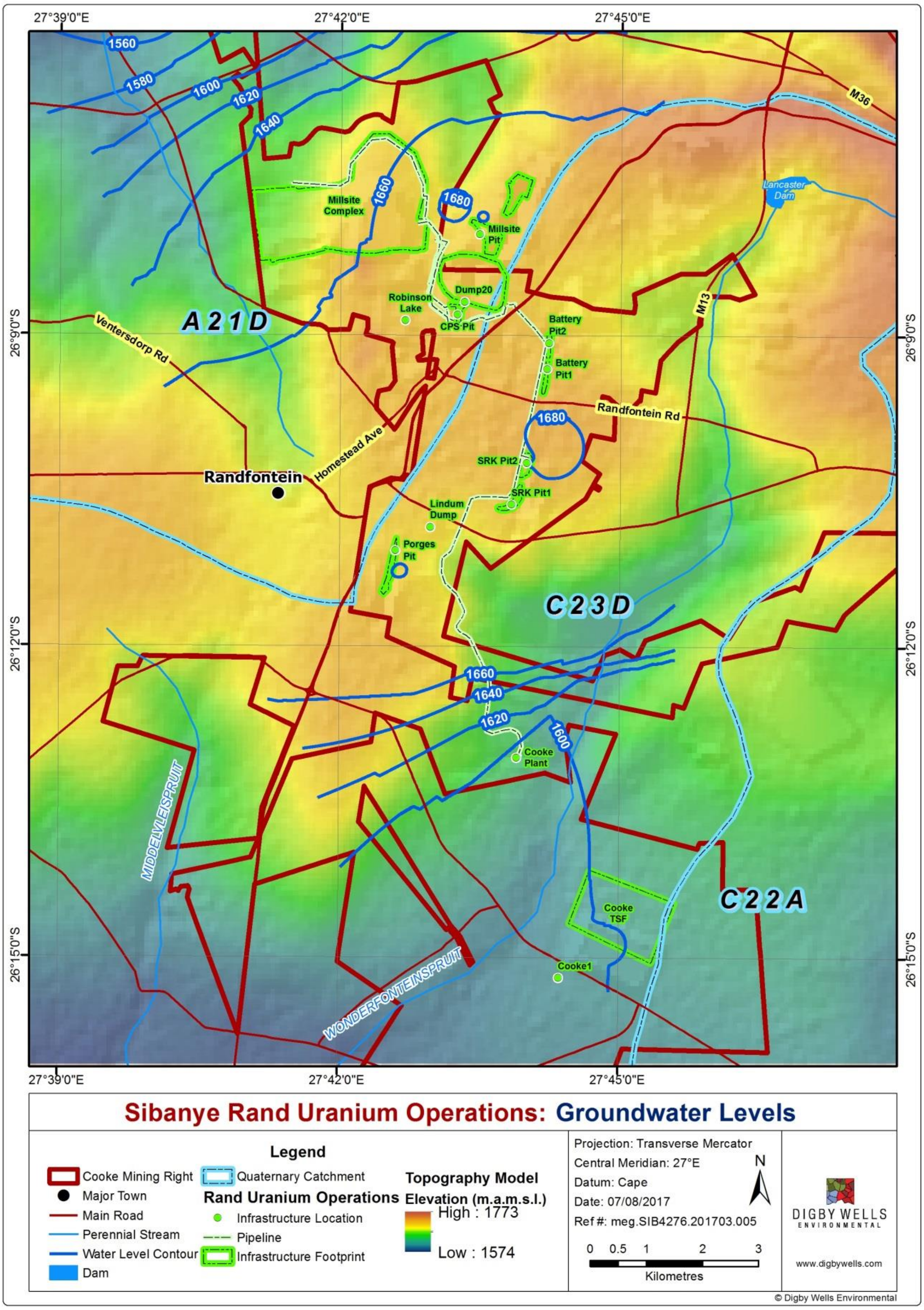

Figure 10-2: Regional groundwater Elevation and Flow Direction

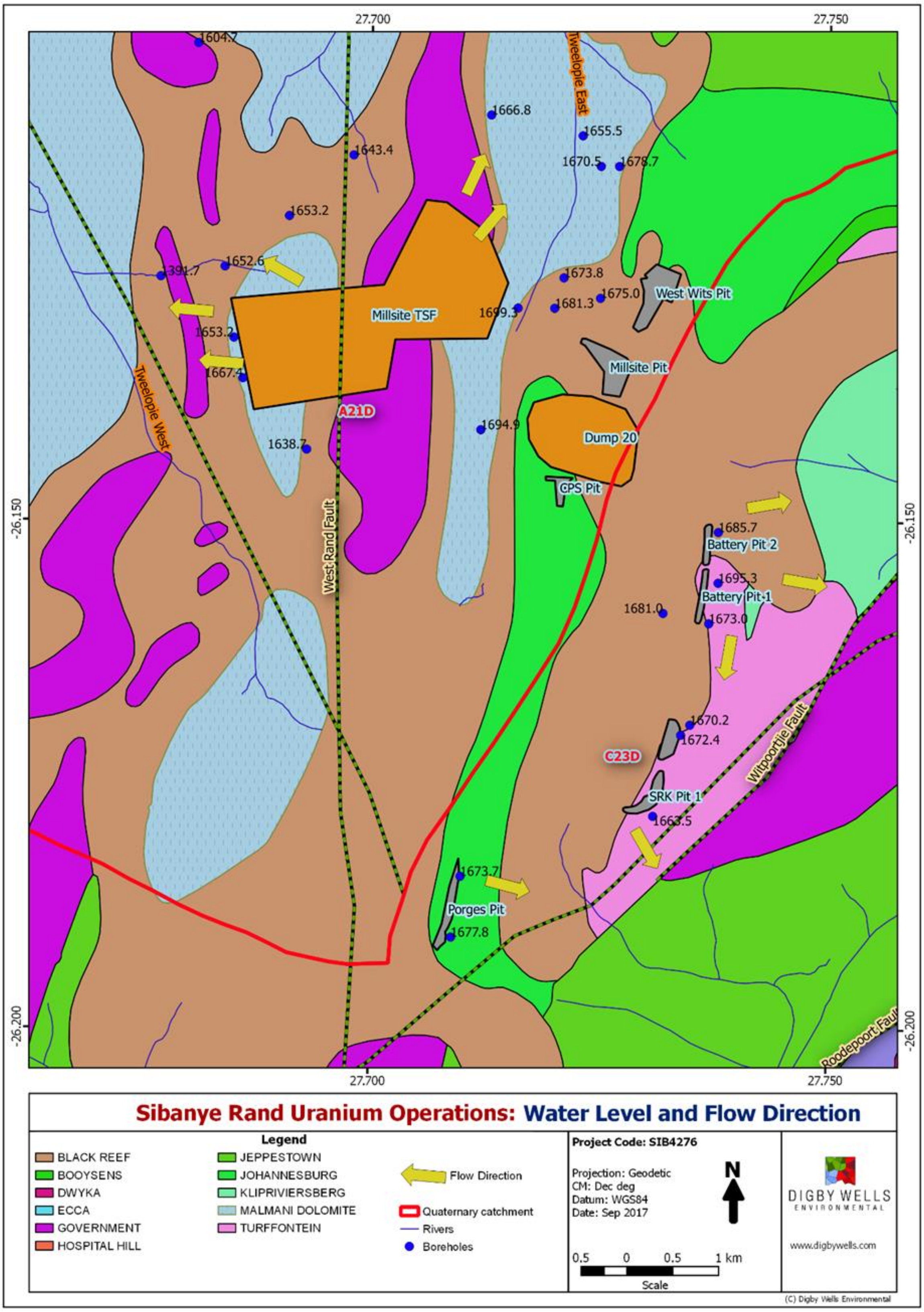

Figure 10-3: Groundwater flow direction from the Millsite TSF

10.2.3 Groundwater Quality

10.2.3.1 *Electrical Conductivity*

The groundwater quality has been compared with the mine's WUL limits for groundwater quality. The electrical conductivity (EC) limit for the groundwater is set between 70 and 150 mS/m for the operations.

The time series data for the EC is presented in Figure 10-4 and indicates three groupings; the first defined by a value below 70 mS/m and is good in quality. The second is between 70 and 150 mS/m and is acceptable quality. The third group is in excess of 150 mS/m and is unacceptable quality.

The water quality in majority of the monitoring point is either in the good or acceptable category. The main concern is the quality of the 17 Winze, 18 Winze, Borehole PH6 (located close to the Millsite Pit) and SRK Pit 2 where it is currently above the 150 mS/m limit.

The 17 and 18 Winzes pose a special concern as they are decanting points that eventually flow to the Tweelopiespruit East. It should, however, be noted that the water quality from both winzes have been improving since the available monitoring date of late 2009. The EC was approximately 500 mS/m in 2009 and has gradually decreased to the current value of approximately 325 mS/m. Although it is still above the 150mS/m WUL limit, the trend is that the water quality is improving and could be within the WUL limit in the future.

The poor water quality of the winzes cannot be associated with the deposition of the Dump 20 into the pits. The water quality was already unacceptable before the reclamation started and the trend has not changed as a result of the inpit deposition.

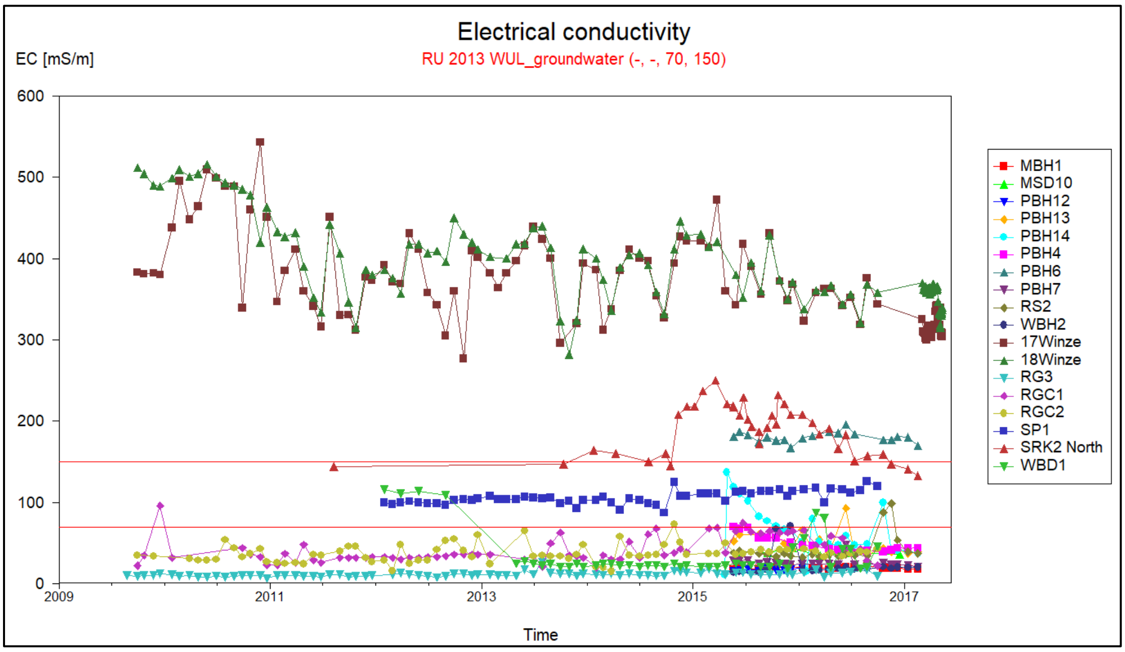

Figure 10-4: Electrical conductivity trend

10.2.3.1 *pH*

The pH trend (Figure 10-5) shows that the Battery Pit 2 (monitoring borehole PBH13) and SRK Pit 2 are consistently below the WUL limit of 5. The pH of Battery Pit 1 (monitoring PBH12) is also below this value but no monitoring data is available since January 2016.

The pH of the 17 and 18 Winzes was approximately 5 up until February 2013. Thereafter it steadily increased to the currently pH of 6.45. Both decants are within WUL limit and the trend is that it will continue to increase in alkalinity. The increase in pH is suspected to be a result of the discharge of the reclaimed Dump 20 tailings which has a pH of between 10 and 11. This is one of the positive impacts associated with the discharging of alkaline tailings into the pits, as this would mean that metals will precipitate.

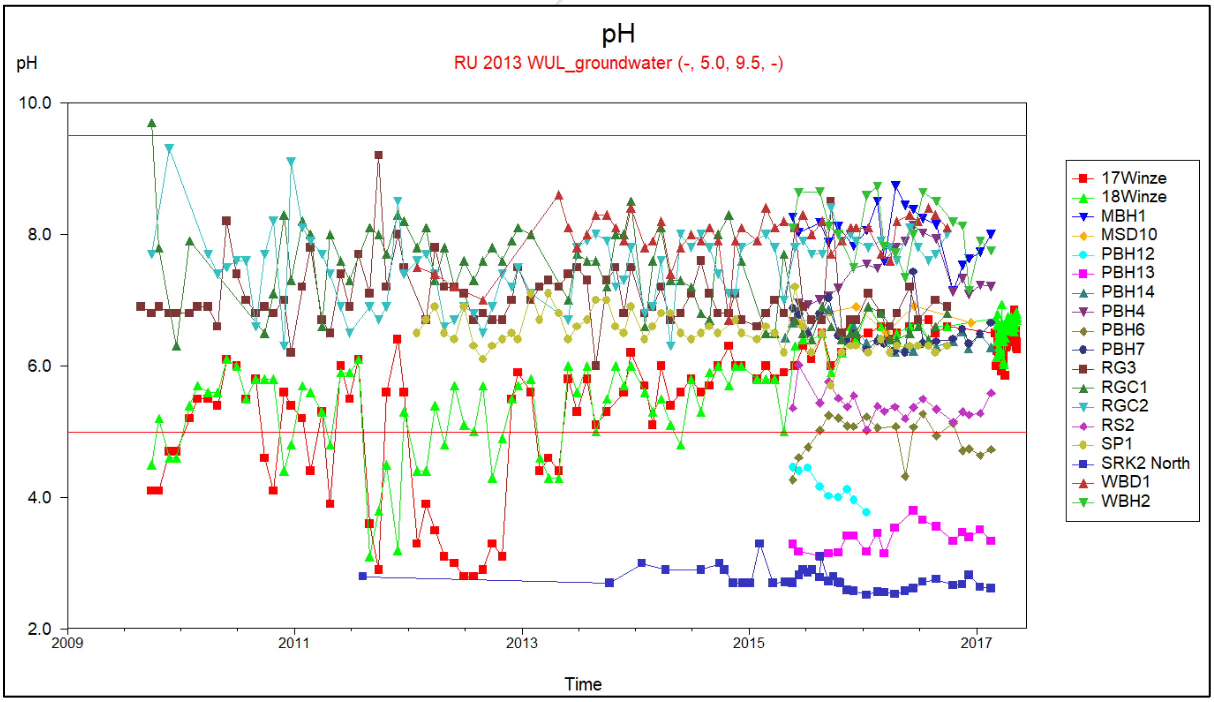

Figure 10-5: pH trend

10.2.3.2 *Calcium*

The WUL requires Ca concentration to be between 80 and 150 mg/L. The Ca trend (Figure 10-6) shows that the water from the 17 and 18 Winzes is poor in quality at a concentration of approximately 610 mg/L. As stated above the decant from these winzes joins the Tweelopiesspruit and is an environmental concern. At a concentration of 247 mg/L, the Millsite Pit water quality is also above the WUL limit. The dolomitic aquifer is chemically composed of Ca and Mg carbonates. The observed Ca and Mg concentration could be a result of the dissolution of the dolomite under natural conditions or enhanced by the interaction of the acid mine.

The rest of the monitoring boreholes are within the WUL limit and are not at a risk of Ca contamination.

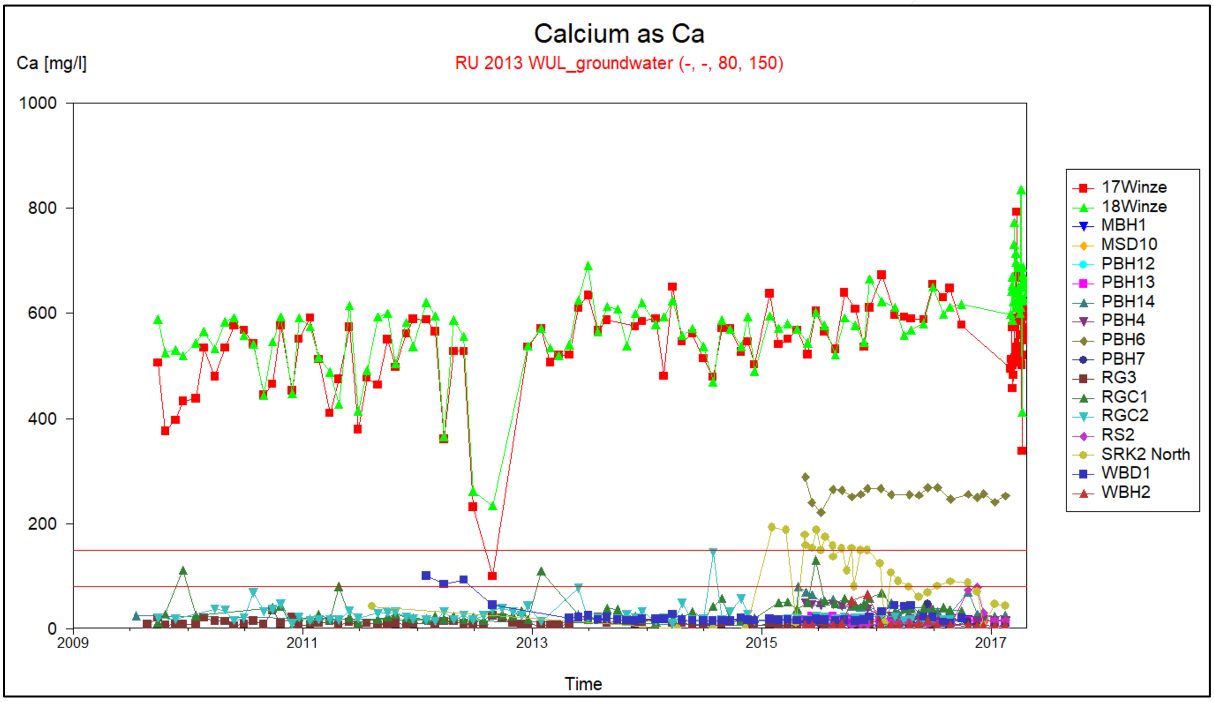

Figure 10-6: Ca trend

10.2.3.3 *Magnesium*

Magnesium concentration is illustrated in Figure 10-7 and shows that it is only 17 and 18 Winze's that are above the WUL limit. The rest of the monitoring points are not at a risk of Mg contamination.

The trend in the winzes has been decreasing continuously since June 2010; from 300 mg/L to the current value of 100 mg/L (which is the WUL upper limit). The trend is that Mg will not be a concern even in the winzes as it likely to decrease below the WUL limit. The on-going decrease in Mg is not suspected to be associated with the Dump 20 deposition as it was already decreasing before 2012 and no change in trend has been recorded that could be linked with the deposition.

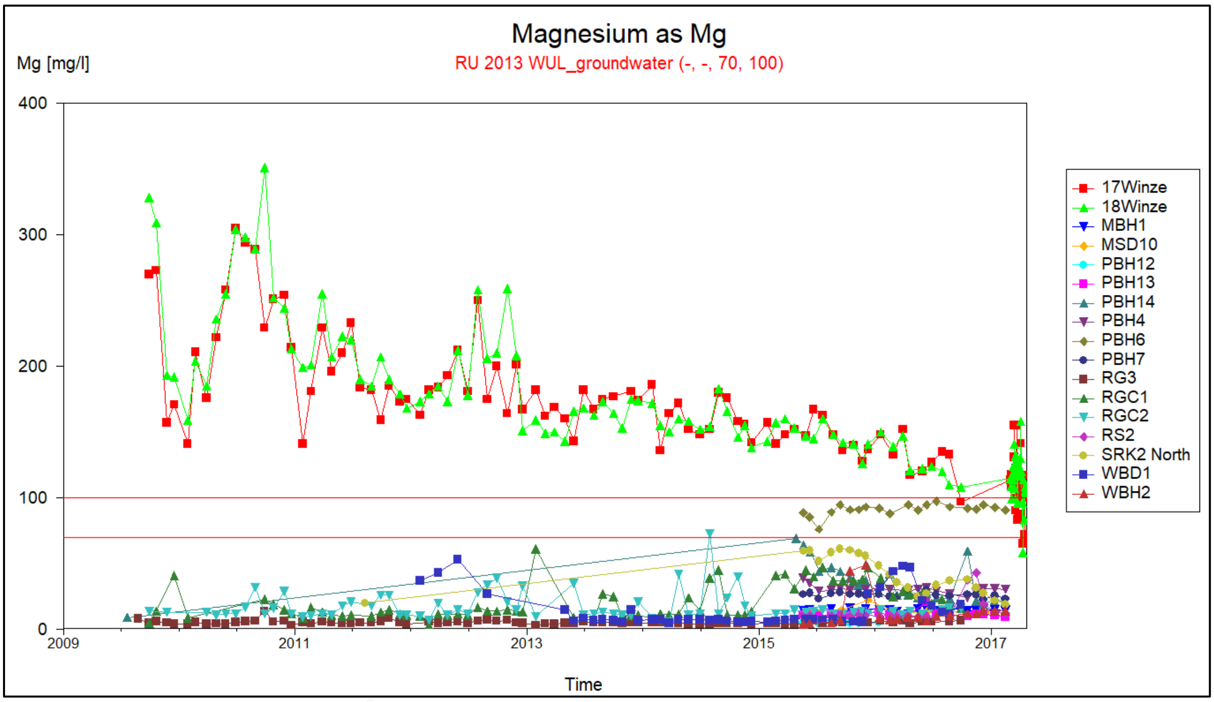

Figure 10-7: Mg trend

10.2.3.4 *Sulphate*

The sulphate trend (Figure 10-8) is similar to that of EC and Mg. Although the winzes decant quality is above the WUL limit of 600 mg/L, it has been consistently decreasing since monitoring started in 2010. The trend has not changed and cannot be associated with the inpit deposition of the reclaimed Dump 20.

The quality of the Millsite Pit (borehole PBH6) and SRK Pit 2 is also above the WUL limit.

The rest of the monitoring boreholes are below 400 mg/L and are not at a risk of contamination.

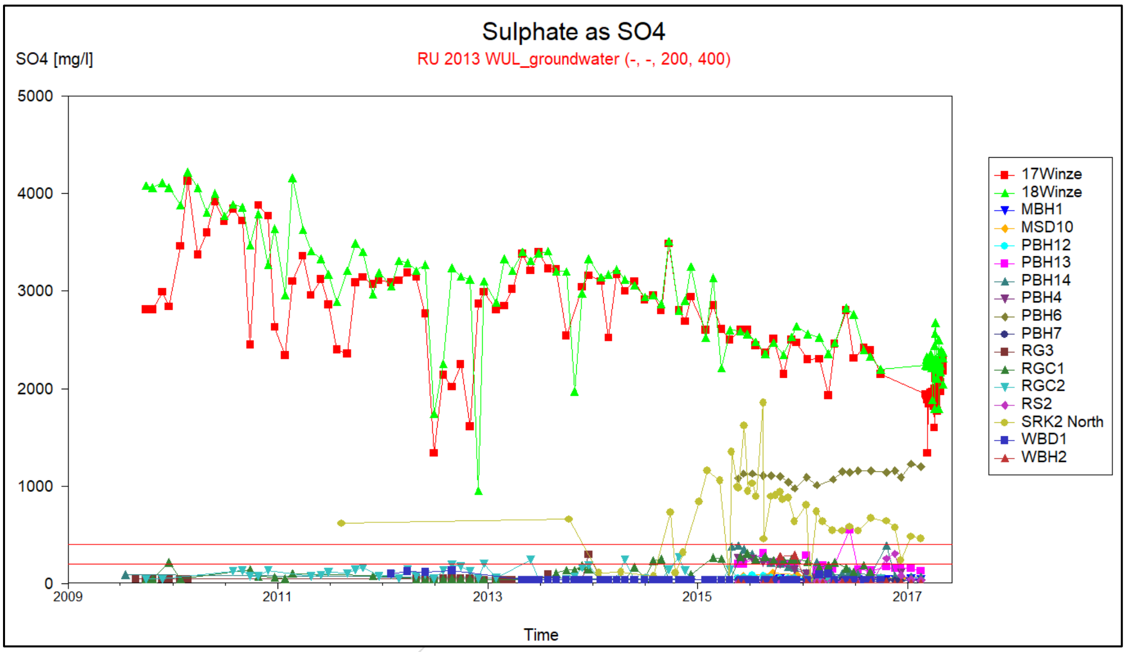

Figure 10-8: Sulphate trend

10.2.3.5 *Metals*

The concentration of Mn, Fe and Al is illustrated in Figure 10-9. The concentration of all these metals is above the WUL in the 17 and 18 Winzes.

Fe concentration has been decreasing consistently since 2013 and could be linked with the deposition of Dump 20. However, Mn has been decreasing since 2010 before the deposition started.

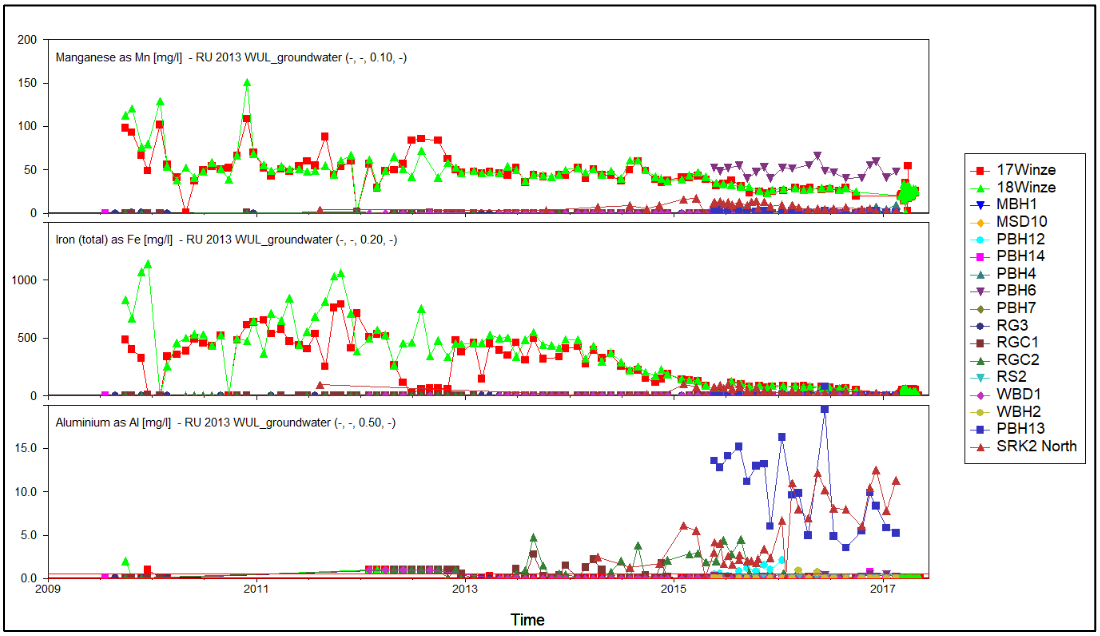

Figure 10-9: Metals (Al, Fe, Mn) trend

10.2.4 Groundwater Receptors

Groundwater usage in the area occurs on agricultural holdings some 2.5km to the north of Millsite TSF and small farms immediately to the west of the tailings dam. Groundwater usage is primarily for domestic purposes although large scale irrigation takes place from the Sterkfontein dolomite. The tailings dam also has the potential to impact on the Tweelopiespruit West and East streams that flow through the Krugersdorp Game Reserve and ultimately into the Cradle of Humankind World Heritage Site.

Groundwater usage in the area between the Millsite TSF and Cooke TSF is mainly on agricultural holdings. Several of the smallholdings are owned by Sibanye-Stillwater/Rand Uranium (Pty) Ltd. Farming operations to the west of the Wonderfonteinspruit utilise groundwater for stock watering and domestic purposes.

Significant streams that could be impacted if the groundwater quality deteriorates include the Wonderfonteinspruit, Tweelopiespruit and Mooirivierloop. These streams are vulnerable to AMD seepage and salt loading as a result of tailings seepage in the shallow groundwater zone and decant of mine water through old shafts.

10.3 Surface Water

The Surface Water Impact Assessment Report is attached hereto as **Appendix 7**.

The Millsite TSF Complex is located in the A21D quaternary catchments of the Limpopo Water Management Area (WMA) (previously known as Crocodile West and Marico), as per the revised WMA boundary descriptions (Government Gazette No. 35517) in 2012, while Cooke Plant is located within C23E quaternary catchment of the Vaal WMA (previously known as Upper Vaal). The hydrological setting of this affected area is shown in Figure 10-10.

The surface water attributes of the affected catchments, namely the Mean Annual Runoff (MAR) quantified in million cubic metres (Mm^3), Mean Annual Precipitation (MAP) and Mean Annual Evaporation (MAE), both quantified in mm, are summarised in Table 10-1 (WRC, 2012).

Table 10-1: Summary of the surface water attributes of the A21D and C23D quaternary catchments

Quaternary Catchment	Total Area (km^2)	MAP (mm)	MAR (Mm^3)	MAE (mm)
A21D	372	714	11.27	1700
C23D	510	664	9.12	1650

A21D quaternary catchment has a total area of 372 km^2 with an MAR of 11.27 Mm^3 whilst the C23D quaternary catchment area is 510 km^2 and has a MAR of 9.12 Mm^3.

10.3.1 Catchments, Rivers and Drainage

The main or perennial river within A21D quaternary catchment is the Bloubankspruit which flows from south towards the north-eastern side where the catchment outlet is situated. The Bloubankspruit is approximately 800 m from the Millsite Complex. There are also a few non-perennial drainages/streams that exist within this catchment and the Bloubankspruit is a tributary of the Crocodile River which the feeds into Hartebeespoort Dam.

The Tweelopiespruit West is the closest stream; approximately 100 m north of Millsite TSF Complex. Approximately 1 km away on the eastern side of Millsite, the catchment is drained by the Tweelopiespruit East.

The Wonderfonteinspruit is the main river within the C23D quaternary catchment. Runoff emanating from this quaternary catchment drains in a south-westerly direction into the Wonderfonteinspruit. C23D quaternary catchment is a contributing catchment to C23E, and therefore all runoff from C23D eventually drains into Mooirivierloop of the C23E quaternary catchment.

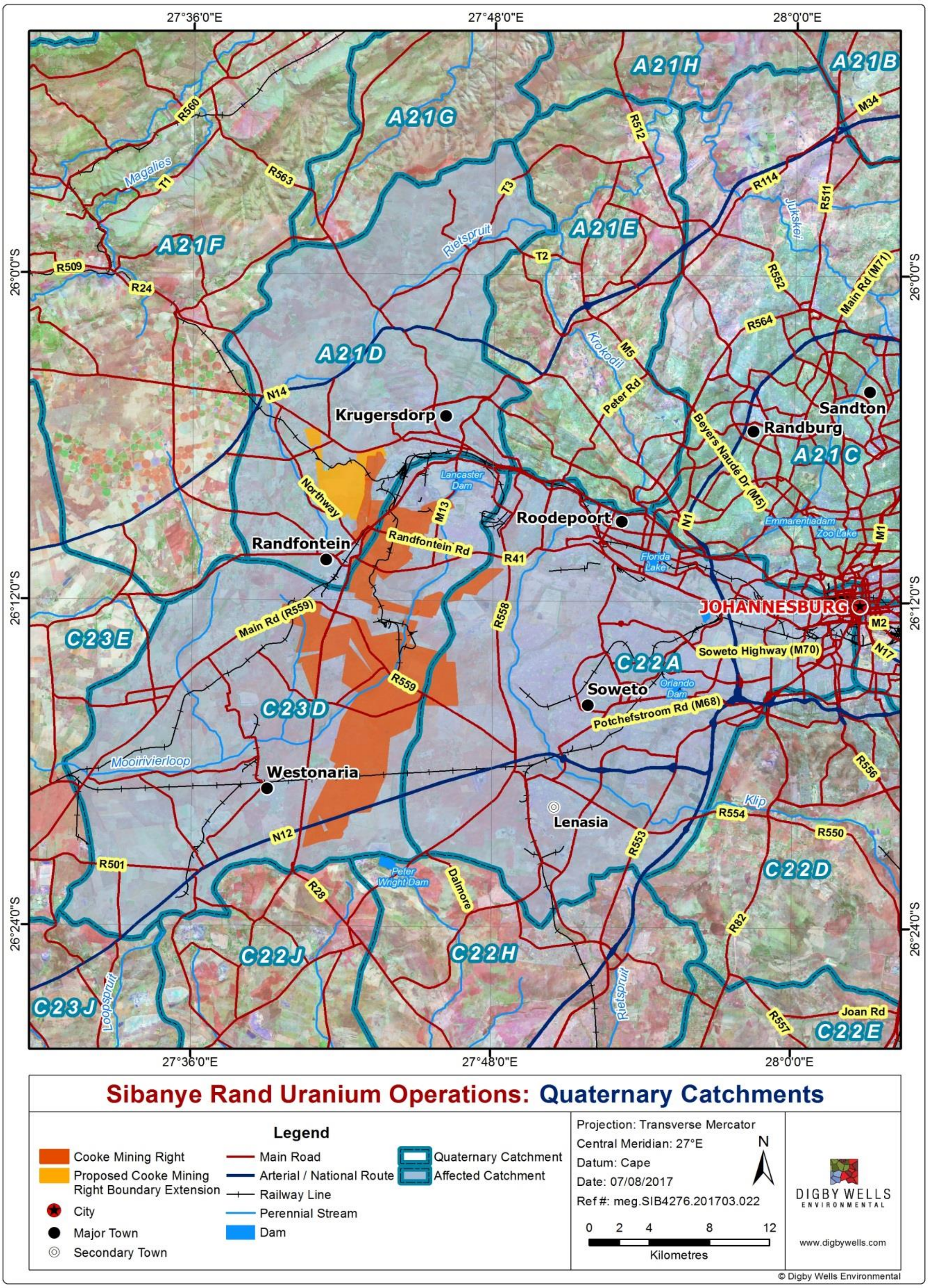

Figure 10-10: Hydrological Setting

10.3.2 Water Quality

Sibanye-Stillwater has been conducting surface- and groundwater monitoring over an extended period of time on existing operations and surrounds. Sibanye-Stillwater provided Digby Wells with the existing water quality monitoring database, ranging from 2012 to 2017. This enabled data interpretation, water quality trend analysis, and establishing the current water quality status prior to the proposed reclamation of the Millsite TSF Complex. Water quality monitoring also serves to quantify and characterise the impact that the mining activity has on the immediate and greater catchment.

As currently authorised in the WUL, Sibanye-Stillwater discharges into the Wonderfonteinspruit at a discharge point located below Cooke Shaft 1. Underground water from Cooke Shaft 2 and 3 is discharged into the Magazine Pan. Water discharged into Magazine pan either seeps back into the underground workings or evaporates from the pan.

Water is pumped out of the Western Basin 8 Shaft and 9 Shaft to be treated in the existing West Rand Mine Drainage Treatment Facility, managed by the Tran-Caledon Tunnel Authority (TCTA). Treated water is then discharged into the Tweelopiespruit. In addition, water is captured from Winze area in the BRI Dam and is pumped to the treatment facility. If the quantity of water to be pumped from the decant points exceeds the water treatment facility's capacity, this water is discharged without treatment.

Water quality results on the Wonderfonteinspruit monitoring points were benchmarked with the WUL discharge limits that were provided for Cooke 1 and Cooke 2 Discharge. The results for the Tweelopiespruit catchment were benchmarked with the TCTA directives or limits provided by DWS. This was done to determine the water quality trends over time, parameters of concerns and the baseline water quality prior to undertaking the proposed Project.

Table 10-2 provides an annual average water quality analysis of the current discharge from Cooke 1 (W14) and Cooke 2 (W16) (January 2017 – October 2017) monitoring points benchmarked against the WUL discharge limits and the proposed Resource Quality Objectives (RQO) for Mooiriver catchment. The parameters of concern during the recent period (March 2017 – October 2017) include but are not limited to EC, TDS, SS, SO4, U, Al and Pb on the Wonderfonteinspruit monitoring points.

Table 10-2: Average (January 2017-October 2017) Water Quality at the Cooke 1 and 2 Shaft Discharge Monitoring Point

Variables	Unit	Proposed RQO's for Mooiriver catchment	WUL Limits	W14	W16
pH			5.5-9.5	7.6	8.7
Electrical conductivity	mS/m	111	115	105.8	139.1
Total dissolved solids	mg/ℓ		750	839.2	1054.2
Suspended solids	mg/ℓ		55	83.3	203.4
Sulphate	mg/ℓ	500	600	417.8	699.9
NO3 as N	mg/ℓ	4		3.2	3.8
PO4 as P	mg/ℓ	0.125		0.7	0.1
Total cyanide	mg/ℓ		0.5	0.7	0.2
Calcium	mg/ℓ		90	116.6	197.8
Chloride	mg/ℓ		50	39.4	34.6
Fluoride	mg/ℓ	3	0.1	0.4	0.5
Magnesium	mg/ℓ		70	30.3	25.7
Sodium	mg/ℓ		70	80.9	99.6
Uranium	µg/ℓ	0.015	0.07	0.072	0.244
Aluminium	mg/ℓ	0.15	0.5	0.8	0.6
Boron	mg/ℓ		0.5	0.2	0.2
Cadmium	mg/ℓ	0.005	0.01	0.03	0.0
Copper	mg/ℓ	0.008	0.1	0.1	0.1
Iron	mg/ℓ		0.2	0.2	0.2
Lead	mg/ℓ	0.013	0.1	0.027	0.024
Manganese	mg/ℓ	1.3	0.1	1.1	0.2
Nickel	mg/ℓ		0.2	1.3	0.2
Zinc	mg/ℓ	0.036	0.08	0.7	0.05

(yellow)	Exceeding WUL
(orange)	Exceeding RQO

Table 10-3 provides annual averages of water quality analysis of water discharged into the Tweelopiespruit by the TCTA's treatment facility. Two points have been selected, one (17

Winze) where uncontrolled overflow enters the Tweelopiespruit (when it occurs) and the other (V1B) where treated water is discharged from the TCTA Water Treatment Plant. These discharges have been compared to the TCTA's directive discharge limits prescribed by DWS and the proposed RQS for Bloubankspruit (labelled as B/spruit RQS in the table). The parameters of concern include but not limited to Total Dissolved Solids (TDS), Suspended Solids (SS), Sulphate (SO_4), Cyanide (CN), Iron (Fe), Manganese (Mn) and Zinc (Zn).

Table 10-3: Average Water Quality of Water Discharged into the Tweelopiespruit

Variables	Unit	B/spruit RQS	TCTA Directive	17 Winze (untreated) March 2016 - March 2017	17 Winze (untreated) March 2015 - March 2016	V1B (treated) March 2016 - March 2017	V1B (treated) March 2015 - March 2016
pH		6.5-8.5	6.5-9.5	6.4	6.2	8.61	7.69
Electrical conductivity	ms/m		450	321.10	378.25	349.86	327.50
Total dissolved solids	mg/l			3225.60	3969.17	3585.17	3410.09
Suspended solids	mg/l			23.1	116.17	11.59	10.80
Sulphate	mg/l	40	3000	2023.34	2446.17	2401.52	2178.98
Total cyanide	mg/l	0.11		0.64	0.58	0.50	0.50
Calcium	mg/l			561.28	583.92	666.61	602.00
Chloride	mg/l			55.48	52.33	48.07	47.39
Fluoride	mg/l			0.37	0.41	0.78	0.81
Magnesium	mg/l			112.78	145.58	99.30	104.82
Sodium	mg/l			141.53	144.67	158.30	131.98
Uranium	µg/ℓ	0.03		0.043	0.036	0.015	0.014
Aluminium	mg/l	0.1	1	0.042	0.029	0.059	0.068
Boron	mg/l			0.25	0.425	0.62	0.44
Cadmium	mg/l			0.008	0.001	0.002	0.001

				March 2016 - March 2017	March 2015 - March 2016	March 2016 - March 2017	March 2015 - March 2016
Variables	**Unit**	**B/spruit RQS**	**TCTA Directive**	**17 Winze (untreated)**		**V1B (treated)**	
Copper	mg/l			0.019	0.004	0.004	0.006
Iron	mg/l	0.3	<1	37.15	83.67	0.51	0.36
Lead	mg/l			0.025	0.001	0.003	0.001
Manganese	mg/l	0.15	<10	23.03	30.67	2.51	3.18
Nickel	mg/l	0.07		0.23	0.081	0.051	0.069
Zinc	mg/l	0.002		0.08	0.034	0.024	0.037
Phosphate	mg/l	0.125					

(yellow)	Exceeding TCTA's Directive
(orange)	Exceeding RQO

10.3.2.1 *Description of the Selected Monitoring Locations*

A representative sample has been selected to interpret the surface water quality. The sample points comprise upstream and downstream points of the operation. The coordinates and descriptions of the selected monitoring locations have been provided Table 10-4 below and also presented in Table 6-2, Part B, Section 6.1.1.2.

Table 10-4: Selected Water Monitoring Points

Name/ID	Descriptions	X co-ord	Y co-ord
Sibanye's Monitoring Points in Wonderfonteinspruit			
W4	West Rand slimes effluent (trench)	26° 8'29.59" S	27° 45'53.30" E
W5	Kagiso low bridge	26° 9'20.82" S	27° 45'52.42" E
W6	Rndfntn/Rdprt bridge 450	26° 9'51.57" S	27° 46'0.13" E
W7	Kagiso bridge	26° 10'2.77" S	27° 46' 39.9" E
W8	Upstream of Flip Human STP	26° 10'39.19"S	27° 45'57.20" E
W9	Flip human STP effluent discharge	26° 10'55.2" S	27° 46'12.35"E
W10	Attenuation dam outlet	26° 12'58.04"S	27° 44'28.66"E
W12	Before Cooke TSF	26° 13'58.27"S	27° 44'12.03"E
W13	After Cooke TSF	26° 14'29.9" S	27° 44'0.71"E
W14	Cooke 1 shaft discharge to the Wonderfonteinspruit	26° 14' 56.9"S	27° 44' 4.9"E
W15	Bridge before Cooke 2 shaft	26° 15'56.3"S	27° 41'55.4"E
TCTA's Monitoring Points in Tweelopiespruit West			
POINT2	Point 2 overflow: Greenhills Avenue	26° 9'56.30"S	27°41'16.20"E
POINT4	Point 4 bridge dirt road below slimes dam 41	26° 8'29.68"S	27°40'32.06"E
POINT6	Point 6 bridge Krugersdorp/ Venterdorp road	26° 6'54.93"S	27°39'41.41"E
POINT7	Point 7 Dirk Mellet Plot 129	26° 7'45.51"S	27°40'36.23"E
TCTA's Monitoring Points in Tweelopiespruit East			
TCTA (V2)	BRI Dam mixture to HDS Plant	26° 6 55.67S	27° 43 22.31E
TCTA V1.A	Uncontrolled Overflow into trench	26° 6 27.50S	27° 43 20.54E
TCTA V1.B	RU Treated water before game reserve - trench	26° 7 15.61S	27° 43 11.73E
8 Shaft	Water pumped from western basin void (Shaft)	26° 08 07.42S	27° 43 10.15E
TCTA V1.C	Uncontrolled and Treated mixing sump	26° 6 24.96S	27° 43 20.16E
17 Winze	Shaft overflow to Tweelopiespruit east	26° 7'17.10"S	27°43'17.82"E
18 Winze	Shaft decant to BRI dam	26° 6'54.50"S	27°43'29.59"E

10.3.2.2 *Water Chemistry Discussion*

The chemistry for quaternary catchments C23D and A21D are summarised below.

10.3.2.2.1 C23D quaternary catchment

- Figure 10-11 below provides the total dissolved solids, sulphates and electrical conductivity which showed elevated levels which are above the proposed Mooiriver quality objectives at the W4 upstream monitoring point. This could be as result of the contaminated slimes effluent from the West Rand slimes that overflow into the Wonderfonteinspruit. It should be noted that the referred to West Rand slimes is not of Sibanye-Stillwater but of other parties around the area. A significant improvement in these parameters occurred as you downstream until the downstream monitoring points.
- Slight increases are observed along Cooke Shaft 1 discharge point. However, the quality within the main stream remained within the Mooiriver RQOs and this is due to dilution of the mine water discharge as it enters the stream.
- Elevated levels of Uranium have been observed downstream of Cooke 1 discharge (W14) whilst Manganese levels have improved along or downstream of Cooke 1 discharge.

From January 2012 to October 2017, water quality at Cooke 1 (W14) and Cooke 2 (W16) discharge has shown fluctuating levels of parameters such Suspended Solids, Iron, Sulphates, Manganese etc. except for iron, most of the parameters have indicated quality which is above the discharge limits as provided in the WUL. It should be noted though that the W16 point does not enter the Wonderfonteinspruit. Water quality along the Wonderfonteinspruit is of poor quality as compared to both the Mooiriver RQO and the WUL limits. Elevated levels of various parameters are above the limits at the most upstream monitoring point (W4) where there is slimes effluent discharge. Reduction of these concentrations occurs along the Wonderfonteinspruit and the levels decreases, but this rises again at the discharge point W14. However, another significant decrease or improvement can be seen at W15 which is further downstream of W14.

10.3.2.2.2 A21D quaternary catchment

- Water quality along the Tweelopiespruit East was benchmarked with the TCTA directive limits. On average (January 2012 to March 2017) as shown in Figure 10-12 below, Electrical Conductivity and sulphate levels are within the limits;
- Manganese is showing fluctuating quality and elevated levels are observed from 18 Winze shaft decant monitoring point to V1C where treated water is discharged. A significant decrease of Manganese levels is then observed going downstream of the Tweelopiespruit East.
- Bloubankspruit/Tweelopiespruit West, parameters such as Uranium, Manganese and Sulphate levels are mostly above the proposed Bloubankspruit RQO's.

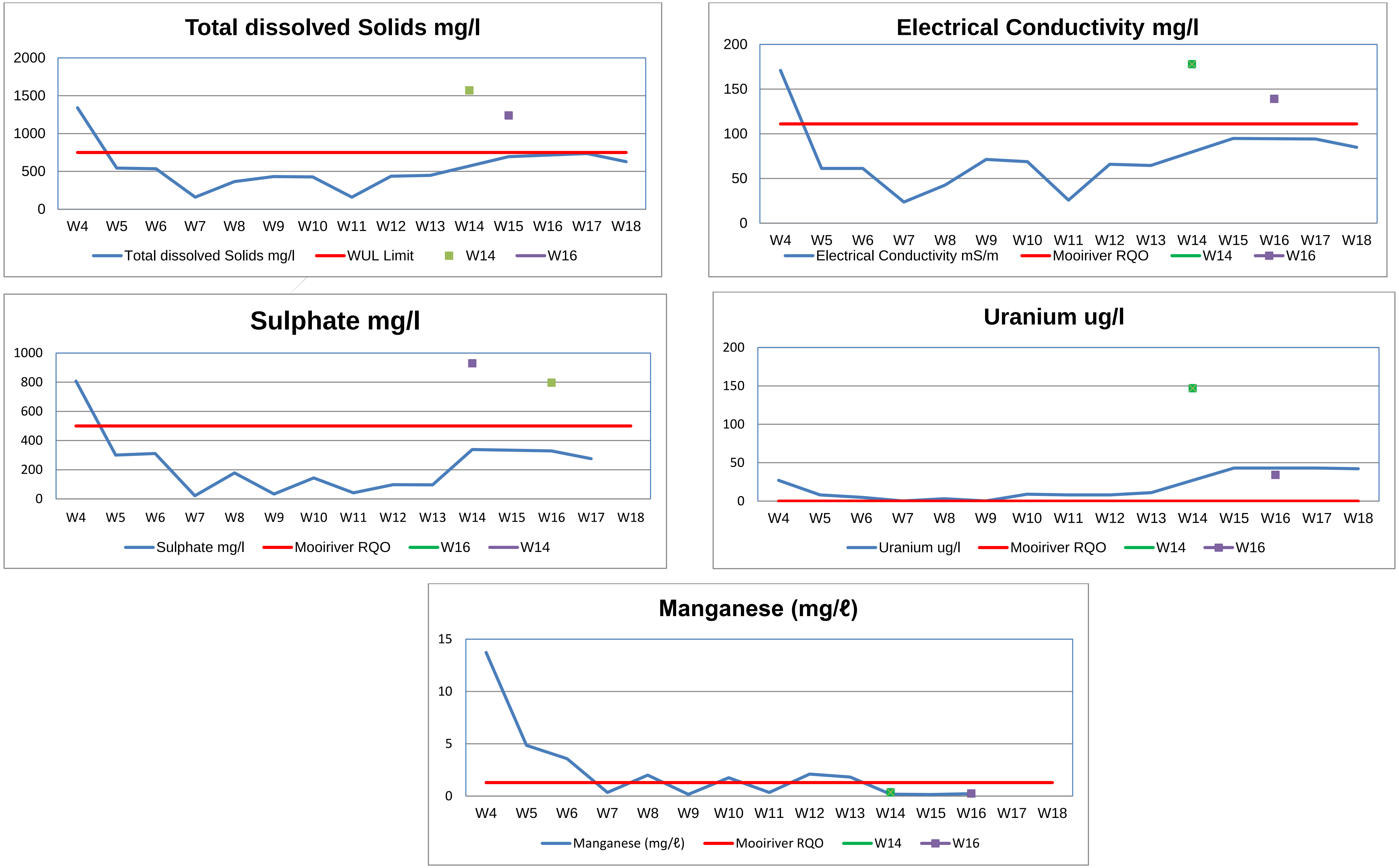

Figure 10-11: Summarised water quality trends from upstream to downstream of the Wonderfonteinspruit (January 2012 to October 2017)

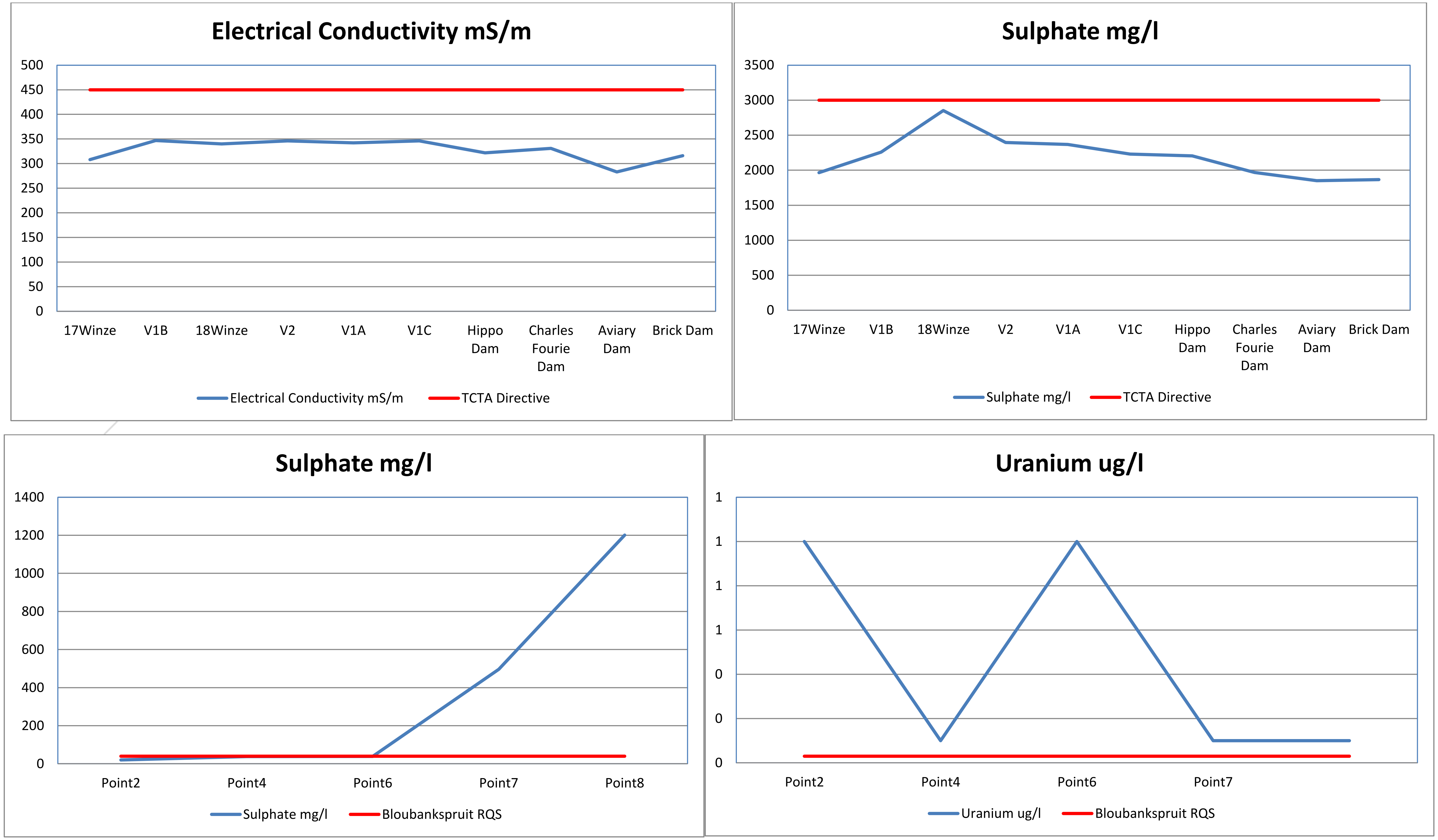

Figure 10-12: Summarised average water quality trends from upstream to downstream of the Tweelopiespruit West and East (January 2012 to March 2017)

10.4 Wetlands

The Wetland Impact Assessment Report is attached hereto as **Appendix 8**.

10.4.1 Baseline Assessment Criteria

The Wetland Impact Assessment considered several sources available to determine the value of wetlands on site, as discussed below.

10.4.1.1 *National Freshwater Ecosystem Priority Areas*

The NFEPA project provides a collated, nationally consistent information source of wetland and river ecosystems for incorporating freshwater ecosystem and biodiversity goals into planning and decision-making processes (Nel *et al.* 2011). The spatial layers (FEPA's) include the nationally delineated wetland areas that are classified into hydrogeomorphic (HGM) NFEPA project types and ranked in terms of their biodiversity importance. These layers were assessed to evaluate the importance of the wetland areas located within the Project area.

10.4.1.2 *Mining and Biodiversity Guideline*

The Mining and Biodiversity Guideline was developed collaboratively by the South African Biodiversity Institute (SANBI), the Department of Environmental Affairs (DEA), the Department of Mineral Resources (DMR), the Chamber of Mines and the South African Mining and Biodiversity Forum in 2013. The purpose of the guideline was to provide the mining sector with a manual to integrate biodiversity into the planning process.

10.4.1.3 *Gauteng Conservation Plan Background*

Gauteng Nature Conservation, a component of the Gauteng Department of Agriculture and Rural Development (GDARD), produced the Gauteng Conservation Plan Version 3 (C-Plan 3). The main purposes of the C-Plan 3.3 are to serve as the primary decision support tool for the biodiversity component of the EIA process, inform protected area expansion and biodiversity stewardship programmes in the province, and serve as a basis for development of Bioregional Plans in municipalities within the province.

10.4.2 Baseline Findings

Five HGM units were identified within 500 m of the Millsite TSF, which cover approximately 105.1 ha. The breakdown of the wetland types per area is detailed in Table 10-5 with localities shown in Figure 10-13. Figure 10-13 illustrates the various wetlands identified. A Zone of Regulation of 100 m around each wetland has been assigned according to GN 704 of the NWA for activities requiring the separation of clean and dirty water systems.

Table 10-5: Wetland HGM Units

HGM Unit	HGM Unit Type	Area (ha)
1	Hillslope Seep	36.2
2	Channelled Valley Bottom	14.8
3	Artificial Wetland	16.8
4	Channelled Valley Bottom	21.1
5	Depression	16.2

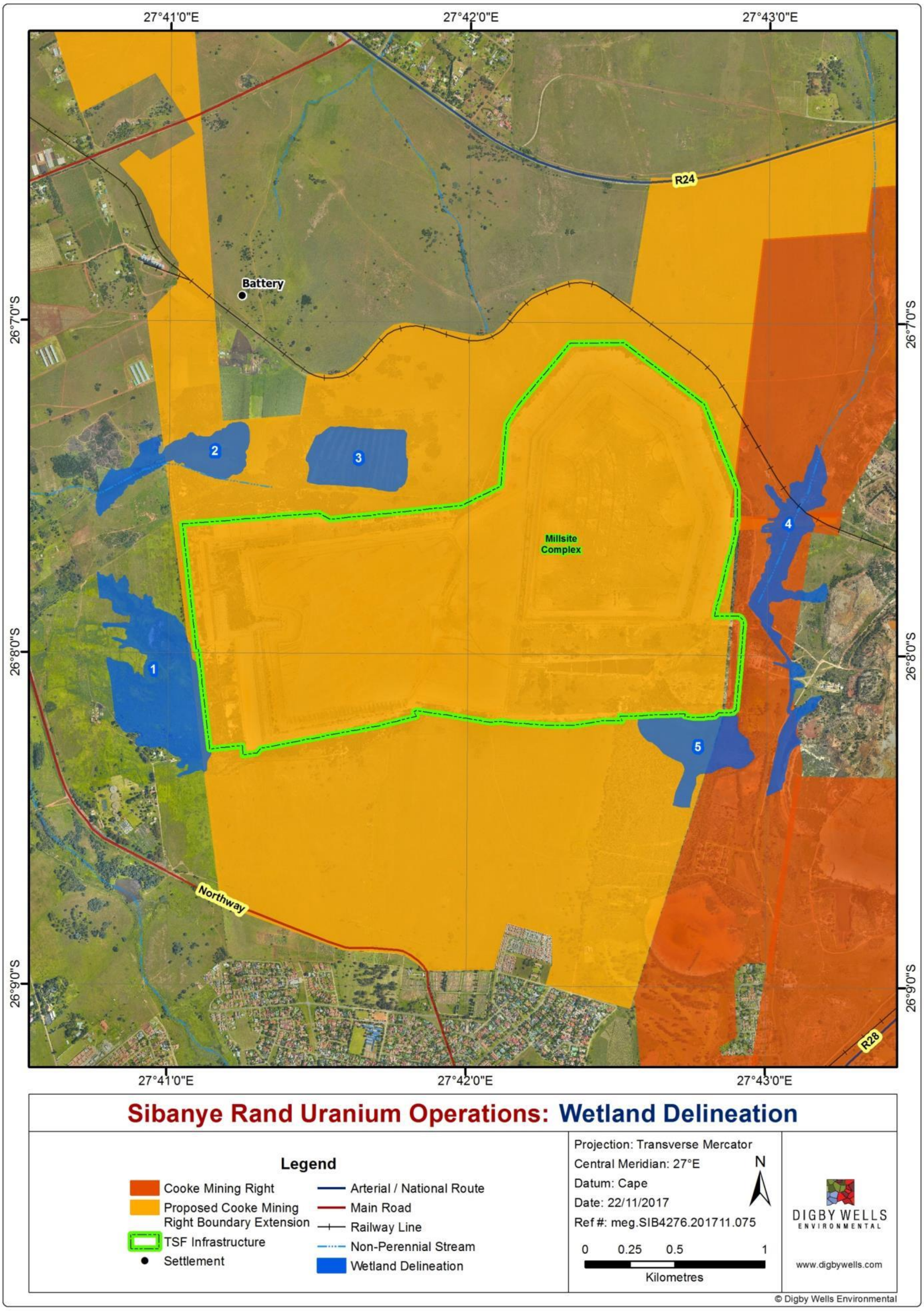

Figure 10-13: Wetland Delineation

10.5 Aquatic Assessment

An Aquatic Ecology Assessment of the Upper, Middle and Lower Wonderfonteinspruit was undertaken by Digby Wells (2016).

This report showed that the total Present Ecological Systems of the extent of the Wonderfonteinspruit evaluated was mainly/extremely altered (class D/E). This has been attributed to widespread habitation alteration as a result of mining and development within the area, compounded by impacts of water quality. Further water quality impacts are also known to occur as a result of urban runoff, exacerbated by sewage effluent and solid waste disposal within the catchment. The desktop ecological information available for the Upper, Middle and Lower Wonderfonteinspruit Sub Quaternary Reaches (SQRs) are consolidated in Table 10-6.

10.5.1 Upper Wonderfonteinspruit: C23D-01313

Within the Upper Wonderfonteinspruit a total of three fish species are expected to be present in this SQR. These expected taxa are tolerant to water quality modification but rely heavily on the volumes of water currently in the SQR and as such their ecological importance is viewed as moderate. Due to the tolerance of the expected taxa, the sensitivity of the SQR is viewed as low. Water quality impacts are therefore seen as important factors to consider in this SQR.

10.5.2 Middle Wonderfonteinspruit: C23D-01365

The Middle Wonderfonteinspruit is located below the confluence of the Middelvleispruit and upstream of the confluence with the Rietfonteinspruit. The SQR is only approximately 4 km in length. According to available desktop information the PES of this SQR is seriously modified (class E). Based on previous observation of the site, the PES differs from the desktop information (DWA, 2013) because this section is completely piped and therefore serious instream modification has occurred. In spite of this, the riparian habitat is still largely intact and therefore is rated as moderately modified. Only two species of fish are expected to be present within this SQR. Due to the piping of the river as well as the presence of several barriers (impeding biota movement) the current biota present are considered to have a moderate ecological importance. Due to the large reliance of this aquatic biota on the remaining water in the SQR the ecological sensitivity is viewed as moderate. Water quantity is therefore seen as an important factor to consider in this SQR.

10.5.3 Lower Wonderfonteinspruit: C23D-01384

The Lower Wonderfonteinspruit, otherwise known as the Mooirivierloop occurs after the confluence with the Rietfonteinspruit and the C23E-01266 SQR. The PES of the lower Wonderfonteinspruit is seriously modified (class E). This PES is largely attributed to industrial activities, waste water treatment works, townships and instream habitat modification (DWA, 2013). This SQR is also piped and therefore serious instream modification has occurred. Due to the presence of substantial impacts and the low confidence in the presence of fish in the SQR the ecological importance and sensitivity is viewed as low. It is noted here that this SQR is also potentially affected by the western cluster.

Table 10-6: Desktop ecological information available for the three SQRs (DWA, 2013)

Component/Catchment	C23D-01313	C23D-01365	C23D-01384
PES (Class)	E (Seriously modified)	E (Seriously modified)	E (Seriously modified)
Ecological Importance	Moderate	Moderate	Low
Ecological Sensitivity	Low	Moderate	Low

The findings for each potentially affected SQR indicate the majority of river systems are largely modified. The modification is attributed to the location of the rivers' sources, which are in urban and industrial areas. Existing instream impacts in the region are impoundments, water quality modification (industrial runoff), sewage effluent and solid waste disposal. Riparian impacts in the northern cluster are vegetation removal, channel and bed modification and urban/industrial encroachment. Overall, only moderately important and sensitive aquatic ecosystems are found (based on desktop information) with no Red Data aquatic taxa expected to be present. It is further stated that the majority of the Wonderfonteinspruit exists within a pipeline which presents serious instream modification. Based on the absence of RTE taxa as well as the classification of aquatic ecology as moderately important and sensitive, no fatal flaws are expected within this mining right area.

10.6 Geochemical Assessment

The Geochemical Assessment Report is attached hereto as **Appendix 9**.

A geochemical assessment was undertaken of the Dump 20 tailings in 2012 to assess the composition of the material to be disposed of into the open pits. Similarly, a geochemical assessment has now been undertaken for the Millsite TSF complex to evaluate the characteristics of the Millsite TSF tailings comprising of acid-base accounting and leachate tests.

AMD and metal leaching are widespread phenomenon affecting the quality of water at many South African mines and historical mining basins. To operate a mine in an informed, environmentally responsible manner, the metal leaching and AMD potential of all the materials excavated, exposed or otherwise disturbed must be understood and managed to prevent metal leaching and AMD formation through prediction and design, avoiding long-term risks wherever possible. Sulphide minerals are the primary sources of acidity and dissolution of metals from mine wastes, and their measurement is a critical requirement in drainage chemistry prediction. This assessment focused on the multi-element composition, mineralogical composition, Acid Base Accounting (ABA) and leachate tests to evaluate the AMD generation and metal leachate concentrations of the reprocessed tailings materials.

As indicated above, the proposed hydraulic reclamation activity of the Millsite TSF complex to be followed is identical to the current approved activities for Dump 20 and Lindum. This includes that the residue is to be deposited into the open pit voids at the rate of 400 000 tons/month.

Eight samples of approximately 2.5 kg of the tailings were collected for acid-base accounting (ABA) and leachate tests under static conditions. The location of the sampling points is illustrated in Figure 10-14.

Samples 1 and 2 were collected from the top 0.5 m of the TSF to represent the oxidised (weathered) part. Samples 3 to 8 were collected from the fresh and saturated sections at a depth of approximately 1 m from surface.

The collected samples were sent to M&L Laboratory in Johannesburg for analysis of the following parameters:

- Mineralogical examination: X-ray diffraction (XRD) was utilised to identify the major and minor minerals in the tailings. XRD allows for the measurement of the crystal structures to identify the mineralogical composition to determine whether any reactive elements will lead to environmental risks through the study of the various minerals;
- Acid-base accounting (ABA) and Sulphur Speciation: Evaluates the acid generation and acid neutralisation potential of the samples. Amounts of the various sulphur species was analysed to determine their oxidation states since mine acid is primarily generated from sulphide sulphur;
- Net Acid Generating (NAG) testing: Indicates behaviour of the samples under oxidising conditions (reaction with hydrogen peroxide), using a standard NAG test method;
- Static leach testing: Provides an indication of the readily leachable components present in a sample by exposing the samples to a leachate extraction; and
- Total Concentration Analysis: Total concentration values were determined by *aqua regia* digestion as stipulated in the NEM: WA Regulations (2013). This provides a measure of the solid-phase levels of various mineral-forming elements that may be of environmental concern. Combined with the metal leachate test, these levels allow the calculation of metal depletion times and can be used as a screening tool to detect constituents which occur in anomalously high concentrations and may, under unfavourable geochemical conditions, be of concern as a constituent in AMD.

The geochemical results from the Millsite TSF Complex have been compared to previous work conducted on Dump 20 to evaluate if the Millsite material deposition is more of an environmental concern. In 2012, three samples were analysed from Dump 20 for ABA and leachate assessments. The samples were collected from the sand residue, slime residue and composite sample (sand residue mixed with underground tonnage). In the discussions to follow, these samples are labelled as Dump 20 Sand, Dump 20 Slime and Dump 20 Composite; and have been used to compare with the Millsite TSF Complex geochemistry.

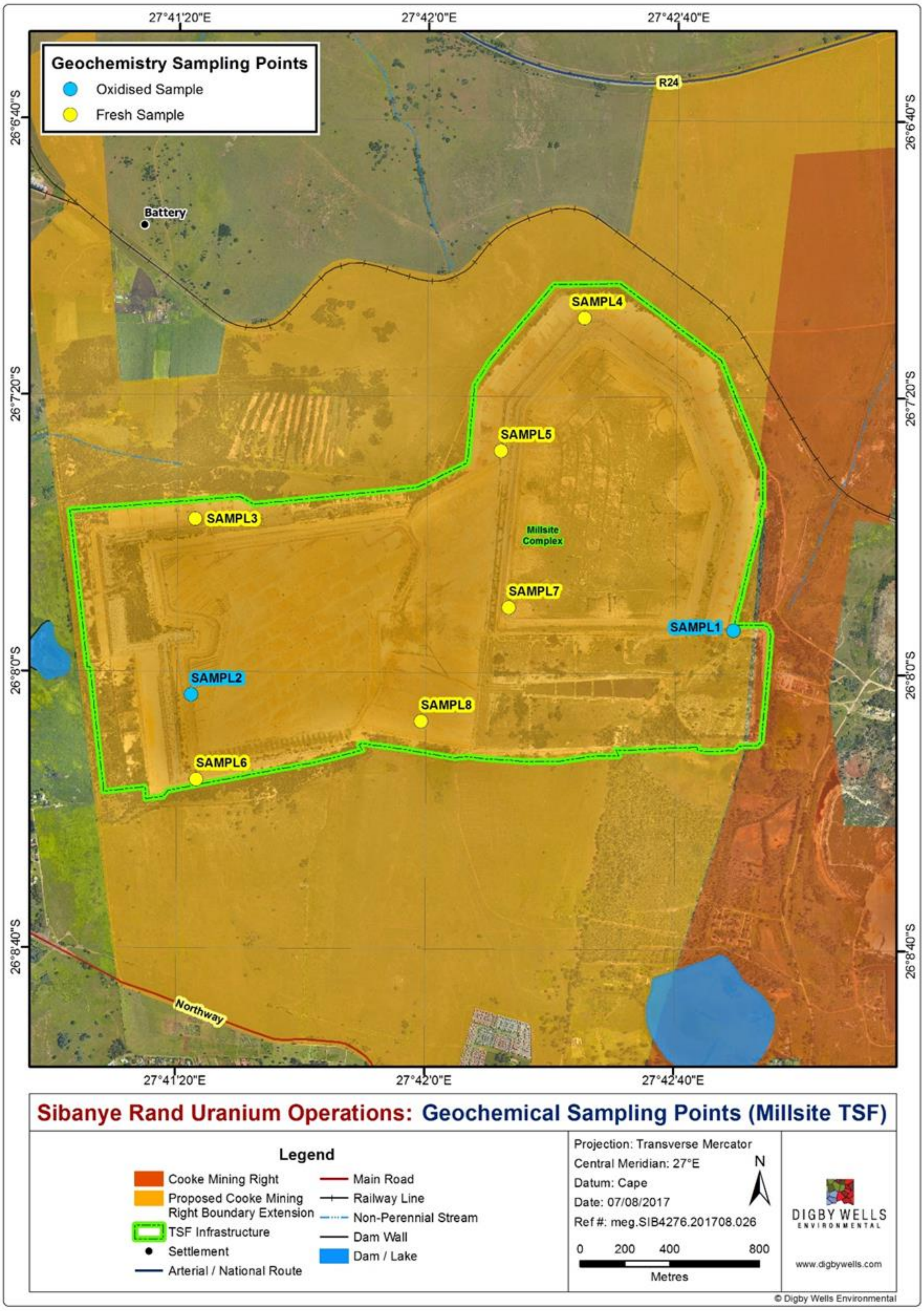

Figure 10-14: Location of the tailings sampling points

10.6.1 Investigation Results

10.6.1.1 *Mineralogy*

Identification of the mineralogy of the tailings is necessary for determining the potentially leachable metals and the acid generating and neutralizing minerals, and is thus valuable information for site-specific predictions of drainage chemistry.

The mineralogical composition of the tailings samples is given in Table 10-7. Copies of the analytical reports are presented in Appendix A of the Geochemistry Analysis Report attached hereto as **Appendix 9**.

The samples are dominated by silicate minerals, particularly quartz, pyrophyllite, muscovite and kaolinite. Quartz is the primary constituent ranging between 33.1 to 93.1% by weight. The difference in the samples mineralogy is suspected to be due to the tailings being sourced from different ores and have been deposited on the Millsite TSF over the years.

The non-silicate minerals are dominated by hematite and jarosite, which are oxidised Fe minerals. Pyrite was only detected in Sample 6, at a concentration of 0.6% by weight meaning that pyrite is not an issue in the tailings. Although no calcite minerals have been detected in any of the samples, pyrophyllite, muscovite, jarosite, and kaolinite are hydroxides and have the potential to buffer acidity.

Based on the mineralogy alone, the TSF is acid neutralising although pockets of potential acid generation (e.g. in the area where Sample 6 was collected) cannot be excluded. However, this needs to be supported by the ABA analysis that will be discussed in the subsequent sections.

The mineralogy of the Dump 20 is also in included in Table 10-7 for comparison purposes. At 1.4%, the pyrite content the composite is higher than that of Millsite where the maximum recorded is 0.6%. The composite sample however contained fresh underground ore which will no longer be added to the tailings which will be deposited into the pits. At the same time there are more silicate hydroxides (mainly Chloritoid and Chlorite) in Dump 20 which could assist in buffering any acid generation. More comparisons on the ABA and leachate quality between the two TSFs are discussed below.

Table 10-7: Mineralogy of the Millsite TSF samples

Mineral	Approximate Formula	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6	Sample 7	Sample 8	Dump 20 composite
Quartz	SiO_2	83.24	93.09	82.94	77.47	33.14	81.71	70.81	84.99	90.59
Pyrophyllite	$Al(Si_2O_5)(OH)$	10.68	5.04	10.92	9.21	4.78	11.66	16.7	9.89	2.83
Hematite	Fe_2O_3				3.69	59.56				
Muscovite	$KAl_2((OH)_2AlSi_3O_{10})$	3.48	1.86	3.38	4.52	1.22	3.79	6.48	1.87	2.04
Jarosite	$KFe_3(SO_4)_2(OH)_6$	2.6		2.75	2.94	1.3	2.21	2.78	1.69	
Bassanite	$CaSO_4 \bullet 0.5H_2O$				2.18			1.57	1.57	
Kaolinite	$Al_4(OH)_8(Si_4O_{10})$							1.66		
Pyrite	FeS_2						0.63			1.41
Chloritoid	$(Fe,Mg,Mn)_2Al_4Si_2O_{10}(OH)_4$									2.42
Chlorite	$(Mg,Fe,A1)_6(Si,A1)_4O_{10}(OH)_8$									0.71

10.6.1.2 *Acid-Base Accounting*

ABA is the most widely used static test to predict acid-mine drainage potential. The ABA results are summarised in Table 10-8 below and laboratory certificates are available in Appendix A of the Geochemical Assessment Report attached hereto in **Appendix 9**.

The test consisted of six measurements:

- The paste pH;
- The amount of acidity a sample is likely to produce (acid potential or AP);
- The inherent neutralization potential (NP) of the same sample;
- Sulphur speciation;
- The net neutralisation potential (NNP) which is NP-AP; and
- The neutralisation potential ration (NPR) which is NP/AP.

Table 10-8: Summary of the ABA results

Sample ID	paste pH	AP (kg/t)	NP	NNP	NPR	Total S%	Sulphate S %	Sulphide S%	NAG pH
Sample 1	3.1	9.68	0.1	-9.68	0.01	0.31	0.1	0.21	4.7
Sample 2	3.3	8.12	0.24	-8.12	0.030	0.26	0.21	0.05	4.9
Sample 3	1.9	34.3	0.1	-34.3	0.003	1.1	0.82	0.28	2.6
Sample 4	2.6	27.5	0.1	-27.5	0.004	0.88	0.84	0.04	4.6
Sample 5	6.9	0.31	9.45	9.45	30.48	<0.01	<0.01	0.01	7.1
Sample 6	1.7	22.8	0.1	-22.8	0.004	0.73	0.11	0.62	2.1
Sample 7	2.1	21.8	0.1	-21.8	0.005	0.7	0.44	0.26	3.3
Sample 8	2	18.7	0.1	-18.7	0.005	0.6	0.33	0.27	2.9
Dump 20 Composite	10.1	87.53	1.96	-85.57	0.02	2.8	0.01	2.78	2.2
Dump 20 Slime	8.4	22	9.4	-12.6	0.4	1	0.88	0.71	2.9
Dump 20 Sand	8.4	21	9.1	-11.9	0.4	0.91	0.71	0.67	2.8

10.6.1.3 *Paste pH*

The paste pH is a type of ABA used to provide a preliminary estimation on the acid generation potential of a rock sample. The sample is placed in a plastic beaker and 10 mL of distilled water (pH 5.33) is added to make a paste. The paste is stirred with a wooden spoon to wet the powder. This way, a quick measure of the relative acid-generating (pH<4) or acid-neutralizing (pH>7) potential of the waste material can be evaluated (Sobek et al. (1978)).

The paste pH of the samples was found to be acidic ranging between 1.7 and 3.3 (with the exception of Sample 5 at a pH of 6.9). Although this indicates the potential for the residue to generate acid, paste pH alone is not a conclusive methodology for ABA classification. The sulphide content, acid generating and acid neutralisation materials of the tailings need to quantified for a more comprehensive ABA evaluations.

The paste pH of Dump 20 was found to be alkaline with an average of 9.0; indicating that without oxidising the residue is alkaline.

10.6.1.4 *Sulphur Speciation*

The objective of sulphur analysis is to identify and measure the concentration of different sulphur species present in the sample. Sulphide minerals are the primary sources of acidity and leaching of trace metals, and their measurement is a critical requirement for acid drainage chemistry prediction.

A set of rules, which has been derived based on several of the factors calculated in ABA, was reported by Soregaroli and Lawrence (1998). It has been shown that for sustainable long-term acid generation, at least 0.3% Sulphide–S is needed. Values below this can yield acidity but this is likely to be only of short-term significance.

The sulphur species analysed for the tailings samples included total sulphur-S, sulphate-S and sulphide-S. The highest Sulphide-S was detected in Sample 6 at 0.62%. The rest of the samples have approximately 0.22% which is less than the 0.3% benchmark required to generate acid sustainably. As discussed above, pyrite was only detected in Sample 6. The 0.22% sulphide-S should therefore be present in other Fe containing trace minerals that do not form part of the main minerals present in the tailings.

Sulphur species and mineralogical assessment were also conducted by Mintek (2013) on 8 different samples from the Millsite TSF. The sulphide-S and pyrite were found at higher concentrations than those conducted during this study. The sulphide concentration ranged between 0.3 and 0.7%, with the average being 0.6%. This is a clear indication that there is sufficient sulphide to generate acid. The pyrite content was also found to range between 0.7 and 1.7 and are likely to be the source of the sulphides. Although the depth of sampling is not available, the samples tested by Mintek are expected to have been collected from a greater depth where it is less oxidised and hence higher pyrite and sulphide content.

The sulphide content of the Dump 20 was on average 0.7% (excluding Dump 20 composite sample as it contains underground ore) and is more than that of Millsite (0.22%). It could generate acid more sustainably than Millsite if not buffered by the alkaline minerals present. This is also in line with the mineralogical content since more pyrite was detected in Dump 20.

10.6.1.5 *Net Neutralisation Potential (NNP)*

The difference between the neutralisation potential (NP) and the acid potential (AP) is defined as the net neutralization potential (NNP); i.e. NNP = NP-AP.

A positive NNP would indicate that there is more neutralising material than acid forming material in any given sample, i.e.:

- If NNP is less than 0 then the sample has the potential to generate acid;
- If NNP is more than 20 then the sample has the potential to neutralise acid; and
- If the NNP is between 0 and 20, the acid properties are not certain and further investigation would be needed to confirm the properties of the sample.

The NP, AP and NNP of the samples is given in Table 10-8 and shows that the samples are all acid neutralising. Although the neutralisation potential is variable for each sample, their overall acid generation potential is considerably less than the neutralisation potential.

The average NP is 1.3 $CaCO_3$/tonne, while the average AP is 17.9 $CaCO_3$/tonne. This means that the average NNP is -16.7 $CaCO_3$/tonne, indicating that the samples are potentially acid generating.

Sample 5 is unique whereby the NNP is 9.5 $CaCO_3$/tonne. This together with its relatively high paste pH (6.9) and low sulphide content (0.01%), the sample is different from the rest and not potentially acid-generating.

The average NNP of the Dump 20 was -12.25 $CaCO_3$/tonne (excluding the Dump 20 composite sample as this contains underground ore) and is more or less similar in acid generating potential to Millsite.

10.6.1.6 *Neutralisation Potential Ratio*

Similar to the NNP, the Neutralisation Potential Ratio (NPR) is used to identify and separate potentially acidic generating from not potentially acidic generating materials. The NPR is calculated by dividing the NP by the AP.

The potential for acid generation was evaluated by using the screening criterion set by Price (1997) as shown in Table 10-9. The NPR of the tailings samples (excluding Sample 5) was quantified between 0.0 and 0.03, the average being 0.01, which confirms that the TSF is likely to be acid generating (Figure 10-15). The geochemistry of Sample 5 is excluded from the rest of the samples as its NPR is 30.5 and falls in the non-acid generating category. This sample is an exception and overall Millsite TSF can be classified as potentially acid generating.

The NPR of Dump 20 is also included in Figure 10-15. The three samples from this TSF are marked with red and all fall on the potentially acid-generating zone and have similar geochemical ABA values to that of the Millsite TSF.

Table 10-9: Criteria for interpreting ABA results

Potential for ARD	Criterion	Comments
Likely	NPR<1	Potentially acid generating, unless sulphide minerals are non-reactive
Possible	1<NPR<2	Possibly acid generating if NP is insufficiently reactive or is depleted at a rate faster than sulphides
Low	2<NPR<4	Not potentially acid generating unless significant preferential exposure of sulphide
None	NPR>4	Non-acid generating

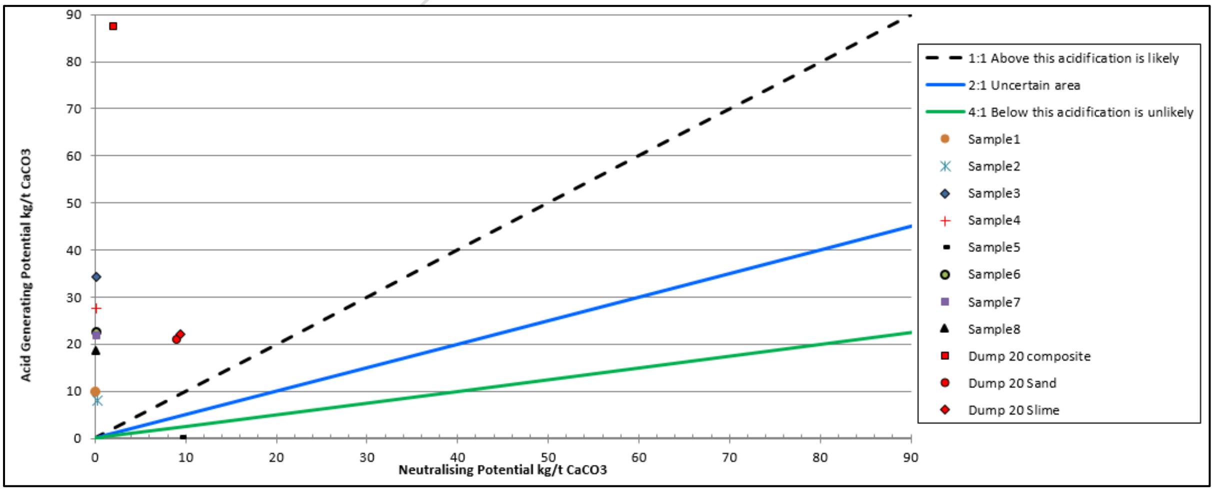

Figure 10-15: Comparison of the neutralisation potential and acid potential of the sample

Another method for classifying non-potentially acid-generating material from the potentially acid-generating materials is based on the ratio of neutralisation potential ratio (NPR) versus sulphide-sulphur (Soregaroli and Lawrence, 1998). Should the NPR be less than 1 and the sulphide-S content greater than 0.3%, the sample is considered to be potentially acid generating.

As can be seen in Figure 10-16, half of the samples (inducing Dump 20) are acid generating due to their sulphide content being more than 0.3% and NPR values being less than 1. The remaining half fall in the non-acid generating zone due to their sulphide content being less than 0.3%, although their NPR values are still less than 1.

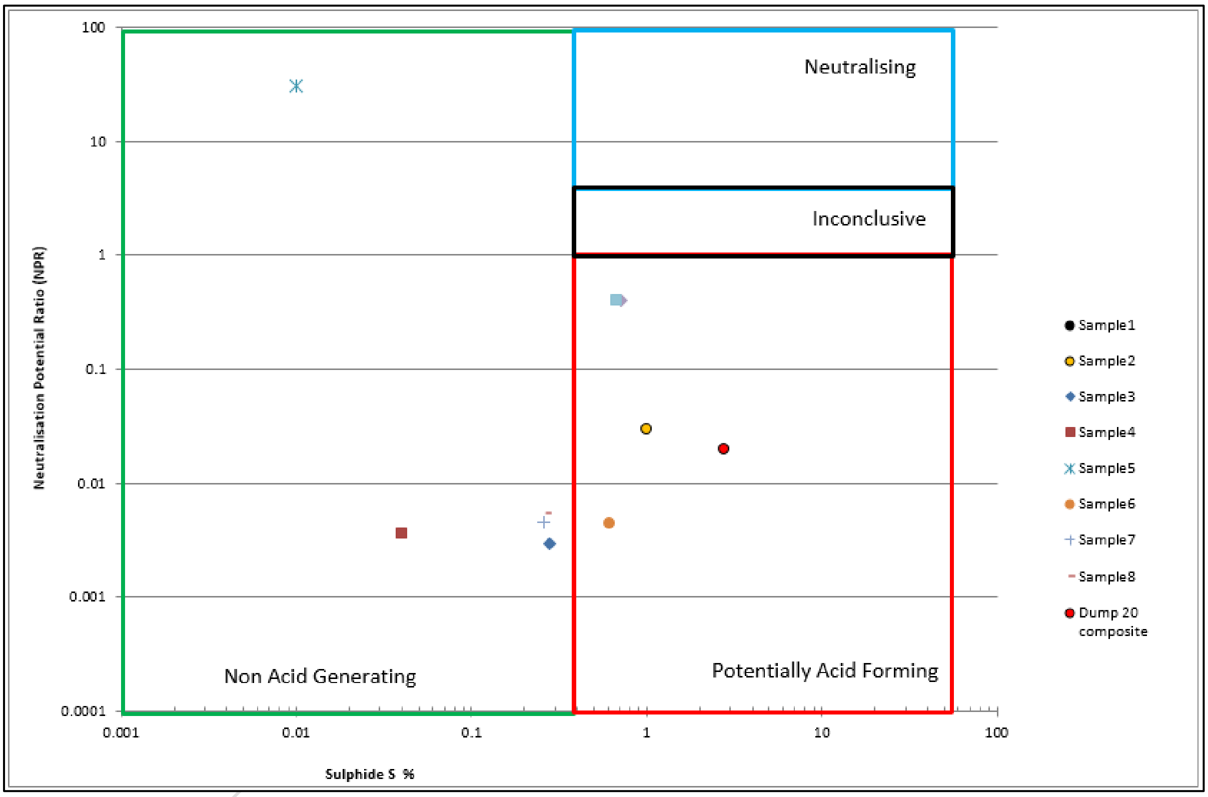

Figure 10-16: Sulphide-S vs NPR

10.6.1.7 *Net Acid Generation (NAG)*

The net acid generating (NAG) test is associated with ABA to classify the acid generating potential of a sample. It is conducted by reacting the sample with hydrogen peroxide to assess the components released by fast mineral dissolution and oxidation reactions, especially sulphide oxidation and carbonate dissolution. Both acid generation and acid neutralization reactions occur simultaneously and the net result represents a direct measure of the amount of acid generated. A pH after reaction (NAG pH) of less than 4.5 indicates that the sample is net acid generating. This subdivision is slightly arbitrary and can serve as a rough guideline but not as stand-alone criteria in categorising the sample.

Figure 10-17 is a plot of NPR and NAG pH and identifies four quadrants.

- Samples with NPR greater than 1 and NAG pH greater than 4.5 plot in the non-acid forming quadrant. Only Sample 5 falls in this zone;
- Samples with NPR less than 1 and NAG pH less than 4.5 plot in the potentially acid forming quadrant. Sample 5 falls in this quadrant;
- Samples with conflicting ABA and NAG results plot in the uncertain quadrants. In Figure 10-17, only Sample 2 plot in the uncertain quadrant and follow up testing can be targeted on this sample to confirm the classification; and

- The remaining 7 Millsite and 3 Dump 20 samples fall in the potentially acid forming category.

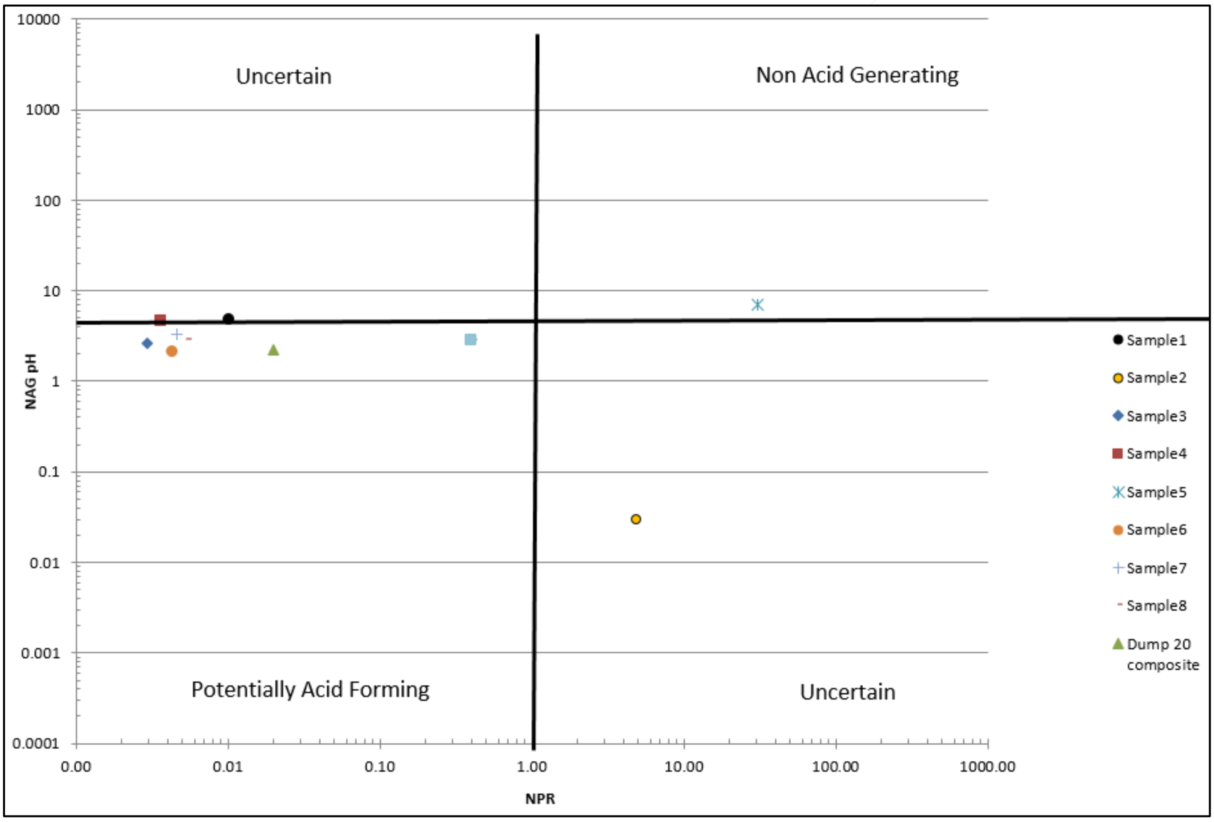

Figure 10-17: NNP vs NAG pH

10.6.1.8 *Multi-element Composition*

The objective of the multi-element analysis is to provide a measure of the solid-phase levels of various mineral-forming cations that may be of environmental concern. Combined with the metal leachate test, these levels allow the calculation of metal depletion times and can be used as a screening tool to detect constituents which occur in anomalously high concentrations and may, under unfavourable geochemical conditions, be of concern as a constituent in AMD.

In this study, determination of which elements occur in high concentrations is made by comparing the multi-element analytical results with the average range of concentrations of these elements in the continental crust as shown in Table 10-10. The average range of metal concentrations in the crust is obtained from Price (1997).

A number of elements (the most being in Sample 5) are found at higher concentrations in the samples than they are usually encountered in the crustal rocks (highlighted in orange in Table 10-10), out of which arsenic can be considered as the main elements that should be looked at from an environmental perspective. This is to be expected from a mineralised and enriched sample.

Noteworthy is the scarcity of uranium in the tailings. This is because uranium had been previously extracted and its concentration in the tailings is below the detection limit.

The Dump 20 samples were not exposed to aqua regia digestion in 2012 and their multi element analysis is not included in Table 10-10.

Table 10-10: Result of the multi-element composition analysis

Element (mg/Kg)	Average value in continental crust (ppm)	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6	Sample 7	Sample 8
Si	281,500	<0.400	<0.400	<0.400	<0.400	<0.400	<0.400	<0.400	<0.400
Ti	5,650	227	199	193	200	210	199	184	147
Al	82,300	28,815	17,500	31,310	24,110	16,870	50,095	48,030	13,290
Fe	56,300	20,515	18,370	23,930	39,310	430,800	16,965	12,110	11,270
Mn	950	193	183	187	185	454	136	70	177
Mg	23,300	1,251	1,399	1,104	971	1,767	1,135	698	551
Ca	41,500	1,427	2,760	1,102	7,254	6,993	1,711	4,649	3,623
Na	23,550	712	306	586	599	318	628	1,215	241
K	20,850	2,431	951	2,363	4,573	1,306	2,808	3,531	1,280
As	1.8	269	51	45	350	1,363	62	98	56
Co	25	5	3	41	37	703	11	12	26
Cr	102	188	130	186	138	140	156	179	97
Cu	60	37	14	67	36	773	12	51	28
Ni	84	26	20	122	72	928	22	38	65
Sb	0.2	<1.000	<1.000	<1.000	<1.000	<1.000	<1.000	<1.000	<1.000
Be	2.8	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200
Bi	0.0085	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
Cd	0.15	2	1	1	3	10	1	1	1
Pb		43	27	42	273	275	38	41	48

Element (mg/Kg)	Average value in continental crust (ppm)	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6	Sample 7	Sample 8
	14								
Mo	1.2	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
Se	0.05	16	10	12	32	363	<3.000	<3.000	<3.000
Sr	370	32	16	25	33	9	28	44	22
Tl	0.85	<0.900	<0.900	<0.900	<0.900	<0.900	<0.900	<0.900	<0.900
Th	9.6	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200
Sn	2.3	<2.000	<2.000	13	<2.000	11	<2.000	<2.000	<2.000
U	2.7	<0.400	<0.400	<0.400	<0.400	<0.400	<0.400	<0.400	<0.400
V	120	38	27	33	24	44	31	28	17
Zn	70	51	77	110	138	515	32	67	73
Zr	165	95	78	90	88	44	82	81	64
Ba	425	55	28	52	130	31	56	62	30

10.6.1.9 *Leachate Test*

Three types of leachate tests were conducted to assist in characterising the mobile elements that could be released from the tailings under various pH conditions. The tests are comprised of leaching with distilled water under, Synthetic Precipitation Leaching Procedure (SPLP) and mine void water collected from 8 Shaft.

The distilled water leachate results are given in Table 10-11, the SPLP are given in Table 10-12and the mine water leachate results are given in Table 3 9. All results have been compared with the mine's WUL for groundwater quality.

10.6.1.9.1 Distilled Water Leachate

The pH of the leachate is acidic and is below the WUL limit of 6.0, with the exception of Sample 5 where it is 8.2. This is in line with the paste pH results whereby all samples were acidic (except for Sample 5).

The metals that exceed the WUL include:

- Ca in all samples, except in Sample 3;
- EC in samples 3, 5, and 8;
- Fe in samples 3, 4, 6, 7 and 8;
- Mn in samples 1, 3, 4, 7 and 8;
- Although As is found at higher concentrations in the solid phase (as observed using the multi-element analysis), it is inert in neutral solvent and its solubility is below the detection limit of 0.02 mg/L; and
- The concentration of U is below the detection limit of 0.004, which is way below the WUL limit of 0.07 mg/L.

10.6.1.9.2 SPLP Leachate

The pH of the SPLP leachate is similar to that of the distilled water. All of the samples leached at a pH that is below the WUL limit, except for Sample 5 where it is 7.3. This is a further confirmation that Sample 5 has more neutralisation potential that was also confirmed using the ABA analysis and can buffer acid generated at least in the short-term. The rest of the samples are likely to generate acid with no or limited buffering capacity.

More metals leached under acidic condition (SPLP) than when the solution is neutral (reagent water). The metals that exceed the WUL include:

- Ca and Fe in all samples;
- Mn in all but Samples 2, 5 and 6;
- There is no arsenic limit provided in the WUL. However, it is expected to leach to some extend. This is particularly true for Sample 5 where the As concentration is 2.6

mg/L. The high level of Fe in solution will tend to retard the As available in solution by forming complexes with it; and

- As was the case with the distilled water leach result, the concentration of U is below the detection limit of 0.004.

10.6.1.9.3 Mine Void Water Leachate

Before leaching the tailings, the mine void water quality was analysed as shown in Table 10-13. The mine water is already contaminated to a large extent and the addition of the tailings material does not dramatically change this level of contamination.

There is not too much difference between leaching in distilled and SPLP water. Although there is increased Na concentration, there are no heavy metals coming out of solution when leached with the mine void water.

The solid phase level of As found in Sample 5 is 1 363 mg/kg. However the leachable As from all the samples is very low thus very little As enters into solution. When leached with the mine void water 0.31 mg/l enters into solution. The As in the remainder of the leached samples are less than 0.02 mg/l. This indicates that although the solid phase level indicate that As may be an element of concern from an environmental perspective, the actual expected extent of leaching is very limited.

Table 10-11: Distilled Water Leachate Test Results

Variables	WUL limits	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6	Sample 7	Sample 8	Dump 20 composite	Dump 20 Slime	Dump 20 Sands
pH	6.0 - 8.5	4.1	4.9	2.7	3.9	8.2	3	3.2	3	10	9.1	9
EC (mS/m)	150	38.2	58.6	174	113	148.4	71.9	88	153.5		20	33
Ca (mg/L)	32.01	48	138	25	307	386	44	133	223	195	30	52
Mg (mg/L)	21.73	6.5	0.7	48	1.7	22	1.1	3.7	25	0.315	2.9	4.2
Na (mg/L)	12.21	3	2.8	2.7	2.9	4.9	3	3	3.2	21	1.6	1.4
Alkalinity (CaCO3 mg/L)	100	-	4	-	-	30	-	-	-		20	15
Cl (mg/L)	10.23	0.8	0.7	1.4	0.8	1.5	0.7	0.7	1.6	101	1.1	0.46
SO4 (mg/L)	600	156	225	726	525	713	161	276	621	360	70	139
Nitrate (mg/L)	0.74	<0.1	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1
F (mg/L)	0.09	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	<0.2	0.21	0.25
Al (mg/l)	NA	6.3	0.1	83	1.6	0.07	1.7	7.7	14.6	3.3	0.42	0.5
As (mg/l)	NA	<0.020	<0.020	<0.020	<0.020	2.9	<0.020	<0.020	<0.020	<0.01	0.01	<0.01
Cr (mg/l)	NA	<0.003	<0.003	0.61	0.003	<0.003	0.008	0.04	0.16	0.11	0.008	0.004
Cu (mg/l)	NA	0.21	0.01	2	0.05	0.008	0.05	0.2	0.35	<0.01	<0.02	<0.02
Fe (mg/L)	0.2	0.04	0.04	28	0.25	0.11	6.7	0.83	1.3	0.047	<0.05	<0.05
Hg (mg/L)	NA	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.0001	<0.0001
Mn (mg/L)	0.1	0.31	0.03	2.4	1.5	0.002	0.04	0.46	13.1	<0.01	<0.01	<0.01
Ni (mg/l)	NA	0.14	0.01	4.6	0.12	<0.003	0.08	0.5	5	<0.01	<0.005	<0.005
Pb (mg/l)	NA	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.01	<0.01	<0.01
U (mg/L)	0.07	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.01	0.02	0.02
Zn (mg/l)	NA	0.12	0.05	3.7	0.31	0.005	0.21	0.69	4.8	<0.01	0.03	<0.01

Table 10-12: SPLP Leachate Test Results

Variables	WUL limits	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6	Sample 7	Sample 8	Dump 20 composite	Dump 20 Slime	Dump 20 Sands
pH	6.0 - 8.5	4.1	4.7	2.7	3.8	7.3	2.7	3.1	3.2	6.7	5.7	5.8
EC (mS/m)	150.0	45.3	64.8	194	132.0	49.3	125.0	115.0	128.0		89.0	85.0
Ca (mg/L)	32.0	53	142	51	346	92	80	190	210	278	210	160
Mg (mg/L)	21.7	10.6	0.8	70	2.1	10.6	2.5	5.4	16.6	27	18	16
Na (mg/L)	12.2	3.0	3.6	3.1	3.1	4.0	3.2	3.1	3.2	21	6.5	9.9
Alkalinity (CaCO3 mg/L)	100.0	-	1.0	-	-	22.0	-	-	-		400	450
Cl (mg/L)	10.2	0.5	0.2	0.9	0.3	1.3	0.4	0.2	0.6	86	<0.05	0.6
SO4 (mg/L)	600.0	180.0	240.0	814	622	163.0	273.0	475.0	567.0	330.0	164.0	73.0
Nitrate (mg/L)	0.7	0.1	<0.1	<0.1	0.2	0.4	0.2	0.1	<0.1	0.2	<0.1	<0.1
F (mg/L)	0.1	0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.2	0.1	0.1
Al (mg/l)	NA	10.8	0.5	118.0	2.2	0.1	4.6	12.0	16.8	0.1	0.2	0.0
As (mg/l)	NA	0.1	0.1	<0.02	0.1	2.6	0.0	0.1	0.1	0.0	0.0	0.0
Cr (mg/l)	NA	<0.003	<0.003	0.8	<0.003	<0.003	<0.003	<0.003	<0.003	0.1	0.0	<0.002
Cu (mg/l)	NA	0.2	<0.002	2.3	0.0	<0.002	0.1	1.4	0.6	<0.01	1.9	0.1
Fe (mg/L)	0.2	0.58	0.32	44	0.95	1.4	37	1.4	1.1	0.2	1.3	<0.05
Hg (mg/L)	NA	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.0001	<0.0001
Mn (mg/L)	0.1	0.45	<0.001	3	1.6	<0.001	0.0	0.54	10.4	1.57	1.3	2.1
Ni (mg/l)	NA	0.2	0.0	5.5	0.2	0.0	0.3	0.6	4.2	0.7	0.4	0.4
Pb (mg/l)	NA	<0.010	0.0	0.0	0.0	0.0	<0.010	<0.010	0.0	<0.01	0.0	<0.01
U (mg/L)	0.1	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	0.194	0.1	0.1
Zn (mg/l)	NA	0.2	0.1	4.6	0.4	0.0	0.7	1.0	4.0	0.2	3.3	0.2

Table 10-13: Mine Void Water Leachate Results

Variables	WUL limits	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6	Sample 7	Sample 8	Mine water
pH	6.0 - 8.5	4.5	5.8	2.7	4.0	7.7	5.1	3.4	2.9	6.8
EC (mS/m)	150.0	319.0	309.0	418.0	309.0	318.0	307.0	322.0	369.0	361.0
Ca (mg/L)	32.0	668.0	652.0	700.0	625.0	679.0	606.0	663.0	622.0	669.0
Mg (mg/L)	21.7	122.0	118.0	177.0	133.0	131.0	120.0	121.0	174.0	122.0
Na (mg/L)	12.2	186.0	187.0	190.0	196.0	188.0	191.0	187.0	186.0	122.0
Alkalinity (CaCO3 mg/L)	100.0	19.0	24.0	0.0	0.0	55.0	27.0	0.0	0.0	28.0
Cl (mg/L)	10.2	63.0	63.0	65.0	66.0	64.0	62.0	65.0	65.0	62.0
SO4 (mg/L)	600.0	2529.0	2492.0	3528.0	2342.0	2409.0	2405.0	2617.0	2850.0	2172.0
Nitrate (mg/L)	0.7	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
F (mg/L)	0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	0.1
Al (mg/l)	NA	5.400	0.170	141.000	3.400	0.130	0.260	8.600	35.000	0.073
As (mg/l)	NA	0.005	<0.001	0.006	0.002	0.310	<0.001	0.003	0.026	<0.001
Cr (mg/l)	NA	0.007	0.005	0.540	0.008	0.005	0.005	0.018	0.200	0.007
Cu (mg/l)	NA	0.170	0.009	2.200	0.093	0.010	0.011	0.240	0.890	0.003
Fe (mg/L)	0.2	0.085	0.055	13.700	0.210	0.380	16.600	0.180	1.300	1.300
Hg (mg/L)	NA	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Mn (mg/L)	0.1	20.0	19.5	23.0	24.0	12.5	21.0	21.0	45.0	19.1
Ni (mg/l)	NA	0.170	0.035	4.400	0.310	0.020	0.096	0.520	9.400	0.013
Pb (mg/l)	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
U (mg/L)	0.1	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Zn (mg/l)	NA	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0	<0.005	<0.005

10.6.2 Analytical Modelling

In 2012 during the assessment of the Dump 20 reclamation, the pits were assumed to be disconnected from the underground voids either due to the sealing of the foundation or the pit depth being shallow and not reaching the underground voids. As observed in the last four years of deposition in the Porges Pit from Dump 20, however, the pit is connected. The deposited tailings has seeped into the voids, with the exception of small heap that has started to accumulate on a portion of the Porges Pit.

The tailings in the Millsite TSF is estimated to be 156 million tonnes (Digby Wells, 2017). Considering a dry density of 2.5 t/m^3, the tailings has a volume of 42.8 million m^3. The volume could increase when water is retained in the wet slurry.

As shown in Table 10-14, the total capacity of the pits is 13.9 million m^3 (Ezendalo, 2009). If the slurry is deposited without disappearing to the underground mining voids, there is sufficient material to completely fill and rehabilitate the pits. The impact assessment in this study has been conducted with the assumption that the pits will be filled completely. Some slurry will enter the underground voids but it is not unreasonable to assume that with the already deposited Dump 20, the Millsite TSF (and possible other TSFs in the area that might be reclaimed in the future) is sufficient to completely backfill the pits and the mining voids.

SGL intends to deposit the residue at the rate of 400 000 tons/month into the pits. As per the WUL, at least 1 m^3 of water will be pumped out from the standing water of the pits or from 8 Shaft for each m^3 of tailings deposited into the pit. This will be conducted to ensure that the water table in the vicinity of the deposition pits does not rise and does not impact the groundwater flow direction and to ensure that the decant will also not increase as a result of pit deposition.

As long as this pumping philosophy is not breached, the deposition into the pits is not expected to alter the groundwater flow direction or the decant rate. Any mounding of water level in the deposition area is expected to be temporary as the flow velocity through the mine void connecting the pits and 8 Shaft is significant.

The pumping of 8 Shaft is expected to create a cone of depression and the flow direction in the mine void is towards the shaft. The abstracted water will partly be used for the reclamation of the Millsite TSF and will partly be treated with lime before it is discharged downstream to compensate the groundwater baseflow feeding the Tweelopiespruit.

Table 10-14: Pit volumes (m^3)

Pit complex	Name	Pit Volume
Battery	North	312,530
	South	196,290
Porges	Porges Main	2,031,351
	Stubbs	
	RTR South	
	RTR North	363,041
SRK	SRK 2B	2,087,699
	SRK 3	951,582
Training Centre		189,471
Millsite		7,745,067
Total		**13,877,031**

10.6.3 Conclusions

The geochemical results of the Millsite TSF have been compared to previous work conducted on Dump 20 to evaluate if the Millsite is more of an environmental concern than Dump 20. The result shows that the two tailings have similar acid generation potential. The metals expected to leach under neutral or acidic conditions are also generally similar.Air Quality

10.7 Air Quality

The Air Quality Impact Assessment Report is attached hereto as **Appendix 10**.

10.7.1 Receptor Assessment

Receptors in the vicinity of the proposed Project area include Greenhills, Kagiso, Krugersdorp and Randfontein. From the assessment, these are all classified as residential areas. According to the United States Environmental Protection Agency (USEPA), (2016), a sensitive receptor encompasses but not limited to "*hospitals, schools, daycare facilities, elderly housing and convalescent facilities. These are areas where the occupants are more susceptible to the adverse effects of exposure to toxic chemicals, pesticides, and other pollutants"*. The identified receptors are all human settlement where one or more of the above mentioned facilities are present, and involuntary exposure to airborne particulate matter is likely to occur. The proximate distances from the MSTF to these receptors are listed in Table 10-15 below.

Table 10-15: Distance and Direction to Major Settlements

Town	Status	Distance (km)	Direction
Greenhills	Residential		S
Kagiso	Residential		SE
Krugersdorp	Residential		NE
Randfontein	Residential		S

10.7.2 Climate and Meteorological Overview

Climate data from Lakes Environmental was used to assess the meteorology of the Project area. Emphasis was placed on meteorological parameters of relevance to wind erosion and storm episodes, such as: wind speed and direction and rainfall.

10.7.2.1 *Wind Direction*

Wind field plays a vital role in the erosion, dispersion and deposition of fugitive dust, i.e. the generation potential, the extent dust can travel downwind and the dilution potential. The amount of particulate matter (PM) generated by wind is highly dependent upon the wind speed and surface properties.

The predominant wind direction is from northeast, with the secondary contributions from the east northeast and east respectively (Figure 10-18). Contributions from the northeast and southeast quadrant are dominant. Calm conditions (wind speeds < 0.5 m/s) occurred for 4.2 % of the time. Figure 10-19 shows the wind class frequency distribution for the area.

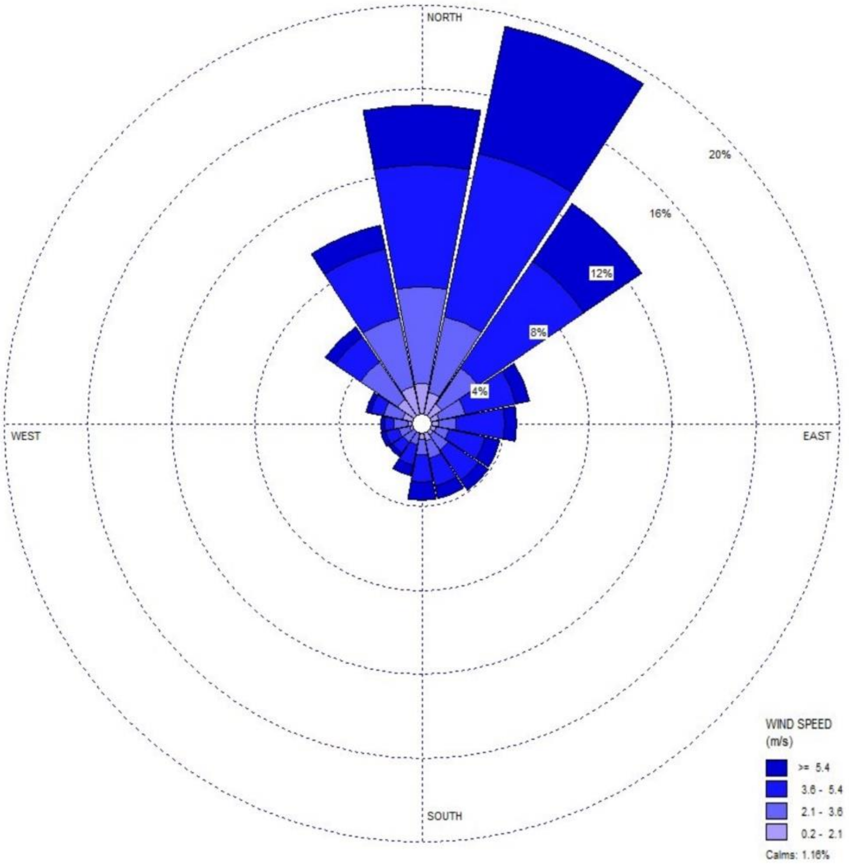

Figure 10-18: Surface Wind Rose for Millsite Project Area

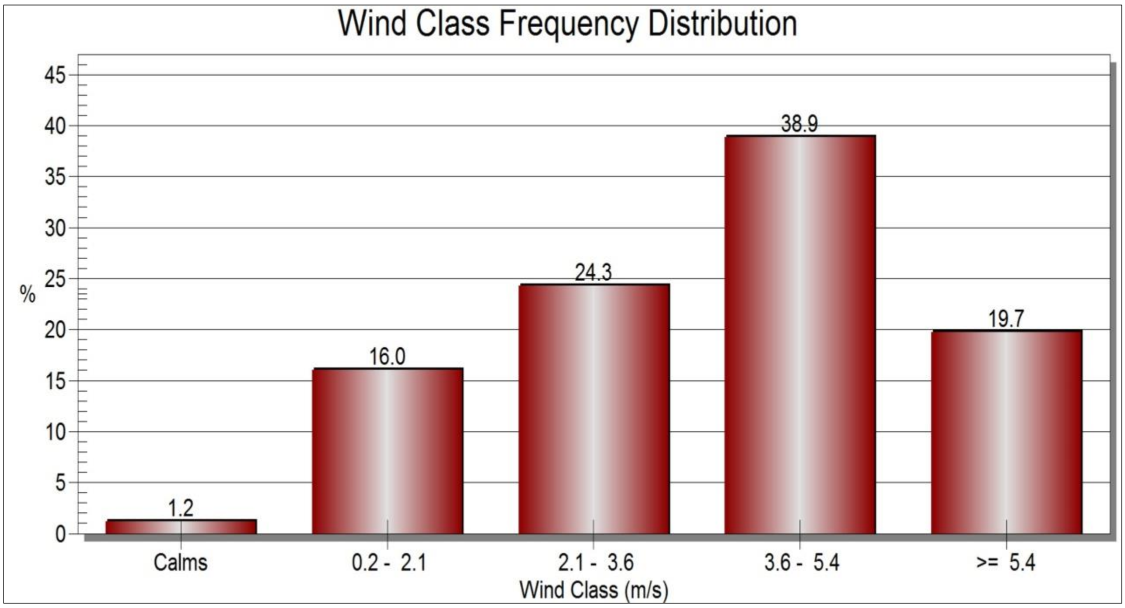

Figure 10-19: Wind Class Frequency – Millsite Project Area

10.7.2.2 *Wind Speed*

Wind speed greater than 5.4 m/s leads to erosion of loose dust PM and the degree of dispersion across the landscape (Table 10-16 and Figure 10-19). Figure 10-19 shows that wind speed greater than 5.4 m/s occur every month with increases observed from the months of June to October. Table 10-16 shows potential for wind erosion to occur each month despite speeds generally remaining below 5.4 m/s. Wind speed greater than 5.4 m/s occurred 19.7% of the time; equivalent to 72 days of high wind speed and potential erosion in a year.

Table 10-16: Monthly Wind Speed Records

Wind Speed (m/s)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Monthly Max.	10	8	9	8	9	14	11	13	12	13	10	9	10
Monthly Ave	4	4	4	3	4	4	4	5	5	5	5	4	4

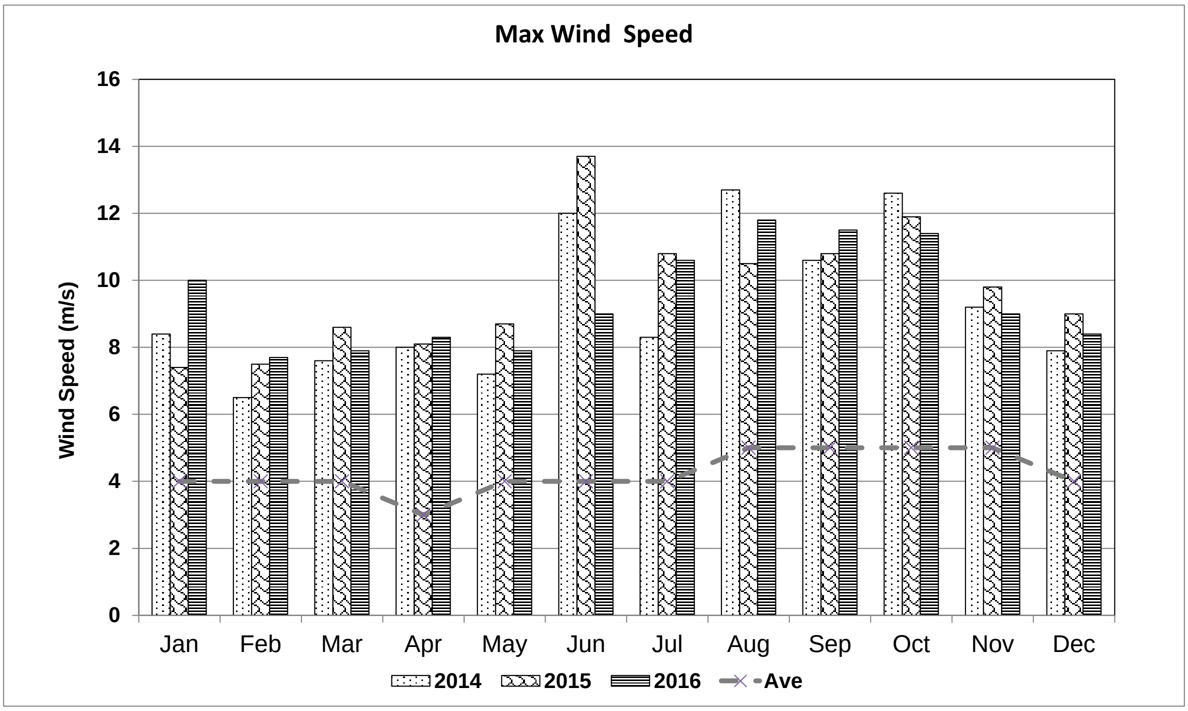

Figure 10-19: Monthly Maximum Wind Speed

10.7.2.3 *Precipitation*

The total monthly and average rainfalls for the period under review are reported in Table 10-17 for the three-year period (2014-2016). This is represented graphically in Figure 10-20. The highest precipitation of 269 mm observed in December. The lowest recorded precipitation (4 mm) was observed from May to June. The annual total and average rainfall reached 1259 mm and 865 mm respectively.

Table 10-17: Total Monthly Precipitation Records

Rainfall (mm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Tot. Mon Rainfall (Max)	268	107	197	62	11	12	6	23	40	103	161	269	1259
Aver. Mon Rainfall	163	88	137	31	4	4	4	11	23	71	123	205	865

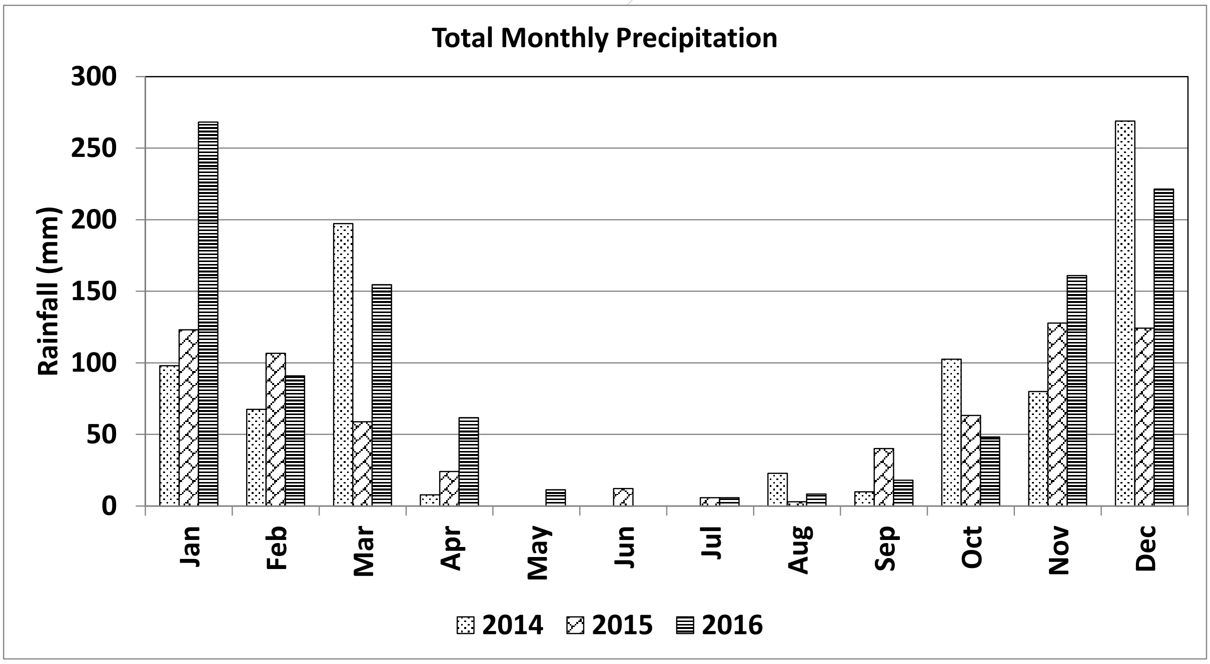

Figure 10-20: Total Monthly Precipitation

10.8 Noise

The Noise Impact Assessment Report is attached hereto as **Appendix 11**.

Baseline noise measurements were not carried out around the project footprint because the Gauteng Noise Control Regulations refer to acceptable rating levels recommended by SANS 10103:2008 to adhere to rather than measured baseline. The baseline soundscape is however characterised by historical noise measurements undertaken in nearby areas as well as by the Noise Specialist's knowledge (supported by 8 years' experience in environmental acoustics) of typical noise levels in certain residential zones.

The relevant suburban residential areas identified for their close proximity to the project footprint are:

- Robinson (1200 meters south of the Millsite Complex);
- Greenhills (1700 meters south of the Millsite Complex);

- Wilbotsdal (1700 meters south of the Millsite Complex); and
- Waterval Plots (1300 meters north of the Millsite Complex).

The relevant rural residential/agricultural areas identified for their close proximity to the project footprint are:

- Elandsvlei (1500 meters west of the Millsite Complex);
- Waterval (500 meters north of the Millsite Complex); and
- Battery (950 meters north west of the Millsite Complex).

The average day and night time suburban noise levels are likely to range between 45dBA and 55dBA with vehicle activity on the interlinking roads within the suburban areas most likely the main noise source. The day and night time rural noise levels are likely to range between 35dBA and 50dBA with agricultural machinery and vehicles probably the main noise source during the daytime and amphibians as well as insects such as *Gryllidae* (Crickets) and Cicada expected to be the main noise source during the night time. Figure

10-21,

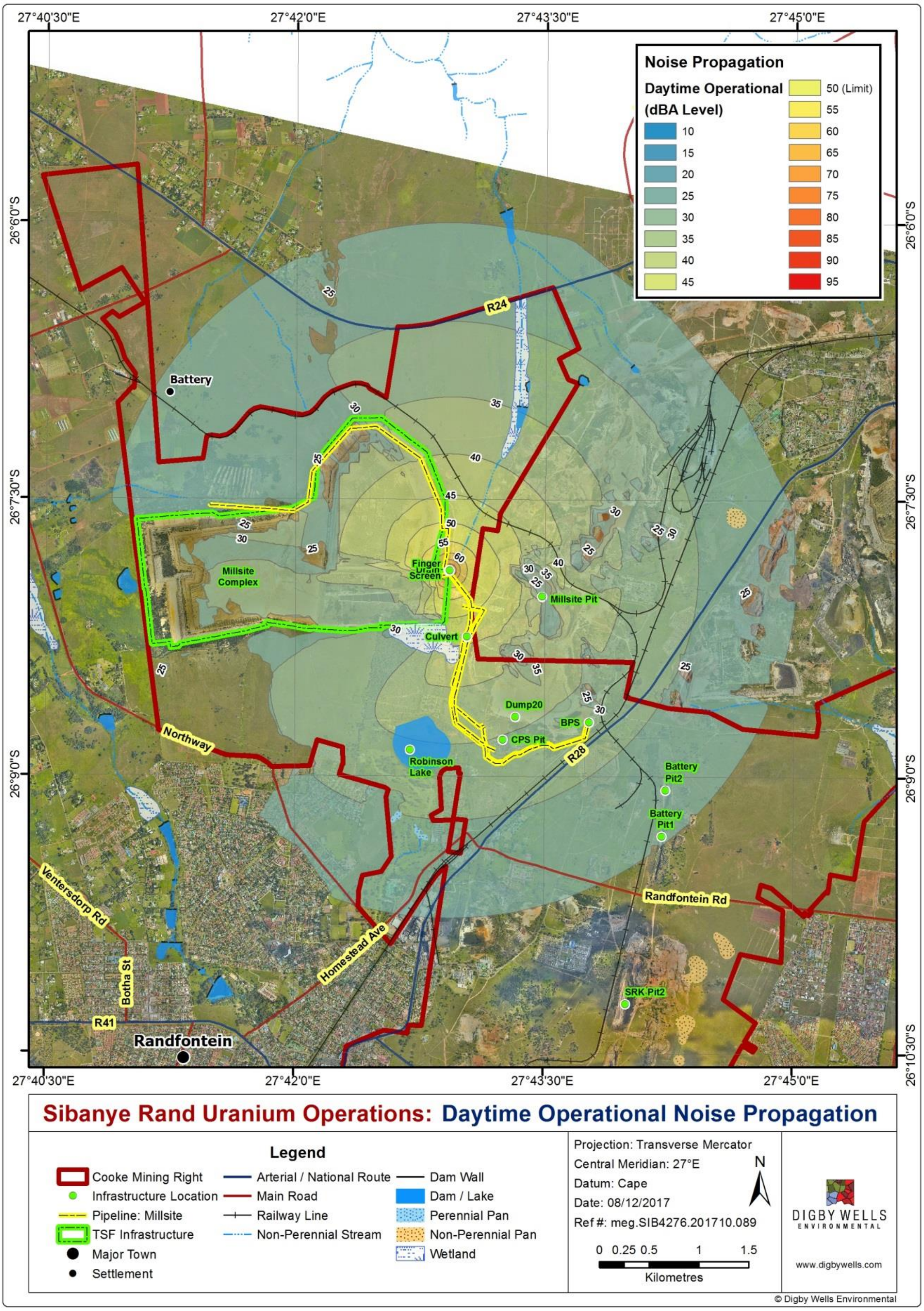
27°40'30"E
27°42'0"E
27°43'30"E
27°45'0"E
26°6'0"S
26°7'30"S
26°9'0"S
26°10'30"S
Noise Propagation
Daytime Operational (dBA Level)
10
15
20
25
30
35
40
45
50 (Limit)
55
60
65
70
75
80
85
90
95
Battery
Millsite Complex
Finger Drain Screen
Millsite Pit
Culvert
Dump20
BPS
CPS Pit
Robinson Lake
Battery Pit2
Battery Pit1
SRK Pit2
R24
R28
R41
Northway
Randfontein Rd
Ventersdorp Rd
Homestead Ave
Botha St
Randfontein
Sibanye Rand Uranium Operations: Daytime Operational Noise Propagation
Legend
Cooke Mining Right
Infrastructure Location
Pipeline: Millsite
TSF Infrastructure
Major Town
Settlement
Arterial / National Route
Main Road
Railway Line
Non-Perennial Stream
Dam Wall
Dam / Lake
Perennial Pan
Non-Perennial Pan
Wetland
Projection: Transverse Mercator
Central Meridian: 27°E
Datum: Cape
Date: 08/12/2017
Ref #: meg.SIB4276.201710.089
N
0 0.25 0.5 1 1.5
Kilometres
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Figure 10-22 and Figure 10-23 show the noise dispersion for the construction phase, daytime operational phase, and night-time operational phase. These models overlay the proposed increase in noise level and dispersion of noise once the reclamation activities commence. The noise levels of both the construction and operational activities will remain below the SANS 10103:2008 limits for Gauteng.

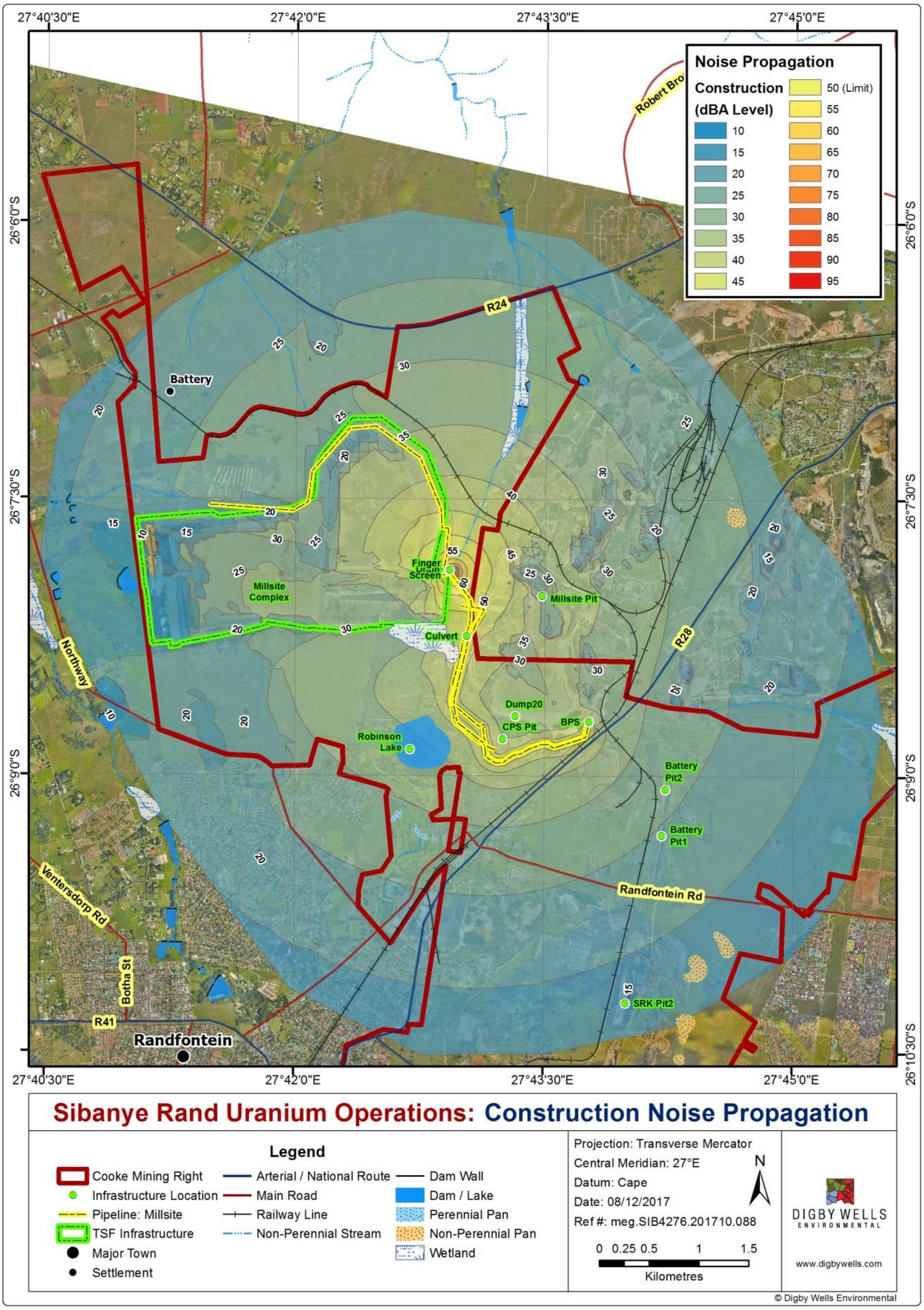

Figure 10-21: Construction Phase Noise Propagation

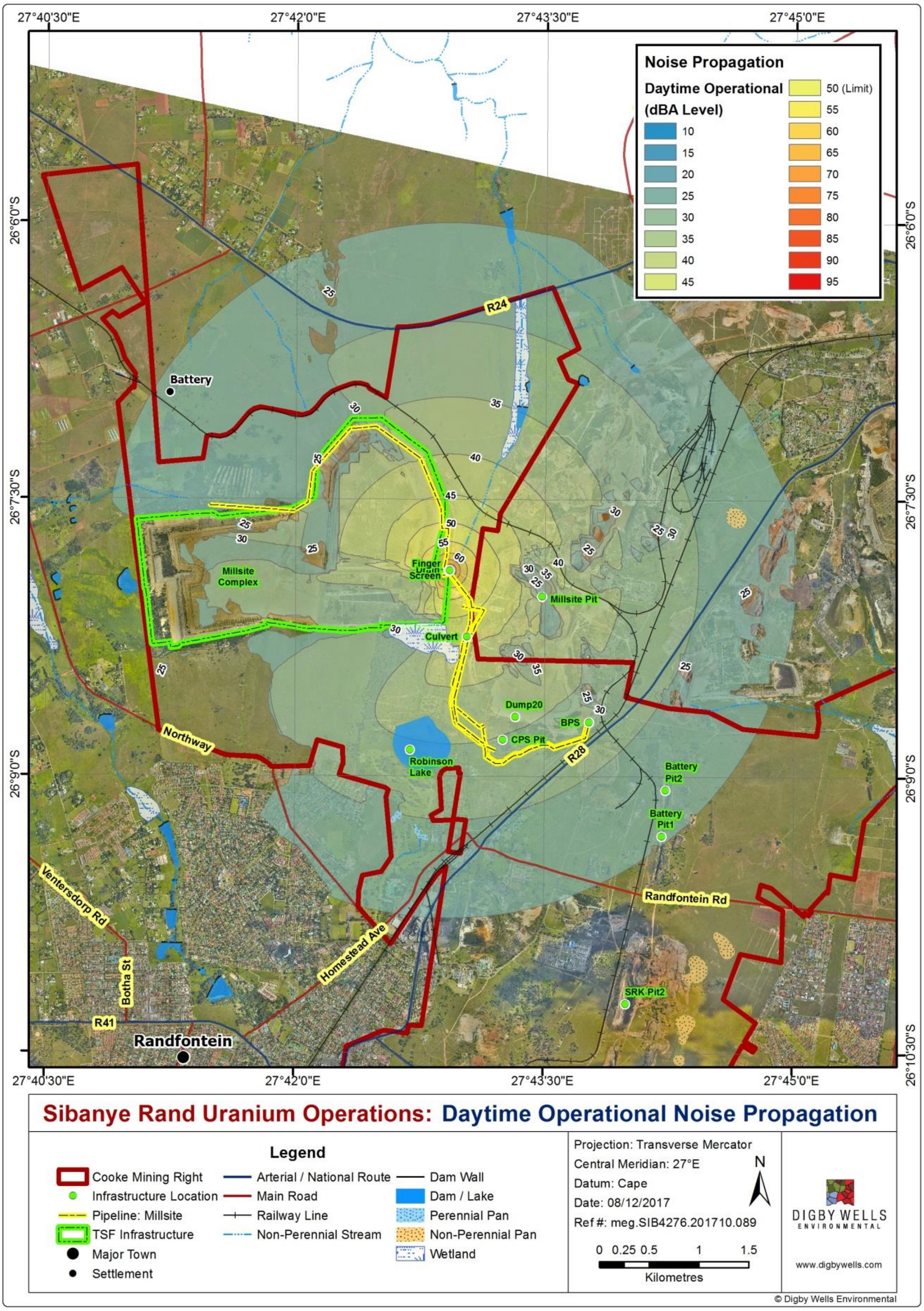

Figure 10-22: Daytime Operational Phase Noise Propagation

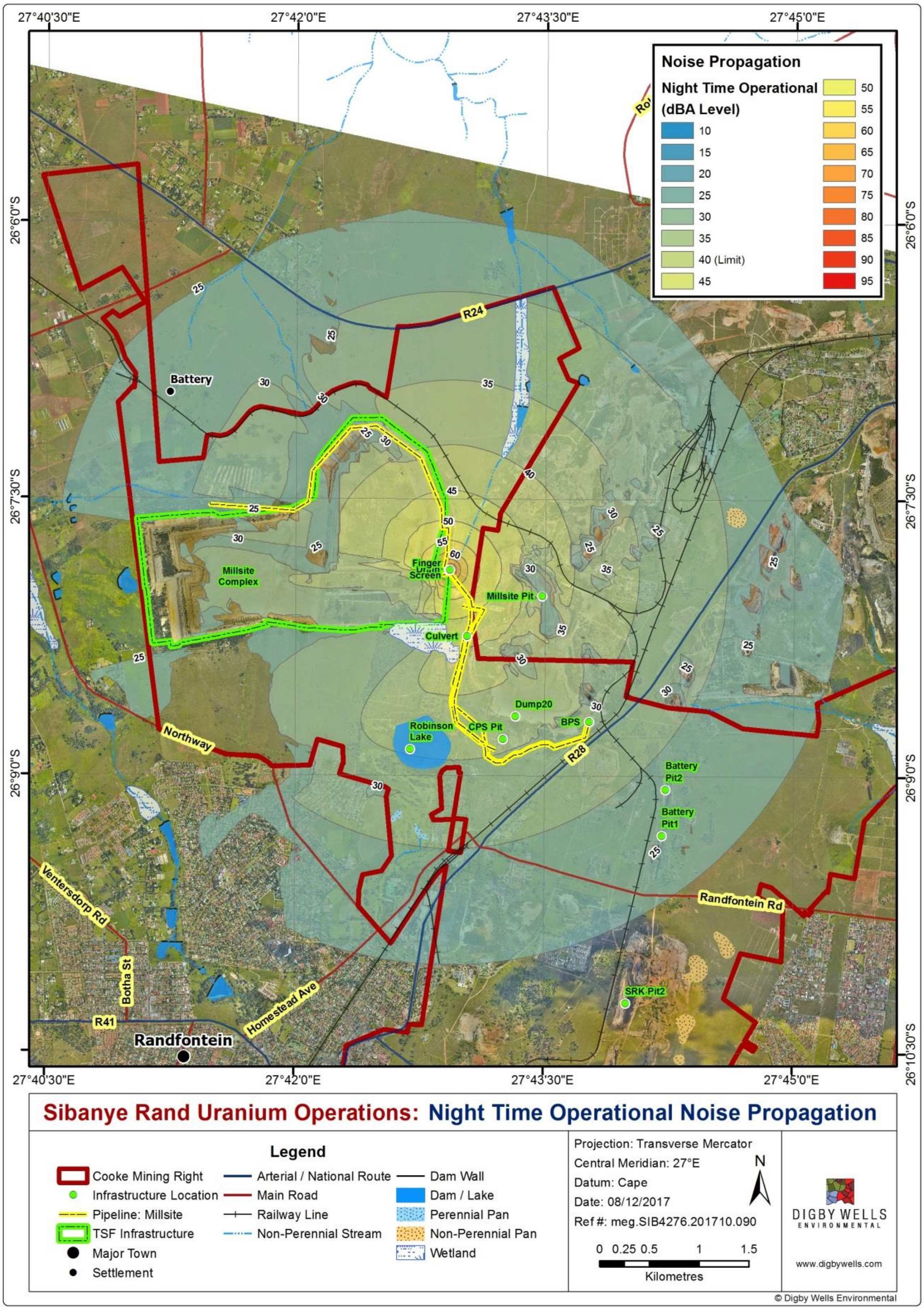

Figure 10-23: Night-time Operational Phase Noise Propagation

10.9 Socio Economic Environment

The broader socio-economic region comprises of the City of Johannesburg Metropolitan Municipality, the West Rand District Municipality which include the Mogale City Local Municipality and the Randfontein Local Municipality. The local municipalities have high population densities with approximately a total number of households of 94 300 in Mogale City Local Municipality, 40 500 in Randfontein Local Municipality, and approximately 1 165 000 in City of Johannesburg Metro. The region has an approximate unemployment rate of 30%, however the income level of the employed is relatively low. Education levels indicate that more than 30% of the population have a matric qualification or a higher level education.

The distribution of income and wealth can also be seen in socioeconomic indicators such as food security, modes of travel and household sizes. The settlements within 500 meters of the project area is characterised by suburbs including Westergloor and Toekomsrus with high employment levels, whereas other suburbs such as Mohlakeng and Slovoville have low employment and income levels.

Municipal services are provided to settlements within the local municipalities, although there is a lack of provision for formal housing as informal dwelling are common. The Randfontein Local Municipality plans to expand Toekomsrus in the vicinity of the Cooke TSF with the development of Toekomsrus Extension 2, which will provide approximately 1 500 dwelling units with associated public services including businesses, crèches and schools.

The region is also characterised by several agricultural holdings which surround the Rand Uranium Cooke operations. Due to the highly urbanised nature of the wider area (including suburbs of Randfontein such as Westergloor, Toekomsrus and Mohlakeng), only a few vegetable gardens are prevalent in the wider area. The Stesa Agricultural holdings do feature some small-scale commercial maize cropping further to the southeast. Communities in the area have high expectations of employment opportunities from mine-related projects generally.

10.10 Heritage

The Heritage Impact Assessment Report is attached hereto as **Appendix 12**.

Dissolution of soluble Malmani dolomites created voids – karst caves – that filled with fine- to coarse-grained alluvium during periodic flooding. The detritus can include diverse animal bone fragments comprising hominid remains and tools (Martini, 2006, pp. 662-663; Knight, Grab, & Esterhuysen, 2014, p. 8; Sinclair, McCraith, & Nelson, 2003), similar to those excavated from the Sterkfontein Caves in the Cradle of Humankind (CoH) World Heritage Site (WHS).

The CoH WHS is also known for its accumulations of stone tool technologies. The Stone Age is divided into three periods; the Early Stone Age (ESA), the Middle Stone Age (MSA) and the Late Stone Age (LSA). These tools provide tangible evidence of occupation of these areas as early as 2.3 Ma during the ESA through the MSA. The LSA is associated with hunter-gatherer societies such as the *San / Bushmen and Khoi herders* (Deacon & Deacon, 1999). Surface accumulations of MSA and LSA lithics are commonly not found *in situ* and provide limited contextual information beyond form, function and technique of manufacture.

The LSA is followed temporally by the farming community period. Archaeologically, common identifiers of this period include stonewalled settlements and ceramics. Klipriviersberg and Type N stonewalled settlements can be found within the regional study area.

The relative political stability[3] of the region was disrupted by the *Mfecane* of the 19th century. The *Mfecane* refers to the period 1815 to 1840 during which large-scale population displacement occurred in the South African interior.

During this period, the *Voortrekkers* were moving in land from the Cape. Shortly after settling in the region, gold was discovered as early as 1834, according to come sources. The Transvaal War also occurred during this period (1880 to 1881), which ended with the establishment of the *Zuid Afrikaanse Republiek* (ZAR) (South African History Online, 2014c). Subsequent to this, gold along the Witwatersrand Reef was discovered by George Harrison between the Wilgespruit and Langlaagte farms in 1886. Notably, Cecil John Rhodes and his associate Charles Rudd established Gold Fields of South African Limited in 1887 as one of the first mining houses to undertake large scale mining activities on the reef.

Control of the goldfields remained in the control of the ZAR until the Jameson Raid of 1986 which is believed to be the catalyst of the South African War (1899 – 1902), which resulted in the development of concentration camps located, including the Krugersdorp Concentration Camp in proximity to the Millsite TSF Complex.

10.10.1 Results of the field survey

No heritage resources were recorded within the development footprint of the Millsite TSF Complex. This notwithstanding, the Millsite TSF Complex itself could be argued as a heritage resource generally protected in terms of Section 34 of the NHRA.

One burial ground (BGG-001) and one memorial (BGG-002) have been recorded within proximity to the Millsite TSF Complex. These sites are situated 1 799 m and 520 m away from the development footprint respectively. Pictures of these sites are shown in Figure 10-24.

BGG-001 correlates with the graves of two British soldiers, Beaty-Powell and Davies, which perished during skirmishes associated with the Jameson Raid discussed above. As indicated by Robert Gilmour, these graves were relocated from their original position during

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[3] The author acknowledges that in southern Africa the last 500 years represents a formative period that is marked by enormous internal economic invention and political experimentation that shaped the cultural contours and categories of modern identities outside of European contact. This period is currently not well documented and is being explored through the 500 year initiative.

the early 20th century to allow for the placement of mining infrastructure associated with the historic Randfontein mine.

BGG-002 is a memorial for Barend Daniel De Beer, who passed away in the underground mining operations at that location in 1939.

Figure 10-24: Photograph of A – BGG-001 and B – BGG-002

The location of these sites are shown in Figure 10-25 and Table 10-18 provides the co-ordinates of the exact locations of each identified heritage resource in proximity to the Millsite TSF Complex.

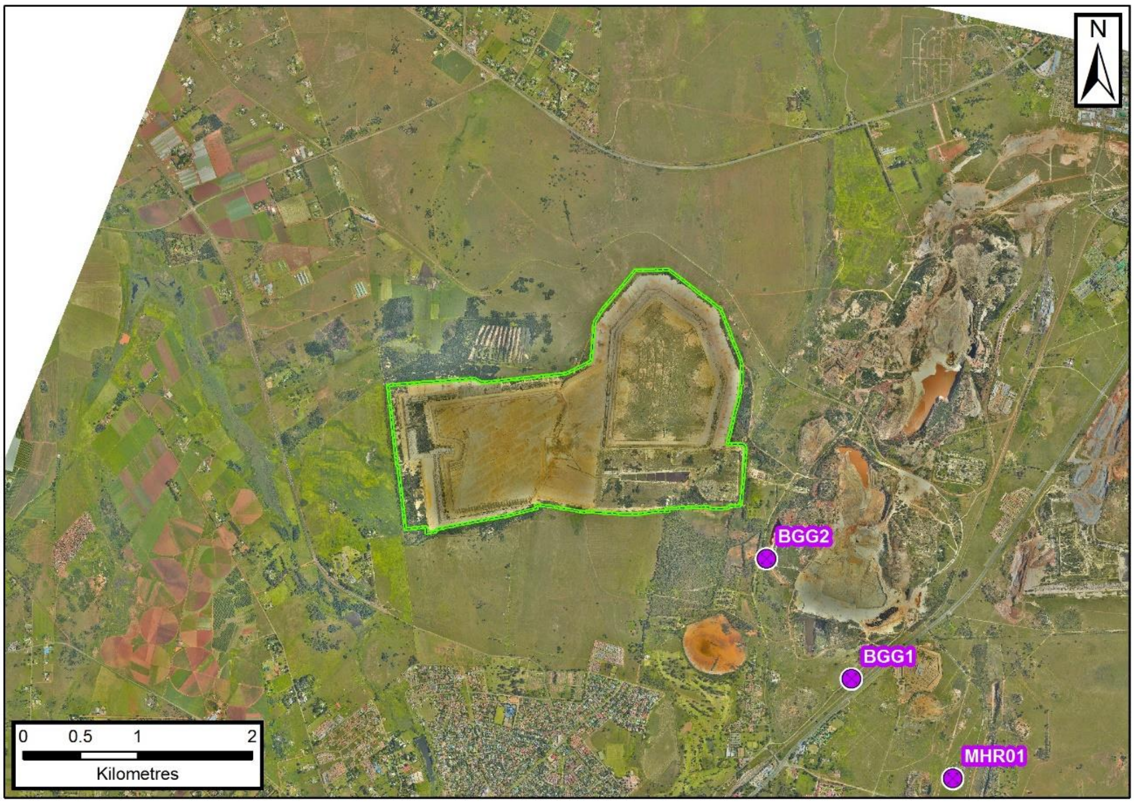

Figure 10-25: Location of identified heritage resources within proximity to the Millsite TSF Complex

Table 10-18: Heritage resources in proximity to the Millsite TSF Complex

Site ID	Summary Description	Latitude	Longitude
BGG-001	Burial Ground	-26.150318	27.724361
BGG-002	Memorial	-26.140912	27.716861

11 Item 3(g)(v): Impacts and risks identified including the nature, significance, consequence, extent, duration and probability

This section discusses the potential impacts related to the various environmental aspects associated with the construction, operation and decommissioning phases. It is noted that only direct impacts are assessed in this section, risks are assessed in Section 11.2.

11.1 Potential Impacts

11.1.1 Groundwater

The proposed reclamation of Millsite TSF and deposition of reprocessed tailings into the pits could have both positive and negative impacts on the groundwater. Potential impacts are assessed in the subsequent subsection considering the establishment, operational and closure phases.

11.1.1.1 *Construction phase*

The project activities, interactions and potential impacts during the establishment phase are listed in Table 11-1.

Table 11-1: Interactions and impacts during the construction phase

Interaction	Impact
Construction of the surface infrastructure (installation of pipelines, access roads, site clearing and storm water trenches)	Groundwater contamination

No impact on the groundwater is expected as long as these activities are taking place above the water table which ranges between 3.5 and 11.1 m in the vicinity of the Millsite TSF. Diesel or other organic fluids and inorganic solvents might be spilled on the ground surface, or leak from storage tanks during the construction. Considering the depth of the water level, however, they are expected to volatilise and unlikely to reach the groundwater.

Establishment will also be conducted in a relatively short period compared to the operational and post-closure phases. Impacts on the groundwater environment are therefore rated as Negligible as provided in Table 11-2 below.

Table 11-2: Potential impact on groundwater quality during the construction phase

Dimension	Rating	Motivation	Significance
Impact Description: Groundwater quality deterioration			
Prior to mitigation/ management			
Duration	Short term (2)	The construction activities are expected to take place over less than 1 year.	Negligible (negative) – 8
Extent	Very limited (1)	Impact will be limited to specific isolated parts of the site	
Intensity	Minimal (1)	Considering the depth of the water table and the current groundwater quality, the impact intensity (if any) is expected to be minimal.	
Probability	Rare (2)	It is unlikely for any seepage during the construction activity to seep and contaminate the groundwater, considering the water depth, construction duration and construction activities	
Nature	Negative		
Mitigation/ Management actions			
▪ Restrict areas that must be cleared of vegetation for construction activities to those of absolute necessity; ▪ Avoid constructing below the water table as far as possible; and ▪ Install long term monitoring boreholes.			
Post- mitigation			
Duration	Short term (1)	Any impact on the groundwater is expected to recover after the construction phase is completed	Negligible (negative) – 6
Extent	Limited (1)	Only isolated areas where there will be spillages or site cleaning below the water table (if any) will be affected	
Intensity	Minimal natural impact (1)	Considering the duration of the construction period and water table depth, the intensity will be minimal	
Probability	Improbable (2)	It is unlikely for groundwater impact to occur during the construction phase, especially with the implementation of the above proposed management plan	

Dimension	Rating	Motivation	Significance
Nature	Negative		

11.1.1.2 *Operational Phase*

The activities during the operational phase that are relevant to the groundwater environment are the hydraulic reclamation of the Millsite TSF complex and the discharge of the reprocessed tailings into the open pits.

11.1.1.2.1 Tailings Reclamation

The historical TSFs in the region (including Millsite TSF complex) are not lined and seepage is expected to drain into the underlying groundwater system. The current hypothesis is that if there were no TSFs located directly over the dolomites, the current decant volume would have decreased, and it is likely that the dolomitic water pumped from the underground chambers would be of better quality than the current status. In addition, the pumping cost would be substantially less if the TSFs seepage portion could be eliminated.

Further to this, infiltration of Millsite TSF seepage can be reduced, the contaminant loads will be less from a pollution perspective. At present, the presence of the TSF and the continued dewatering activities in the compartment will encourage continued infiltration of seepage to the deeper aquifer units and mining areas, the consequent deterioration of water quality, increased decant rates and increased volumes of water to be pumped from the underground chambers.

The long-term impact as a result of the reclamation operations at the TSF is therefore anticipated to be positive in the long run since the TSF, which is a source of contamination, will be removed. In the short-term, however, hydraulic reclamation could result in the partial seepage through the TSF (Table 11-4). The exposure of the tailings to oxygen and water can result in AMD.

Table 11-3: Interactions and impacts during the TSF reclamation

Interaction	Impact
Hydraulic reclamation	Seepage through the TSF of the water to be used for hydraulic reclamation inside the foot print
Tailings exposure to oxygen and water	Acid mine drainage
Pump station or pipelines	Slime or process spillage from pump station or pipeline

The potential impacts associated with the reclamation of the TSF are provided in Table 11-4.

Table 11-4: Potential impact during the operation phase of the re-mining of the TSF

Dimension	Rating	Motivation	Significance
Impact Description: Groundwater contamination due to seepage during hydraulic re-mining			
Prior to mitigation/ management			
Duration	Project Life (5)	Seepage of contaminated water could occur during the operation phase	Minor (negative) – 44
Extent	Local (3)	The impact is expected to be local	
Intensity	Moderate (3)	The contamination will be moderate as it will be local and an area that is already contaminated	
Probability	Probable (4)	Seepage due to the water used during hydraulic re-mining is probable	
Nature	Negative		
Mitigation/ Management actions			
▪ Monitoring of groundwater quality and water levels; and ▪ Minimise ponding of water within the reclamation area.			
Post- mitigation			
Duration	Project Life (5)	Contamination due to the hydraulic reclamation will persist during the life of mine	Negligible (negative) – 24
Extent	Limited (2)	The seepage is expected to be limited to the TSF footprint area	
Intensity	Minimal (1)	Impact will be underneath the TSF only due to the dolomitic nature and vertical hydraulic gradient	
Probability	Unlikely (3)	Impact to the groundwater outside the TSF areas is unlikely	
Nature	Negative		
Impact Description: Acid mine drainage due to the TSF disturbance and exposure to oxygen and moisture			
Prior to mitigation/ management			
Duration	Project Life (5)	Acid mine drainage can be generated and heavy metals can be mobilised. This is likely to persist throughout the life of	Minor (negative) – 54

Dimension	Rating	Motivation	Significance
		operation	
Extent	Local (3)	The pollution plume is expected to be local laterally, but with a potential of migrating vertically to the underground mines	
Intensity	Minor (2)	The area is already contaminated. The existence of dolomite is also beneficial to buffer the acid	
Probability	Almost certain (6)	AMD generation is during the reclamation process and tailings disturbance is almost certain	
Nature	Negative		
Mitigation/ Management actions			
▪ Monitoring of groundwater quality; and ▪ Minimise area of disturbance to avoid AMD at multiple places.			
Post management			
Duration	Long-term (4)	AMD generation will stop once the TSF have been reclaimed	Negligible (negative) – 21
Extent	Limited (2)	With the reclamation from one end of the TSF, instead of multiple areas is likely to render AMD generation at controlled sites only	
Intensity	Minimal (1)	Once the AMD generation is controlled, the environmental impact in the area that is already contaminated is expected to be minimal	
Probability	Unlikely (3)	AMD is unlikely to occur if the above recommended procedures are implemented	
Nature	Negative		

11.1.1.2.2 Pit Deposition

Backfilling of the open pits with the reprocessed tailings is likely to result in the increase of the groundwater level, increase of decant rate and potentially impact on the groundwater quality. The impact rating for all the pits is expected to be similar, although the water level to recover will be quicker in the smaller pits such as the Battery pits than the larger Porges and Millsite pits.

The water in the underground mine void is affected by AMD and is already of poor quality with pH of approximately 6.5 and EC of 325 mS/m. Without backfilling, the open pits are a constant source of water ingress into the Western Basin mine void as rainwater falls into the pits and enters into the mine voids. This rainwater then comes into contact with pyrite on the exposed pit walls and assume the characteristics of acid mine drainage, similar to that of the underlying mine void.

The reprocessed tailings is treated with lime in the metallurgical plant and is generally deposited at high pH values (around 10 – 11). This has a positive impact in the groundwater quality as the pH of the mine void has increased and causes some of the dissolved metals to precipitate. As described in the water quality section above; 17 and 18 Winzes represented poor water quality of pH less than 5 up until 2012. This has been improving since then to its current value of 6.5. This is likely to be due to the alkaline slurry deposited from Dump 20.

The deposition of the slurry is, however, expect to increase the salt load which overall has a negative impact.

During the operational phase, water will be added to the pits in the tailings slurry. This will result in an increase in the pit and mine void water levels. As the pit is filled with tailings slurry, water level in the pits will be higher than the surrounding groundwater level. This is however expected to only be in the short-term since Sibanye-Stillwater will be pumping at a 1:1 ratio to the amount of slurry deposited. The pumping will take place from 8 Shaft with the intent of maintaining the groundwater level and the abstracted water will be used for the reclamation of the Millsite TSF complex.

If no abstraction from 8 Shaft is to take place to balance the deposition, however, there is a possibility of an increase in discharge from the decant point due to the displacement of water in the pits by the newly deposited tailings.

The project activities, interactions and potential impacts during the pit deposition are listed in Table 11-5.

Table 11-5: Interactions and impacts during pit deposition

Interaction	Impact
Pit deposition	Rising of water level in the vicinity of the pits
	Increase of decant rates
	Deterioration of groundwater quality

The potential impacts associated with the TSF reclamation and pit deposition are given in Table 11-6.

Table 11-6: Potential impact during the operation phase due to pit deposition

Dimension	Rating	Motivation	Significance
Impact Description: Groundwater contamination due to pit deposition			
Prior to mitigation/ management			
Duration	Project Life (5)	Contaminants will be added as part of the slurry throughout the life of mine	Minor (negative) – 45
Extent	Local (3)	The impact is expected to be local	
Intensity	Minimal (1)	The intensity is rated as minimal since the area is already contaminated. In fact the reprocessed tailings is has alkaline pH and is expected to have a positive impact as it will neutralise the acidic mine water but the salt load is expected to increase.	
Probability	Likely (5)	The salt load of the mine void water is likely to increase	
Nature	Negative		
Mitigation/ Management actions			
▪ Monitoring of groundwater quality and water levels; ▪ Ensuring that the deposited tailings is alkaline; and ▪ Ensuring that the cyanide is destroyed before deposited.			
Post- mitigation			
Duration	Project Life (5)	Contamination due to the hydraulic reclamation will persist during the life of mine	Negligible (negative) – 32
Extent	Limited (2)	The impact is expected to be local	
Intensity	Minimal (1)	Impact will be underneath the TSF only due to the dolomitic nature and vertical hydraulic gradient	
Probability	Probable (4)	The impact is likely to occur even with the above proposed mitigation measures	
Nature	Negative		
Impact Description: impact on the groundwater level			
Prior to mitigation/ management			
Duration	Project Life (5)	The water level is expected to increase	Minor (negative) – 36

Dimension	Rating	Motivation	Significance
		due to the pit deposition throughout the life of mine	
Extent	Local (3)	The radius of influence is expected to be local as it will be maintained by the decant point and hydrostatic pressure	
Intensity	Minor (2)	The rise in water level is not expected to be minor as the slurry will settle in the mine void	
Probability	Probable (4)	The rise in water level is likely to occur as the slurry is discharged into the pits	
Nature	Negative		
Mitigation/ Management actions			
▪ Monitoring of groundwater level; ▪ Abstract equal volume of water from 8 Shaft (which is connected with the pits) to ensure that the water level or decant rate does not increase; and ▪ The abstracted water can be used for the reclamation of the tailings.			
Post management			
Duration	Short-term (2)	With the abstraction of equal volume of water from 8 Shaft, the rise in water level is expected to be temporary	Negligible (negative) – 10
Extent	Limited (2)	The rise in water level is expected to only be in the immediate vicinity of the pits	
Intensity	Minimal (1)	No impact on the water level or decant rate is expected with the abstraction of equal volume of water	
Probability	Rare (2)	AMD is unlikely to occur if the above recommended procedures are implemented	
Nature	Negative		

11.1.1.3 Decommissioning and post closure

11.1.1.3.1 Tailings Reclamation

The impact as a result of the reclamation is anticipated to be positive after closure. This is due to the removal of the TSF, which is a source of contamination.

As discussed above, the Millsite TSF complex is not lined and seepage is expected to drain into the underlying groundwater system. Seepage from the TSF, which is partly over dolomite, would impact the water quality negatively. This implies that if infiltration of tailings seepage can be reduced, the contaminant loads will be less from a pollution perspective and decant rates at the winzes will be less. At present, the presence of the TSF and the continued dewatering activities in the compartment will encourage continued infiltration of TSF seepage to the deeper aquifer units, and the consequent deterioration of water quality and increased volumes of water to be pumped from the underground chambers.

The interactions and potential impacts after the TSF reclamation is listed in Table 10-10 above.

Table 11-7: Interactions and impacts after the TSF reclamation

Interaction	Impact
TSF removal	No seepage and AMD drainage

The potential impacts associated with the reclamation of the TSF are provided in Table 11-8.

Table 11-8: Potential impacts after closure due to the TSF reclamation

Dimension	Rating	Motivation	Significance
Impact Description: Impact on groundwater contamination due to re-mining of the Millsite TSF			
Prior to mitigation/ management			
Duration	Permanent (7)	Seepage of contaminated water will permanently be removed	Moderate (positive) – 105
Extent	Local (3)	The impact is expected to be local as the site is already contaminated	
Intensity	Serious (5)	There will be significant environmental advantages when the unlined TSF is removed	
Probability	Definite (7)	There are sound scientific reasons to expect that the positive impact will definitely occur	
Nature	Positive		
Mitigation/ Management actions			
▪ Monitoring of groundwater quality and water levels; and ▪ Rehabilitation of old TSF footprints.			
Post- mitigation			
Duration	Permanent (7)	The source of the contamination plume will be permanently removed	Moderate (positive) – 105

Dimension	Rating	Motivation	Significance
Extent	Local (3)	The impact is expected to be local as the area is already contaminated	
Intensity	Serious (5)	There is positive environmental advantages once the unlined TSF is removed	
Probability	Definite (7)	There are sound scientific reasons to expect that the positive impact will definitely occur	
Nature	Positive		

11.1.1.3.2 Pit Deposition

After the pits have been backfilled, the tailings will be left to dewater and consolidate. The tailings backfill will be domed, shaped, profiled and capped with a soil/weathered material layer that will prevent ponding and minimise infiltration of rain water. The recharge from the pits to the underground mine void will be significantly less than the recharge prior to backfilling. During this period sulphide oxidation and AMD formation is expected to be limited significantly as a result of the soil cap that excludes exposure of the deposited tailings to atmospheric oxygen.

The interactions and potential impacts after the deposition in the pits are given in Table 10-10 above.

Table 11-9: Interactions and impacts of pit deposition after the closure phase

Interaction	Impact
Pit rehabilitation	No seepage from the pits

The potential impacts associated with the closure of the pits are given in Table 11-10.

Table 11-10: Potential impacts after closure due to pit rehabilitation

Dimension	Rating	Motivation	Significance
Impact Description: Impact on groundwater contamination			
Prior to mitigation/ management			
Duration	Permanent (7)	When the pits are completely filled, there will be no source of AMD ingress into the underground	Moderate (positive) – 78
Extent	Local (3)	The impact is expected to be local as the site is already contaminated and improvement in the pit recharge quality	

Dimension	Rating	Motivation	Significance
		will only have a local extent	
Intensity	Moderate (3)	The backfilling of the pits will reduce recharge of poor quality and will have positive environmental significance	
Probability	Highly probable (6)	The closure of the pits will definitely have a positive impact	
Nature	Positive		
Mitigation/ Management actions			
▪ Monitoring of groundwater quality and water levels; and ▪ Rehabilitation of the pits by properly shaping and capping with a soil/weathered material layer that will prevent ponding and minimise infiltration of rain water.			
Post- mitigation			
Duration	Permanent (7)	The source of the contamination plume and groundwater ingress will be permanently removed	Moderate (positive) – 98
Extent	Local (3)	The impact is expected to be local as the sites are already contaminated	
Intensity	Moderate (4)	The rehabilitation and vegetating of the pits will have a positive impact of moderate intensity	
Probability	Definite (7)	The closure and rehabilitation of the pits will definitely have a positive impact	
Nature	Positive		

11.1.2 Surface Water Quality

11.1.2.1 *Construction Phase*

In preparation for reclamation activities at the Millsite TSF complex, the following activities will be undertaken:

- Site clearance / vegetation removal; and
- Construction of collection sump and paddocks, installation of pipelines, and storm/dirty water trenches.

These activities have the potential to impact on the surface water resources as discussed in the sections below.

Table 11-11: Interactions and Impacts of Activity

Interaction	Impact
Exposure of soils due to loss of vegetation (site clearance).	Siltation of surface water resources leading to deteriorated water quality.
Construction the surface infrastructure (collection sump and paddocks, installation of pipelines, access roads)	Contamination of clean water runoff by mixing up with dirty water runoff emanating from construction areas;

11.1.2.1.1 Impact Description: Siltation of Surface Water Resources

Clearing and stripping of vegetation during construction leaves the soils prone to erosion during rainfall events, and as a result runoff from these areas which will be high in suspended solids may cause siltation on the Tweelopiespruit, Bloubankspruit and the unnamed stream north of Millsite complex when it reports into these streams.

Dust generated during the construction activities and caused by increased vehicular movements and excavation of sumps can also be deposited into these rivers, thereby contributing to the accumulation of suspended solids in the rivers, leading to the siltation of the water bodies.

11.1.2.1.2 Impact Description: Water Contamination

Dirty or contaminated runoff emanating from fuels storage areas, other liquid waste and general waste have the potential to contaminate the closest rivers as explained above.

Human activity will generate waste which includes general wastes (paper, glass, plastic and cans), biological sewage waste and other hazardous waste that may be exposed during construction. The handling and disposal of these wastes may have an impact on the surrounding streams if not managed appropriately.

These impacts will lead to the deterioration of water quality, thereby impacting the aquatic life and the downstream water users as well. Measures presented in Table 11-12 must be implemented to prevent and/or reduce these potential impacts.

11.1.2.1.3 Impact Ratings and the Recommended Mitigation/Management Measures

Table 11-12 presents the significance rating of the identified potential impacts together with the appropriate mitigation and/or management measures

Table 11-12: Impact Rating for the Construction Phase

Dimension	**Rating**	**Motivation**	**Significance**
Impact: Siltation of surface water resources leading to deteriorated water quality			
Pre-Mitigation			
Duration	Medium term (3)	With no measures in place, siltation may occur for as long as the construction takes place	Minor (negative) -70
Extent	Local (3)	The impacts will be localized to the nearby water resources from where the silt is being generated and the immediate downstream	
Intensity x type of impact	Moderately high - negative (-4)	This will have moderate impacts resulting reduction in water quality for local downstream users and aquatic life	
Probability	Certain (7)	Without appropriate mitigation there will definitely be significant erosion on the TSF.	
Mitigation/ Management Actions			
▪ Clearing of vegetation must be limited to the development footprint area, and the use of existing access roads must be prioritized to minimize construction of new access roads, hence potential for erosion; ▪ If possible, construction activities must be prioritized to the dry months of the year (May-October) to limit mobilization of sediments or hazardous substances during site clearing; ▪ Vegetation along the edges of the dumps (where reclamation is not active) should be left as is, and only be removed when the rest of the dump has been reclaimed; ▪ Dust suppression on the haul roads and cleared areas must regularly be undertaken; and ▪ An appointed Environmental Control Officer (ECO) must always be available to ensure implementation of the recommended mitigation/management measures during construction, operational, and decommissioning of the project.			
Post-Mitigation			
Duration	Medium term (3)	As for pre-mitigation	Minor (negative) -36
Extent	Limited (2)	The impact may be limited to the site and its immediate surroundings	
Intensity x type of impact	Moderate - negative (-3)	Mitigation will reduce the impacts	
Probability	Probable (4)	Necessary mitigations will reduce the	

		erosion probability significantly	

Dimension	**Rating**	**Motivation**	**Significance**
Impact: Deterioration of water quality due to dirty/contaminated runoff from the project reporting into the surrounding streams			
Pre-Mitigation			
Duration	Medium term (3)	With no measures in place, this impact may occur for as long as the construction takes place.	Minor (negative) -60
Extent	Municipal (4)	The impacts may be limited to the provincial scale from where the contaminated runoff enters the stream and the downstream	
Intensity	Serious loss (-5)	This may have serious impacts on the downstream water users due to elevated hydrocarbon levels, salts and other dissolved minerals from the tailings in the surrounding streams	
Probability	Likely (5)	Without appropriate mitigation, the probability of the impact occurring is <65%	
Mitigation/ Management Actions			
▪ All fuel storage areas should be appropriately bunded and spill kits should be in place, and construction workers trained in the use of spill kits, to contain and immediately clean up any potential leakages or spills; ▪ Vehicles should regularly be maintained as per the developed maintenance program. This should also be inspected on a daily basis before use to ensure there are no leakages underneath; ▪ Ablutions facility for construction workers and general waste bins should be provided. An accredited contractor should be appointed to properly dispose the waste; ▪ The storm water management as detailed in section 6.1.1.3 of Part B to ensure separation of clean and dirty and water runoff, as stated, the temporary surface water ditches are to be constructed on the upstream boundary of the TSF, which will meet GN 704 requirements regarding the separation of clean and dirty water runoff. All clean water runoff will therefore be diverted away from the cleared area. The temporary surface ditches are to be sized such that the 1:50 year peak discharge can be contained within it. ▪ Surface water quality monitoring should continue on the monitoring locations indicated in Section 10.3, Part A to enable detection of the water quality impacts and therefore ensure that necessary mitigation measures are immediately implemented			
Post-Mitigation			

Duration	Medium term (3)	As for pre-mitigation	Negligible (negative) -33
Extent	Local (3)	As for pre-mitigation	
Intensity	Serious loss (-5)	As for pre-mitigation	
Probability	Probable (3)	Necessary mitigations will reduce the probability of impact occurrence significantly (<25%)	

11.1.2.2 Operational Phase

Activities that may have surface water impacts during the operational phase include hydraulic reclamation of the dump, pumping through a proposed pipeline and runoff containment within the site.

Table 11-13: Interactions and Impacts of Activity

Interaction	Impact
Runoff from the dirty water areas (reclamation site)	Runoff from the tailings will contain high level of dissolved minerals which may result in water contamination or the deterioration of the water quality

11.1.2.2.1 Impact Description: Water Contamination leading to deterioration of water quality

Normally, hydraulic reclamation will be done by spraying water into the tailings material to dissolve the material. Slimes will then be collected in a sump where pumping will be done to transport this into the reclamation plant at Cooke plant. This runoff may find its way into the Tweelopiespruit, Bloubankspruit and the unnamed stream north of Millsite complex and that may result in the deterioration of the water quality and hence impact the downstream water users and the aquatic life.

Runoff from the fuel storage areas may also contaminate these streams when runoff reports into them during operational phase.

11.1.2.2.2 Impact Ratings and the recommended mitigation/management measures

Table 11-14: Impact Rating for the Operational Phase

Dimension	Rating	Motivation	Significance
Impact: Water Contamination leading to deterioration of water quality			
Pre-Mitigation			
Duration	Project Life (5)	For as long as reclamation activity is taking place, this potential surface water impact may occur	Moderate (negative) -70

Dimension	Rating	Motivation	Significance
Extent	Municipal (4)	Contaminated runoff from the tailings may affect the quality of the surrounding streams and the impact can be felt on the municipal level	
Intensity	Serious - negative (-5)	This may have serious impacts on the water quality in the surrounding streams and their downstream water users (agricultural- livestock watering and crop irrigation)	
Probability	Likely (5)	Without appropriate mitigation, the probability of the impact occurring is <65%	

Mitigation Measures

- All fuel storage areas should be appropriately bunded and spill kits should be in place, and construction workers trained in the use of spill kits, to contain and immediately clean up any potential leakages or spills;
- Vehicles should regularly be maintained as per the developed maintenance program. This should also be inspected on a daily basis before use to ensure there are no leakages underneath;
- Ablutions facility for construction workers and general waste bins should be provided. An accredited contractor should be appointed to properly dispose the waste;
- The storm water management as detailed in Section 6.1.1.3, Part B to ensure separation of clean and dirty and water runoff, as stated, the temporary surface water ditches are to be constructed on the upstream boundary of the TSF, which will meet GN 704 requirements regarding the separation of clean and dirty water runoff. All clean water runoff will therefore be diverted away from the cleared area. The temporary surface ditches are to be sized such that the 1:50 year peak discharge can be contained within it.
- Surface water quality monitoring should continue on the monitoring locations indicated in section 10.3.2.1 to enable detection of the water quality impacts and therefore ensure that necessary mitigation measures are immediately implemented; and
- Ensure emergency procedures in the event of power failure such as operational modifications and the use of a stand-by generator to operate the pump station should the sump be getting full.

Post-Mitigation

Duration	Project Life (5)	As for pre-mitigation	Negligible (negative)- 42
Extent	Municipal (4)	As for pre-mitigation	
Intensity	Serious - negative (-5)	As for pre-mitigation	

Dimension	Rating	Motivation	Significance
Probability	Probable (3)	Necessary mitigations will reduce the probability of impact occurrence significantly (<25 %)	

11.1.2.3 *Decommissioning*

Once the full reclamation processes have been completed on all of the dumps, decommissioning will commence with the removal of infrastructure such as pump stations, sumps, pipelines, removal of berms, paddocks, pipelines and anything else installed during construction. Rehabilitation will take place as decommissioning has been completed to try and restore or re-establish the natural surface condition similar to the pre-TSF conditions.

During the decommissioning activities, there could still be impacts on the Tweelopiespruit, Bloubankspruit and the unnamed stream. The slimes will normally be reclaimed down to the topsoil level where this will now be prone to erosion as it’s exposed, this may easily erode onto the mentioned streams thereby causing siltation of this water course.

However, the complete removal of these slimes dam will have a positive impact on the surrounding natural water resources as the pollution source has been cleaned out.

Table 11-15: Interactions and Impacts of Activity

Interaction	Impact
Runoff from the dirty water areas (reclamation site)	Runoff from the tailings will contain high level of dissolved minerals which may result in water contamination or the deterioration of the water quality
Complete removal of the TSF and rehabilitation	Improvement on the surface water quality as a result of complete removal of the pollution source

11.1.2.3.1 Impact Ratings and the Recommended Mitigation/Management Measures

Table 11-16 presents the significance rating of the identified potential impacts together with the appropriate mitigation and/or management measures.

Table 11-16: Impact Rating for the Decommissioning Phase

Dimension	Rating	Motivation	Significance
Impact: Siltation of surface water resources leading to deteriorated water quality			
Pre-Mitigation			
Duration	Medium term (3)	Siltation impact may occur for as long as the decommissioning takes place	Minor (negative) -50
Extent	Local (3)	The impacts will be localized to the nearby water resources from where the silt is being generated and the immediate downstream	

Intensity x type of impact	Moderately high - negative (-4)	This will have moderate impacts resulting reduction in water quality for downstream users and aquatic life	
Probability	Likely (5)	Without appropriate mitigation, it is likely (<65%) that erosion may occur during this phase	
Mitigation/ Management Actions			
- Use of accredited contractors for removal or demolition of infrastructure is recommended; this will reduce the risk of waste generation and accidental spillages; - The constructed storm water management infrastructure will have to remain until post closure to ensure dirty water is captured and contained during removal of infrastructures; - Ensure that the infrastructure (pipelines, fuel storage areas, pumps) are first emptied of all residual material before decommissioning. This can be input of the standard operation procedures at each of the dumps to ensure it's carried out; and - Ensure that the surface profile is rehabilitated to promote natural runoff drainage and avoid ponding of water within the rehabilitated area. Surface inspection should be continuously undertaken to allow runoff to drain onto the natural streams until vegetation has fully established on the site.			
Post-Mitigation			
Duration	Medium term (3)	As for pre-mitigation	Minor (negative) - 36
Extent	Local (3)	As for pre-mitigation	
Intensity x type of impact	Moderate - negative (-3)	Mitigation will reduce the impacts	
Probability	Probable (4)	Necessary mitigations will reduce the erosion probability significantly	

Dimension	**Rating**	**Motivation**	**Significance**
Impact: Siltation of surface water resources leading to deteriorated water quality			
Pre-Management or Enhancement Measures			
Duration	Medium term (7)	Impact may permanently occur for as the area has been rehabilitated	Minor (positive) 66
Extent	Provincial (4)	The impacts will be felt on the downstream water resources	

Intensity x type of impact	Moderately high - negative (5)	There will be great improvement to the overall surface water quality on the surrounding streams	
Probability	Likely (5)	Without appropriate mitigation, it is likely (<65%) that erosion may occur during this phase	
Mitigation/ Management Actions			
▪ Use of accredited contractors for removal or demolition of infrastructure is recommended; this will reduce the risk of waste generation and accidental spillages; ▪ Ensure that the surface profile is rehabilitated to promote natural runoff drainage and avoid ponding of water within the rehabilitated area. Surface inspection should be continuously undertaken to allow runoff to drain onto the natural streams until vegetation has fully established on the site.			
Post-Mitigation			
Duration	Medium term (7)	Impact may permanently occur for as the area has been rehabilitated	Minor (positive) + 80
Extent	Provincial (4)	The impacts will be felt on the downstream water resources	
Intensity x type of impact	Moderately high - negative (5)	There will be great improvement to the overall surface water quality on the surrounding streams	
Probability	Highly probable (6)	Necessary mitigations will reduce the erosion probability significantly	

11.1.3 Wetlands

Impacts assessed for wetlands are relevant to the Operational, Decommissioning, Rehabilitation and Post-Closure Phases.

11.1.3.1 *Operational Phase*

11.1.3.1.1 Project Activities Assessed

Project activities and associated impacts for the proposed Millsite TSF reclamation and rehabilitation project are listed in Table 11-17.

Table 11-17: Interactions for the Decommissioning Phase

Interaction	Impact
Site access roads crossing wetlands	Increased vehicular movement along river crossings and within wetland/riparian zones, resulting in: ▪ Potential contamination of soils as a result of the ingress of hydrocarbons; ▪ Compaction of soils; ▪ Loss of natural vegetation; ▪ Increased sedimentation; and ▪ Increased potential for onset of erosion
Heavy moving machinery and vehicles required for tailings reclamation	▪ Potential contamination of soils as a result of the ingress of hydrocarbons; ▪ Compaction of soils; ▪ Loss of natural vegetation; ▪ Increased sedimentation; and ▪ Increased potential for onset of erosion
Removal of tailings and contaminated soils	▪ Physical disturbance of contaminated soil and tailings resulting in erosion and sedimentation; ▪ Ingress of pollutants to watercourses and wetland areas as a result of tailings and contaminated soil spills during transport and reclamation activities; and ▪ Potential for further contamination of the freshwater resources present as a result of increased oxidation as a result of disturbance of the tailings during reclamation activities

11.1.3.1.2 Impact Description

Minor and major impacts associated with the proposed Project have been identified. The minor impacts include hydrocarbon and mechanical spillage and the major impacts include compaction of soils, potential loss of natural vegetation and the increased potential for erosion and sedimentation in the operational areas and resulting in impacts further downstream.

In addition, any temporary stockpiling or dumping of tailings or contaminated soils within wetland areas has the potential to result in loss of stream connectivity, loss of refuge areas, alterations to the terrain profiles of the areas and the creation of preferential flow paths, which may result in sedimentation, alterations to the vegetation structure of the area, encourage alien vegetation encroachment and result in increased erosion and sedimentation potentials.

Removal of vegetation and disturbance of soils in the vicinity of the operational footprint is likely to give rise to an increased potential for encroachment by robust pioneer species and alien invasive vegetation species, further altering the natural vegetation profiles of the wetlands encountered in the vicinity of the MIllsite TSF.

Transport of tailings and contaminated soils has the potential to result in further contamination and sedimentation of the freshwater resources present through spills. Furthermore, disturbance of historical tailings and contaminated soils has the potential to result in increased oxidation of pollutants such as pyrites, which has the potential to increase impacts to water quality of the freshwater resources in the vicinity of the Millsite TSF.

In addition, disturbance and reclamation of tailings and contaminated soils has the potential to result in increased erosion and sedimentation of the freshwater resources present.

11.1.3.1.3 Impact Ratings

The wetlands present in the vicinity of the Millsite TSF have already been impacted as a result of various activities and further impacts related to sedimentation and habitat degradation may result in a further drop in ecological state of the wetland features present. Table 11-18 represents the impact ratings for the operational phase.

Table 11-18: Potential Impacts of the Operational Phase

Dimension	Rating	Motivation	Significance
Activity and Interactions: Reclamation of the Millsite tailings material			
Prior to Mitigation/Management			
Duration	Project life (5)	The impact will cease after the operational, decommissioning, rehabilitation and closure phases of the project have been completed.	Minor (negative) – 56
Extent	Greater municipal area (4)	General scouring from sedimentation, as well as degraded habitat due to water quality deterioration will affect entire watercourse and river reaches.	
Intensity x type of impact	Serious long term environmental effects (5)	Due to the sensitivity of wetland systems in general and the already degraded nature of the systems present, should no management or mitigation measures be employed, activities could result in serious long term impacts.	
Probability	Probable (4)	Should no precautionary measures be implemented, further impacts to the wetlands present are considered probable.	
Nature	Negative		
Post-Mitigation			

Dimension	Rating	Motivation	Significance
Duration	Project life (5)	The impact will cease after the operational, decommissioning, rehabilitation and closure phases of the project has been completed.	Minor (negative) - 27
Extent	Limited (2)	Impacts will be limited only to the project footprint area and will affect only small portions of historically impacted wetlands within the TSF footprint	
Intensity x type of impact	Minor effects on the biological or physical environment (2)	Due to the impacted nature of the systems present, should the project proceed, and the appropriate precautions and management or mitigation measures be employed, it is unlikely that further significant degradation of the wetlands present occur.	
Probability	Unlikely (3)	Should the proposed decommissioning and rehabilitation project proceed improvements to the ecological integrity of the systems present are considered likely.	
Nature	Negative		

11.1.3.2 *Decommissioning Phase*

11.1.3.2.1 Project Activities Assessed

Project activities and associated impacts for the proposed decommissioning are listed in Table 11-19.

Table 11-19: Interactions for the Decommissioning Phase

Interaction	Impact
Site access roads crossing wetlands	Increased vehicular movement along wetland crossings and within wetland/riparian zones, resulting in: ▪ Potential contamination of soils as a result of the ingress of hydrocarbons; ▪ Compaction of soils; ▪ Loss of natural vegetation; ▪ Increased sedimentation; and ▪ Increased potential for onset of erosion

Interaction	Impact
Removal of any remaining tailings, contaminated soils and tailings infrastructure	▪ Potential dumping of decommissioned infrastructure in wetland/riparian areas; ▪ Potential incomplete removal of infrastructure; ▪ Disturbance of natural vegetation structures; ▪ Further contamination of wetland soils; and ▪ Sedimentation of wetlands and their downstream resources

11.1.3.2.2 Impact Description

Hydrocarbon and machinery spill are considered minor impacts during this phase. Larger impacts include

Larger impacts include compaction of soils, potential loss of natural vegetation and the increased potential for erosion and sedimentation in the decommissioned areas and resulting in impacts further downstream. With unregulated use of existing dirt roads across wetlands and indiscriminate driving and movement of heavy machinery across wetland areas, vegetation establishment will be hindered and erosion will be promoted. These impacts have the potential to increase sediment loads being deposited on river bends and levees, which in turn may result in the establishment and further spread of invasive hydrophytic plants and loss of stream flow and natural refuge areas in the aquatic systems further downstream.

Any temporary storage or dumping of decommissioned infrastructure within wetland areas, as well as any materials associated with the removal of remaining tailings or contaminated soils has the potential to result in loss of stream connectivity, loss of refuge areas, alterations to the terrain profiles of the areas and the creation of preferential flow paths, which may result in sedimentation, alterations to the vegetation structure of the area, encourage alien vegetation encroachment and result in increased erosion and sedimentation potentials.

Removal of vegetation and disturbance of soils in the vicinity of the decommissioning footprint is likely to give rise to an increased potential for encroachment by robust pioneer species and alien invasive vegetation species, further altering the natural vegetation profiles of the wetlands encountered in the vicinity of the decommissioning footprint.

11.1.3.2.3 Impact Ratings

The majority of wetlands that are at risk of negative impacts during the decommissioning phase have been identified as largely modified to seriously modified and further impacts related to sedimentation and habitat degradation may result in a further drop in ecological state of the wetland features present. Table 11-20 represents the impact ratings for the decommissioning phase.

Table 11-20: Potential Impacts of the Decommissioning Phase

Dimension	Rating	Motivation	Significance
Activity and Interactions: Decommissioning of Millsite TSF Infrastructure			
Prior to Mitigation/Management			
Duration	Medium term 1 – 5 years (3)	The impact will cease after the decommissioning, rehabilitation and closure phases of the project has been completed.	Minor (negative) – 44
Extent	Greater municipal area (4)	General scouring from sedimentation, as well as degraded habitat due to water quality deterioration will affect entire watercourse and river reaches.	
Intensity x type of impact	Serious medium term environmental effects (4)	Due to the sensitivity of wetland systems in general and the already degraded nature of the systems present, should no management or mitigation measures be employed, activities could result in serious medium term impacts.	
Probability	Probable (4)	Should no precautionary measures be implemented, further impacts to the wetlands present are considered probable.	
Nature	Negative		
Post-Mitigation			
Duration	Medium term 1 – 5 years (3)	The impact will cease after the decommissioning, rehabilitation and closure phases of the project have been completed.	Minor (positive) + 36
Extent	Limited (2)	Impacts will be limited only to the project footprint area and will be rehabilitated accordingly on completion of the decommissioning phase.	

Dimension	Rating	Motivation	Significance
Intensity x type of impact	Positive impact will be moderate with a visible improvement to the natural resources present (4)	Due to the impacted nature of the systems present, should the decommissioning and rehabilitation project proceed, and the appropriate precautions and management or mitigation measures be employed, the project could result in a significant ecological improvement of the wetland systems present	
Probability	Probable (4)	Should the proposed decommissioning and rehabilitation project proceed improvements to the ecological integrity of the systems present are considered likely.	
Nature	Positive		

11.1.3.3 *Rehabilitation, Closure and Post-Closure Phases*

11.1.3.3.1 Project Activities Assessed

Project activities and associated impacts for the Rehabilitation, Closure and Post-closure Phases are listed in Table 11-21.

Table 11-21: Interactions for the Rehabilitation, Closure and Post-Closure Phases

Interaction	Impact
Site access roads crossing wetlands	Increased vehicular movement along river crossings and within wetland/riparian zones, resulting in: ▪ Potential contamination of soils as a result of the ingress of hydrocarbons; ▪ Compaction of soils; ▪ Loss of natural vegetation; ▪ Increased sedimentation; and ▪ Increased potential for onset of erosion

Interaction	Impact
Rehabilitation, closure and post-closure activities within and around any wetland/riparian habitat, such as demolition and removal of all infrastructure, and subsequent rehabilitation and closure of the wetland areas present in the vicinity of the decommissioning footprint including: ▪ Rehabilitation of historical impacts to the wetlands in the vicinity of the proposed decommissioning footprint ▪ Removal of alien invasive vegetation and implementation of an alien vegetation management plan ▪ Clean-up of any waste or hazardous materials in the vicinity of the proposed decommissioning footprint, both in and in the vicinity of wetland areas ▪ Ripping and re-profiling of slopes and natural terrain profiles in the vicinity of the decommissioned Millsite TSF and associated historically eroded areas ▪ Re-seeding of disturbed or cleared areas. Re-seeding of re-profiled areas.	Similarly to the decommissioning phase, the activities occurring within an ecologically sensitive catchment pose significant potential negative impacts to functioning wetlands and catchment. Furthermore, the rehabilitated area could cause major negative impacts due to spread of alien invasive vegetation, increased soil compaction erosion and subsequent sedimentation into the wetland ecosystems.

11.1.3.3.2 Impact Description

The rehabilitation, closure and post-closure activities occurring within an ecologically sensitive catchment pose significant potential negative impacts to functioning wetlands and catchment including spread of alien invasive vegetation, increased soil compaction, erosion and subsequent sedimentation into the wetland ecosystems should the appropriate activities and management and mitigation measures not be adequately implemented.

11.1.3.3.3 Impact Ratings

During the rehabilitation, closure and post-closure phases, minor impacts are expected. Table 11-22 represents the impact rating for the rehabilitation, closure and post-closure phases.

Table 11-22: Potential Impacts of the Rehabilitation, Closure and Post-Closure Phase

Dimension	Rating	Motivation	Significance
Activity and Interactions: Rehabilitation of habitat and wetlands within and in the vicinity of the proposed Millsite TSF and associated infrastructure reclamation project			
Prior to Mitigation/Management			
Duration	Medium term 1 – 5 years (3)	The impact will cease after the decommissioning, rehabilitation and closure phases of the project have been completed.	Minor (negative) – 44
Extent	Greater municipal area (4)	General scouring from sedimentation, as well as degraded habitat due to water quality deterioration will affect entire watercourse and river reaches.	
Intensity x type of impact	Serious medium term environmental effects (4)	Due to the sensitivity of wetland systems in general and the already degraded nature of the systems present, should no management or mitigation measures be employed, activities could result in serious medium term impacts.	
Probability	Probable (4)	Should no precautionary measures be implemented, further impacts to the wetlands present are considered probable.	
Nature	Negative		
Post-Mitigation			
Duration	Long term (4)	Benefits of the rehabilitation with be permanent, should the appropriate management and mitigation measures be adequately implemented	Minor (Positive) + 44
Extent	Local (3)	Improvements are likely to be observed both on a site specific and a local level in terms of improvements to stream flow and connectivity, reduced impacts related to sedimentation and improved water quality.	

Dimension	Rating	Motivation	Significance
Intensity x type of impact	Positive impact will be moderate with a visible improvement to the natural resources present (4)	Due to the impacted nature of the systems present, should the rehabilitation project proceed, and the appropriate precautions and management or mitigation measures be employed, the project could result in a significant ecological improvement of the wetland systems present	
Probability	Probable (4)	Should the proposed decommissioning and rehabilitation project proceed improvements to the ecological integrity of the systems present are considered likely.	
Nature	Positive		

11.1.4 Air Quality

11.1.4.1 *Project Activities Assessed*

As part of the Construction Phase, the following activity is identified that may impact on the ambient air quality of the area i.e. increasing particulate matter loading in the atmosphere:

- Site clearing and removal of vegetation.

Table 11-23: Interactions and Impacts of Construction Phase

Interaction	Impact
Site clearing and removal of vegetation	Health impacts as a result of exposure to airborne particulate matter.
	Nuisance due to dust fallout.

11.1.4.1.1 Impact Ratings

Table 11-24: Significance Ratings for Impacts on Air Quality during Site Clearing

Activity and Interaction (Site Clearing))			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Reduction in ambient air quality Site clearing, which encompasses the removal of vegetation using a range of heavy construction equipment, can result in breaking the surface structure of tailings leading to the availability of loose material, providing the right conditions for fugitive emissions comprising TSP, PM_{10} and $PM_{2.5}$ from			

Activity and Interaction (Site Clearing))			
Dimension	**Rating**	**Motivation**	**Significance**
vehicle wheels and wind erosion. Fugitive emissions from site clearing are considered negligible due to the relatively short-term nature of this activity. Also, the area to be worked on will be cleared in phases, hence limiting the area disturbed or exposed to wind erosion.			
Prior to mitigation/ management			
Duration	Short term (1)	Dust generation will be less than 1 year and is reversible	Negligible (negative) – 30
Extent	Limited (2)	Limited to the reclamation site and immediate surroundings.	
Intensity	Minor (2)	Minor effect on surrounding area is anticipated	
Probability	Almost certain (6)	There is certainty that dust will be generated during this activity.	
Nature	Negative		
Mitigation/ Management actions			
▪ Application dust suppressant on exposed areas; ▪ Limit activity to non-windy days (wind speed ≤5.4 m/s); ▪ The area of disturbance at all times must be kept to a minimum and no unnecessary clearing, digging or scraping must occur, especially on windy days (with wind speed ≥ 5.4 m/s).			
Post- mitigation			
Duration	Short term (1)	Dust generation will be less than 1 year and is reversible	Negligible (negative) – 12
Extent	Very Limited (1)	After mitigation measures are implemented, It is expected that dust impacts will be limited to isolated parts of the site.	
Intensity	Minimal (1)	Generated dust will have minimal impacts on air quality after mitigation	
Probability	Probable (4)	Probable that impact on ambient air quality may occur.	
Nature	Negative		

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11.1.4.2 Operational Phase

11.1.4.2.1 Project Activities Assessed

The reclamation process will be conducted as a wet process; hence dust generation will not occur during the Operational Phase. However, the following activities will have some impacts on the ambient air quality of the area:

- Use of unpaved access roads; and
- Wet reclamation.

Table 11-25: Interactions and Impacts of Operational Phase

Interaction	Impact
Use of unpaved access road	Health impacts as a result of exposure to airborne particulate matter.
	Nuisance due to dust fallout.

Table 11-26: Significance Ratings for Development and use of Access Roads

Activity and Interaction (Development and use of access roads will result in fugitive emissions and reduction in air quality)			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Fugitive emissions and reduction in air quality During the operational phase, there will be movement of equipment and employee commute using dirt roads, leading to dust generation. This will be conducted throughout the Project life.			
Prior to mitigation/ management			
Duration	Project life (5)	Dust will be generated throughout the project life	Minor (negative) – 36
Extent	Limited (2)	Airborne dust may extend across the Project site.	
Intensity	Minor (2)	Minor environmental effect is anticipated	
Probability	Unlikely (4)	It is unlikely that impact will occur.	
Nature	Negative		
Mitigation/ Management actions			
▪ Application dust suppressant on access areas; and ▪ There is need to set maximum speed limits on access roads and to have these limits enforced.			
Post- mitigation			

Activity and Interaction (Development and use of access roads will result in fugitive emissions and reduction in air quality)			
Dimension	**Rating**	**Motivation**	**Significance**
Duration	Project life (5)	Dust will be generated throughout the project life	Negligible (negative) – 16
Extent	Very Limited (1)	Airborne dust limited to the site and its immediate surrounding after mitigation measures are applied.	
Intensity	Minor (2)	Minor impact anticipated after mitigation measures are applied	
Probability	Rare (2)	It is probable impact will occur.	
Nature	Negative		

Table 11-27: Significance Ratings for Wet Reclamation of Tailings

Activity and Interaction (Wet reclamation of tailings will result in dust suppression and improves air quality)			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Fugitive emissions and reduction in air quality During the operational phase, the wet screening and reclamation process will result in the suppression of dust, leading to a cleaner atmosphere.			
Prior to mitigation/ management			
Duration	Project life (5)	Dust will be suppressed throughout the project life	Negligible (Positive) – 7
Extent	Very limited (1)	Airborne dust may extend across the Project site.	
Intensity	Minimal (1)	Minor environmental effect is anticipated	
Probability	Highly unlikely (1)	It is highly unlikely that impact will occur.	
Nature	Positive		
Mitigation/ Management actions			
▪ Not applicable			
Post- mitigation			
Duration	Project life (5)	Dust will be suppressed throughout the project life	Negligible (Positive) – 7

Activity and Interaction (Wet reclamation of tailings will result in dust suppression and improves air quality)			
Dimension	**Rating**	**Motivation**	**Significance**
Extent	Very limited (1)	Airborne dust may extend across the Project site.	
Intensity	Minimal (1)	Minor environmental effect is anticipated	
Probability	Highly unlikely (1)	It is highly unlikely that impact will occur.	
Nature	Positive		

11.1.4.3 *Decommissioning Phase*

11.1.4.3.1 Project Activities Assessed

As part of the Decommissioning Phase, the following activities are identified that may impact on the ambient air quality of the area:

- Demolition and removal of all infrastructure; and
- Rehabilitation of TSF footprint.

Table 11-28: Interactions and Impacts of Decommissioning Phase

Interaction	Impact
Demolition & removal of infrastructure	Health impacts as a result of exposure to airborne particulate matter
	Nuisance due to dust fallout
Rehabilitation	Health impacts as a result of exposure to airborne particulate matter
	Nuisance due to dust fallout

Table 11-29: Significance ratings for the Demolition of Infrastructure

Activity and Interaction (Demolition of infrastructure and rehabilitation of TSFs footprint results in fugitive emission and reduction in air quality)			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Reduction in air quality The dismantling of site infrastructure and rehabilitation of the TSFs footprint will involve the use of heavy machinery and vehicles similar to those used in the construction phase. This will result in the generation of fugitive dust containing TSP, PM_{10} and $PM_{2.5}$.			

Activity and Interaction (Demolition of infrastructure and rehabilitation of TSFs footprint results in fugitive emission and reduction in air quality)			
Dimension	**Rating**	**Motivation**	**Significance**
Prior to mitigation/ management			
Duration	Short term (2)	Impact will be limited to the duration of the decommissioning phase	Negligible (negative) – 20
Extent	Limited (2)	Impact is limited to site and immediate surroundings	
Intensity	Minor (1)	Minor impact	
Probability	Probable (4)	It is probable that dust impact will occur.	
Nature	Negative		
Mitigation/ Management actions			
▪ The dismantling area disturbed must be kept to a minimum; ▪ Drop heights when loading and offloading materials offsite must be minimised; ▪ There is need to set maximum speed limits on site and to have these limits enforced. It is confirmed that the dust generating capacity of particles less than 10 micro meters is reduced by 58% when speed controls are reduced from 25 mph (40 km/h) to 10 mph (16 km/h) (Flocchini et al., 1994; Watson et al., 1996);and ▪ Limit demolition activities to non-windy days (≥5.4 m/s).			
Post- mitigation			
Duration	Short term (2)	Impact will be limited to the duration of the decommissioning phase	Negligible (negative) – 12
Extent	Very Limited (1)	Impact will be limited to isolate parts of the site after mitigation.	
Intensity	Minimal (1)	Minimal dust impact anticipated after mitigation	
Probability	Unlikely (3)	It is unlikely that dust will impact will occur.	
Nature	Negative		

Table 11-30: Significance ratings for Rehabilitation

Activity and Interaction (Rehabilitation of project area results in fugitive emission)			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Reduction in air quality			
Prior to mitigation/ management			

Activity and Interaction (Rehabilitation of project area results in fugitive emission)			
Dimension	**Rating**	**Motivation**	**Significance**
Duration	Short term (2)	Impact on air quality is limited to the duration of the decommissioning phase	Negligible (negative) – 18
Extent	Limited (2)	Impact will be limited to site and surroundings.	
Intensity	Minor (2)	Minor impact	
Probability	Unlikely (3)	Unlikely that dust generated from this activity will impact ambient air quality	
Nature	Negative		
Mitigation/ Management actions			
▪ Drop heights when offloading materials for rehabilitation must be minimised; ▪ Limit rehabilitation activities to non-windy days (≥ 5.4 m/s); ▪ Rehabilitated landscape should be vegetated; and ▪ Use of dust suppressant on dirt roads and exposed areas; and ▪ Wind speed of vehicle on dirt road during rehabilitation must be minimised. It is confirmed that the dust generating capacity of particles less than 10 micro meters is reduced by 58% when speed controls are reduced from 25 mph (40 km/h) to 10 mph (16 km/h) (Flocchini et al., 1994; Watson et al., 1996).			
Post- mitigation			
Duration	Short term (2)	Impact on air quality is limited to the duration of the decommissioning phase	Negligible (negative) – 12
Extent	Very Limited (1)	Airborne dust will be limited to the development site area.	
Intensity	Minimal (1)	Minimal dust impact after mitigation measures are applied	
Probability	Unlikely (3)	It is unlikely that the air quality will be impacted on if mitigation measures are applied.	
Nature	Negative		

11.1.5 Noise

11.1.5.1 *Construction phase*

The construction activities may impact on the ambient sound levels at surrounding receptors by causing noise disturbance in terms of the Gauteng Noise Control Regulations.

1.1.1.1 Project activities assessed

The Construction Phase noise was assessed in terms of the activities in Table 11-31.

Table 11-31: Interactions and Impacts of the construction activities

Interaction	Impact
Construction of pipeline	Noise disturbance from the construction vehicles and machinery
Site clearing and construction of the screens and pump stations	Noise disturbance from the construction vehicles and machinery

1.1.1.2 Impact description

The noise dispersion model run for the construction of the screen, pump stations and pipeline indicates that the expected noise will not measure above the SANS 10103:2008 rating levels at the surrounding suburban and urban receptors and therefore not impact on the surrounding receptors. Based on the definition of disturbing noise in the Gauteng Noise Control Regulations there will be no disturbance although certain noise sources may still be audible and therefore rated as a negligible impact on the surrounding receptors.

11.1.5.1.1 Management objectives

To minimise/prevent the noise impact of causing a noise disturbance at the surrounding receptors as a result of the construction activities and subsequently comply with the Gauteng Noise Control Regulations.

11.1.5.1.2 Management actions and targets

Construction activities should be restricted to daylight hours (this will keep the night time noise levels to a minimum). Construction related machinery and vehicles should be switched off when not in use.

11.1.5.1.3 Construction phase impact ratings

The table below summarises the rating of the impact significance for the construction phase.

Table 11-32: Pre-mitigation and post-mitigation significance ratings for impacts on noise during the Construction Phase

Dimension	Rating	Motivation	Significance
Activity and Interaction (Site clearance and construction of the pump stations and pipeline)			
Impact Description: Noise will emanate from the machinery and vehicles operating during the construction activities.			
Prior to mitigation/ management			
Duration	Short term (2)	Noise will be produced for the duration of the construction phase	Negligible (negative) – 18
Extent	Local (3)	It is expected that during construction noise will extend as far as development site area.	
Intensity x type of impact	Minimal - negative (-1)	It is expected that during construction noise will have a minimal impact	
Probability	Unlikely (3)	It is unlikely that noise will impact on the surrounding receptors.	
Nature	Negative		
Mitigation/ Management action			
▪ Restricting construction activities to daylight hours; ▪ Project related machines and vehicles to be serviced to the designed requirements of the machinery/vehicles to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; and ▪ Switching off equipment when not in use.			
Post- mitigation			
Duration	Short term (2)	Noise will be produced for the duration of the construction phase	Negligible (negative) – 12
Extent	Local (3)	It is expected that during construction noise will be limited to site if mitigation measures are implemented.	
Intensity x type of impact	Minimal - negative (-1)	It is expected that during construction noise will have a minimal social impact	
Probability	Rare (2)	It is improbable that noise will impact on the surrounding receptors.	
Nature	Negative		

11.1.5.1.4 Operational Phase

The operational activities may impact on the ambient sound levels at surrounding receptors by causing noise disturbance in terms of the Gauteng Noise Control Regulations.

11.1.5.1.5 Project activities assessed

The Operational Phase noise was assessed in terms of the activities in Table 11-33.

Table 11-33: Interactions and Impacts of the operational activities

Interaction	Impact
Operation of finger screen	Noise disturbance from the screening activities
Operation of pump stations	Noise disturbance from the pump stations

11.1.5.1.6 Impact description

The operational scenarios were run for day and night times. The noise modelling results indicate that the expected noise will not measure above the SANS 10103:2008 day and night time rating levels at the surrounding suburban and rural receptors, therefore not impacting on the surrounding receptors.

11.1.5.1.7 Management objectives

To minimise/prevent the noise impact of causing a noise disturbance at the surrounding receptors as a result of the operational activities and subsequently comply with the Gauteng Noise Control Regulations.

11.1.5.1.8 Management actions and targets

Due to the likely negligible impact no mitigation measures are required

11.1.5.1.9 Operational phase impact ratings

The table below summarises the rating of the impact significance for the operational phase.

Table 11-34: Pre-mitigation and post-mitigation significance ratings for impacts on noise during the Operational Phase

Dimension	Rating	Motivation	Significance
Activity and Interaction (Operation of the screening activities and pump station			
Impact Description: Noise will emanate from the screening activities as well as the pump station during the operational phase.			
Prior to mitigation/ management			
Duration	Project Life (5)	Noise will be produced for the duration of life of mine	Negligible (negative) – 16
Extent	Limited (2)	It is expected that during operation noise will extend as far as development site area.	
Intensity x type of impact	Minor - negative (-1)	It is expected that during operational phase noise will be limited to site	

Dimension	Rating	Motivation	Significance
Probability	Improbable (2)	It is improbable that noise will impact on the surrounding communities.	
Nature	Negative		
Mitigation/ Management action			
▪ No mitigation required			
Post- mitigation			
Duration	Project Life (5)	Noise will be produced for the duration of life of mine	Negligible (negative) – 16
Extent	Limited (2)	It is expected that during operation noise will extend as far as development site area.	
Intensity x type of impact	Minor - negative (-1)	It is expected that during operational phase noise will be limited to site	
Probability	Improbable (2)	It is improbable that noise will impact on the surrounding communities.	
Nature	Negative		

11.1.5.2 Decommissioning

11.1.5.2.1 Project activities assessed

The Decommissioning Phase noise was assessed in terms of the activities in Table 11-35.

Table 11-35: Interactions and Impacts of the decommissioning activities

Interaction	Impact
Dismantling of pump stations	Noise disturbance from the demolition
Dismantling and removal of pipelines	Noise disturbance from the decommissioning activities

11.1.5.2.2 Impact description

The decommissioning activities using similar machinery and vehicles than the construction phase, it is expected that the significance of the noise impact during this phase will be similar.

11.1.5.2.3 Management objectives

To minimise/prevent the noise impact of causing a noise disturbance at the surrounding receptors as a result of the decommissioning activities and subsequently comply with the Gauteng Noise Control Regulations.

11.1.5.2.4 Management actions and targets

Decommissioning activities should be restricted to daylight hours (this will keep the night time noise levels to a minimum). Decommissioning phase related machines and vehicles to be serviced to the designed requirements of the machinery/vehicles to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers. Switch off equipment when not in use.

11.1.5.2.5 Decommissioning phase impact ratings

The table below summarises the rating of the impact significance for the decommissioning phase.

Table 11-36: Pre-mitigation and post-mitigation significance ratings for impacts on noise during the Decommissioning Phase

Dimension	Rating	Motivation	Significance
Activity and Interaction (Dismantling and removal of the pump stations and pipeline infrastructure)			
Impact Description: Noise will emanate from the machinery and vehicles operating during the decommissioning activities.			
Prior to mitigation/ management			
Duration	Short term (2)	Noise will be produced for the duration of the decommissioning phase	Negligible (negative) – 18
Extent	Local (3)	It is expected that during construction noise will extend as far as development site area.	
Intensity x type of impact	Minimal - negative (-1)	It is expected that during construction noise will have a minimal impact	
Probability	Unlikely (3)	It is unlikely that noise will impact on the surrounding receptors.	
Nature	Negative		
Mitigation/ Management action			
▪ Restricting decommissioning activities to daylight hours; ▪ Decommissioning phase related machines and vehicles to be serviced to the designed requirements of the machinery/vehicles to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; and ▪ Switching off equipment when not in use.			
Post- mitigation			
Duration	Short term (2)	Noise will be produced for the duration of the decommissioning phase	Negligible (negative) – 12

Extent	Local (3)	It is expected that during decommissioning noise will be limited to site if mitigation measures are implemented.	
Intensity x type of impact	Minimal - negative (-1)	It is expected that during decommissioning noise will have a minimal social impact	
Probability	Rare (2)	It is improbable that noise will impact on the surrounding receptors.	
Nature	Negative		

11.1.5.3 *Post-closure phase*

The construction, operational and decommissioning activities will have ceased and the subsequent noise levels from the activities will have ceased, therefore no post closure impacts expected and also no post closure monitoring programme is recommended

11.1.6 Heritage

The impacts associated with Heritage Resources are discussed in Section 25.2 below.

11.1.7 Cumulative Impacts

The cumulative impacts identified are discussed per environmental aspect. Cumulative impacts associated with Heritage sites of cultural importance are discussed separately in Section 11.2.2 below.

11.1.7.1 *Groundwater and Surface Water*

There are a number of municipal sewage waste water treatment plants and mines operating in West Rand. Sources of future surface and groundwater impacts in the affected catchments will therefore not be from the Millsite TSF Complex reclamation only.

The current water qualities of the Tweelopiespruit and the Wonderfonteinspruit are poor when benchmarked with current WUL limits. This is mainly due to decant from the old mine workings and also discharge of partially treated mine water. A Waste Water Treatment Plant also discharges into the catchments and this could possibly have contributed to the existing water quality status.

Closure and rehabilitation of the Millsite TSF Complex and surrounding pits by Sibanye-Stillwater will have a positive impact on the surface and groundwater environment. However, a rehabilitation strategy that encompasses the nearby mines and municipal treatment activities is required for a lasting improvement with a regional footprint.

11.1.7.2 *Wetlands*

The freshwater resources in this area are currently cumulatively impacted as a result of of extensive historical and artisanal mining activities in the area. Deposition of re-mined tailings will need to be investigated and a suitable location approved. Other impacts to the freshwater resources in the vicinity of the proposed Project include agricultural cultivation and grazing activities, as well as impacts from increasing urbanisation and other anthropogenic activities. It is the opinion of the ecologist that should this project be allowed to proceed and the recommended management and mitigation measures supplied in this report are adhered to, the ecological integrity and functioning of the wetland ecosystems present are likely to improve, with special mention of HGM Unit 4 and HGM Unit 5. Improved wetland ecosystems could lead to the return of species reliant on these systems, thereby improving biodiversity of the area.

11.1.7.3 *Air Quality*

The model predictions show that ambient ground-level concentrations will increase in the vicinity of the Millsite TSF Complex during the operational phase. The predicted emissions confirm exceedances of the regulatory limit that are confined to the Project footprint without mitigation. As a result of the aforementioned, mitigations were not generated. The open spaces around the Millsite TSF Complex will serve as an unplanned buffer to potential emissions. Predicted ground-level concentrations at the surrounding receptors were all within the applicable standards without mitigation measures in place.

As mentioned above, the activities associated with reclamation will have minimal impact on ambient air quality of the area. Despite the aforementioned, Sibanye-Stillwater's existing mitigation measures applied to other reclamation sites should be incorporated into the daily reclamation process as best practice to ensure the operation is conducted within compliance.

11.1.7.4 *Noise*

No cumulative impacts are anticipated for noise disturbance; however, existing noise reduction procedures applicable to other Sibanye-Stillwater operations should be undertaken as best practice for the proposed Project.

11.2 Item 3(g)(vi): Methodology used in determining and ranking the nature, significance, consequence, extent, duration and probability of potential environmental impacts and risks

Digby Wells has developed two separate Impact Rating methodologies. The general impact rating applies to biophysical and social impacts (Section 11.2.1), whilst Heritage Resources require a separate impact rating (Section 11.2.2).

11.2.1 General Impact Rating

The general methodology utilised to assess the significance of potential environmental and social impacts is discussed in detail below. The general significance rating formula is as follows:

Significance = Consequence x Probability

Where

Consequence = Type of Impact x (Intensity + Spatial Scale + Duration)

And

Probability = Likelihood of an Impact Occurring

In addition, the formula for calculating consequence:

***Type of Impact** = **+1** (Positive Impact) or **-1** (Negative Impact)*

The matrix calculates the rating out of 147, whereby Intensity, Extent, Duration and Probability are each rated out of seven as indicated in Table 11-37. The weight assigned to the various parameters is then multiplied by +1 for positive and -1 for negative impacts.

Impacts are rated prior to mitigation and again after consideration of the mitigation measure proposed in this WULA/IWWMP. The significance of an impact is then determined and categorised into one of eight categories, as indicated in Table 11-38, which is extracted from Table 11-37. The description of the significance ratings is discussed in Table 11-39.

It is important to note that the pre-mitigation rating takes into consideration the activity as proposed, i.e. there may already be certain types of mitigation measures included in the design (for example due to legal requirements). If the potential impact is still considered too high, additional mitigation measures are proposed.

Table 11-37: Impact Assessment Parameter Ratings

Rating	Severity		Spatial scale	Duration	Probability
	Environmental	Social, cultural and heritage			
7	Very significant impact on the environment. Irreparable damage to highly valued species, habitat or eco system. Persistent severe damage. The positive impact will result in a significant improvement to the initial/post disturbance environmental status and will benefit ecological and natural resources.	Irreparable damage to highly valued items of great cultural significance or complete breakdown of social order. The positive impact will be of high significance which will result the improvement of the socio-economic status of a greater area beyond the boundary of the directly affected of the community and/or promote archaeological and heritage awareness and contribute towards research and documentation of sites and artefacts through phase two assessments.	International The effect will occur across international borders.	Permanent: The impact is irreversible, even with management, and will remain after the life of the project.	Definite: There are sound scientific reasons to expect that the impact will definitely occur. >80% probability.
6	Significant impact on highly valued species, habitat or ecosystem. The positive impact is of high significance which will result in a vast improvement to the environment such as ecological diversification and/or rehabilitation of endangered species.	Irreparable damage to highly valued items of cultural significance or breakdown of social order. The positive impact will be of high significance and will result in the upliftment of the surrounding community and/or contribute towards research and documentation of sites and artefacts through phase two assessments.	National Will affect the entire country.	Beyond project life: The impact will remain for some time after the life of the project and is potentially irreversible even with management.	Almost certain/Highly probable: It is most likely that the impact will occur. <80% probability.

Rating	Severity		Spatial scale	Duration	Probability
	Environmental	Social, cultural and heritage			
5	Very serious, long-term environmental impairment of ecosystem function that may take several years to rehabilitate. The positive impact will be moderately high and will have a long term beneficial effect on the natural environment.	Very serious widespread social impacts. Irreparable damage to highly valued items. The positive impact will be moderately high and will result in visible improvements on the socio-economic environment of the local and regional community, and/or promote archaeological and heritage awareness through mitigation.	Circle/Region Will affect the entire Circle or Region	Project Life (>15 years): The impact will cease after the operational life span of the project and can be reversed with sufficient management.	Likely: The impact may occur. <65% probability.
4	Serious medium term environmental effects. Environmental damage can be reversed in less than a year The positive impact on the environment will be moderate with visible improvement to the natural resources and regional biodiversity.	On-going serious social issues. Significant damage to structures/items of cultural significance The positive impact on the socio-economic environment will be of a moderate extent and benefits should be experience across the local extent and/or potential benefits for archaeological and heritage conservation.	Commune Area Will affect the whole municipal area.	Long term: 6-15 years and impact can be reversed with management	Probable: Has occurred here or elsewhere and could therefore occur. <50% probability.

Rating	Severity		Spatial scale	Duration	Probability
	Environmental	Social, cultural and heritage			
3	Moderate, short-term effects but not affecting ecosystem functions. Rehabilitation requires intervention of external specialists and can be done in less than a month. The positive impact will be moderately beneficial to the natural environment, but will be short lived.	Ongoing social issues. Damage to items of cultural significance. The positive impact will be moderately beneficial for some community members and/or employees, but will be short lived and/or there will be a moderate possibility for archaeological and heritage conservation	Local. Local extending only as far as the development site area.	Medium term: 1-5 years and impact can be reversed with minimal management.	Unlikely: Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur. <25% probability.
2	Minor effects on biological or physical environment. Environmental damage can be rehabilitated internally with/without help of external consultants. The positive impacts will be minor and slight environmental improvement will be visible.	Minor medium-term social impacts on local population. Mostly repairable. Cultural functions and processes not affected. Minor positive impacts on the social/cultural and/or economic environment.	Limited Limited to the site and its immediate surroundings.	Short term: Less than 1 year and is reversible.	Rare/improbable: Conceivable, but only in extreme circumstances. The possibility of the impact materialising is very low as a result of design, historic experience or implementation of adequate mitigation measures. <10% probability.
1	Limited damage to minimal area of low significance, (e.g. ad hoc spills within plant area). Will have no impact on the environment. The positive impact on the environment will be insignificant and will not result in visible improvements	Low-level repairable damage to commonplace structures. The positive impact on social and cultural aspects will be insignificant.	Very limited Limited to specific isolated parts of the site.	Immediate: Less than 1 month and is completely reversible without management.	Highly unlikely/None: Expected never to happen. <1% probability.

Table 11-38: Probability / Consequence Matrix

	Significance																																					
Probability 7	-147	-140	-133	-126	-119	-112	-105	-98	-91	-84	-77	-70	-63	-56	-49	-42	-35	-28	-21	21	28	35	42	49	56	63	70	77	84	91	98	105	112	119	126	133	140	147
6	-126	-120	-114	-108	-102	-96	-90	-84	-78	-72	-66	-60	-54	-48	-42	-36	-30	-24	-18	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	126
5	-105	-100	-95	-90	-85	-80	-75	-70	-65	-60	-55	-50	-45	-40	-35	-30	-25	-20	-15	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105
4	-84	-80	-76	-72	-68	-64	-60	-56	-52	-48	-44	-40	-36	-32	-28	-24	-20	-16	-12	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80	84
3	-63	-60	-57	-54	-51	-48	-45	-42	-39	-36	-33	-30	-27	-24	-21	-18	-15	-12	-9	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63
2	-42	-40	-38	-36	-34	-32	-30	-28	-26	-24	-22	-20	-18	-16	-14	-12	-10	-8	-6	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42
1	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
	-21	**-20**	**-19**	**-18**	**-17**	**-16**	**-15**	**-14**	**-13**	**-12**	**-11**	**-10**	**-9**	**-8**	**-7**	**-6**	**-5**	**-4**	**-3**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**
	Consequence																																					

Table 11-39: Significance Ratings

Score	Description	Rating
109 to 147	A very beneficial impact which may be sufficient by itself to justify implementation of the project. The impact may result in permanent positive change.	Major (positive)
73 to 108	A beneficial impact which may help to justify the implementation of the project. These impacts would be considered by society as constituting a major and usually a long-term positive change to the (natural and/or social) environment.	Moderate (positive)
36 to 72	An important positive impact. The impact is insufficient by itself to justify the implementation of the project. These impacts will usually result in positive medium to long-term effect on the social and/or natural environment.	Minor (positive)
3 to 35	A small positive impact. The impact will result in medium to short term effects on the social and/or natural environment.	Negligible (positive)
-3 to -35	An acceptable negative impact for which mitigation is desirable but not essential. The impact by itself is insufficient even in combination with other low impacts to prevent the development being approved. These impacts will result in negative medium to short term effects on the social and/or natural environment.	Negligible (negative)
-36 to -72	An important negative impact which requires mitigation. The impact is insufficient by itself to prevent the implementation of the project but which in conjunction with other impacts may prevent its implementation. These impacts will usually result in negative medium to long-term effect on the social and/or natural environment.	Minor (negative)
-73 to -108	A serious negative impact which may prevent the implementation of the project. These impacts would be considered by society as constituting a major and usually a long-term change to the (natural and/or social) environment and result in severe effects.	Moderate (negative)
-109 to -147	A very serious negative impact which may be sufficient by itself to prevent implementation of the project. The impact may result in permanent change. Very often these impacts are immitigable and usually result in very severe effects.	Major (negative)

11.2.2 Heritage Resource Impact Rating

Heritage impacts are discussed in Section 25.2, below.

Digby Wells designed the significance rating process to provide a numerical rating of the CS[4] of identified heritage resources. This process considered heritage resources assessment criteria set out in subsection 3(3) of the NHRA, which determined the intrinsic, comparative and contextual significance of identified heritage resources. A resource's importance rating was based on information obtained through review of available credible sources and representability or uniqueness (i.e. known examples of similar resources to exist).

The rationale behind the heritage value matrix takes into account that a heritage resource's value is a direct indication of its sensitivity to change (i.e. impacts). Value, therefore, was determined prior to completing any assessment of impacts.

The matrix rated the potential, or importance, of an identified resource relative to its contribution to certain values – aesthetic, historical, scientific and social. Resource significance was directly related to the impact on it that could result from project-related activities, as it provided minimum accepted levels of change to the resource.

11.2.2.1 *Definition of Heritage Impacts*

Potential impacts to heritage resources may manifest differently across geographical areas or diverse communities when one considers the simultaneous affect to the tangible resource and social repercussions associated with the intangible aspects. Furthermore, potential impacts may concurrently influence the CS of heritage resources. This assessment therefore considers three broad categories adapted from Winter & Bauman 2005: 36.

Table 11-40: Impact definition

Category	Description
Direct Impact	Affect the fabric or physical integrity of the heritage resource, for example destruction of an archaeological site or historical building. Direct impacts may be the most immediate and noticeable. Such impacts are usually ranked as the most intense, but can often be erroneously assessed as high-ranking.
Indirect Impact	Occur later in time or at a different place from the causal activity, or as a result of a complex pathway. For example, restricted access to a heritage resource resulting in the gradual erosion of its CS that may be dependent on ritual patterns of access. Although the physical fabric of the resource is not affected through any direct impact, its significance is affected to the extent that it can ultimately result in the loss of the resource itself.

[4] Cultural significance is defined in the NHRA as the intrinsic "aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance" of a heritage resource. These attributes are combined and reduced to four themes used in the Digby Wells significance matrix: aesthetic, historical, scientific and social.

Category	Description
Cumulative Impact	Result from in-combination effects on heritage resources acting within a host of processes that are insignificant when seen in isolation, but which collectively have a significant effect. Cumulative effects can be: ▪ Additive: the simple sum of all the effects, e.g. the reclamation of a historical TSF will minimise the sense of the historic mining landscape. ▪ Synergistic: effects interact to produce a total effect greater than the sum of the individual effects, e.g. the removal of all historical TSFs will sterilise the historic mining landscape. ▪ Time crowding: frequent, repetitive impacts on a particular resource at the same time, e.g. the effect of regular blasting activities on a nearby rock art site or protected historical building could be high. ▪ Neutralizing: where the effects may counteract each other to reduce the overall effect, e.g. the effect of changes from a historic to modern mining landscape could reduce the overall impact on the sense-of-place of the study area. ▪ Space crowding: high spatial density of impacts on a heritage resource, e.g. density of new buildings resulting in suburbanisation of a historical rural landscape.

11.3 Item 3(g)(vii): The positive and negative impacts that the proposed activity (in terms of the initial site layout) and alternatives will have on the environment and the community that may be affected

As this Application is in support of a Regulation 31 Amendment process, no consideration of alternatives is required as no Listed Activities have been triggered by the proposed Project. A summary of the positive and negative impacts extracted from the Specialist Studies specifically undertaken in support of this Application are tabulated below. It must be noted that this is exclusive of the positive and negative impacts associated with the Socio-Economic aspects of the proposed Project, as this was not assessed separately. General negative and positive socio-economic impacts are discussed based on general knowledge and experience.

11.3.1 Positive Impacts

The post mitigation positive impacts from each project phase is summarised in Table 11-41 below. Of the assessed impacts, there is one negligible positive impact, three minor positive impacts, and two moderate positive impacts, totalling six positive impacts overall. The total post-mitigation *average* score for these positive impacts is **62**; a **Minor positive** overall.

Table 11-41: Positive Impacts

Pre-mitigation Significance	Post-mitigation Significance
Negligible (Positive) 7	Negligible (Positive) 7
Moderate (positive) 105	Moderate (positive) 105
Moderate (positive) 78	Moderate (positive) 98
Minor (negative) – 44	Minor (positive) 36
Minor (positive) 66	Minor (positive) 80
Minor (negative) – 44	Minor (Positive) 44
TOTAL	**372**

11.3.2 Negative Impacts

The negative impacts associated with the Project are in Table 11-42. Of the impacts assessed; the post-mitigation ratings equate to 14 negligible negatives and four minor negatives, totalling 18 negative impacts overall. The total post-mitigation *average* score for these negative impacts is **22**; a **Negligible negative** overall.

Table 11-42: Negative Impacts

Pre-mitigation Significance	Post-mitigation Significance
Negligible (negative) – 8	Negligible (negative) – 6
Minor (negative) – 70	Minor (negative) – 36
Minor (negative) – 60	Negligible (negative) –33
Negligible (negative) – 30	Negligible (negative) – 12
Negligible (negative) – 18	Negligible (negative) – 12
Minor (negative) – 44	Negligible (negative) – 24
Minor (negative) – 54	Negligible (negative) – 21
Minor (negative) – 36	Negligible (negative) – 10
Minor (negative) – 45	Negligible (negative) – 32
Minor (negative) – 70	Minor (negative) – 42
Minor (negative) – 56	Minor (negative) - 27
Minor (negative) – 36	Negligible (negative) – 32
Negligible (negative) – 16	Negligible (negative) – 16
Minor (negative) – 50	Minor (negative) – 36
Negligible (negative) – 20	Negligible (negative) – 12
Negligible (negative) – 18	Negligible (negative) – 12

Pre-mitigation Significance	Post-mitigation Significance
Negligible (negative) – 20	Negligible (negative) – 12
Negligible (negative) – 18	Negligible (negative) – 12
TOTAL	**387**

11.4 Item 3(g)(viii): The possible mitigation measures that could be applied and the level of risk

Mitigation measures for each identified impact have been proposed and are presented in Section 11.1 and Table 13-1.

11.5 Item 3(g)(ix): Motivation where no alternatives sites were considered

Based on existing Authorisations pertaining to the Cooke Operations, the Millsite TSF Complex has previously been identified as a future resource and therefore, given the urgency of the application, no alternatives have been considered. The Millsite TSF Complex will provide the mining operation with sufficient tailings to maintain operations at the Cooke Plant, as well as provide additional residue tailings for pit deposition. Furthermore, Sibanye-Stillwater can utilise existing or approved infrastructure for the reclamation process which further negates the need for alternatives.

11.6 Item 3(g)(x): Statement motivating the alternative development location within the overall site

As previously stated, no alternatives have been assessed due to the location of the Millsite TSF Complex and placement of existing or approved infrastructure to facilitate the reclamation process. Due to authorised or existing infrastructure, the development and location as proposed will result in the least impact to the surrounding environment.

12 Item 3(h): Full description of the process undertaken to identify, assess and rank the impacts and risks the activity will impose on the preferred site (In respect of the final site layout plan) through the life of the activity

Refer to Section 11.2 above for the impact assessment methodology used by Digby Wells.

13 Item 3(i): Assessment of each identified potentially significant impact and risk

Table 13-1 consolidates the impacts as displayed in Section 11. Each impact identified and rated by the Specialists is included and arranged per project activities and per Project Phase.

Table 13-1: Impact Assessment Table

Activity	Potential Impact	Aspects Affected	Phase	Significance	Mitigation Type	Significance
Construction Activities (installation of pipelines, access roads, site clearing, collection sump and paddocks, and storm water trenches)	Groundwater contamination	Groundwater	Construction	Negligible (negative) – 8	▪ Restrict areas that must be cleared of vegetation for construction activities to those of absolute necessity; ▪ Avoid constructing below the water table as far as possible; and ▪ Continue the existing monitoring programme.	Negligible (negative) – 6
	Siltation of surface water resources leading to deteriorated water quality	Surface Water	Construction	Minor (negative) – 70	▪ Clearing of vegetation must be limited to the development footprint area, and the use of existing access roads must be prioritized to minimize construction of new access roads, hence potential for erosion; ▪ If possible, construction activities must be prioritized to the dry months of the year (May-October) to limit mobilization of sediments or hazardous substances during site clearing; ▪ Vegetation along the edges of the dumps (where reclamation is not active) should be left as is, and only be removed when the rest of the dump has been reclaimed; ▪ Dust suppression on the haul roads and cleared areas must regularly be undertaken; and ▪ An appointed Environmental Control Officer (ECO) must always be available to ensure implementation of the recommended mitigation/management measures during construction, operational, and decommissioning of the project.	Minor (negative) – 36
	Deterioration of water quality due to dirty/contaminated runoff from the project reporting into the surrounding streams	Surface Water	Construction	Minor (negative) – 60	▪ All fuel storage areas should be appropriately bunded and spill kits should be in place, and construction workers trained in the use of spill kits, to contain and immediately clean up any potential leakages or spills; ▪ Vehicles should regularly be maintained as per the developed maintenance program. This should also be inspected on a daily basis before use to ensure there are no leakages underneath; ▪ Ablutions facility for construction workers and general waste bins should be provided. An accredited contractor should be appointed to properly dispose the waste; ▪ The storm water management to ensure separation	Negligible (negative) –33

Activity	Potential Impact	Aspects Affected	Phase	Significance	Mitigation Type	Significance
					of clean and dirty and water runoff, as stated, the temporary surface water ditches are to be constructed on the upstream boundary of the TSF, which will meet GN 704 requirements regarding the separation of clean and dirty water runoff. All clean water runoff will therefore be diverted away from the cleared area. The temporary surface ditches are to be sized such that the 1:50 year peak discharge can be contained within it; and ▪ Surface water quality monitoring should continue on the monitoring locations to enable detection of the water quality impacts and therefore ensure that necessary mitigation measures are immediately implemented	
	▪ Health impacts as a result of exposure to airborne particulate matter; and ▪ Nuisance due to dust fallout	Air Quality	Construction	Negligible (negative) – 30	▪ Application dust suppressant on exposed areas; ▪ Limit activity to non-windy days (wind speed ≤5.4 m/s); and ▪ The area of disturbance at all times must be kept to a minimum and no unnecessary clearing, digging or scraping must occur, especially on windy days (with wind speed ≥ 5.4 m/s).	Negligible (negative) – 12
	Noise disturbance from the construction vehicles and machinery	Noise	Construction	Negligible (negative) – 18	▪ Restricting construction activities to daylight hours; ▪ Project related machines and vehicles to be serviced to the designed requirements of the machinery/vehicles to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; and ▪ Switching off equipment when not in use	Negligible (negative) – 12
Mixing the slimes and water to create a slurry (hydraulic reclamation and associated processing)	Water used for hydraulic reclamation may seep through the TSF and contaminate the TSF footprint	Groundwater	Operational	Minor (negative) – 44	▪ Monitoring of groundwater quality and water levels; and ▪ Minimise ponding of water within the reclamation area.	Negligible (negative) – 24
	Runoff from the tailings will contain high levels of dissolved minerals which may result in water contamination or the deterioration of surface water quality	Surface Water	Operational	Minor (negative) – 70	▪ All fuel storage areas should be appropriately bunded and spill kits should be in place, and construction workers trained in the use of spill kits, to contain and immediately clean up any potential leakages or spills; ▪ Vehicles should regularly be maintained as per the developed maintenance program. This should also be inspected on a daily basis before use to ensure there are no leakages underneath; ▪ Ablutions facility for construction workers and	Minor (negative) – 42

Activity	Potential Impact	Aspects Affected	Phase	Significance	Mitigation Type	Significance
					general waste bins should be provided. An accredited contractor should be appointed to properly dispose the waste; ▪ The storm water management to ensure separation of clean and dirty and water runoff, as stated, the temporary surface water ditches are to be constructed on the upstream boundary of the TSF, which will meet GN 704 requirements regarding the separation of clean and dirty water runoff. All clean water runoff will therefore be diverted away from the cleared area. The temporary surface ditches are to be sized such that the 1:50 year peak discharge can be contained within it. ▪ Surface water quality monitoring should continue on the monitoring locations to enable detection of the water quality impacts and therefore ensure that necessary mitigation measures are immediately implemented	
	Increased vehicular movement along river crossings and within wetland/riparian zones, resulting in: ▪ Potential contamination of soils as a result of the ingress of hydrocarbons; ▪ Compaction of soils; ▪ Loss of natural vegetation; ▪ Increased sedimentation; and ▪ Increased potential for onset of erosion	Wetlands	Operational	Minor (negative) – 56	▪ Ensure that sound environmental management is in place during the proposed operational phase; ▪ Ensure that as far as possible all operational activities take place outside of wetland/riparian areas and their associated 100 m zone of regulation; ▪ Limit the footprint area of the operational activities to what is absolutely essential in order to minimise impacts as a result of vegetation clearing and compaction of soils; ▪ If it is absolutely unavoidable that any of the wetland areas present will be affected, disturbance must be minimised and suitably rehabilitated; ▪ Ensure that no incision and canalisation of the wetland features present takes place as a result of the proposed operational activities; ▪ All erosion noted within and in the vicinity of the	Minor (negative) - 27

Activity	Potential Impact	Aspects Affected	Phase	Significance	Mitigation Type	Significance
	Physical disturbance of contaminated soil and tailings resulting in erosion and sedimentation; Ingress of pollutants to watercourses and wetland areas as a result of tailings and contaminated soil spills during transport and reclamation activities; Potential for further contamination of the freshwater resources present as a result of increased oxidation as a result of disturbance of the tailings during reclamation activities				area footprint should be remedied immediately and included as part of the ongoing rehabilitation plan; ▪ All soils compacted as a result of operational activities should be ripped and profiled; ▪ A suitable alien-vegetation control programme must be put in place so as to prevent further encroachment as a result of disturbance to the surrounding terrestrial zones; ▪ Permit only essential personnel within the 100 m zones of regulation for all wetland features identified; ▪ All areas of increased ecological sensitivity should be designated as "No-Go" areas and be off limits to all unauthorised vehicles and personnel; ▪ No crossing of the wetland features and their associated buffers should take place and the substrate conditions of the wetlands and downstream stream connectivity must be maintained; ▪ No material may be dumped or stockpiled within any wetland areas in the vicinity of the proposed decommissioning footprint. ▪ No vehicles or heavy machinery may be allowed to drive indiscriminately within any wetland areas and their associated zone of regulation. All vehicles must remain on demarcated roads and within the Project area footprint; ▪ All vehicles must be regularly inspected for leaks; ▪ Re-fueling must take place on a sealed surface area to prevent ingress of hydrocarbons into topsoil; ▪ All spills should be immediately cleaned up and treated accordingly; ▪ Water quality with special mention of pH, dissolved salts and specific problem substances like pyrites need to be managed, and monitored in order to ensure that reasonable water quality occurs downstream of the mined areas to allow for the on-going survival of wetland and aquatic communities of some diversity and reasonable sensitivity; ▪ Appropriate sanitary facilities must be provided for the duration of the operational activities and all waste must be removed to an appropriate waste facility; ▪ Monitor all systems for erosion and incision; ▪ During the operational phase, erosion berms should	

Activity	Potential Impact	Aspects Affected	Phase	Significance	Mitigation Type	Significance
					be installed on roadways and in the vicinity of disturbed soils and cleared vegetation soils as well as in areas where tailings or contaminated soils are reclaimed or removed to prevent gully formation and siltation of the wetland areas. The following points should serve to guide the placement of erosion berms: ▪ Where the track has slope of less than 2%, berms every 50m should be installed; ▪ Where the track slopes between 2% and 10%, berms every 25m should be installed; ▪ Where the track slopes between 10%-15%, berms every 20m should be installed; ▪ Where the track has slope greater than 15%, berms every 10m should be installed.	
	The wet screening and reclamation process will result in the suppression of dust, leading to a cleaner atmosphere	Air Quality	Operational	Negligible (Positive) – 7	No mitigation required	Negligible (Positive) – 7
	Noise disturbance from the screening activities	Noise	Operational	Negligible (negative) – 16	No mitigation required	Negligible (negative) – 16
Hydraulic conveying of the slurry to the Cooke Plant via the BPS at Dump 20 (operation of pipelines and pump stations)	Acid mine drainage due to the TSF disturbance and exposure to oxygen and moisture	Groundwater	Operational	Minor (negative) – 54	▪ Monitoring of groundwater quality; and ▪ Minimise area of disturbance to avoid AMD at multiple places.	Negligible (negative) – 21
	Noise disturbance from the pump stations	Noise	Operational	Negligible (negative) – 16	No mitigation required	Negligible (negative) – 16
Final deposition of the residue material into the open pits	▪ Rising of water level in the vicinity of the pits ▪ Increase of decant rates	Groundwater	Operational	Minor (negative) – 36	▪ Monitoring of groundwater level; ▪ Abstract equal volume of water from 8 Shaft (which is connected with the pits) to ensure that the water level or decant rate does not increase; and ▪ The abstracted water can be used for the reclamation of the tailings or discharged to the environment after treatment.	Negligible (negative) – 10
	Deterioration of groundwater quality	Groundwater	Operational	Minor (negative) – 45	▪ Monitoring of groundwater quality and water levels; ▪ Ensuring that the deposited tailings is alkaline; and ▪ Ensuring that the cyanide is destroyed before deposited.	Negligible (negative) – 32
Use of dirt roads	Movement of equipment	Air Quality	Operational	Minor (negative) – 36	▪ Application dust suppressant on access areas; and	Negligible (negative) – 32

Activity	Potential Impact	Aspects Affected	Phase	Significance	Mitigation Type	Significance
	and employee commute using dirt roads, leading to dust generation				▪ There is need to set maximum speed limits on access roads and to have these limits enforced.	
Rehabilitation of the Millsite Complex footprint	No seepage and AMD drainage	Groundwater	Decommissioning	Moderate (positive) – 105	▪ Monitoring of groundwater quality and water levels; and ▪ Rehabilitation of old TSF footprints.	Moderate (positive) – 105
	Runoff from the tailings will contain high level of dissolved minerals which may result in water contamination or the deterioration of the water quality	Surface Water	Decommissioning	Minor (negative) – 50	▪ Use of accredited contractors for removal or demolition of infrastructure is recommended; this will reduce the risk of waste generation and accidental spillages; ▪ The constructed storm water management infrastructure will have to remain until post closure to ensure dirty water is captured and contained during removal of infrastructures; ▪ Ensure that the infrastructure (pipelines, fuel storage areas, pumps) are first emptied of all residual material before decommissioning. This can be input of the standard operation procedures at each of the dumps to ensure it's carried out; and ▪ Ensure that the surface profile is rehabilitated to promote natural runoff drainage and avoid ponding of water within the rehabilitated area. Surface inspection should be continuously undertaken to allow runoff to drain onto the natural streams until vegetation has fully established on the site.	Minor (negative) – 36
	Improvement on the surface water quality as a result of complete removal of the pollution source	Surface Water	Decommissioning	Minor (positive) – 66	▪ Use of accredited contractors for removal or demolition of infrastructure is recommended; this will reduce the risk of waste generation and accidental spillages; ▪ Ensure that the surface profile is rehabilitated to promote natural runoff drainage and avoid ponding of water within the rehabilitated area. Surface inspection should be continuously undertaken to allow runoff to drain onto the natural streams until vegetation has fully established on the site.	Minor (positive) – 80
	Rehabilitation of the TSFs footprint will involve the use of heavy machinery and vehicles similar to those used in the construction phase. This will result in the generation of fugitive dust	Air Quality	Decommissioning	Negligible (negative) – 20	▪ The dismantling area disturbed must be kept to a minimum; ▪ Drop heights when loading and offloading materials offsite must be minimised; ▪ There is need to set maximum speed limits on site and to have these limits enforced. It is confirmed that the dust generating capacity of particles less than 10 micro meters is reduced by 58% when	Negligible (negative) – 12

Activity	Potential Impact	Aspects Affected	Phase	Significance	Mitigation Type	Significance
	containing TSP, PM_{10} and $PM_{2.5}$.				speed controls are reduced from 25 mph (40 km/h) to 10 mph (16 km/h) (Flocchini et al., 1994; Watson et al., 1996);and ▪ Limit demolition activities to non-windy days (≥5.4 m/s).	
	Reduction in air quality	Air Quality	Decommissioning	Negligible (negative) – 18	▪ Drop heights when offloading materials for rehabilitation must be minimised; ▪ Limit rehabilitation activities to non-windy days (≥ 5.4 m/s); ▪ Rehabilitated landscape should be vegetated; and ▪ Use of dust suppressant on dirt roads and exposed areas; and ▪ Wind speed of vehicle on dirt road during rehabilitation must be minimised. It is confirmed that the dust generating capacity of particles less than 10 micro meters is reduced by 58% when speed controls are reduced from 25 mph (40 km/h) to 10 mph (16 km/h) (Flocchini et al., 1994; Watson et al., 1996).	Negligible (negative) – 12
Removal of structures and infrastructure (pipelines, screens, berms)	Increased vehicular movement along wetland crossings and within wetland/riparian zones, resulting in: ▪ Potential contamination of soils as a result of the ingress of hydrocarbons; ▪ Compaction of soils; ▪ Loss of natural vegetation; ▪ Increased sedimentation; and ▪ Increased potential for onset of erosion	Wetlands	Decommissioning	Minor (negative) – 44	▪ Ensure that sound environmental management is in place during the proposed decommissioning phase; ▪ Ensure that as far as possible all decommissioned infrastructures, tailings and contaminated soils are placed outside of wetland/riparian areas and their associated 100 m zone of regulation; ▪ Limit the footprint area of the decommissioning activities to what is absolutely essential in order to minimise impacts as a result of vegetation clearing and compaction of soils; ▪ If it is absolutely unavoidable that any of the wetland areas present will be affected, disturbance must be minimised and suitably rehabilitated; ▪ Ensure that no incision and canalisation of the wetland features present takes place as a result of the proposed decommissioning activities; ▪ All erosion noted within the decommissioning area footprint should be remedied immediately and included as part of the ongoing rehabilitation plan; ▪ All soils compacted as a result of decommissioning activities should be ripped and profiled; ▪ A suitable alien-vegetation control programme must be put in place so as to prevent further encroachment as a result of disturbance to the surrounding terrestrial zones;	Minor (positive) 36
	▪ Potential dumping of decommissioned infrastructure in wetland/riparian areas; ▪ Potential incomplete removal of					

Activity	Potential Impact	Aspects Affected	Phase	Significance	Mitigation Type	Significance
	infrastructure; ▪ Disturbance of natural vegetation structures; ▪ Further contamination of wetland soils; ▪ Sedimentation of wetlands and their downstream resources				▪ Permit only essential personnel within the 100 m zone of regulation for all wetland features identified; ▪ All areas of increased ecological sensitivity should be designated as "No-Go" areas and be off limits to all unauthorised vehicles and personnel; ▪ No crossing of the wetland features and their associated buffers should take place and the substrate conditions of the wetlands and downstream stream connectivity must be maintained; ▪ Wherever possible, restrict decommissioning activities to the drier winter months to avoid sedimentation of the wetlands and the aquatic resources further downstream; ▪ No material may be dumped or stockpiled within any rivers, tributaries or drainage lines in the vicinity of the proposed decommissioning footprint. ▪ No vehicles or heavy machinery may be allowed to drive indiscriminately within any wetland areas and their associated zones of regulation. All vehicles must remain on demarcated roads and within the decommissioning area footprint; ▪ All vehicles must be regularly inspected for leaks; ▪ Re-fueling must take place on a sealed surface area to prevent ingress of hydrocarbons into topsoil; ▪ All spills should be immediately cleaned up and treated accordingly; ▪ Appropriate sanitary facilities must be provided for the duration of the decommissioning activities and all waste must be removed to an appropriate waste facility; ▪ Monitor all systems for erosion and incision; ▪ Ongoing wetland rehabilitation is necessary both within and in the vicinity of the proposed decommissioning footprint and appropriate wetland monitoring techniques must take place on an annual basis during the summer/wet season in order to identify any emerging issues, trends or improvements in the receiving environment	
	The dismantling of site infrastructure will involve the use of heavy machinery and vehicles similar to those used in the construction phase.	Air Quality	Decommissioning	Negligible (negative) – 20	▪ The dismantling area disturbed must be kept to a minimum; ▪ Drop heights when loading and offloading materials offsite must be minimised; ▪ There is need to set maximum speed limits on site and to have these limits enforced. It is confirmed	Negligible (negative) – 12

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Activity	Potential Impact	Aspects Affected	Phase	Significance	Mitigation Type	Significance
	This will result in the generation of fugitive dust containing TSP, PM_{10} and $PM_{2.5}$.				that the dust generating capacity of particles less than 10 micro meters is reduced by 58% when speed controls are reduced from 25 mph (40 km/h) to 10 mph (16 km/h) (Flocchini et al., 1994; Watson et al., 1996);and ▪ Limit demolition activities to non-windy days (≥5.4 m/s).	
	Noise will emanate from the machinery and vehicles operating during the decommissioning activities	Noise	Decommissioning	Negligible (negative) – 18	▪ Restricting decommissioning activities to daylight hours; ▪ Decommissioning phase related machines and vehicles to be serviced to the designed requirements of the machinery/vehicles to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; and ▪ Switching off equipment when not in use.	Negligible (negative) – 12
Rehabilitation of the pits should they have been successfully sealed and filled	▪ No seepage from the pits ▪ Decrease of decant rate	Groundwater	Decommissioning	Moderate (positive) – 78	▪ Monitoring of groundwater quality and water levels; and ▪ Rehabilitation of the pits by properly shaping and capping with a soil/weathered material layer that will prevent ponding and minimise infiltration of rain water.	Moderate (positive) – 98
	Increased vehicular movement along river crossings and within wetland/riparian zones, resulting in: ▪ Potential contamination of soils as a result of the ingress of hydrocarbons; ▪ Compaction of soils; ▪ Loss of natural vegetation; ▪ Increased sedimentation; and ▪ Increased potential for onset of erosion Similarly to the decommissioning phase, the activities occurring within an ecologically sensitive catchment pose	Wetlands	Decommissioning	Minor (negative) – 44	▪ Wetland monitoring must be carried out during both the decommissioning and rehabilitation phases to ensure no unnecessary impact to wetlands takes place. Monitoring should take place on an annual basis during the summer/wet season and carried out by an independent consultant for the duration of the decommissioning phase. Monitoring should continue to take place every two years until the systems are considered stable; ▪ Wetlands and their associated 100 m zone of regulation, to be clearly demarcated and avoided; ▪ An alien vegetation management plan to be implemented and managed for the life of the proposed decommissioning, rehabilitation, closure and post-closure phases of the proposed decommissioning and rehabilitation project; ▪ As much vegetation growth as possible should be promoted within the proposed development area during all phases. In order to protect soils and vegetation, clearance should be kept to a minimum as the biomass in the area is not very high and so therefore plants will not grow quickly; ▪ Monitor all systems for erosion and incision;	Minor (Positive) 44

Activity	Potential Impact	Aspects Affected	Phase	Significance	Mitigation Type	Significance
	significant potential negative impacts to functioning wetlands and catchment. Furthermore, the rehabilitated area could cause major negative impacts due to spread of alien invasive vegetation, increased soil compaction erosion and subsequent sedimentation into the wetland ecosystems.				▪ All areas where active erosion is observed should be ripped, re-profiled and seeded with indigenous grasses; ▪ Preventative measures such as hessian sheeting should be used in steep re-seeded areas where high erosion potentials exist; ▪ The use of indigenous phyto-remediation specific grass, forb and tree species is encouraged; ▪ No vehicles or heavy machinery may be allowed to drive indiscriminately within any wetland areas and their associated zones of regulation. All vehicles must remain on demarcated roads and within the project area footprint; ▪ Compacted soils should be ripped, re-profiled and re-seeded; ▪ All vehicles must be regularly inspected for leaks; ▪ Re-fueling must take place on a sealed surface area to prevent ingress of hydrocarbons into topsoil; ▪ All existing litter, debris should be removed from the wetland areas and littering should be prohibited on an ongoing basis; ▪ All spills should be immediately cleaned up and treated accordingly; ▪ Appropriate sanitary facilities must be provided for the duration of the rehabilitation activities and all waste must be removed to an appropriate waste facility; ▪ Ongoing wetland rehabilitation is necessary both within and in the vicinity of the proposed decommissioning footprint and appropriate wetland monitoring techniques must take place on an annual basis during the summer/wet season in order to identify any emerging issues, trends or improvements in the receiving environment.	

14 Item 3(j): Summary of specialist reports

The Specialist Studies and associated Specialist recommendations required for the Regulation 31 Amendment process are tabulated below.

Table 14-1: Specialist Studies Undertaken for the Regulation 31 Amendment Process

List of studies undertaken	Recommendations of specialist reports	Specialist Recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included
Groundwater Impact Assessment	▪ During the establishment phase, restrict areas that must be cleared of vegetation for construction activities to those of absolute necessity; ▪ Avoid constructing below the water table as far as possible; ▪ Minimise ponding of water within the reclamation area to avoid AMD seepage during the operation phase; ▪ Ensuring that the deposited tailings is alkaline; ▪ Ensuring that the cyanide is destroyed before deposited; ▪ Abstract equal volume of water from 8 Shaft (which is connected with the pits) to ensure that the water level or decant rate does not increase; ▪ The abstracted water can be used for the reclamation of the tailings or discharged to the environment after treatment; ▪ The water levels measured directly from the pits should be made available as this would help to assess their hydraulic connectivity. The water levels at 8 Shaft, 17 Winze and 18 Winze should also be made available; ▪ Rehabilitate the pits by properly shaping and capping with a soil/weathered material layer that will prevent ponding and minimise infiltration of rain water	X	Part A: Section 11, Section 13, Section 16, Section 20.2; Part B: Section 4, Section 5; Section 6, Section 8.
Surface Water Impact Assessment	▪ Clearing of vegetation must be limited to the development footprint area, and the use of existing access roads must be prioritized to minimize construction of new access roads, hence potential for erosion; ▪ Implementation of dust suppression measures during construction and operational activities; ▪ All fuel storage areas should be appropriately bunded and spill kits should be in place, and construction workers trained in the use of spill kits, to contain and immediately clean up any potential leakages or spills; ▪ Vehicles should regularly be maintained as per the developed maintenance program. This should also be inspected on a daily basis before use to ensure there are no leakages underneath; ▪ Ablutions facility for construction workers and general waste bins should be provided. An accredited contractor should be appointed to properly dispose the waste; ▪ The storm water management as detailed in section 7 of this report to ensure separation of clean and dirty and water runoff, as stated, the temporary surface water ditches are to be constructed on the upstream boundary of the TSF, which will meet GN 704 requirements regarding the separation of clean and dirty water runoff. All clean water runoff will therefore be diverted away from the cleared area. The temporary surface ditches or trenched are to be sized such that the 1:50 year peak discharge can be contained within it. ▪ Surface water quality monitoring should continue on the monitoring locations indicated in section 5 of this report to enable detection of the water quality impacts and therefore ensure that necessary mitigation measures are immediately implemented; ▪ Ensure emergency procedures in the event of power failure such as operational	X	Part A: Section 11, Section 13, Section 16, Section 20.2; Part B: Section 4, Section 5; Section 6, Section 8.

List of studies undertaken	Recommendations of specialist reports	Specialist Recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included
	modifications and the use of a stand-by generator to operate the pump station should the sump be getting full; and ▪ Use of accredited contractors for removal or demolition of infrastructure is recommended; this will reduce the risk of waste generation and accidental spillages; and ▪ Ensure that the surface profile is rehabilitated to promote natural runoff drainage and avoid ponding of water within the rehabilitated area. Surface inspection should be continuously undertaken to allow runoff to drain onto the natural streams until vegetation has fully established on the site		
Wetland Delineation and Impact Assessment	▪ Ensure that sound environmental management is in place during the proposed operational phase; ▪ Ensure that as far as possible all operational activities take place outside of wetland/riparian areas and their associated 100 m zone of regulation; ▪ Limit the footprint area of the operational activities to what is absolutely essential in order to minimise impacts as a result of vegetation clearing and compaction of soils; ▪ If it is absolutely unavoidable that any of the wetland areas present will be affected, disturbance must be minimised and suitably rehabilitated; ▪ Ensure that no incision and canalisation of the wetland features present takes place as a result of the proposed operational activities; ▪ All erosion noted within and in the vicinity of the area footprint should be remedied immediately and included as part of the ongoing rehabilitation plan; ▪ All soils compacted as a result of operational activities should be ripped and profiled; ▪ A suitable alien-vegetation control programme must be put in place so as to prevent further encroachment as a result of disturbance to the surrounding terrestrial zones; ▪ Permit only essential personnel within the 100 m zones of regulation for all wetland features identified; ▪ All areas of increased ecological sensitivity should be designated as "No-Go" areas and be off limits to all unauthorised vehicles and personnel; ▪ No crossing of the wetland features and their associated buffers should take place and the substrate conditions of the wetlands and downstream stream connectivity must be maintained; ▪ No material may be dumped or stockpiled within any wetland areas in the vicinity of the proposed decommissioning footprint. ▪ No vehicles or heavy machinery may be allowed to drive indiscriminately within any wetland areas and their associated zone of regulation. All vehicles must remain on demarcated roads and within the Project area footprint; ▪ All vehicles must be regularly inspected for leaks; ▪ Re-fuelling must take place on a sealed surface area to prevent ingress of hydrocarbons into topsoil; ▪ All spills should be immediately cleaned up and treated accordingly; ▪ Water quality with special mention of pH, dissolved salts and specific problem substances like pyrites need to be managed, and monitored in order to ensure that reasonable water quality occurs downstream of the mined areas to allow for the on-going survival of wetland and aquatic communities of some diversity and reasonable sensitivity; ▪ Appropriate sanitary facilities must be provided for the duration of the operational activities	X	Part A: Section 11, Section 13, Section 16, Section 20.2; Part B: Section 4, Section 5; Section 6, Section 8.

List of studies undertaken	Recommendations of specialist reports	Specialist Recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included
	and all waste must be removed to an appropriate waste facility; ▪ Monitor all systems for erosion and incision; ▪ During the operational phase, erosion berms should be installed on roadways and in the vicinity of disturbed soils and cleared vegetation soils as well as in areas where tailings or contaminated soils are reclaimed or removed to prevent gully formation and siltation of the wetland areas. The following points should serve to guide the placement of erosion berms: ▪ Where the track has slope of less than 2%, berms every 50m should be installed; ▪ Where the track slopes between 2% and 10%, berms every 25m should be installed; ▪ Where the track slopes between 10%-15%, berms every 20m should be installed; ▪ Where the track has slope greater than 15%, berms every 10m should be installed.		
Geochemical Analysis	The paste pH of the samples was found to be acidic ranging between 1.7 and 3.3 (with the exception of Sample 5 at a pH of 6.9). Although this indicates the potential for the residue to generate acid, paste pH alone is not a conclusive methodology for ABA classification. The sulphide content, acid generating and acid neutralisation materials of the tailings need to quantified for a more comprehensive ABA evaluations	X	Part A: Section 15; Part B: Section 4.
Air Quality Impact Assessment	▪ Commission a dust monitoring network for compliance monitoring for the life of mining; ▪ Site clearing should be done in phases and limited to the area to be reclaimed; ▪ The area of disturbance at all times must be kept to a minimum and no unnecessary clearing, digging or scraping must occur, especially on windy days (with wind speed ≥ 5.4 m/s); ▪ Use of suppressants on exposed areas and access road to reduce dust generation; and ▪ Monitor the air quality management measures and information to ensure that adopted measures are sufficient to achieve current air quality standards at site and the closest receptors for the duration of the project	X	Part A: Section 11, Section 13, Section 16, Section 20.2; Part B: Section 4, Section 5; Section 6, Section 8.
Noise Impact Assessment	▪ Limit construction activities to daylight hours; ▪ Switch of vehicles and machinery not in use; and ▪ Machine and vehicles must be serviced on a regular basis to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers	X	Part A: Section 11, Section 13, Section 16, Section 20.2; Part B: Section 4, Section 5; Section 6, Section 8.
Heritage Impact Assessment	▪ The proposed Project be exempt from further palaeontological assessment based on the motivation provided; ▪ Section 34(1) of the NHRA makes provision for the protection of structures older than 60 years, the Millsite TSF Complex falling within this threshold. While an argument can be made that the Millsite TSF Complex is generally protected under this provision, it is recommended that Sibanye-Stillwater be exempt from applying for a Section 34 Destruction Permit as regulated by Chapter III of the Regulations to the Act (GN R 548), as the health benefits outweigh the heritage impact; ▪ Sibanye-Stillwater must develop and include the aforementioned CMP and project specific CFPs as a condition of authorisation	X	Part A: Section 11, Section 16, Section 20.2; Part B: Section 4, Section 5; Section 6, Section 8.

15 Item 3(k): Environmental Impact Statement

The majority of the negative impacts rated for each activity were minor or negligent in significance. The most significant impacts for the Construction and Operational Phases relate to the siltation of surface water and associated water quality degradation, however, when the mitigation measure is applied the impact is negligible or a low minor. The most significant and highest rating pertains to the Decommissioning Phase and the positive outcome of the elimination of AMD generating material. Based on the summaries below, the proposed reclamation activities will benefit the receiving environment once rehabilitation is complete.

15.1 Item 3(k)(i): Summary if the key findings of the environmental impact assessment

The Environmental Impact Statement is utilised to summarise all of the potential environmental impacts identified during each phase of the proposed Project. The significance of the impacts associated with the relevant project phases, pre-mitigation and post-mitigation, is summarised in Table 15-1, Table 15-2 and Table 15-3.

Table 15-1: Summary of the Potential Impacts during the Construction Phase

Aspects Affected	Potential Impact	Prior to Mitigation Significance	Post-Mitigation Significance
Groundwater	Groundwater contamination	Negligible (negative) – 8	Negligible (negative) – 6
Surface Water	Siltation of surface water resources leading to deteriorated water quality	Minor (negative) – 70	Minor (negative) – 36
	Deterioration of water quality due to dirty/contaminated runoff from the project reporting into the surrounding streams	Minor (negative) – 60	Negligible (negative) –33
Air Quality	▪ Health impacts as a result of exposure to airborne particulate matter; and ▪ Nuisance due to dust fallout	Negligible (negative) – 30	Negligible (negative) – 12
Noise	Noise disturbance from the construction vehicles and machinery	Negligible (negative) – 18	Negligible (negative) – 12

Table 15-2: Summary of the Potential Impacts during the Operational Phase

Aspects Affected	Potential Impact	Prior to Mitigation Significance	Post-Mitigation Significance
Groundwater	Seepage through the TSF of the water to be used for hydraulic reclamation inside the foot print	Minor (negative) – 44	Negligible (negative) – 24
	Acid mine drainage due to the TSF disturbance and exposure to oxygen and moisture	Minor (negative) – 54	Negligible (negative) – 21
	▪ Rising of water level in the vicinity of the pits ▪ Increase of decant rates	Minor (negative) – 36	Negligible (negative) – 10

Aspects Affected	Potential Impact	Prior to Mitigation Significance	Post-Mitigation Significance
	Deterioration of groundwater quality	Minor (negative) – 45	Negligible (negative) – 32
Surface Water	Runoff from the tailings will contain high levels of dissolved minerals which may result in water contamination or the deterioration of surface water quality	Minor (negative)– 70	Minor (negative) – 42
Wetlands	Increased vehicular movement along river crossings and within wetland/riparian zones, resulting in: ▪ Potential contamination of soils as a result of the ingress of hydrocarbons; ▪ Compaction of soils; ▪ Loss of natural vegetation; ▪ Increased sedimentation; and ▪ Increased potential for onset of erosion	Minor (negative) – 56	Minor (negative) - 27
	Physical disturbance of contaminated soil and tailings resulting in erosion and sedimentation; Ingress of pollutants to watercourses and wetland areas as a result of tailings and contaminated soil spills during transport and reclamation activities; Potential for further contamination of the freshwater resources present as a result of increased oxidation as a result of disturbance of the tailings during reclamation activities		
Air Quality	The wet screening and reclamation process will result in the suppression of dust, leading to a cleaner atmosphere	Negligible (Positive) 7	Negligible (Positive) 7

Aspects Affected	Potential Impact	Prior to Mitigation Significance	Post-Mitigation Significance
	Movement of equipment and employee commute using dirt roads, leading to dust generation	Minor (negative) – 36	Negligible (negative) – 32
Noise	Noise disturbance from the screening activities	Negligible (negative) – 16	Negligible (negative) – 16
	Noise disturbance from the pump stations	Negligible (negative) – 16	Negligible (negative) – 16

Table 15-3: Summary of the Potential Impacts during the Decommissioning Phase

Aspects Affected	Potential Impact	Prior to Mitigation Significance	Post-Mitigation Significance
Groundwater	No seepage and AMD drainage	Moderate (positive) 105	Moderate (positive) 105
	▪ No seepage from the pits ▪ Decrease of decant rate	Moderate (positive) 78	Moderate (positive) 98
Surface Water	Improvement on the surface water quality as a result of complete removal of the pollution source	Minor (positive) 66	Minor (positive) 80
Wetlands	Increased vehicular movement along wetland crossings and within wetland/riparian zones, resulting in: ▪ Potential contamination of soils as a result of the ingress of hydrocarbons; ▪ Compaction of soils; ▪ Loss of natural vegetation; ▪ Increased sedimentation; and ▪ Increased potential for onset of erosion	Minor (negative) – 44	Minor (positive) 36

Aspects Affected	Potential Impact	Prior to Mitigation Significance	Post-Mitigation Significance
	▪ Potential dumping of decommissioned infrastructure in wetland/riparian areas; ▪ Potential incomplete removal of infrastructure; ▪ Disturbance of natural vegetation structures; ▪ Further contamination of wetland soils; ▪ Sedimentation of wetlands and their downstream resources		
	Increased vehicular movement along river crossings and within wetland/riparian zones, resulting in: ▪ Potential contamination of soils as a result of the ingress of hydrocarbons; ▪ Compaction of soils; ▪ Loss of natural vegetation; ▪ Increased sedimentation; and ▪ Increased potential for onset of erosion	Minor (negative) – 44	Minor (Positive) 44
	Similarly to the decommissioning phase, the activities occurring within an ecologically sensitive catchment pose significant potential negative impacts to functioning wetlands and catchment. Furthermore, the rehabilitated area could cause major negative impacts due to spread of alien invasive vegetation, increased soil compaction erosion and subsequent sedimentation into the wetland ecosystems.		
Air Quality	Rehabilitation of the TSFs footprint will involve the use of heavy machinery and vehicles similar to those used in the construction phase. This will result in the generation of fugitive dust containing TSP, PM_{10} and $PM_{2.5}$.	Negligible (negative) – 20	Negligible (negative) – 12

Aspects Affected	Potential Impact	Prior to Mitigation Significance	Post-Mitigation Significance
	Reduction in air quality	Negligible (negative) – 18	Negligible (negative) – 12
	The dismantling of site infrastructure will involve the use of heavy machinery and vehicles similar to those used in the construction phase. This will result in the generation of fugitive dust containing TSP, PM_{10} and $PM_{2.5}$.	Negligible (negative) – 20	Negligible (negative) – 12
Noise	Noise will emanate from the machinery and vehicles operating during the decommissioning activities	Negligible (negative) – 18	Negligible (negative) – 12

15.2 Item 3(k)(ii): Final Site Map

The final site map is attached as **Appendix 4**.

15.3 Item 3(k)(iii): Summary of the positive and negative implications and risks of the proposed activity and identified alternatives

Table 15-4 and Table 15-5 provide a consolidation of negative and positive impacts ratings and compare the pre-mitigation and post-mitigation impact ratings. As previously discussed, no alternatives have been considered for this Project.

15.3.1 Summary of Negative Impacts

Eighteen negative post-mitigation impacts have been identified for the proposed Project. The negative impacts comprise three minor impacts and 15 negligible impacts. The mean average for all negative ratings is a **Negligible (negative) 20**.

Table 15-4: Summary of Pre- and Post-Mitigation Impact Ratings

Prior to Mitigation Significance	Post-Mitigation Significance
Negligible (negative) – 8	Negligible (negative) – 6
Minor (negative) – 70	Minor (negative) – 36
Minor (negative) – 60	Negligible (negative) –33
Negligible (negative) – 30	Negligible (negative) – 12
Negligible (negative) – 18	Negligible (negative) – 12
Minor (negative) – 44	Negligible (negative) – 24
Minor (negative) – 54	Negligible (negative) – 21
Minor (negative) – 36	Negligible (negative) – 10
Minor (negative) – 45	Negligible (negative) – 32
Minor (negative)– 70	Minor (negative) – 42
Minor (negative) – 56	Minor (negative) – 27
Minor (negative) – 36	Negligible (negative) – 32
Negligible (negative) – 16	Negligible (negative) – 16
Negligible (negative) – 16	Negligible (negative) – 16
Negligible (negative) – 20	Negligible (negative) – 12
Negligible (negative) – 18	Negligible (negative) – 12
Negligible (negative) – 20	Negligible (negative) – 12
Negligible (negative) – 18	Negligible (negative) – 12

Prior to Mitigation Significance	Post-Mitigation Significance
AVERAGE NEGATIVE RATING	**Negligible (negative) – 20**

15.3.2 Summary of Positive Impacts

Six positive post-mitigation impacts have been identified for the proposed Project. The positive impacts comprise two moderate impacts, three minor impacts and one negligible impact. The mean average for all positive ratings is a **Minor (positive) 62**.

Table 15-5: Summary of Positive Pre- and Post-Mitigation Impact Ratings

Prior to Mitigation Significance	Post-Mitigation Significance
Moderate (positive) 105	Moderate (positive) 105
Moderate (positive) 78	Moderate (positive) 98
Minor (positive) 66	Minor (positive) 80
Negligible (positive) 7	Negligible (Positive) 7
Minor (negative) – 44	Minor (positive) 36
Minor (negative) – 44	Minor (positive) 44
AVERAGE POSITIVE RATING	**Minor (positive) 62**

When simply quantified, the overall positive impacts outweigh the overall negative impacts. No Moderate of Major negative impacts were identified, nor were any Major positive impacts.

16 Item 3(l): Proposed impact management objectives and the impact management outcomes for inclusion in the EMPR

Based on the assessment and, where applicable, the recommendations from specialist reports, the recording of proposed impact management objectives, and the impact management outcomes for the proposed Project to be included in the EMPR, as well as for inclusion as conditions of authorisation, are contained in Part B: Environmental Management Programme Report.

17 Item 3(m): Final proposed alternative

The final proposed alternative to reclaim the Millsite TSF Complex is based on the location of the TSFs, the approved or existing infrastructure, and the haste with which the reclamation can commence. The impact management measures assessed by the Specialists pertain to this preferred site and the associated environmental impacts can be mitigated to an acceptable standard.

18 Item 3(n): Aspects for inclusion as conditions of authorisation

The Specialist studies and impact assessment has been based on the proposed mine layout and associated project activities. Should there be any changes to the proposed Project description contained herein, the adequacy and accuracy of the Project impact assessment and outcomes may be affected, and additional work may be required to address these changes.

19 Item 3(o): Description of any assumptions, uncertainties and gaps in knowledge

The assumptions, uncertainties and gaps in knowledge identified by the Specialists are listed below, per specialist field.

19.1 Surface Water

The following assumptions and limitations are applicable to this surface water assessment:

- The surface water impact assessment was conducted based on the provided project descriptions with the associated proposed activities. Additional activities and infrastructure which may form part of this project after issuance of this report may require an update on this study;
- Water quality data was provided by Sibanye for Digby Wells to analyse and interpret on the baseline water quality descriptions

19.2 Wetlands

The following limitations were encountered during this study:

- Due to serious safety risks and fatalities regarding illegal miners, security would not allow access to some of the wetland areas, therefore these areas were desktop delineated. In this case, historical imagery and contours were used to improve accuracy. Some of these areas were visited and observed by means of drive-through. In addition, the Wonderfonteinspruit was investigated historically by members of the project team in 2015 and this knowledge was used to inform and add to the current report;
- The composition of the freshwater resources in the Project area prior to major disturbance is unknown. For this reason, reference conditions are hypothetical, and are based on professional judgement and/or inferred from limited data available; and
- With ecology being dynamic and complex, as well as a result of restricted access to portions of the Project area (as mentioned above), certain aspects, some of which may be important, may have been overlooked. However, wherever possible, it is expected that the Project area has been accurately assessed and considered, based on the field observations undertaken and the consideration of historical and existing studies and the desktop data available.

19.3 Noise

The following assumptions and limitations are included as part of this assessment:

- The construction phase is assumed to be carried out during daytime hours (06:00-22:00), therefore only daytime scenarios were modelled for the construction phase;
- The resulting noise contours represent worst case (unmitigated), LAeq at any receiver located 360 degrees in the horizontal plane around the noise sources. The noise modelling software is limited to calculating the predominant wind direction (or downwind conditions of propagation) per single receptor only. Calm wind conditions have therefore been included in the model due to the number of surrounding receptors. Thus, the noise dispersion plots do not represent a typical seasonal scenario in the predominant wind direction but rather a yearly average of the area's meteorological conditions in all directions; and
- The decommissioning phase was not modelled specifically as it is likely that it would produce similar results than that of the construction phase because of similar vehicle and machinery involved.

19.4 Heritage

The following constraints and limitations were experienced during compilation of this HIA:

- The HIA only considers the EMPr amendment as relevant to the reclamation of the Millsite Complex;
- All authorised activities across the various Mining Rights are considered relevant and remain applicable;
- Whilst every attempt to obtain the latest available information was made, the reviewed literature does not represent an exhaustive list of information sources for the various study areas;
- The HIA does not present an exhaustive list of heritage resources in the various study areas;
- The pre-disturbance survey was limited to the Millsite Complex footprint to assess the current cultural landscape;
- Results from previously completed heritage studies were not subject to an assessment of CS or verified during the field survey;
- Palaeontological and archaeological resources commonly occur at subsurface levels. These types of resources may not be adequately recorded or documented by assessors without intrusive and destructive methodologies. Therefore, the reviewed literature and previously completed assessments are in themselves limited to surface observations; and

- The HIA was compiled prior to the initiation of the regulated consultation process. No results from formal consultation were considered in the compilation of this HIA. All heritage related comments will be addressed as part of the required Comments and Response Report (CRR) after the public commenting period to further satisfy the requirements Section 38(3) of the NHRA.

20 Item 3(p): Reasoned opinion as to whether the proposed activity should or should not be authorised

It is the opinion of the EAP that the proposed Project should be approved and the reasons for this opinion are discussed below

20.1 Item 3(p)(i): Reasons why the activity should be authorised or not

Tailings dams which were established in the West Rand during the era of historic mining are not lined by a protective barrier which has had a negative impact to water in the region. Run-off and seepage have contributed to the decreased quality of surface water and groundwater. The Trans-Caledon Tunnel Authority (TCTA) is currently undergoing a project to intervene and address AMD pollution within the east, west and central basins of this region. Removal of TSFs will have multiple positive effects to reduce AMD pollution and will assist with the TCTA project as a whole.

During the construction of historic TSFs, the impact to surrounding water bodies was not necessarily considered. Some TSFs were constructed within wetlands or within close proximity to streams and rivers. The removal of TSFs and rehabilitation of TSF footprints will lead to increased water quality and improved water body functioning. The Wetland Impact Assessment (**Appendix 8**) identified wetlands surrounding the Millsite TSF Complex; and reclamation and sufficient rehabilitation of the site will benefit these habitats and potentially improve overall wetland functioning.

The Integrated Development Plan (IDP) for the WRDM, compiled for the period 2016-2020 discusses the need to diversify the economy as mining is not sustainable. The IDP focusses on increasing tourism, agriculture, agro-processing and renewable energy industries in the region. The close proximity to Lanseria Airport City facilitates enhancing these sectors. Furthermore, the Environmental Management Framework (EMF) designates the Millsite TSF Complex footprint as an industrial development zone. Recommended end-land uses could therefore potentially support the IDP requirements for the development of agriculture, agro-processing and renewable energy by constructing a hydroponics farm or solar farm.

20.2 Item 3(p)(ii): Conditions that must be included in the authorisation

20.2.1 Specific conditions to be included into the compilation and approval of EMPR

The following specific conditions are proposed:

- All mitigation measures proposed in this report should be implemented;

- Environmental monitoring and reporting should be undertaken as recommended;
- Where stolen pipelines require replacement between the Millsite TSF and the BPS, the authorised routes as provided in
- A grievance system or communication platform must be established to create a forum for the public to interact with the mining house;

20.2.2 Rehabilitation requirements

Relinquishment of the environmental legal responsibility of an operation requires formal acceptance from the regulatory authority to ensure that all obligations associated with closure are achieved, prior to a closure certificate being issued. For relinquishment to be achieved, criteria need to be set, measured and met. This provides all parties involved in the closure process, a pre-defined target or agreed target that needs to be achieved and sets the minimum standards that closure and rehabilitation are measured against. The proposed requirements as stated in the Rehabilitation Plan Report include:

- Remove all tailings material;
- Perform Radiation Assessment. High radiation exposure is linked with gold tailings dumps and it is expected that radiation will remain unacceptably high even after the reclamation of the dumps and no human activities should be allowed until acceptable radiation levels have been reached. In most cases, the radiation penetrates into the soil profile and it can remain in the upper 300mm of the soil profile. The National Nuclear Regulator (NNR) has set the level for gamma radiation, for which regulation is not required, below 500 Bq (Becquerel) per kg. Direct radiation originates from uranium, which is a common mineral associated in the reefs that contain gold and is contained within the tailings material. The Radiation Assessment measures the gamma radiation emanating from the decaying of the uranium atoms;
- Remove contaminated material identified by Radiation Assessment;
- Remove any other contaminants, such as hydrocarbons;
- Once the site has been cleared the exposed underlying materials should be reshaped to create a gently sloping, free-draining topography. Re-instate natural drainage lines to limit erosion and sediment build up within local river courses;
- No stripping took place prior to the creation of the TSF. Therefore no stockpiled topsoil is available for use. Appropriate topsoil would need to be sourced and replaced to a minimum thickness of 300 mm on the rehabilitated areas. Alternatively the soil fertility can be assessed and appropriate soil amelioration conducted. It should be noted that should a borrow pit be utilised to acquire material, that borrow pit will need to be rehabilitated;
- The soil should be ripped to a depth of between 400m and 600 mm to reduce compaction;

- Reseed with species recommended (refer to Part B, Section 5.1.3). Soil tests should be conducted during this process to ensure correct amelioration techniques to enhance soil fertility;
- Remove alien invasive plants; and
- Prevent inadvertent access of people/machinery/vehicles/grazing animals on newly rehabilitated land to allow regeneration of vegetation and reduce erosion

These requirements which need to be met during closure are further discussed in Part B Section 5.1.3.

21 Item 3(q): Period for which the environmental authorisation is required

The Environmental Authorisation should be valid for 20 years to ensure sufficient time for TSF material to be removed allow time for successful rehabilitation of the reclamation area footprints.

22 Item 3(r): Undertaking

The undertaking required to meet the requirements of this section is provided at the end of the Part B, Section 10 and is applicable to both the EIA report and the EMPr.

23 Item 3(s): Financial provision

The financial provisioning provided was undertaken by Golder Associates South Africa and comprises costing for the Rand Uranium Surface Operations. The financial provision for 2017 calculated for scheduled closure is R 232,936,502.02, and the unscheduled closure costs for 2017 were calculated at R 549,842,084.42.

23.1 Item 3(s)(i): Explain how the aforesaid amount was derived

Golder Associates Africa (Pty) Ltd (Golder) is currently finalising the 2017 Financial Provision Report however, the methodology used for the 2016 Closure Calculation, also undertaken by Golder, is provided below:

The approach followed for the 2016 closure costs update was as follows:

- Conduct a project initiation meeting with Sibanye to workshop and agree on the template to be used for the 2016 and 2017 closure costs, as well as key aspects to be addressed;
- Set unit rates and benchmark these against industry rates through consultation with demolition contractors and rehabilitation practitioners;
- Conduct a site visit to the key areas at operations;
- Assess the available information related to changes that occurred at the mine;

- Re-measure and/or confirm quantities/allowances and key assumptions, to be aligned with those adopted for the other operations;
- Update sum allowances as applicable;
- Review and update the closure costing spreadsheets by incorporating the above changes;
- Update and include additional narratives for the assumptions and qualifications made for each cost item; and
- Compile this concise technical memorandum documenting the findings of the update of the respective closure costs for the individual operations

23.2 Item 3(s)(ii): Confirm that this amount can be provided for from operating expenditure

Sibanye Stillwater contributes annually in the form of financial guarantees (fully funded as per the 2016 assessment), which will be adjusted once sign off of the final Financial Provisioning Report takes place to ensure that Sibanye-Stillwater is fully funded as per the 2017 assessment, and submitted to the DMR during Q1 2018.

24 Item 3(t): Deviations from the approved scoping report and plan of study

Not applicable to the Regulation 31 Amendment Process.

24.1 Item 3(t)(i): Deviations from the methodology used in determining the significance of potential environmental impacts and risks

No deviations pertaining to the standard Digby Wells impact and risk assessment methodologies were realised.

24.2 Item 3(t)(ii): Motivation for the deviation

Not applicable.

25 Item 3(u): Other Information required by the competent authority

Compliance with the provisions of sections 24(4)(a) and (b) read with section 24 (3) (a) and (7) of the National Environmental Management Act (Act 107 of 1998), an EIA report must include consideration of socio-economic and cultural impacts. These aspects are discussed below.

25.1 Item 3(u)(i)(1): Impact on the socio-economic conditions of any directly affected person

The properties to which this Regulation 31 Amendment application pertains are currently used for mining or were previously associated with mining (the decommissioned railway). The owner of these properties is Sibanye-Stillwater Rand Uranium (Pty) Ltd, and therefore no person is directly affected by this Project proceeding.

25.2 Item 3(u)(i)(2): Impact on any national estate referred to in section 3(2) of the National Heritage Resources Act.

The impact assessment methodology specific to heritage resources is described in Section 11.2.2, above.

25.2.1.1 *Cultural significance of the landscape*

A representative sample of the recorded heritage resources within the local study area demonstrates that the landscape comprises heritage resource types ranging from paleontological through historical (Figure 25-1). These findings are congruent with our secondary data collection.

The cultural landscape, as represented by heritage resources, is intrinsic to the history and beliefs of communities. These characterise community identity and cultures, are finite, non-renewable and irreplaceable.

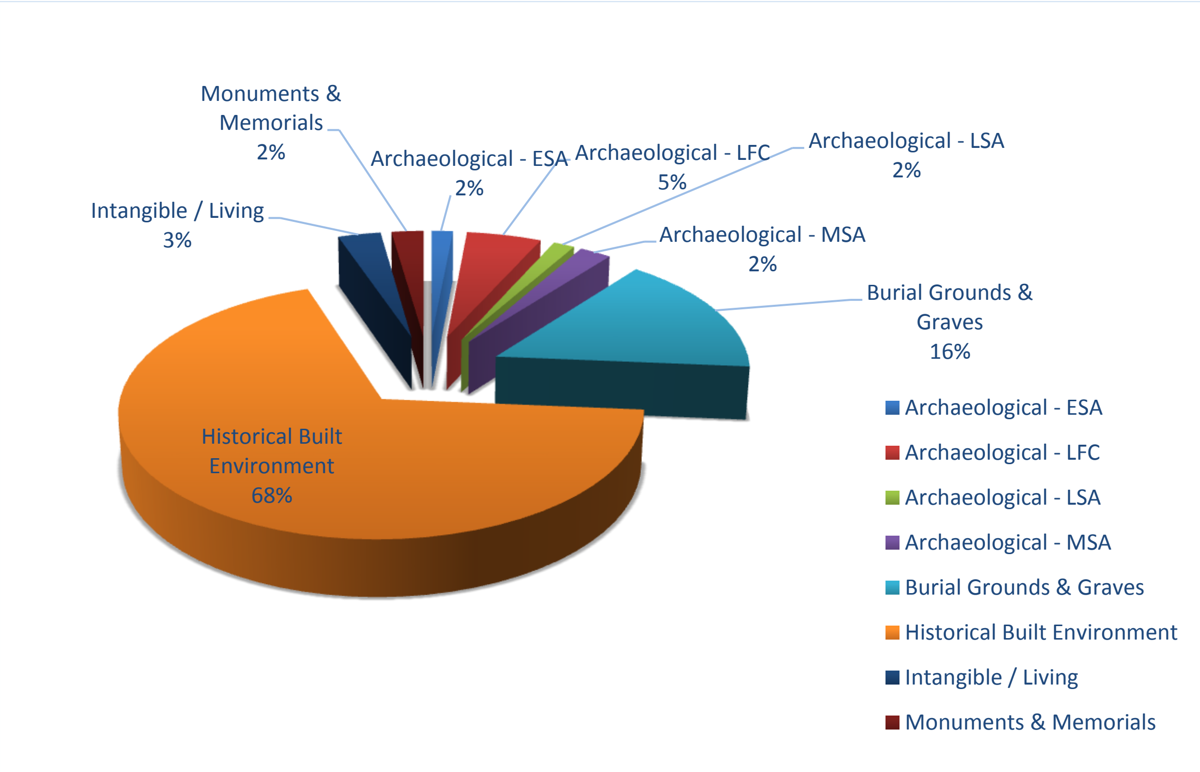

Figure 25-1: Representative sample of recorded heritage resources

To define the CS of the landscape, the importance of the various categories occurring within the local study area were considered on four dimensions. The results of the CS determination are summarised in Table 25-1.

Table 25-1: Statement of CS of the landscape

Resource ID	Aesthetic	Historic	Scientific	Social	INTEGRITY	VALUE
Malmani Subgroup and karst caves	-	-	5	-	4	20
Archaeological sites with good integrity	4	4	4	-	3	12
Archaeological sites with poor integrity	0	5	2	-	1	2
Historical sites associated with living communities - good integrity	4	3	3	3	4	13
Historical sites associated with living communities - poor integrity	1	3	2	3	1	2
Historical sites not associated with living communities - good integrity	4	3	3	-	4	13
Historical sites not associated with living communities - poor integrity	1	3	2	-	1	2
Burial grounds and graves	-	-	-	5	4	20

Archaeological and historical sites were assessed on all dimensions and attributes. Palaeontological sites, karst caves and burial grounds and graves were assessed on select dimensions as applicable. The result of the assessment indicates that the cultural landscape ranges predominantly from negligible to medium-high, with palaeontological sites / karst caves and burial grounds and graves being the notable exception.

25.2.1.2 *Heritage Impact Assessment*

Based on the understanding of the proposed amendments, as well as the results of the field survey reported, no direct or indirect impacts to heritage resources are envisaged.

25.2.1.3 *Cumulative impacts on the cultural landscape*

Cumulative impacts occur from in-combination effects of various impacts on heritage resources acting within a host of processes that result in an incremental effect. The importance of identifying and assessing cumulative impacts is that the whole is often greater than the sum of its parts. This implies that the total effect of multiple stressors or change processes acting simultaneously on a system may be greater than the sum of their effects when acting in isolation.

As demonstrated in the cultural baseline, the local study area contributes to the historic mining landscape associated with the West Rand, and the mining history of Johannesburg at large.

The cumulative impacts manifest as additive, synergistic and neutralising. These are summarised in Table 25-2 and discussed separately below.

Table 25-2: Summary of potential cumulative impacts

Type	Cumulative Impact	Direction of Change	Extent of Impact
Neutralising	The sense of place will be altered insofar as the historical mining landscape, characterised by the numerous individual historical dumps, will change to a modernised mining landscape through reclamation of the Millsite TSF Complex and surrounding TSFs in the local study area. This change, however, is an inherent, organic continuation of a living mining heritage. The creation of new mining-related sites neutralises the removal of older, existing structures. The overall sense of place, however, remains intrinsically associated with a mining heritage.	Neutral to positive	Local, Regional
Additive	The *historic* mining landscape will be permanently changed through the reclamation of historical TSFs, i.e. tangible markers of the mining history of the West Rand.	Negative	Local, Regional
Synergistic	The removal of historical TSFs will increase the historical cultural significance of remaining TSFs and other mining infrastructure. The significance of these will exponentially increase as more features are removed.	Negative	Site Specific, Local & Regional

As demonstrated, the area within which the proposed development footprint is situated is associated with historic mining activities of the West Rand specifically, but that also contributes to the overall mining heritage of the greater Johannesburg area. Visible tangible markers associated with this history are historic mining infrastructures, such as headgears, and more significantly, historical TSFs.

The proposed Project, when considered against other proposed developments in the local study area, will have neutralising cumulative impact. These will be manifested primarily through the alteration to the sense-of-place in so far as the historic mining landscape characterised by the numerous individual historical dumps will be changed into a modernised mining landscape through time. The overall sense-of-place, however, will remain intrinsically associated with the mining landscape, which is a part of a living mining heritage and cannot therefore be “preserved” through keeping of the static *status quo*.

The proposed reclamation activities will result in an additive cumulative impact to the historic mining landscape, i.e. the sum of all the effects of the reclamation. Reclamation activities will decrease the number of remaining historical TSFs as tangible markers of historic mining activities on the West Rand.

The removal of the historical TSF’s will subsequently gradually increase the significance of *in situ* resources. Through time, the remaining historical TSFs associated with the mining heritage of the greater Johannesburg region will have a high CS regardless of the integrity of the resource.

26 Item 3(v): Other matters required in terms of sections 24(4)(a) and (b) of the Act

Section 24(4)(b)(i) of the Act requires proof of investigation and motivation if no reasonable or feasible alternatives, as contemplated in sub-regulation 22(2)(h), exist.

Prior to the commencement of this Application process, Sibanye-Stillwater did assess alternatives in terms of sources of tailings material to process in the Cooke Plant to allow this plant to remain optional, as well as gain Environmental Authorisation in the shortest amount of time possible. Site selection was based on position of a TSF to the Cooke Plant, existing authorisation which can be amended, and the availability of existing infrastructure.

As detailed throughout this Regulation 31 Amendment Report, the site location and proposed methods of reclamation have been dictated by the position of the Millsite TSF Complex and the approved pipeline routes associated with the broader Cooke Operations. This report has investigated the possible negative and positive impacts of the proposed Project and demonstrates the effects of reclaiming the Millsite TSF Complex. Due to the positive attributes associated with the removal of the Millsite TSF Complex, no alternatives are deemed necessary in terms of alternative TSFs to reclaim. Similarly, no alternatives have been assessed for the reclamation process as Sibanye-Stillwater is applying for hydraulic reclamation utilising existing and/or approved infrastructure. This reduces the project footprint and facilitates a less environmentally damaging process. Due to the authorisations associated with Cooke Operations and associated pipelines, the EMPr can be amended to include reclaiming the Millsite TSF Complex as no Listed Activities have been triggered by the proposed Project. A Scoping and EIA Process was important to avoid due to the timeframe of the process, and therefore the proximity of all existing infrastructure and the TSF were confirmed to be the most viable option for Sibanye-Stillwater, and alternatives have therefore been excluded from this Impact Assessment.

Part B: Environmental Management Programme Report

1 Item 1(a): Details of the EAP

1.1.1 The qualifications of the EAP

Barbara Wessels completed her B.Sc. in Geography and Environmental Management in 2005.

1.1.2 Summary of the EAP's past experience

Ms Barbara Wessels of Digby Wells is the lead Environmental Assessment Practitioner (EAP) for this Project. Ms Wessels has compiled numerous EIA and EMP reports (EMPr) and managed the associated multi-disciplinary processes. Ms Wessels has been involved in projects which include due diligence, EMP auditing, closure cost assessments, water use licensing, waste management, aquatic assessments and biomonitoring as well as the compilation of rehabilitation plans. Ms Wessels has worked in various African countries and was seconded to Anglo Platinum (Rustenburg), Anglogold Ashanti Iduapriem Mine (Ghana) providing assistance to the Environmental Manager, and Randgold Resources Loulo Gold Mine as acting Environmental Superintendent. Ms Wessels' Curriculum Vitae is attached in Appendix 2.

2 Item 1(b): Description of the aspects of the activity

The project involves the inclusion of a Tailings Storage Facility (TSF) into the Mining Right applicable to the Sibanye-Stillwater Rand Uranium (Pty) Ltd Cooke Operations. The Millsite TSF Complex, locate to the east of the Cooke Operations, has been identified as the most feasible resource for reclamation and processing at the Cooke Plant. The motivation for this Project is to allow the Cooke Plant to remain operational, at a processing rate of 400,000 tonnes per month (tpm).

Infrastructure requirements for the TSF reclamation activities, such as pipelines, have been authorised under previous projects and therefore no additional infrastructure construction will be required for the reclamation of the Millsite TSF Complex.

3 Item 1(c): Composite Map

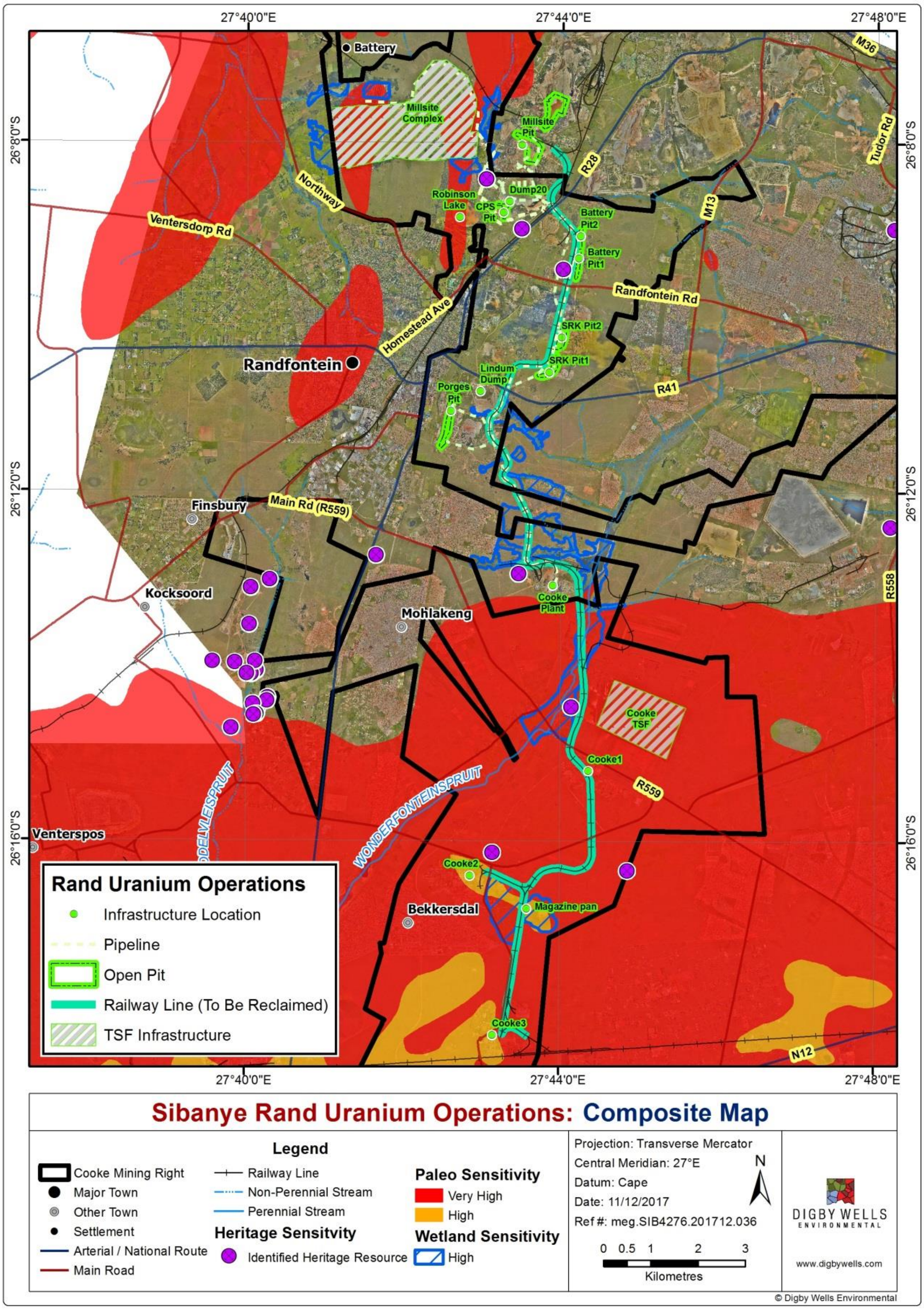

Figure 3-1: Composite Map

4 Item 1(d): Description of Impact management objectives including management statements

4.1 Item 1(d)(i): Determination of closure objectives

Closure objectives are informed by the type of environment described in this report. Final rehabilitation will be carried out once the mine goes into its closure phase. This final rehabilitation will be carried out within the context of a closure plan (Bailie, 2006). A mine will obtain a closure certificate only once it can prove that rehabilitation is satisfactory, and that if any residual pollution effects exist they can be adequately managed. Whatever form of rehabilitation is used, a post-closure monitoring programme must be implemented before the mine applies for closure. The institution of this monitoring programme will enable the mine to identify and rectify any residual pollution impacts.

The preliminary closure objectives identified have been divided into eight categories and each category is explained in Table 4-1, below.

Table 4-1: Closure Objectives

Category	Objective
Physical stability	To remove and/or stabilise surface infrastructure, rehabilitated land and mining residue according to the planned land use plan after closure
Environmental quality	To manage the impact of physical effects and chemical contaminants on the environment such that the environmental quality is not adversely affected after closure
Health and safety	To limit, as far as reasonably possible, health and safety risks to humans accessing the reclaimed mine site after closure
Land capability/land-use	To re-instate the mixed-land use through the implementation and maintenance of the post closure land use plan
Aesthetic quality	To leave behind a reclaimed mine site that gives an acceptable overall aesthetic appearance
Biodiversity	To encourage the re-establishment of native and/or appropriate flora and fauna on the reclaimed mine site such that the biodiversity is largely re-instated by natural succession over time
Social	To involve local community members in rehabilitation maintenance programmes that should contribute towards the socio-economic sustainability of the local communities

Category	Objective
Stakeholder Management	To follow an appropriate stakeholder engagement process with all Interested and Affected Parties (I&APs) and authorities.

The objective of the risk assessment is to use information from specialist studies to confirm/verify the objectives set and to identify risks that could prevent Cooke operations from achieving its closure objectives

4.2 Item 1(d)(ii): The process for managing any environmental damage, pollution, pumping and treatment of extraneous water or ecological degradation as a result of undertaking a listed activity

Currently the Rand Uranium Cooke operations abstract extraneous underground water that ingresses at Cooke Shafts 1, 2 and 3. This water is utilised in the reclamation operations, underground mining process as well as being discharged at Magazine pan and into the Wonderfonteinspruit below Cooke 2 shaft. These water uses are authorised in terms of the Rand Uranium WUL. It should be noted that to ensure safe mining conditions, the volume limits of water abstracted from the shafts as stipulated in the Rand Uranium WUL are being exceeded.

A total of 30 709.59 m^3/day of water is abstracted from Cooke Shaft 1 as follows:

- 6 709.59 m^3/day for use in metallurgical plant, tailings reclamation and underground mining process;
- 2 000 m^3/day for domestic purposes; and
- 22 000 m^3/day removed for the continuation of mining.

Of this water, 16 000 m^3/day is discharged into the Wonderfonteinspruit and 2 700 m^3/day transported via a dedicated pipeline to the raw water dams (RWDs) located at the Cooke TSF. Water is temporarily stored in the RWDs at the Cooke TSF for use in the Cooke Plant. There are two surge ponds located at the Cooke Plant with a total capacity of 12 267 m^3 which are utilised for temporary storage of water (2 000 m^3/day) during surge conditions.

A total of 21 000 m^3/day of water is abstracted from Cooke Shaft 2 as follows:

- 2 500 m^3/day for use in metallurgical plant, tailings reclamation and underground mining process;
- 2 000 m^3/day for domestic purposes; and
- 17 000 m^3/day removed for the continuation of mining.

Cooke Shaft 2 and 3 are interlinked underground areas with a shared pumping system at Cooke Shaft 2 where all water is abstracted. Of this water, 16 000 m^3/day is discharged into the Magazine Pan. Sibanye-Stillwater intends to use 30 000 m^3/day from 8 Shaft for reclamation activities at the Millsite TSF complex. This process water will be stored in a tank at the Water Treatment Plant adjacent to the Millsite TSF complex with a water pipeline utilised to convey the water.

4.3 Item 1(d)(iii): Potential risk of Acid Mine Drainage

The Millsite TSF is a historical tailings dump which does not have a protective liner at its base and therefore has contributed to AMD since its establishment. Reclamation of the Millsite Complex will therefore contribute to the rehabilitation of the area by removing AMD-producing dumps. However, after processing these tailings, residue material will be deposited in the open pits and therefore geochemical analysis of the Millsite Complex material had to be undertaken to determine the potential for AMD once deposited.

Water in the underground mine void is affected by AMD and is already of poor quality with pH of approximately 3. Without backfilling, the open pits are a constant source of water ingress into the Western Basin mine void as rainwater falls into the pits and enters into the mine voids. This rainwater then comes into contact with pyrite on the exposed pit walls and assumes the characteristics of AMD, similar to that of the underlying mine void.

4.4 Item 1(d)(iv): Steps taken to investigate, assess, and evaluate the impact of acid mine drainage

Eight samples were taken at the Millsite Complex to compare the chemical composition of the Millsite tailings to the residue material currently being deposited in the open pits from Dump 20. The purpose of the comparison is to ensure that Millsite residue material will not create or increase the impact to groundwater in the region.

4.5 Item i(d)(v): Engineering or mine design solutions to be implemented to avoid or remedy acid mine drainage

The reprocessed tailings material is treated with lime in the metallurgical plant and is generally deposited at high pH values (around 10 – 11). This is expected to have a positive impact in the groundwater quality as the pH of the mine void will increase and precipitate the dissolved metals.

4.6 Item 1(d)(vi): Measures that will be put in place to remedy any residual or cumulative impact that may result from acid mine drainage

Closure and rehabilitation of the Millsite TSF Complex and surrounding pits by Sibanye-Stillwater will definitely have a positive impact on the surface and groundwater environment. However, a rehabilitation strategy that encompasses the nearby mines and municipal treatment activities is required for a lasting improvement with a regional footprint.

4.7 Item 1(d)(vii): Volumes and rate of water use required for the mining, trenching or bulk sampling operation

A site-wide water balance model has been prepared to understand flows within the Rand Uranium operational water circuit. The operational water volumes for the period of 2015 – 2017 were provided by Sibanye together with a schematic process flow diagram for Rand Uranium operation. The daily water and salt balance depicted in Figure 4-1, below. The water balance results are summarised as follows:

- 31 500 m^3/day will be required to reclaim the Millsite TSF Complex which will be sourced from Shaft 8;
- A total of 33 650 m^3/day is sent to Cooke Plant. 950 m^3 is Randfontein municipal water, 3 700 m^3 recovered from backfilling areas, while the remainder is slurry water from the Millsite TSF.
- 18 000 m^3/day of residue tailings is backfilled into Millsite, Battery 1 & 2, Porges, SRK 2 & 3 and Training open pits.
- Some discharge water parameters are above the discharge limits as provided in the Water Use License. The concentrations from the abstraction points and discharge points have also been indicated in Figure 4-1.

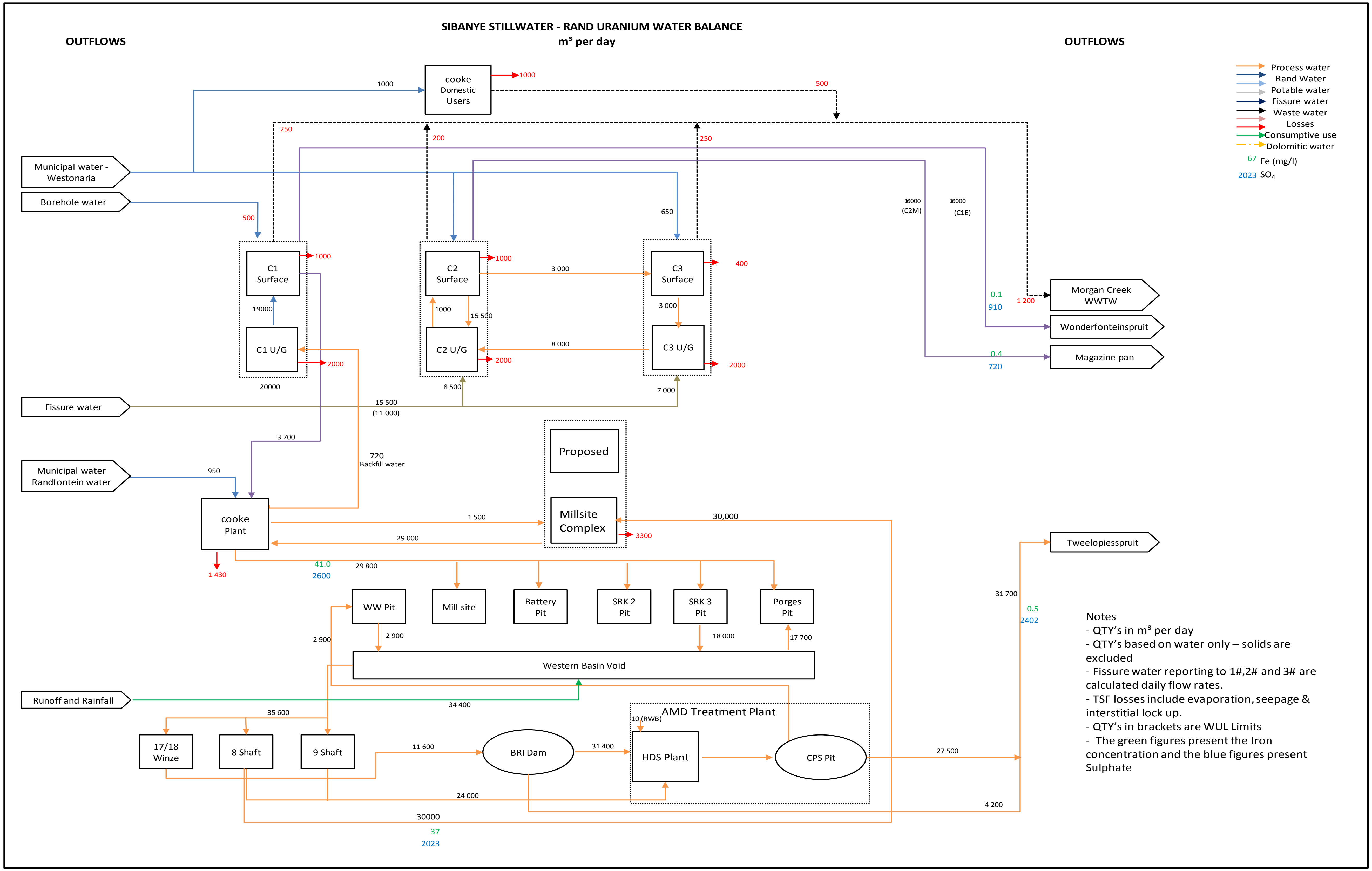

Figure 4-1: Daily Water and Salt Balance for Sibanye-Stillwater Rand Uranium Operation

4.8 Item 1(d)(viii): Has a water use licence has been applied for

A Water Use Licence Application is applicable to this process due to the water uses associated with hydraulic monitoring as a method of reclamation. Sibanye-Stillwater intends to use 30 000 m^3/day from 8 Shaft for reclamation activities at the Millsite TSF complex. This process water will be stored in a tank at the Water Treatment Plant adjacent to the Millsite TSF complex with a water pipeline utilised to convey the water. New Water Uses which require licencing are shown in Table 4-2 below.

Table 4-2: New Water Uses

Section 21 Water Use	Description	Related Activity
S 21 (a)	Taking water from a water resource.	Abstraction of water from the Western Basin mine void to use as process water for the operations.
S 21 (c)	Impeding or diverting the flow of water in a watercourse.	Maintenance, reclamation and rehabilitation of the Millsite TSF within 500 m of tributaries of the Tweelopiespruit and wetlands; and Maintenance, reclamation and rehabilitation of old railway berm crossing a number of water drainage areas/watercourses.
S 21 (g)	Disposing of waste or water containing waste in a manner which may detrimentally impact on a water resource.	Surge ponds located at the Cooke plant ; Waste Rock Stockpile located at Cooke Shaft 2; and Mine water silt trap dam located at Cooke Shaft 1.
S 21 (i)	Altering the bed, banks, course or characteristics of a watercourse.	Maintenance, reclamation and rehabilitation of the Millsite TSF within 500 m of tributaries of the Tweelopiespruit and wetlands; and Maintenance, reclamation and rehabilitation of old railway berm crossing a number of drainage areas/watercourses

4.9 Item 1(d)(ix), 1(e) & 1(f): Impacts to be Mitigated in their Respective Phases; Impact Management Outcomes, and Impact Management Actions

This section provides measures to rehabilitate the environment affected by the undertaking of any listed activity (none applicable to this Project), description of impact management outcomes identifying the standard of impact management required for the aspects contemplated in paragraph 13 of Part A, in one consolidated table.

Table 4-3: Impact Mitigations

Activity	Potential Impact	Aspects Affected	Phase	Scale and Size of Disturbance	Mitigation Type
Construction Activities (installation of pipelines, access roads, site clearing, collection sump and paddocks, and storm water trenches)	Groundwater contamination	Groundwater	Construction	Approximately 450 ha	▪ Restrict areas that must be cleared of vegetation for construction activities to those of absolute necessity; ▪ Avoid constructing below the water table as far as possible; and ▪ Continue the existing monitoring programme.
	Siltation of surface water resources leading to deteriorated water quality	Surface Water	Construction	Approximately 450 ha	▪ Clearing of vegetation must be limited to the development footprint area, and the use of existing access roads must be prioritized to minimize construction of new access roads, hence potential for erosion; ▪ If possible, construction activities must be prioritized to the dry months of the year (May-October) to limit mobilization of sediments or hazardous substances during site clearing; ▪ Vegetation along the edges of the dumps (where reclamation is not active) should be left as is, and only be removed when the rest of the dump has been reclaimed; ▪ Dust suppression on the haul roads and cleared areas must regularly be undertaken; and ▪ An appointed Environmental Control Officer (ECO) must always be available to ensure implementation of the recommended mitigation/management measures during construction, operational, and decommissioning of the project.
	Deterioration of water quality due to dirty/contaminated runoff from the project reporting into the surrounding streams	Surface Water	Construction	Approximately 450 ha	▪ All fuel storage areas should be appropriately bunded and spill kits should be in place, and construction workers trained in the use of spill kits, to contain and immediately clean up any potential leakages or spills; ▪ Vehicles should regularly be maintained as per the developed maintenance program. This should also be inspected on a daily basis before use to ensure there are no leakages underneath; ▪ Ablutions facility for construction workers and general waste bins should be provided. An accredited contractor should be appointed to properly dispose the waste; ▪ The storm water management to ensure separation of clean and dirty and water runoff, as stated, the temporary surface water ditches are to be constructed on the upstream boundary of the TSF, which will meet GN 704 requirements regarding the separation of clean and dirty water runoff. All clean water runoff will therefore be diverted away from the cleared area. The temporary surface ditches are to be sized such that the 1:50 year peak discharge can be contained within it; and ▪ Surface water quality monitoring should continue on the monitoring locations to enable detection of the water quality impacts and therefore ensure that necessary mitigation measures are immediately implemented
	▪ Health impacts as a result of exposure to airborne particulate	Air Quality	Construction	N/A	▪ Application dust suppressant on exposed areas; ▪ Limit activity to non-windy days (wind speed ≤5.4 m/s); and ▪ The area of disturbance at all times must be kept to a minimum and no unnecessary

Activity	Potential Impact	Aspects Affected	Phase	Scale and Size of Disturbance	Mitigation Type
	matter; and ▪ Nuisance due to dust fallout				clearing, digging or scraping must occur, especially on windy days (with wind speed ≥ 5.4 m/s).
	Noise disturbance from the construction vehicles and machinery	Noise	Construction	N/A	▪ Restricting construction activities to daylight hours; ▪ Project related machines and vehicles to be serviced to the designed requirements of the machinery/vehicles to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; and ▪ Switching off equipment when not in use
Mixing the slimes and water to create a slurry (hydraulic reclamation and associated processing)	Water used for hydraulic reclamation may seep through the TSF and contaminate the TSF footprint	Groundwater	Operational	Approximately 450 ha	▪ Monitoring of groundwater quality and water levels; and ▪ Minimise ponding of water within the reclamation area.
	Runoff from the tailings will contain high levels of dissolved minerals which may result in water contamination or the deterioration of surface water quality	Surface Water	Operational	Approximately 450 ha	▪ All fuel storage areas should be appropriately bunded and spill kits should be in place, and construction workers trained in the use of spill kits, to contain and immediately clean up any potential leakages or spills; ▪ Vehicles should regularly be maintained as per the developed maintenance program. This should also be inspected on a daily basis before use to ensure there are no leakages underneath; ▪ Ablutions facility for construction workers and general waste bins should be provided. An accredited contractor should be appointed to properly dispose the waste; ▪ The storm water management to ensure separation of clean and dirty and water runoff, as stated, the temporary surface water ditches are to be constructed on the upstream boundary of the TSF, which will meet GN 704 requirements regarding the separation of clean and dirty water runoff. All clean water runoff will therefore be diverted away from the cleared area. The temporary surface ditches are to be sized such that the 1:50 year peak discharge can be contained within it. ▪ Surface water quality monitoring should continue on the monitoring locations to enable detection of the water quality impacts and therefore ensure that necessary mitigation measures are immediately implemented
	Increased vehicular movement along river crossings and within wetland/riparian zones, resulting in: ▪ Potential contamination of soils as a result of the ingress of hydrocarbons; ▪ Compaction of soils; ▪ Loss of natural vegetation; ▪ Increased	Wetlands	Operational	Limited to crossing footprints	▪ Ensure that sound environmental management is in place during the proposed operational phase; ▪ Ensure that as far as possible all operational activities take place outside of wetland/riparian areas and their associated 100 m zone of regulation; ▪ Limit the footprint area of the operational activities to what is absolutely essential in order to minimise impacts as a result of vegetation clearing and compaction of soils; ▪ If it is absolutely unavoidable that any of the wetland areas present will be affected, disturbance must be minimised and suitably rehabilitated; ▪ Ensure that no incision and canalisation of the wetland features present takes place as a result of the proposed operational activities; ▪ All erosion noted within and in the vicinity of the area footprint should be remedied immediately and included as part of the ongoing rehabilitation plan; ▪ All soils compacted as a result of operational activities should be ripped and profiled;

Activity	Potential Impact	Aspects Affected	Phase	Scale and Size of Disturbance	Mitigation Type

	sedimentation; and
	▪ Increased potential for onset of erosion
					▪ A suitable alien-vegetation control programme must be put in place so as to prevent further encroachment as a result of disturbance to the surrounding terrestrial zones;
					▪ Permit only essential personnel within the 100 m zones of regulation for all wetland features identified;
					▪ All areas of increased ecological sensitivity should be designated as "No-Go" areas and be off limits to all unauthorised vehicles and personnel;
					▪ No crossing of the wetland features and their associated buffers should take place and the substrate conditions of the wetlands and downstream stream connectivity must be maintained;
					▪ No material may be dumped or stockpiled within any wetland areas in the vicinity of the proposed decommissioning footprint.
					▪ No vehicles or heavy machinery may be allowed to drive indiscriminately within any wetland areas and their associated zone of regulation. All vehicles must remain on demarcated roads and within the Project area footprint;
					▪ All vehicles must be regularly inspected for leaks;
					▪ Re-fueling must take place on a sealed surface area to prevent ingress of hydrocarbons into topsoil;
					▪ All spills should be immediately cleaned up and treated accordingly;
					▪ Water quality with special mention of pH, dissolved salts and specific problem substances like pyrites need to be managed, and monitored in order to ensure that reasonable water quality occurs downstream of the mined areas to allow for the on-going survival of wetland and aquatic communities of some diversity and reasonable sensitivity;
					▪ Appropriate sanitary facilities must be provided for the duration of the operational activities and all waste must be removed to an appropriate waste facility;
					▪ Monitor all systems for erosion and incision;
					▪ During the operational phase, erosion berms should be installed on roadways and in the vicinity of disturbed soils and cleared vegetation soils as well as in areas where tailings or contaminated soils are reclaimed or removed to prevent gully formation and siltation of the wetland areas. The following points should serve to guide the placement of erosion berms:
					  ▪ Where the track has slope of less than 2%, berms every 50m should be installed;
					  ▪ Where the track slopes between 2% and 10%, berms every 25m should be installed;
					  ▪ Where the track slopes between 10%-15%, berms every 20m should be installed;
					  ▪ Where the track has slope greater than 15%, berms every 10m should be installed.

	Physical disturbance of contaminated soil and tailings resulting in erosion and sedimentation; Ingress of pollutants to watercourses and wetland areas as a result of tailings and contaminated soil spills during transport and reclamation activities; Potential for further contamination of the freshwater resources present as a result of increased oxidation as a result of disturbance of the tailings during reclamation activities			Approximately 450 ha	
	The wet screening and reclamation process will result in the suppression of dust, leading to a cleaner	Air Quality	Operational	N/A	No mitigation required

Activity	Potential Impact	Aspects Affected	Phase	Scale and Size of Disturbance	Mitigation Type
	atmosphere				
	Noise disturbance from the screening activities	Noise	Operational	N/A	No mitigation required
Hydraulic conveying of the slurry to the Cooke Plant via the BPS at Dump 20 (operation of pipelines and pump stations)	Acid mine drainage due to the TSF disturbance and exposure to oxygen and moisture	Groundwater	Operational	Approximately 450 ha	▪ Monitoring of groundwater quality; and ▪ Minimise area of disturbance to avoid AMD at multiple places.
	Noise disturbance from the pump stations	Noise	Operational	N/A	No mitigation required
Final deposition of the residue material into the open pits	▪ Rising of water level in the vicinity of the pits ▪ Increase of decant rates	Groundwater	Operational	Groundwater plume	▪ Monitoring of groundwater level; ▪ Abstract equal volume of water from 8 Shaft (which is connected with the pits) to ensure that the water level or decant rate does not increase; and ▪ The abstracted water can be used for the reclamation of the tailings or discharged to the environment after treatment.
	Deterioration of groundwater quality	Groundwater	Operational	Approximately 450 ha	▪ Monitoring of groundwater quality and water levels; ▪ Ensuring that the deposited tailings is alkaline; and ▪ Ensuring that the cyanide is destroyed before deposited.
Use of dirt roads	Movement of equipment and employee commute using dirt roads, leading to dust generation	Air Quality	Operational	Limited to roads	▪ Application dust suppressant on access areas; and ▪ There is need to set maximum speed limits on access roads and to have these limits enforced.
Rehabilitation of the Millsite Complex footprint	No seepage and AMD drainage	Groundwater	Decommissioning	Approximately 450 ha	▪ Monitoring of groundwater quality and water levels; and ▪ Rehabilitation of old TSF footprints.
	Runoff from the tailings will contain high level of dissolved minerals which may result in water contamination or the deterioration of the water quality	Surface Water	Decommissioning	Approximately 450 ha	▪ Use of accredited contractors for removal or demolition of infrastructure is recommended; this will reduce the risk of waste generation and accidental spillages; ▪ The constructed storm water management infrastructure will have to remain until post closure to ensure dirty water is captured and contained during removal of infrastructures; ▪ Ensure that the infrastructure (pipelines, fuel storage areas, pumps) are first emptied of all residual material before decommissioning. This can be input of the standard operation procedures at each of the dumps to ensure it's carried out; and ▪ Ensure that the surface profile is rehabilitated to promote natural runoff drainage and avoid ponding of water within the rehabilitated area. Surface inspection should be continuously undertaken to allow runoff to drain onto the natural streams until vegetation has fully established on the site.
	Improvement on the surface water quality as a result of complete removal of the pollution source	Surface Water	Decommissioning	Approximately 450 ha	▪ Use of accredited contractors for removal or demolition of infrastructure is recommended; this will reduce the risk of waste generation and accidental spillages; ▪ Ensure that the surface profile is rehabilitated to promote natural runoff drainage and avoid ponding of water within the rehabilitated area. Surface inspection should be continuously undertaken to allow runoff to drain onto the natural streams until vegetation has fully established on the site.

Activity	Potential Impact	Aspects Affected	Phase	Scale and Size of Disturbance	Mitigation Type
	Rehabilitation of the TSFs footprint will involve the use of heavy machinery and vehicles similar to those used in the construction phase. This will result in the generation of fugitive dust containing TSP, PM_{10} and $PM_{2.5}$.	Air Quality	Decommissioning	Approximately 450 ha	▪ The dismantling area disturbed must be kept to a minimum; ▪ Drop heights when loading and offloading materials offsite must be minimised; ▪ There is need to set maximum speed limits on site and to have these limits enforced. It is confirmed that the dust generating capacity of particles less than 10 micro meters is reduced by 58% when speed controls are reduced from 25 mph (40 km/h) to 10 mph (16 km/h) (Flocchini et al., 1994; Watson et al., 1996);and ▪ Limit demolition activities to non-windy days (≥5.4 m/s).
	Reduction in air quality	Air Quality	Decommissioning	Approximately 450 ha	▪ Drop heights when offloading materials for rehabilitation must be minimised; ▪ Limit rehabilitation activities to non-windy days (≥ 5.4 m/s); ▪ Rehabilitated landscape should be vegetated; and ▪ Use of dust suppressant on dirt roads and exposed areas; and ▪ Wind speed of vehicle on dirt road during rehabilitation must be minimised. It is confirmed that the dust generating capacity of particles less than 10 micro meters is reduced by 58% when speed controls are reduced from 25 mph (40 km/h) to 10 mph (16 km/h) (Flocchini et al., 1994; Watson et al., 1996).
Removal of structures and infrastructure (pipelines, screens, berms)	Increased vehicular movement along wetland crossings and within wetland/riparian zones, resulting in: ▪ Potential contamination of soils as a result of the ingress of hydrocarbons; ▪ Compaction of soils; ▪ Loss of natural vegetation; ▪ Increased sedimentation; and ▪ Increased potential for onset of erosion	Wetlands	Decommissioning	Limited to crossing footprints	▪ Ensure that sound environmental management is in place during the proposed decommissioning phase; ▪ Ensure that as far as possible all decommissioned infrastructures, tailings and contaminated soils are placed outside of wetland/riparian areas and their associated 100 m zone of regulation; ▪ Limit the footprint area of the decommissioning activities to what is absolutely essential in order to minimise impacts as a result of vegetation clearing and compaction of soils; ▪ If it is absolutely unavoidable that any of the wetland areas present will be affected, disturbance must be minimised and suitably rehabilitated; ▪ Ensure that no incision and canalisation of the wetland features present takes place as a result of the proposed decommissioning activities; ▪ All erosion noted within the decommissioning area footprint should be remedied immediately and included as part of the ongoing rehabilitation plan; ▪ All soils compacted as a result of decommissioning activities should be ripped and profiled; ▪ A suitable alien-vegetation control programme must be put in place so as to prevent further encroachment as a result of disturbance to the surrounding terrestrial zones; ▪ Permit only essential personnel within the 100 m zone of regulation for all wetland features identified; ▪ All areas of increased ecological sensitivity should be designated as "No-Go" areas and be off limits to all unauthorised vehicles and personnel; ▪ No crossing of the wetland features and their associated buffers should take place and the substrate conditions of the wetlands and downstream stream connectivity must be maintained; ▪ Wherever possible, restrict decommissioning activities to the drier winter months to avoid sedimentation of the wetlands and the aquatic resources further downstream;
	▪ Potential dumping of decommissioned infrastructure in wetland/riparian areas; ▪ Potential incomplete removal of infrastructure; ▪ Disturbance of natural vegetation structures; ▪ Further contamination			Wetlands associated with the TSF	

Activity	Potential Impact	Aspects Affected	Phase	Scale and Size of Disturbance	Mitigation Type
	of wetland soils; ▪ Sedimentation of wetlands and their downstream resources				▪ No material may be dumped or stockpiled within any rivers, tributaries or drainage lines in the vicinity of the proposed decommissioning footprint. ▪ No vehicles or heavy machinery may be allowed to drive indiscriminately within any wetland areas and their associated zones of regulation. All vehicles must remain on demarcated roads and within the decommissioning area footprint; ▪ All vehicles must be regularly inspected for leaks; ▪ Re-fueling must take place on a sealed surface area to prevent ingress of hydrocarbons into topsoil; ▪ All spills should be immediately cleaned up and treated accordingly; ▪ Appropriate sanitary facilities must be provided for the duration of the decommissioning activities and all waste must be removed to an appropriate waste facility; ▪ Monitor all systems for erosion and incision; ▪ Ongoing wetland rehabilitation is necessary both within and in the vicinity of the proposed decommissioning footprint and appropriate wetland monitoring techniques must take place on an annual basis during the summer/wet season in order to identify any emerging issues, trends or improvements in the receiving environment
	The dismantling of site infrastructure will involve the use of heavy machinery and vehicles similar to those used in the construction phase. This will result in the generation of fugitive dust containing TSP, PM_{10} and $PM_{2.5}$.	Air Quality	Decommissioning	Approximately 450 ha	▪ The dismantling area disturbed must be kept to a minimum; ▪ Drop heights when loading and offloading materials offsite must be minimised; ▪ There is need to set maximum speed limits on site and to have these limits enforced. It is confirmed that the dust generating capacity of particles less than 10 micro meters is reduced by 58% when speed controls are reduced from 25 mph (40 km/h) to 10 mph (16 km/h) (Flocchini et al., 1994; Watson et al., 1996);and ▪ Limit demolition activities to non-windy days (≥5.4 m/s).
	Noise will emanate from the machinery and vehicles operating during the decommissioning activities	Noise	Decommissioning	N/A	▪ Restricting decommissioning activities to daylight hours; ▪ Decommissioning phase related machines and vehicles to be serviced to the designed requirements of the machinery/vehicles to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; and ▪ Switching off equipment when not in use.
Rehabilitation of the pits should they have been successfully sealed and filled	▪ No seepage from the pits ▪ Decrease of decant rate	Groundwater	Decommissioning	Extent of groundwater plume	▪ Monitoring of groundwater quality and water levels; and ▪ Rehabilitation of the pits by properly shaping and capping with a soil/weathered material layer that will prevent ponding and minimise infiltration of rain water.
	Increased vehicular movement along river crossings and within wetland/riparian zones, resulting in: ▪ Potential contamination of soils as a result of the ingress of hydrocarbons;	Wetlands	Decommissioning	Limited to crossing footprints	▪ Wetland monitoring must be carried out during both the decommissioning and rehabilitation phases to ensure no unnecessary impact to wetlands takes place. Monitoring should take place on an annual basis during the summer/wet season and carried out by an independent consultant for the duration of the decommissioning phase. Monitoring should continue to take place every two years until the systems are considered stable; ▪ Wetlands and their associated 100 m zone of regulation, to be clearly demarcated and avoided; ▪ An alien vegetation management plan to be implemented and managed for the life of

Activity	Potential Impact	Aspects Affected	Phase	Scale and Size of Disturbance	Mitigation Type
	▪ Compaction of soils; ▪ Loss of natural vegetation; ▪ Increased sedimentation; and ▪ Increased potential for onset of erosion				the proposed decommissioning, rehabilitation, closure and post-closure phases of the proposed decommissioning and rehabilitation project; ▪ As much vegetation growth as possible should be promoted within the proposed development area during all phases. In order to protect soils and vegetation, clearance should be kept to a minimum as the biomass in the area is not very high and so therefore plants will not grow quickly; ▪ Monitor all systems for erosion and incision; ▪ All areas where active erosion is observed should be ripped, re-profiled and seeded with indigenous grasses; ▪ Preventative measures such as hessian sheeting should be used in steep re-seeded areas where high erosion potentials exist; ▪ The use of indigenous phyto-remediation specific grass, forb and tree species is encouraged; ▪ No vehicles or heavy machinery may be allowed to drive indiscriminately within any wetland areas and their associated zones of regulation. All vehicles must remain on demarcated roads and within the project area footprint; ▪ Compacted soils should be ripped, re-profiled and re-seeded; ▪ All vehicles must be regularly inspected for leaks; ▪ Re-fueling must take place on a sealed surface area to prevent ingress of hydrocarbons into topsoil; ▪ All existing litter, debris should be removed from the wetland areas and littering should be prohibited on an ongoing basis; ▪ All spills should be immediately cleaned up and treated accordingly; ▪ Appropriate sanitary facilities must be provided for the duration of the rehabilitation activities and all waste must be removed to an appropriate waste facility; ▪ Ongoing wetland rehabilitation is necessary both within and in the vicinity of the proposed decommissioning footprint and appropriate wetland monitoring techniques must take place on an annual basis during the summer/wet season in order to identify any emerging issues, trends or improvements in the receiving environment.
	Similarly to the decommissioning phase, the activities occurring within an ecologically sensitive catchment pose significant potential negative impacts to functioning wetlands and catchment. Furthermore, the rehabilitated area could cause major negative impacts due to spread of alien invasive vegetation, increased soil compaction erosion and subsequent sedimentation into the wetland ecosystems.			Catchment	

5 Financial provision

5.1 Item (i)(1): Determination of the amount of Financial Provision

5.1.1 Item (i)(1)(a): Describe the closure objectives and the extent to which they have been aligned to the baseline environment described under Regulation 22 (2) (d) as described in 2.4 herein

Closure and rehabilitation is a continuous series of activities that begin with planning prior to the project's design and construction, and end with achievement of long-term site stability and the establishment of a self-sustaining ecosystem. Not only will the implementation of this concept result in a more satisfactory environmental conclusion, but it will also reduce the financial burden of closure and rehabilitation.

- The following points outline the main objectives for rehabilitation and closure:
- Comply with the local and national regulatory requirements;
- Closure must be a long term sustainable solution;
- Ensure closure of mine sites is done in a practical manner that ensures all mine sites are self-sustaining, biodiverse ecosystems (where possible);
- Closure plans to address historical issues related to mining over the last century;
- There must be adequate finance to ensure plans can be implemented, thus ensuring closure can be achieved (Financial Provision);
- Encourage collaboration between different mines within the region to ensure closure objectives are aligned and sustainable;
- Ensure that water management objectives for the catchments and surroundings are taken into consideration to promote water efficiency and protection of water resources;
- Identification of potential latent and residual risks and implementation of mitigation measures to try and reduce or eliminate the risk to the receiving environment.
- Implement post mining land use options that are sustainable, practical and aligned with development frameworks;
- Minimise impacts to the ecosystem within the study area;
- Provide suitable vegetation establishment techniques that will create a sustainable cover and promote succession over time;
- Reduction in dust generation from historic facilities through rehabilitation efforts and concurrent rehabilitation;

- Engagement with stakeholders to take into account socio-economic issues that may arise as a result of closure and align the closure process in order to minimise negative impacts and promote opportunities; and
- Maintain and monitor the rehabilitated areas post rehabilitation.

5.1.2 Item (i)(1)(b): Confirm specifically that the environmental objectives in relation to closure have been consulted with landowner and interested and affected parties

This report is subject to public review for a period of 30 days, allowing I&APs opportunity to supply feedback and raise concerns or comments. The landowner is Sibanye-Stillwater.

5.1.3 Item (i)(1)(c): Provide a rehabilitation plan that describes and shows the scale and aerial extent of the main mining activities, including the anticipated mining area at the time of closure

Sibanye-Stillwater has appointed Digby Wells to compile a long-term, site wide rehabilitation strategy for the Cooke Operations which includes the Millsite TSF.

5.1.4 Item (i)(1)(d): Explain why it can be confirmed that the rehabilitation plan is compatible with the closure objectives

The Rehabilitation Plan and Closure objectives have been developed in tandem and included in a single report. This report contains several plans pertaining alien invasive management, land design focus areas, landscape design, recommended plant species, threatened ecosystems,

5.1.5 Item (i)(1)(e): Calculate and state the quantum of the financial provision required to manage and rehabilitate the environment in accordance with the applicable guideline

Golder Associates Africa (Pty) Ltd (Golder) is currently finalising the 2017 Financial Provision Report however, the methodology used for the 2016 Closure Calculation, also undertaken by Golder, is provided. The approach followed for the 2016 closure costs update was as follows:

- Conduct a project initiation meeting with Sibanye to workshop and agree on the template to be used for the 2016 and 2017 closure costs, as well as key aspects to be addressed;
- Set unit rates and benchmark these against industry rates through consultation with demolition contractors and rehabilitation practitioners;
- Conduct a site visit to the key areas at operations;
- Assess the available information related to changes that occurred at the mine;

- Re-measure and/or confirm quantities/allowances and key assumptions, to be aligned with those adopted for the other operations;
- Update sum allowances as applicable;
- Review and update the closure costing spreadsheets by incorporating the above changes;
- Update and include additional narratives for the assumptions and qualifications made for each cost item; and
- Compile this concise technical memorandum documenting the findings of the update of the respective closure costs for the individual operations

5.1.6 Item (i)(1)(f): Confirm that the financial provision will be provided as determined

Sibanye Stillwater contributes annually in the form of financial guarantees (fully funded as per the 2016 assessment), which will be adjusted once sign off of the final Financial Provisioning Report takes place to ensure that Sibanye-Stillwater is fully funded as per the 2017 assessment, and submitted to the DMR during Q1 2018.

6 Monitoring compliance with and performance assessment

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

6.1 Item 1(g): Monitoring of impact management actions

6.1.1 Groundwater and Surface Water

Water monitoring and analysis are conducted by an external contractor at Rand Uranium Cooke operations and in accordance to the license requirements. This section provides the details of the existing monitoring programme that will continue to be carried out at the Rand Uranium Cooke operations. The monitoring programme covers all watercourses that interact and are affected by the operation.

6.1.1.1 *Groundwater*

The groundwater monitoring programme comprises the monitoring of boreholes at the open pits, Cooke groundwater and the Millsite groundwater. The groundwater sampling points are provided in Table 6-1 below as well as shown in Figure 6-1 below.

Table 6-1: Groundwater Sampling Locations

Sample ID	Sample Description	Coordinates	Coordinates
Open Pits			

Sample ID	Sample Description	Coordinates	Coordinates
PBH1	North of Millsite North Pit	26° 7'53.57"S	27°43'30.15"E
PBH4	East of Millsite Pit	26° 7'58.56"S	27°43'37.82"E
PBH6	Southeast of Millsite Pit	26° 8'11.86"S	27°43'43.49"E
PBH7	East of deep pit	26° 9'33.04"S	27°43'54.16"E
PBH8	East of SRK2 North Pit	26°10'16.1"S	27°44'3.4"E
PBH9	Northeast of SRK2 North Pit	26°10'10.3"S	27°44'7.01"E
PBH10	Southeast of SRK3 Pit	26°10'42.99"S	27°43'53.10"E
PBH11	-	26° 9'20.48"S	27°44'16.39"E
PBH12	-	26° 9'34.81"S	27°44'12.77"E
PBH13	-	26° 9'3.37"S	27°44'15.05"E
PBH14	East of Porges Pit	26°11'6.54"S	27°42'36.54"E
PBH15	South of Porges Pit	26°11'28.28"S	27°42'33.74"E
Cooke Ground Water			
ZZM6	West Rand AH - ZB compartment	26°18'35.20"S	27°47'28.90"E
Z-ZM36	West Rand AH - ZB compartment	26°18'22.50"S	27°46'31.00"E
ZZM43	West Rand AH - ZB compartment	26°17'27.87"S	27°44'37.08"E
L5	Lindum reef borehole adjacent to Lindum north TSF	26°10'51.60"S	27°43'11.35"E
CSD3	Northeast of Cooke TSF	26°14'25.50"S	27°45'25.40"E
CSD7	Northwest of Cooke TSF	26°14'16.60"S	27°44'59.50"E
CHostel1	Cooke 1 hostel groundwater	26°15'15.18"S	27°44'26.94"E
CPlotX	Chicken farmer groundwater	26°14'30.97"S	27°44'8.04"E
CPlotX	Chicken farmer groundwater	26°14'28.58"S	27°44'6.60"E
CSRK8	Southwest of Cooke TSF	26°14'39.10"S	27°44'16.90"E
CSRK5D	Southeast of Cooke TSF	26°14'54.12"S	27°44'52.62"E
CSRK12	North of Cooke TSF RWD	26°14'16.27"S	27°44'21.23"E
GABH4	Lower west of plant	26°13'7.10"S	27°43'33.70"E
GABH5	Middle west of plant	26°13'1.90"S	27°43'38.30"E
GABH6	Upper west of plant	26°12'55.30"S	27°43'34.10"E
GABH7	Northwest of plant	26°12'57.60"S	27°43'27.90"E
Millsite Groundwater			

Sample ID	Sample Description	Coordinates	Coordinates
Millsite North	Millsite North Pit	26° 8'2.31"S	27°43'32.39"E
SRK2 North Pit	SRK2 North Pit	26°10'14.18"S	27°43'58.98"E
SRK2 South Pit	SRK2 South Pit	26°10'19.46"S	27°43'58.44"E
SRK3 Pit	SRK3 Pit	26°10'37.33"S	27°43'50.97"E
Main Porges Pit	Main Porges Pit	26°11'8.20"S	27°42'33.69"E
FTN1	Fountain NW of decant shaft	26° 6'40.10"S	27°43'21.30"E
Decant	Decant from closed shaft	26° 6'54.91"S	27°43'29.63"E
RS2	East of decant shaft	26° 6'55.35"S	27°43'35.70"E
WBH2	Behind Millsite rock dump	26° 7'46.03"S	27°43'12.33"E
MBH1	Millsite borehole at corner	26° 7'51.02"S	27°43'26.39"E
Fountain A	Fountain west of Millsite TSF	26° 7'34.58"S	27°40'36.01"E
Fountain B	Fountain west of Millsite TSF	26° 7'36.00"S	27°40'37.40"E
Farmers Dam	Farmer dam Northeast of Millsite TSF	26° 7'3.50"S	27°43'24.30"E
Plot43	Groundwater north of Millsite TSF	26° 6'21.80"S	27°41'53.50"E
Plot45	Groundwater north of Millsite TSF	26° 6'18.40"S	27°41'48.20"E
Plot47	Groundwater north of Millsite TSF	26° 6'11.70"S	27°41'42.00"E
Plot63	Groundwater Northeast of Millsite TSF	26° 6'51.30"S	27°40'41.50"E
Plot69	Groundwater Northeast of Millsite TSF	26° 6'37.90"S	27°40'29.50"E

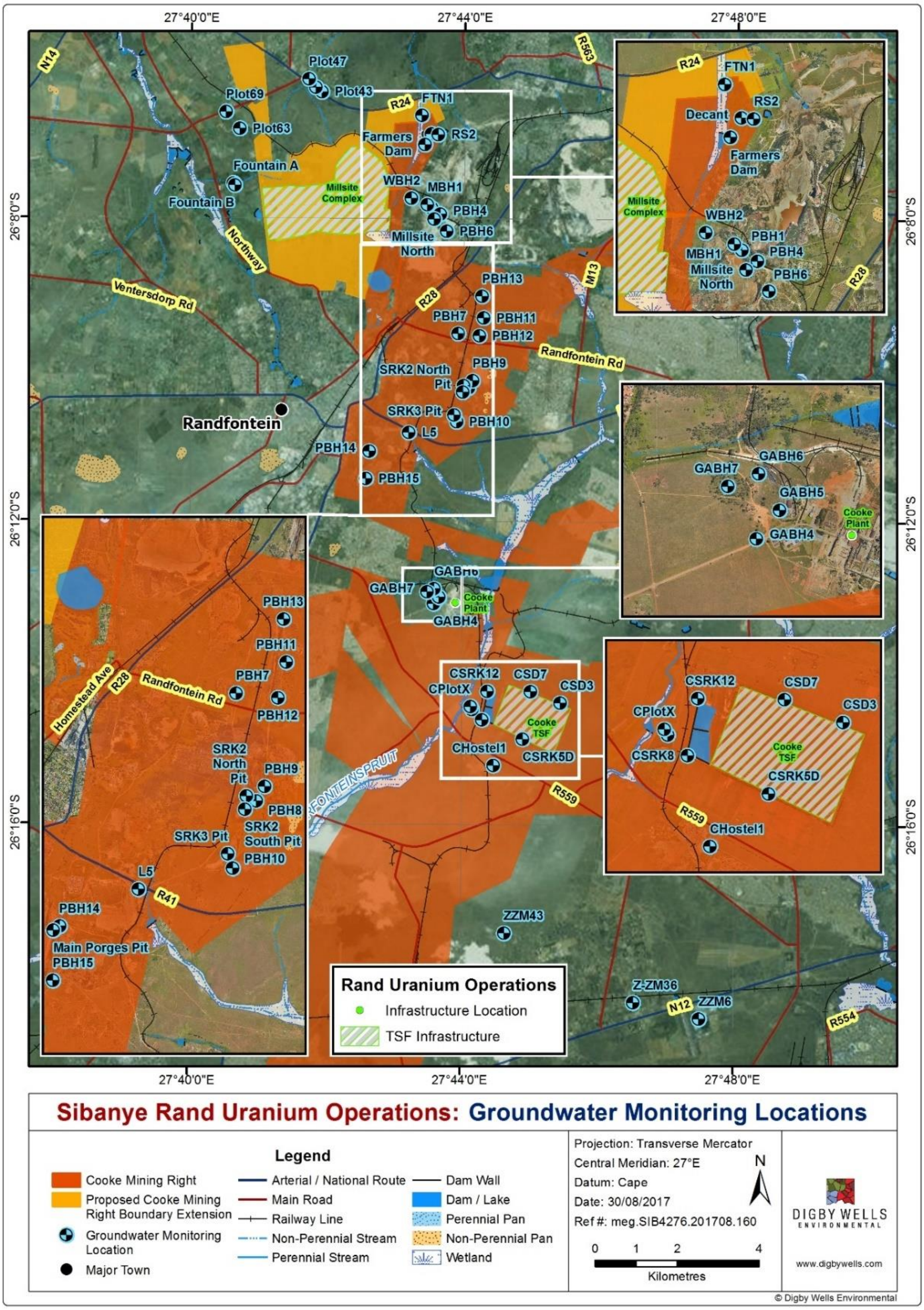

Figure 6-1: Groundwater Monitoring Points

6.1.1.2 *Surface Water*

A monitoring programme is essential as a management tool to detect negative impacts as they arise and to ensure that the necessary mitigation measures are implemented. It also ensures that storm water management structures are in working order. Monitoring should be implemented throughout the project life.

Continuous water quality monitoring should be undertaken, the monitoring data should be benchmarked with the existing WUL limits to determine deviations from the baseline water quality so as to establish if the reclamation project is impacting on the Blesbokspruit.

Water quality monitoring should continue at the existing locations and on the proposed monitoring locations indicated in Table 6-2 below. This should be undertaken for all the constituents that already exist in the monitoring programme.

Table 6-2 : Surface Water Proposed Monitoring Locations

Site	Description	Latitude	Longitude
SW1	Upstream of the Unnamed Stream (North of Millsite)	26° 6'16.73"S	27°41'36.61"E
SW2	Downstream of Unnamed Stream West (North of Millsite)	26° 5'19.57"S	27°42'18.93"E

Geographic Coordinate System WGS84 Datum

6.1.1.3 *Storm Water Management Plan*

Stormwater structures (channels, berms, sumps, etc.) should be monitored every year in September before the rainy season begins, to ensure that any blockages, silted up structures, or breaches in structures, are repaired and are in good working order for the rainy season. They should further be monitored immediately after every storm event during the rainy season. Should blockages, silted up structures or breaches occur, immediate action should be undertaken to remove debris and / or repair breaches. In the event of any spillage of slime occurring, the slime and silt must be cleaned up as soon as possible, to ensure that the SWS can continue to function as they have been designed. Monitoring should be undertaken by the onsite Environmental Control Officer (ECO) or maintenance manager. Inspections must be recorded and should include the following:

- Date of inspection;
- Rainfall amount received;
- Photographs of blockages, spills, silted up structures or breaches witnessed;
- What action was undertaken to fix issues, and the amount of time taken to address them; and
- Photographs post action taken.

Inspection reports should be kept ready and supplied to the DWS when requested, or as part of the WUL conditions.

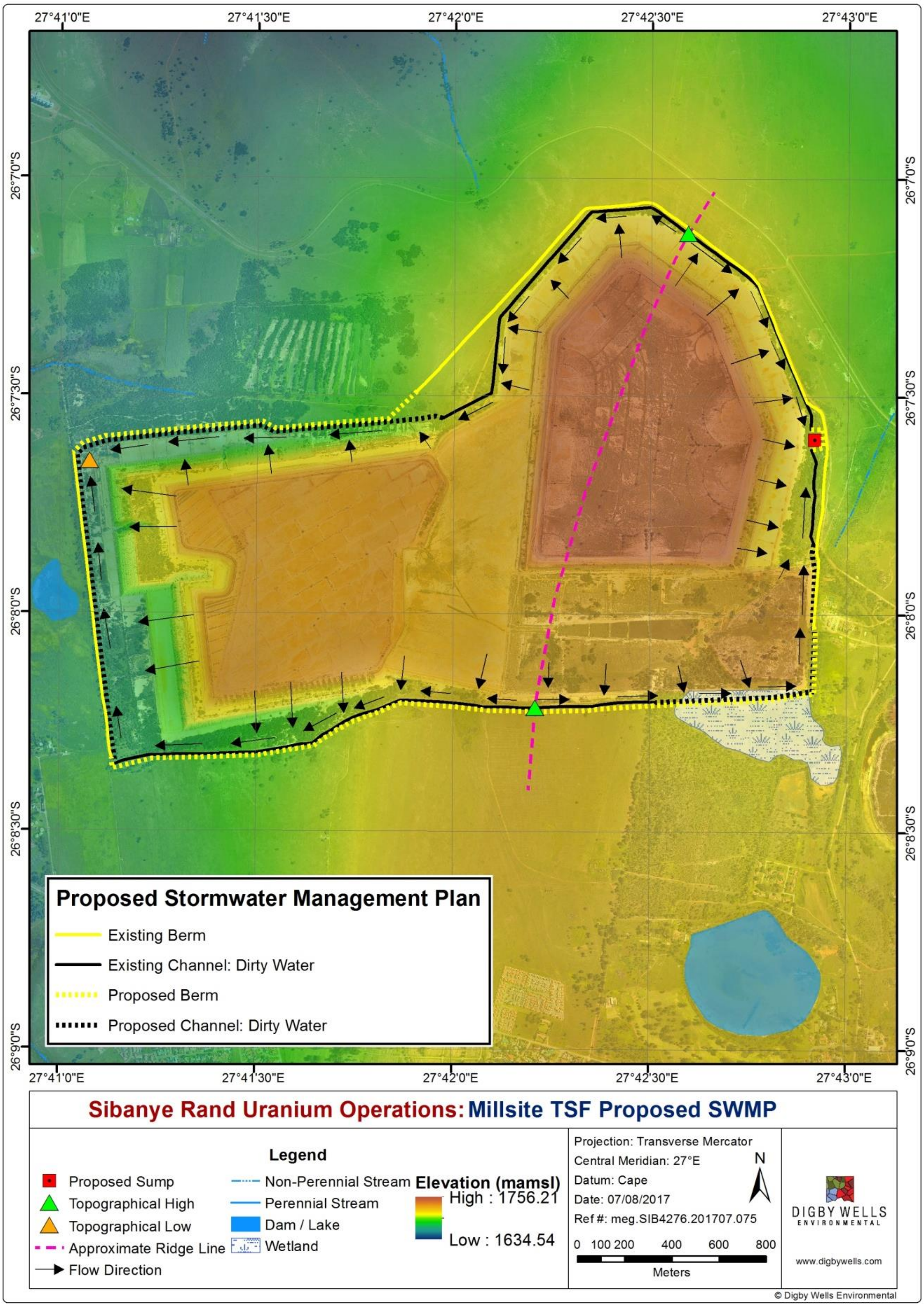

Figure 6-2: Proposed Millsite TSF Complex SWMP

6.1.2 Wetlands

Due to the extensive nature of the rehabilitation required in some areas, with special mention again of HGM Unit 4 and HGM Unit 5, the Wet-health and Wet-Ecoservices tools are to be used to re-evaluate PES and eco-services on an annual basis by a suitably qualified wetland specialist for at least 5 years after the decommissioning and closure of the proposed project during the summer/wet monitoring season. Thereafter, monitoring is recommended every two years until the system is deemed appropriately rehabilitated. If monitoring results necessitate corrective action in terms of alien vegetation removal and erosion control, these corrective measures should be implemented immediately.

The Environmental Management Officer (EMO) must be present on site during decommissioning and rehabilitation phases and must ensure that the wetland areas and their associated zones of regulation are clearly demarcated and that no unnecessary clearing of vegetation takes place.

6.1.3 Air Quality

Considerations for dust and PM_{10} monitoring are discussed below.

6.1.3.1 *Dust Monitoring*

The predicted dust deposition rates are well below the recommended standards, although it is advised that monitoring be commissioned to assess dust deposition rates in the vicinity of the proposed Millsite TSF Complex during reclamation. Although model prediction has shown potential impacts to be minimal, the unlikely event of “dust storm” episode cannot be ruled out as these events are common on the Witwatersrand.

Monitoring is mainly for compliance and management purposes, so that proactive measures can be in place to mitigate unforeseen episodes and effect a reduction in deposition rates. As reclamation progresses, the sources of emissions decreases over time and will eventually disappear.

6.1.3.2 *PM_{10} Monitoring*

The model predictions show that the areas where PM_{10} standards are exceeded are confined to the Millsite TSF Complex footprint (without mitigation measures in place). Predicted ground-level concentrations at the respective receptors are well below the daily and annual standards. As a result, it is not recommended that a compliance monitoring be initiated. If dust deposition rates show non-compliance, once-off monitoring can be conducted to ambient levels of this pollutant. If the latter is the case, data collected can be useful in management decision-making on the way forward.

6.1.4 Noise

Due to the negligible nature of the potential noise impact, it is not recommended that a noise monitoring programme be implemented from the onset. In the event of a complaint being received however, it is recommended to monitor the noise levels near the complainant.

6.1.5 Heritage

Due to the low potential for the exposure of, or damage to fossiliferous material, monitoring is not deemed necessary for this proposed Project.

6.2 Item 1(h): Monitoring and reporting frequency

Frequency of monitoring to be undertaken for the proposed operation and reporting thereof, if applicable, is discussed below.

6.2.1 Groundwater

Groundwater samples are collected on a monthly basis in the open pits for full chemical analysis while the Cooke and Millsite groundwater is sampled and analysed quarterly.

6.2.2 Surface Water

Water samples are collected on a monthly basis for a full chemical analysis while the water discharged into Cooke Shaft 1 and Cooke Shaft 2 into the Wonderfonteinspruit is sampled and analysed on a weekly basis.

6.2.3 Wetlands

PES and eco-services must be monitored on an annual basis by a suitably qualified wetland specialist for at least 5 years after the decommissioning and closure phase. Reporting to DWS is recommended on an annual basis after the PES and eco-services results are available.

6.2.4 Air Quality

Dust monitoring should be undertaken monthly for compliance and management purposes. Internal monthly reporting should be undertaken and this information can be provided during EMPr Performance Assessments to ensure compliance and reporting to DMR.

6.2.5 Noise

If Sibanye-Stillwater receives a noise complaint, monitoring can be conducted on an ad hoc basis. A report must be compiled after the monitoring has been carried out then submitted to management to ascertain compliance with the required regulations and standards.

6.2.6 Heritage

No monitoring will be undertaken for the reclamation of the Millsite TSF Complex.

6.3 Item 1(i): Responsible persons

Rand Uranium will be responsible for appointing the appropriate people from within the organisation as well as required subcontracted Specialists to undertake monitoring and reporting responsibilities. The Wetland Specialist has recommended an Specialist be appointed

6.4 Item 1(j): Time period for implementing impact management actions

Each mitigation measure must be implemented during the project phase as stipulated in Part B, Section 4.9. The monitoring programme as stipulated in Part B, Section 6.

6.5 Item 1(k): Mechanism for monitoring compliance

Monitoring results must be taken at the frequency indicated, and reported on internally. Quarterly and/or annual reports must also be submitted to the respective departments. External audits for the Water Use Licence and EMP must be conducted every second year and a report submitted to the respective departments.

7 Item 1(l): Indicate the frequency of the submission of the performance assessment report

An EMP Performance Assessment to be undertaken by an independent EAP must be submitted to the DMR every two years.

8 Item 1(m): Environmental Awareness Plan

The purpose of an Environmental Awareness Plan is to outline the methodology that will be used to inform the mine's employees of any environmental risks which may result from their work and the manner in which the risks must be dealt with in order to avoid pollution or the degradation of the environment. The awareness plan is primarily a tool to introduce and describe the requirements of the range of environmental and social plans to the construction and operational personnel.

Sibanye-Stillwater has a well-established internal and external communication strategy that was developed and successfully implemented. The environmental awareness plan forms a part of the communication strategy, together with other issues such as health, safety, operations, productions, etc. Ultimately, the Sibanye-Stillwater water management policies and practices ensure the promotion of water awareness and water stewardship through active participation and communication. Furthermore, the duty of care is exercises by providing local and professional communities with information, capacity building, technology assistance and related support services.

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

Various lines of communication are in place to ensure that environmental matters are addressed. These include but are not limited to meetings and toolbox talks for example. These forms of communication can also be extended to other forums if the need arises to address any concerns or reoccurring issues on the mine.

With respect to external communication, Sibanye-Stillwater is responsible for communicating information to I&APs, ensuring transparency and building good relationships with the communities surrounding its operations.

8.2 Item 1(m)(2): Manner in which risks will be dealt with in order to avoid pollution or the degradation of the environment

Sibanye-Stillwater has a number of policies that relate to the management of the environment which includes the sustainable and equitable relationship between the company, the environment and surrounding human communities. The relevant policy statements are publicly available and are summarised in Table 8-1.

Table 8-1: Summary of Key Policies related to the Environment

Policy	Purpose	Key Objectives
Water Management	Strive to ensure effective and integrated management of water resources and systems as a key component of its business strategy.	Achieve effective, innovative and caring water resources and water systems management.
Environmental	Strive to minimise or rectify adverse impacts and maximise positive impacts of an environmental or socio-economic nature.	Responsible stewardship of natural resources and the ecological environment for present and future generations.
Sustainable Development	Operate in a manner that represents a platform for responsible investment through the integration of sustainable development considerations into the decision-making process.	Balance of the company's requirements to perform financially, to strive toward world-class standards in environmental management and to ensure broad social benefit.
Material Stewardship	Strive to undertake its material stewardship and supply chain management activities in a manner	Ensure value added, cost effective and sustainable service delivery that enables our operations to

	that is sustainable and adheres to internationally recognised practices.	achieve their strategic growth and productivity objectives.
Community and Indigenous People	Develop mutually beneficial relationships with host communities and governments	Open engagement and active involvement in the support and development of the communities in which we operate.

9 Item 1(n): Specific information required by the Competent Authority

The requirements for the contents of a Regulation 31 Amendment Report, as stipulated in Regulation 32 of GN R 982 under the NEMA, have been provided herein.

Section 41 (1) of the MPRDA has been repealed and in terms of Section 24P of the NEMA, as amended, and the EIA Regulations thereunder, which provides that the holder of a Mining Right must set aside Financial Provision for rehabilitation of negative environmental impacts. The financial provision will be reviewed annually.

10 Item 2: Undertaking

The EAP herewith confirms:-

2(a) the correctness of the information provided in the reports

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

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

2(d) the acceptability of the project in relation to the finding of the assessment and level of mitigation proposed.

Appendix 1: Previous EMP Authorisations

Appendix 2: EAP CV

Appendix 3: Locality Map

Appendix 4: Infrastructure Layout Map

Appendix 5: Public Participation Documentation

Appendix 6: Groundwater Impact Assessment

Appendix 7: Surface Water Impact Assessment

Appendix 8: Wetland Impact Assessment

Appendix 9: Geochemical Analysis

Appendix 10: Air Quality Impact Assessment

Appendix 11: Noise Impact Assessment

Appendix 12: Heritage Impact Assessment