ENVIROROOTS

SURFACE WATER ASSESSMENT

FOR
THE PROPOSED TRANSALLOYS POWER GENERATION PROJECT
(120-150 MW NET CAPTIVE COAL-FIRED POWER PLANT)

DATE: FEBRUARY 2019

Transalloys

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PROJECT DETAILS:

PROJECT TITLE:	Surface Water Assessment for the proposed Transalloys Power Generation Project (120-150 MW Net Captive Coal-fired Power Plant), Mpumalanga Province

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SPECIALIST DECLARATION

I, Chantel Muller, declare that:

General declaration:

- I act as the independent specialist in this application;
- do not have and will not have any vested interest (either business, financial, personal or other) in the undertaking of the proposed activity, other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations, 2014;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I am aware that a person is guilty of an offence in terms of Regulation 48 (1) of the EIA Regulations, 2014, if that person provides incorrect or misleading information. A person who is convicted of an offence in terms of sub-regulation 48(1) (a)-(e) is liable to the penalties as contemplated in section 49B(1) of the National Environmental Management Act, 1998 (Act 107 of 1998).

Signature of the specialist

EnviroRoots (Pty) Ltd

Name of company (if applicable)

12 February 2019

Date

EXECUTIVE SUMMARY

Transalloys (Pty) Ltd ("Principal") is a producer of export grade Silico-manganese alloy, essential for the steelmaking industry. As an energy intensive electricity user, the Principal intends to build, operate and own a new coal-fired Power Plant associated with the Smelter with the aim to reduce to a minimum supply from the Eskom grid. The Smelter will be the single consumer of all electrical power generated by this new power plant. There is no intention to supply third parties or to supply power to the grid. However, a connection to the grid will be maintained in order to provide electricity supply for power plant start up, during care and maintenance, as well as emergency shut down periods, and to provide the Smelter's excess demand. The project will be developed and built on existing property associated with the Smelter and owned by the Principal in Mpumalanga province, 14 km west of eMalahleni and directly north of Clewer, South Africa.

The Principal's objective is to build and operate a state of the art coal-fired power plant meeting world best practice criteria including an emphasis on excellence in Health, Safety and Environmental (HSE) performance.

The project area is located on the Farms Elandsfontein 309 JS and Schoongezicht 308 JS within the jurisdiction of the Emalahleni Local Municipality (MP312) and the Nkangala District Municipality (DC31). Surrounding land uses include the Evraz Highveld Steel and Vanadium industrial complex to the west, Clewer Town and mining operations to the south as well as mining operations to the east, and the Kwa Guqa settlement to the north. Mining, Industrial and Residential land uses dominate the area however, some agricultural crop farming is evident. The historical industrial, mining and residential nature of the greater study area has significantly impacted on the Brugspruit and unnamed tributary transecting the Transalloys property as well as other drainage features within the region.

The primary surface water impacts associated with the proposed Transalloys Power Generation Project are the potential impacts on the regional water balance, water quality degradation due to incidental waste and wastewater discharges, contaminated storm water runoff and subsequent degradation of wetlands and/or drainage lines.

In terms of findings related to the overall surface water environment relevant to the study site, the following conclusions are made:

- The surface water study area falls within the B11K Quaternary Catchment of the Olifants WMA.
- The identified water resources, within close proximity to the project site include the Brugspruit to the east of the project site and an unnamed western tributary of the Brugspruit found to the north-west of the proposed ash dump site.

- These tributaries drain in a northern direction to join the Klipsruit where it further flows in a north eastern direction to ultimately confluence with the Olifants River.
- *In situ* water quality variables taken during all three sampling years (2012, 2014 and 2019) have remained within **unacceptable** limits compared to the Target Water Quality Ranges (TWQRs) for aquatic ecosystems of South Africa.
- The overall Ecological Category of the surface water study area was determined to fall within a Class E Category, indicating a seriously modified system.
- All sites were furthermore found to be **low sensitive** (EIS), due to the extensive anthropogenic activities.
- As per the National Freshwater Ecosystem Priority Areas (NFEPA) Atlas (Nel, *et.al.*, 2011) the water use activities at the Transalloys study site is located within a Low Priority Area. The Brugspruit and its unnamed tributary transecting the Transalloys property is therefore not considered important or sensitive in terms of aquatic ecosystems contribution.
- As indicated by Mucina and Rutherford (2006) the Transalloys Smelter and proposed power generation project area is situated within the Eastern Highveld Grassland Vegetation Unit (Gm12). This Vegetation Unit is listed as Vulnerable in terms of the national list of ecosystems that are threatened and in need of protection (GN 1002 of 09 December 2011).
- As indicated by the MBSP Freshwater Assessment (2011), the proposed Ash Dump Site (Site 1) is situated within an already heavily modified terrain, whereas the proposed Power Plant Site (Site 2) is situated within an area classified as "other natural areas". However, no Freshwater CBAs or ESAs are found within the immediate vicinity of the study site.
- The overall results for the wetland delineation and assessment in accordance with the Department of Water and Sanitation (DWS) requirements concluded that:
    - Three wetland areas were delineated within a 500 m buffer surrounding the Transalloys boundary and associated infrastructure.
    - The wetlands were classified into three hydrogeomorphic (HGM) units, comprising of one seepage wetland (HGM1) and two channelled valley bottom wetlands (HGM 2 and HGM 3).
    - A wetland health assessment concluded the seep wetland to be **largely modified (Category D)** and the two valley bottom wetlands to be **moderately modified (Category C)**.
    - The Ecological Sensitivity and Importance of the wetlands has generally been recorded as **low** as a result of the provision of natural resources and the maintenance of biodiversity that many of these wetlands provide.
    - The Ecological Services of the wetlands has generally been recorded as **intermediate**.
- The calculated results indicate that a 110 m buffer is appropriate for the protection of the ecosystem services provided by the wetland systems

The overall impact on the surrounding surface water environment could be seen as significant without the appropriate mitigation measures in place. However, with the implementation of mitigation management measures the impact of the power plant on the surface water environment is ranked as Moderate to Low.

Considering that adequate hydrologic data had been gathered through specialist investigations coupled with the fact that ongoing data collection could fill the knowledge gaps, the Transalloys Power Generation Project would be in a position to implement an integrated water management plan with the main objective of reducing water resource and environmental degradation.

The Environmental Management Programme (EMP) and the Integrated Water and Waste Management Plan (IWWMP) for the proposed project should address good waste management practices, guidelines for the storage, handling, use and disposal of waste, etc. It is important that the project aim to limit impacts on the aquatic resources as far as possible in order to not only maintain its current basic ecosystem functions but strive to improve it.

All mitigation measures that were provided within this report should be implemented and included in the relevant management plans.

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LIST OF ABBREVIATIONS

ACC	Air Cooling Condenser
APCV	Annual Precipitation Coefficient of Variation
BFS	Bankable Feasibility Study
CAPEX	Capital Expenditures
CBA	Critical Biodiversity Area
CFB	Circulating Fluidised Bed
CMA	Catchment Management Agency
DCS	Distribution Controlled System
DO	Dissolved Oxygen
DWA	Department of Water Affairs (previously)
DWAF	Department of Water Affairs and Forestry (previously)
DWS	Department of Water and Sanitation (current)
EAP	Environmental Assessment Practitioner
EC	Electrical Conductivity
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
EMP	Environmental Management Programme
EPC	Engineering Procurement and Construction
ESA	Ecological Support Area
EWR	Ecological Water Requirement
FRAI	Fish Response Assessment Index
GN	Government Notice
HGM	Hydrogeomorphic
HSE	Health, Safety and Environmental
I/O	Input and Output Signals
IHIA	Intermediate Habitat Integrity Assessment
IUA	Integrated Units of Analyses
MAP	Mean Annual Precipitation
MA(P)E	Mean Annual (Potential) Evaporation
(N)MAR	(Natural) Mean Annual Runoff
MASMS	Mean Annual Soil Moisture Stress
MAT	Mean Annual Temperature
MBCP	Mpumalanga Biodiversity Conservation Plan
MBSP	Mpumalanga Biodiversity Sector Plan
MFD	Mean Frost Days
MIRAI	Macro-Invertebrate Assessment Index
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
NEMWA	National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)
NFDS	National Framework for Sustainable Development
NFEPA	National Freshwater Ecosystem Priority Areas
NWA	National Water Act, 1998 (Act No. 36 of 1998)
NWRS	National Water Resources Strategy
PES	Present Ecological State
PLC	Programmable Logic Controller
REC	Recommended Ecological Category
RQO	Resource Quality Objectives
RU	Resource Unit

SANBI	South African National Biodiversity Institute
SASS5	South African Scoring System V.5
SR	Significance Rating
TWQR	Target Water Quality Range
VEGRAI	Riparian Vegetation Assessment Index
WM	With Mitigation
WMA	Water Management Area
WOM	Without Mitigation
WR(C)	Water Research (Commission)
WUL	Water Use License

UNITS OF MEASURE

%	Percentage
ºC	Degrees Celsius
km	Kilometres
m	Metres
m^3/a	Cubic Metres per annum
mcm	Million Cubic Metres
mg/l	Milligram per litre
ml	Millilitres
mm	Millimetres
mS/m	Millisiemens per metre
MW	Megawatt
µS/cm	Microsiemens per centimetre

1 INTRODUCTION

1.1 LOCALITY AND BACKGROUND

Transalloys (Pty) Ltd ("Principal") is a producer of export grade Silico-manganese alloy, essential for the steelmaking industry. The company is wholly owned by Renova Group ("Renova"), a Russian based widely-diversified conglomerate with interests in mining and mineral resources beneficiation. For more information about Renova please visit http://www.renova.ru/en/.

The production capacity of the Transalloys smelter complex ("Smelter") is over 180,000 tons of Silico-manganese alloy per annum. Alloys are produced by 5 submerged arc furnaces of between 14 and 28 MW, with a total electrical power demand of 100 MW by furnaces only, excluding auxiliaries.

As an energy intensive electricity user, the Principal intends to build, operate and own a new coal-fired Power Plant associated with the Smelter with the aim to reduce to a minimum supply from the Eskom grid. The Smelter will be the single consumer of all electrical power generated by this new power plant. There is no intention to supply third parties or to supply power to the grid. However, a connection to the grid will be maintained in order to provide electricity supply for power plant start up, during care and maintenance, as well as emergency shut down periods, and to provide the Smelter's excess demand. The project will be developed and built on existing property associated with the Smelter and owned by the Principal in Mpumalanga province, 14 km west of eMalahleni and directly north of Clewer, South Africa (see **Figure 1-1** below).

The Principal's objective is to build and operate a state of the art coal-fired power plant meeting world best practice criteria including an emphasis on excellence in Health, Safety and Environmental (HSE) performance. A small Owner's Team will direct and provide support to the EPC Contractor through its own involvement in the implementation of the project, as well as by virtue of the appointment of the Owner's Engineer.

Savannah Environmental (Pty) Ltd as the Project Managers for the proposed Transalloys coal fired Power Plant, has appointed EnviroRoots (Pty) Ltd, as independent environmental specialists, to conduct a surface water assessment for the impacts associated with the proposed development.

1.2 SITE DESCRIPTION

The project area is located on the Farms Elandsfontein 309 JS and Schoongezicht 308 JS within the jurisdiction of the Emalahleni Local Municipality (MP312) and the Nkangala District Municipality (DC31). The power generation facility site is approximately 46 hectares and is owned by the Principal. The site slopes slightly from the southwest corner to the northeast corner down to the perennial stream. The Ash Dispoal Facility site is aproximately 38 hectares and is owned by the Principal. It slopes from east

to west down to the perennial stream. The Power Generation Facility site is currently used as agricultural land with portions of the Ash Disposal Facility site used for ponds as part of the Smelter. The Power Generation Facility and Ash Disposal Facility sites were selected initially for a 150 MW CFB boiler power plant and therefore the Contractor has to verify and reconsider, if required, sites selection for the proposed smaller scale power plant within the boundaries of the Principal's entire site.

Various roads in the vicinity of Transalloys provide sufficient access to the project site. Major roads include the R547, R555 and N12 east of the project site as well as the R104 and the N4 to the north. A railway line runs along the south-western border and around the southern border of the Transalloys infrastructures area. Surrounding land uses include the Evraz Highveld Steel and Vanadium industrial complex to the west, Clewer Town and mining operations to the south as well as mining operations to the east, and the Kwa Guqa settlement to the north. Mining, Industrial and Residential land uses dominate the area however, some agricultural crop farming is evident. The historical industrial, mining and residential nature of the greater study area has significantly impacted on the Brugspruit and unnamed tributary transecting the Transalloys property as well as other drainage features within the region.

1.3 PURPOSE OF THE STUDY

The purpose of the Surface Water Assessment is to define the water resources in its associated drainage area and to evaluate the potential surface water impacts at the different sites related to the proposed development and its associated infrastructure. This is done to identify fatal flaws related to surface water impacts, and to identify potential sources of surface water contamination. The surface water assessment also aims to characterise the existing surface water environment for it to be used as a benchmark against which future surface water impacts could be measured.

1.4 APPROACH TO THE STUDY

EnviroRoots (Pty) Ltd, as independent specialists, undertook to facilitate the compilation of a Surface Water Assessment Report for the proposed Transalloys Power Generation Project by piloting the following approach and methodology.

An extensive desktop study was conducted for the area by making use of the following main databases (amongst others):

- The Water Resources (WR2012) database;
- The SANBI (South African National Biodiversity Institute) National Freshwater Ecosystem Priority Areas Atlas and online database (Nel, *et. al.*, 2011);
- Google Earth™ Satellite Imagery.

Supplementary to the desktop study, a field investigation was conducted to determine the current situation of surface water resources transecting the property. The field investigation was conducted on the 17 January 2019. Furthermore, the Surface Water Assessment (MENCO, 2014) previously conducted for the site was also investigated and utilised where information was still relevant.

1.5 ASSUMPTIONS AND LIMITATIONS

The hydrology section of the Environmental Impact Assessment (EIA) Process generally consist of the following five main aspects:

- Surface Water Assessment;
- Aquatic Ecologic Assessment;
- Wetland Delineation and Functional Assessment;
- Flood Line Determination; and
- Storm Water Management Reports.

This Report summarises the Surface Water, Aquatic Ecological and Wetland aspects of the study site. Flood Line Determinations and Storm Water Management have been excluded as these should be conducted by qualified engineers in their respective fields.

Regarding this study, it should be noted that, while every care is taken to ensure that the data presented is qualitatively adequate, inevitably conditions are never of such a nature that the data is entirely satisfactory. To conduct a comprehensive, completely factually based surface water study, requires an extensive amount of time over different seasons. Unfortunately, such comprehensive studies are generally limited by budget constraints and most importantly by time constraints subject to submission of EIA Applications.

It should further be noted that the findings of this study were largely based on a single site visit within which to identify indicators. Visibility of indicators vary throughout seasons and it is therefore noted that, if in future, any further indicators are found on site, the author cannot be held liable for conclusions deducted in good faith based on the available resources and information provided at the time of the study. Furthermore, this study, only outlines the surface water environment directly related to the properties on which development will take place and does not include drainage lines outside of this scope. It is important that this report be viewed and acted upon with these limitations in mind.

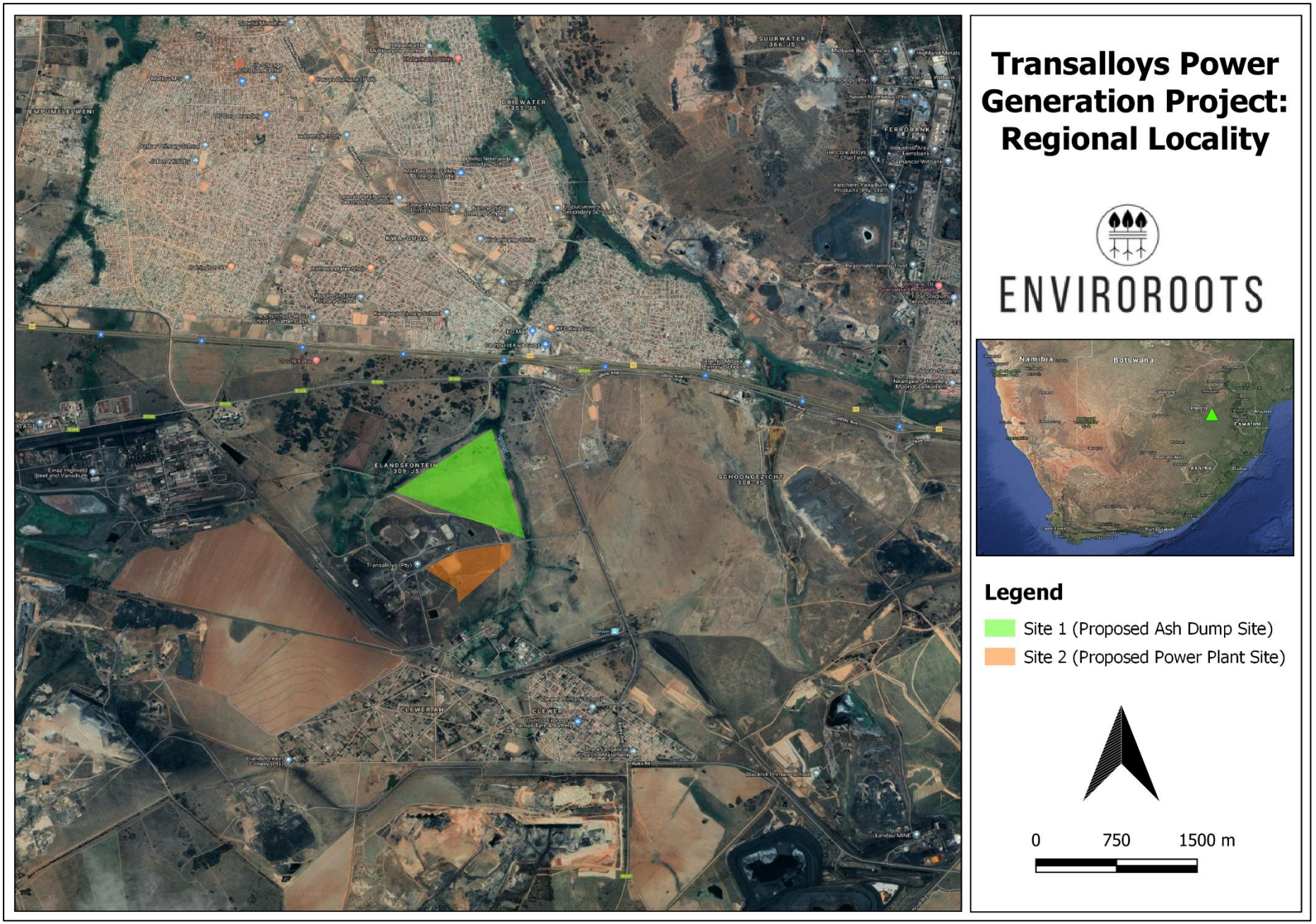

Figure 1-1: Regional locality of the surface water study area

2 DESCRIPTION OF THE PROPOSED PROJECT

Information in this section was derived from the 2016 Request for Proposals Document as provided by the Environmental Assessment Practitioner (EAP), Savannah Environmental (Pty) Ltd.

2.1 PROJECT HISTORY

Transalloys is an energy intensive user. The recent above inflation increases in the South African electricity tariffs had a negative impact on profitability and were identified as one of the major risk factors for future sustainability and possible expansion of the business. Therefore in 2013 Transalloys decided to investigate the option of "own generation" through a captive thermal power plant to supply total current demand and potential future expansion.

A high level Desktop Study of the Proposed Captive Coal Fired Power Station was completed by EME Group for the Principal in August 2013. The study determined that substantial quantities of low grade waste coal were available from nearby collieries. It was therefore proposed that the power generation facility would utilize the CFB boiler technology. Additionally, it was determined that the preferable power plant configuration would be a 1x150 MW industry standard unit.

Later in 2013 the Principal commenced with a Bankable Feasibility Study (BFS) development for the 150 MW CFB boiler power plant. The BFS was terminated in 2014 predominantly due to the high CAPEX estimate for that scale of the power plant.

Notwithstanding the termination of the BFS, an Environmental Impact Assessment (EIA) for 150 MW Circulating Fluidized Bed (CFB) boiler Power Plant was completed and an application for an Integrated Environmental Authorisation was submitted to the South African environmental authorities for consideration and approval. The Integrated Environmental Authorisation was granted to Transalloys in March 2016 for the costruction of a coal-fired power plant. Due to the fact that the project concept has been changed from the 2014 project parameters, the current authorisation will require appropriate amendment through a routine short-term application process, subject to the finally selected power plant configuration.

2.2 BRIEF PROJECT DESCRIPTION

The following paragraphs contain a general description of the major features of the Power Plant currently under consideration. The project site is located in one of the major South African coal fields with numerous collieries surrounding the Project. Therefore the use of waste and discard coal abundant in the area, as well as use of saleable quality Run of Mine coal, shall be investigated. The coal characteristics vary significantly based on the source and type. The Principal is conducting a coal availability and sourcing study and additional information will be provided by the Principal for the BFS

development. Different types of boiler technologies shall be evaluated and final selection of most cost and performance effective boiler technology has to be motivated in the BFS. Coal will be delivered to the Power Station's on-site storage area by means of trucks. The storage area and coal feeding system will be appropriately designed according to the relevant Battery Limits.

The Project shall meet as a minimum the Republic of South Africa's emissions limits, as well as emission limits and requirements of the EIA document. Therefore, limestone would be required for sulfur dioxide (SO_2) control in case of CFB boiler, or as the sorbent for offgas filters, or for use with other technical solutions. Limestone delivery options either by railroad or by trucks shall be evaluated. The limestone storage and feeding system will be appropriately designed according to the relevant Battery Limits. Similarly, technical solution for the particulate emission control.

Because water availability at the site is limited, a closed cycle dry Air Cooled Condenser (ACC) needs to be utilized for the steam cycle heat rejection. Ambient temperature, wind direction and topography proved to be challenging for similar installations in similar projects in South Africa. The specification and design of units will be scrutinised for incorporation of local lessons learnt. The Principal's current capability to supply raw water for power cycle make-up, fire water, portable water, service water, and water for other plant uses through the existing pipeline connected to the Smelter will be verified and confirmed. If current supply capacity is not sufficient the Prinsipal shall be responsible for water supply expansion. The water connection from the Smelter's pipeline to the power plant shall be designed accordingly.

Start-up power for the power plant will be sourced from the Eskom grid. In the periods of peak consumption, when the Smelter's consumption exceeds power plant generation capacity, or during maintanance, the technical capability of sourcing of balance power from the Eskom's grid shall be available in addition to own generation supply. The power plant connection to the Smelter shall be appropriately designed and must be compliant to the requirement of balance power sourcing from Eskom's grid. The power plant Control and Monitoring systems shall be implemented in the logic programming and I/O hardware of the equipment's associated Distributed Control System (DCS), Programmable Logic Controller (PLC) or proprietary Contractor's control system.

A landfill for disposal of ash is expected to be developed as a common area close to the Power Generation Facility site boundary inclusive of all equipment and/or material handling and managing of the landfill. A fire protection system shall be furnished and include both automatic and manual features to provide alarm, detection, and suppression capability for the entire power plant facility, compliant to South African building code requirements. The Principal anticipates proposed plant operating life cycle to be not less than 20 years.

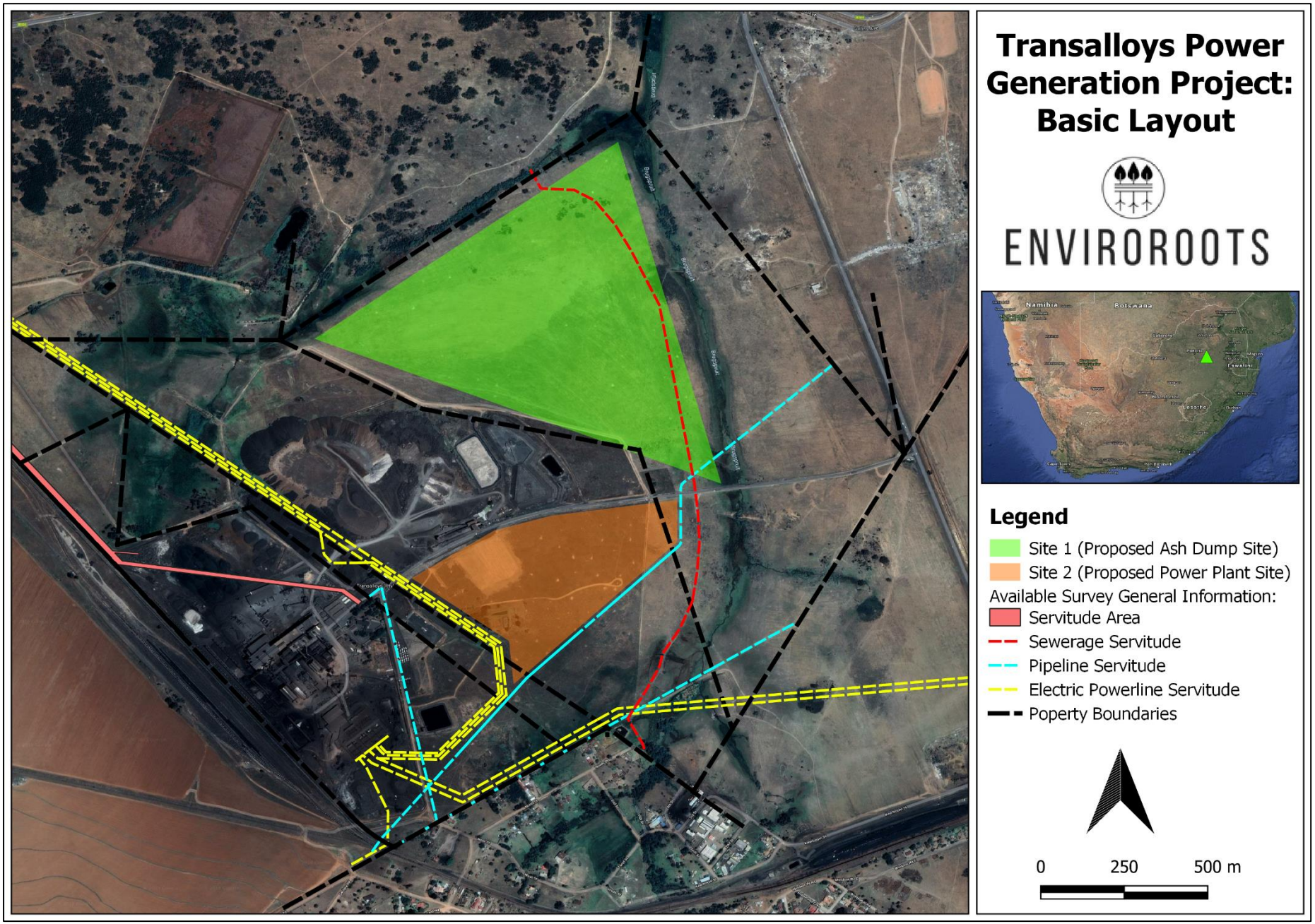

Figure 2-1: Basic site layout of the project area (existing Transalloys Smelter and proposed new Power Plant and Ash Dump localities)

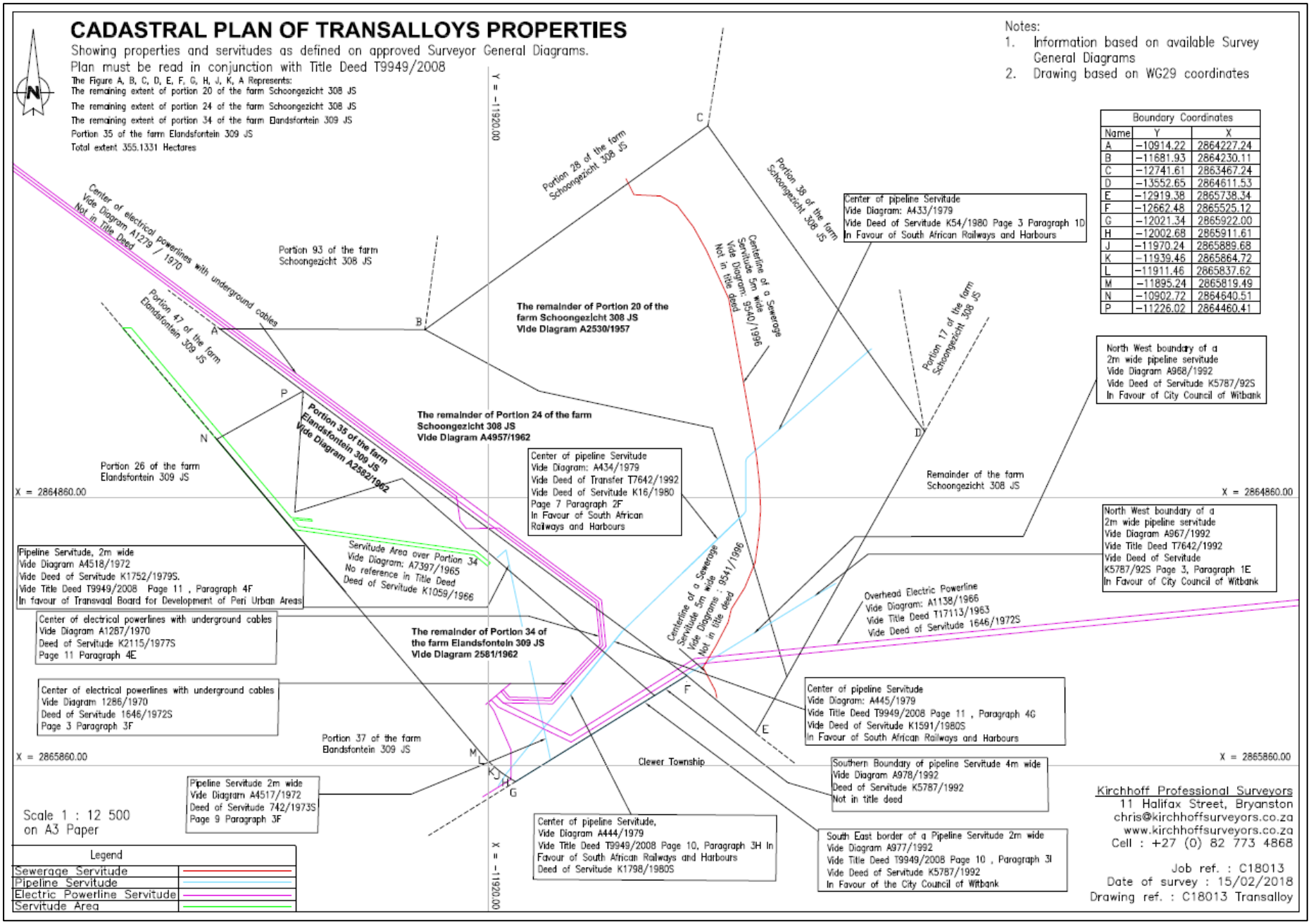

Figure 2-2: Cadastral Plan of Transalloys Properties

3 LEGAL ASSESSMENT

The conservation and wise use of water and aquatic ecosystems (including biological and physical properties) is recognised in South Africa at a National and Provincial level. Several pieces of legislation and policies have been put in place to ensure the protection of South Africa's water resources. The most relevant pertaining to this study has been summarised in **Table 3-1** below.

Table 3-1: Relevant Legislation/Guidelines pertaining to Surface Water in SA and Mpumalanga

Level	Legislation	Description
National	South African Constitution 108 of 1996	The Constitution is the supreme law of the land and includes the Bill of rights which is the cornerstone of democracy in South Africa and enshrines the rights of people in the country. It includes the right to an environment which is not harmful to human health or well-being and to have the environment protected for the benefit of present and future generations through reasonable legislative and other measures.
National	Strategic Framework for Sustainable Development in South Africa	The development of a broad framework for sustainable development was initiated to provide an overarching and guiding National Sustainable Development Strategy. The National Framework for Sustainable Development (NFSD) in South Africa (2008) is a goal orientated policy framework aimed at meeting the Millennium Development Goals. Aquatic ecosystems have been identified as one of the key crosscutting trends in the NFSD. The NFSD proposes that interventions and actions are undertaken in respect of improving aquatic ecosystems, water availability and water quality. This requires, amongst other things improved land management throughout catchments so that it does not compromise the integrity of rivers and wetlands.
National	National Environmental Management Act (NEMA), 1998 (Act No. 107 of 1998)	This is a fundamentally important piece of legislation and effectively promotes sustainable development and entrenches principles such as the 'precautionary approach', 'polluter pays' principle, and requires responsibility for impacts to be taken throughout the

Level	Legislation	Description
		life cycle of a project NEMA provides the legislative backing (Including Impact Assessment Regulations) for regulating development and ensuring that a risk-averse and cautious approach is taken when making decisions about activities.
National	Environmental Impact Assessment (EIA) regulations	Amendments to the regulations have been promulgated and were published on 07 April 2017 in Government Notice (GN) No. 326. In addition, Listing Notices 1-3 (GN 324, 325 and 327 of 07 April 2017) lists activities which are subject to an Environmental Authorisation. Development and land use activities which require Environmental Authorisation in terms of the NEMA EIA Regulations, 2014 (as amended), are in Listing Notice 3 identified via geographic areas with the intention being that activities require Environmental Authorisation when located within designated sensitive areas. These sensitive/geographic areas were identified and published for each of the nine (9) Provinces. In Mpumalanga Province the Critical Biodiversity Areas (CBAs) is one of the sensitive layers against which several activities are listed, and which would require environmental authorisation if the project falls within the CBA identified areas.
National	National Environmental Management: Waste Act (NEMWA), 2008 (Act No. 59 of 2008)	The National Environmental Management Waste Act, Act 59 of 2008 (NEMWA) came into effect on 1 July 2009 and aims to reform the law regulating waste management to protect health and the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development.
National	Listed Waste Activities	The regulations pertaining to the NEMWA activities were published on 29 November 2013 in Government Gazette 37083 under GN 921, as amended by GN 332 of 2 May 2014. These notices lists waste management activities in respect of which a waste management license is required in accordance with section 20(b) of

Level	Legislation	Description
		the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008).
National	National Water Act (NWA), 1998 (Act No. 36 of 1998)	The National Water Act, 1998 (Act No. 36 of 1998) aims to manage the national water resources to achieve sustainable use of water for the benefit of all water users. This requires that the quality of water resources is protected and also requires integration of the management of water resources with the delegation of powers to institutions at the regional or catchment level. The purpose of the Act is to ensure that the nation's water resources are protected, used, developed, conserved, managed and controlled in ways, which take into account: ▪ Meeting the basic human needs of present and future generation ▪ Promoting equitable access to water ▪ Redressing the results of past racial discrimination ▪ Promoting the efficient, sustainable and beneficial use of water in the public interest ▪ Facilitating social and economic development ▪ Providing for the growing demand of water use ▪ Protecting aquatic and associated ecosystems and their biological diversity ▪ Reducing and preventing pollution and degradation of water resources ▪ Meeting international obligations ▪ Promoting dam safety; and ▪ Managing floods and droughts. The above is regulated by the following: ▪ Government Gazette No. 40713 of 24 March 2017: No. R.267: Regulations regarding the Procedural Requirements for Water Use License Applications and Appeals.

Level	Legislation	Description
		▪ Government Gazette No. 40229 of 26 August 2016: No. 509: General authorisation in terms of Section 39 of the National Water Act, 1998 (Act No. 36 of 1998) for Water Uses as defined in Section 21(c) or Section 21(i). ▪ Government Gazette No. 40243 of 2 September 2016: No.538: Revision of General Authorisation for the Taking and Storing of Water (Section 21(a) and Section 21(b)). ▪ Government Gazette No. 36820 of 6 September 2013: No. 665: Revision of General Authorisations in terms of Section 39 of the National Water Act, 1998 (Act No. 36 of 1998), (Sections 21(e)(f)(g)(h) and (j)).
National	National Water Resources Strategy (2nd Ed., 2013)	The purpose of this second edition of the National Water Resource Strategy (NWRS) is to ensure that national water resources are managed towards achieving South Africa's growth, development and socio-economic priorities in an equitable and sustainable manner. The NWRS is the legal instrument for implementing or operation alising the National Water Act (Act 36 of 1998) and it is thus binding on all authorities and institutions implementing the Act. It is the primary mechanism to manage water across all sectors towards achieving national government's development objectives.
National	National Environmental Management: Biodiversity Act (NEMBA), 2004 (Act No. 10 of 2004)	The Biodiversity Act provides for the management and conservation of South Africa's biodiversity within the framework of the National Environmental Management Act. The intention of this Act is to protect species and ecosystems and promote the sustainable use of indigenous biological resources. It addresses aspects such as protection of threatened ecosystems and imposes a duty of care relating to listed alien invasive species. The South African National Biodiversity

Level	Legislation	Description
		Institute is established by this Act and is responsible for coordinating and implementing programs.
National	National Heritage Resources Act, 1999 (Act No. 25 of 1999)	This legislation aims to promote good management of the national heritage resources, and to enable and encourage communities to nurture and conserve their legacy so that it may be bestowed to future generations.
Provincial	Mpumalanga Biodiversity Conservation Plan (MBCP)	The MBCP takes its mandate from the South African Constitution, the National Biodiversity Act, 2010 (Act No. 10 of 2004) and the Mpumalanga Tourism and Parks Agency Act, 1998 (Act No. 10 of 1998). These and other statutes require the state to provide for a conserved and healthy environment that supports sustainable development and is safe and healthy for all citizens. The MBCP builds on these national plans at the provincial level in Mpumalanga. It is intended to be used by all who are involved in land-use and development planning, most particularly those specialists who need a comprehensive source of biodiversity information.

4 SURFACE WATER ENVIRONMENT

This section provides an overview of the baseline surface water environment of the specific activities. Emphasis is placed on the description of the water resources. It is the responsibility of the Department to inform the proponent regarding the current and future management class of the relevant water resource and the applicable Reserve Determination. The applicable Receiving Water Quality Objectives will also be provided by the Department. The determination of the Present Ecological Status (PES) and Ecological Importance and Sensitivity (EIS) will assist in the determination of management measures required to be implemented by the water user in the specific catchment.

4.1 CLIMATE, RAINFALL AND EVAPORATION

As indicated by Mucina and Rutherford (2006) the Transalloys Smelter and proposed power generation project area is situated within the Eastern Highveld Grassland Vegetation Unit (Gm12). **Figure 4-1** below indicates typical climate conditions associated with this Vegetation Unit. Blue bars show the median monthly precipitation whereas the upper and lower red lines show the mean daily maximum and minimum temperature respectively. The information in this graph strongly corresponds with monthly climate data for Emalahleni Town provided by the Climate-Data.org webpage (refer to **Figure 4-2**).

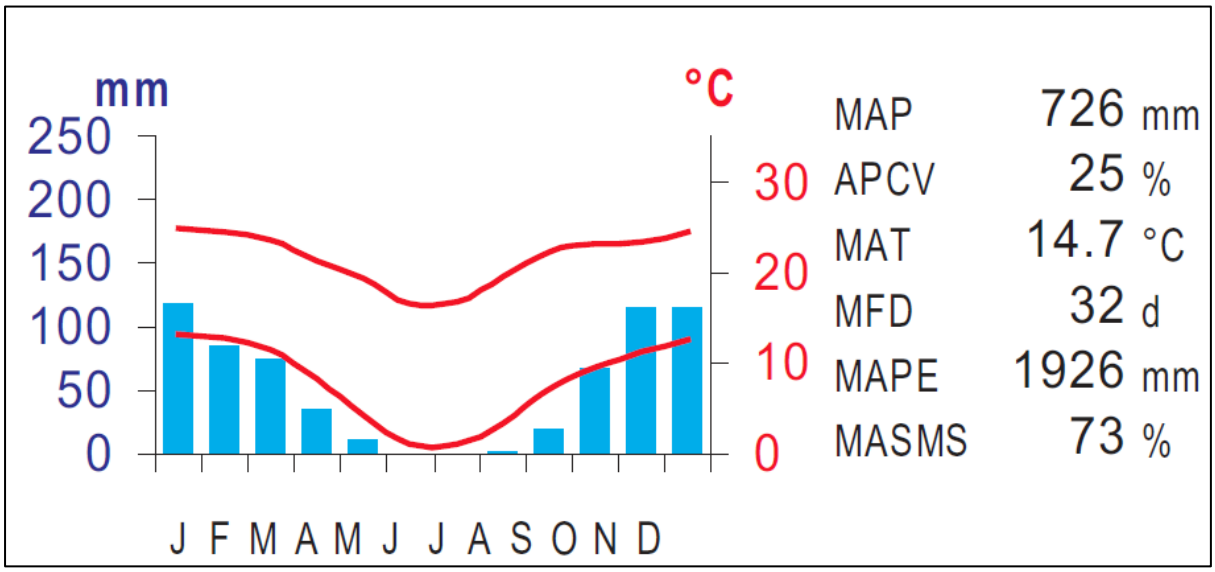

Figure 4-1: Climate diagram for the Eastern Highveld Grassland (Gm12) Vegetation Unit (Mucina and Rutherford, 2006)

The area around Emalahleni, Mpumalanga, enjoys a typical Highveld climate with warm summers and dry, cold winters. The study area clearly falls within the summer rainfall region, with precipitation mainly concentrated between October and April. Mean Annual Precipitation (MAP) ranges from 650-750 mm with Temperature averaging at around 20.1ºC in January and 8.7ºC in June.

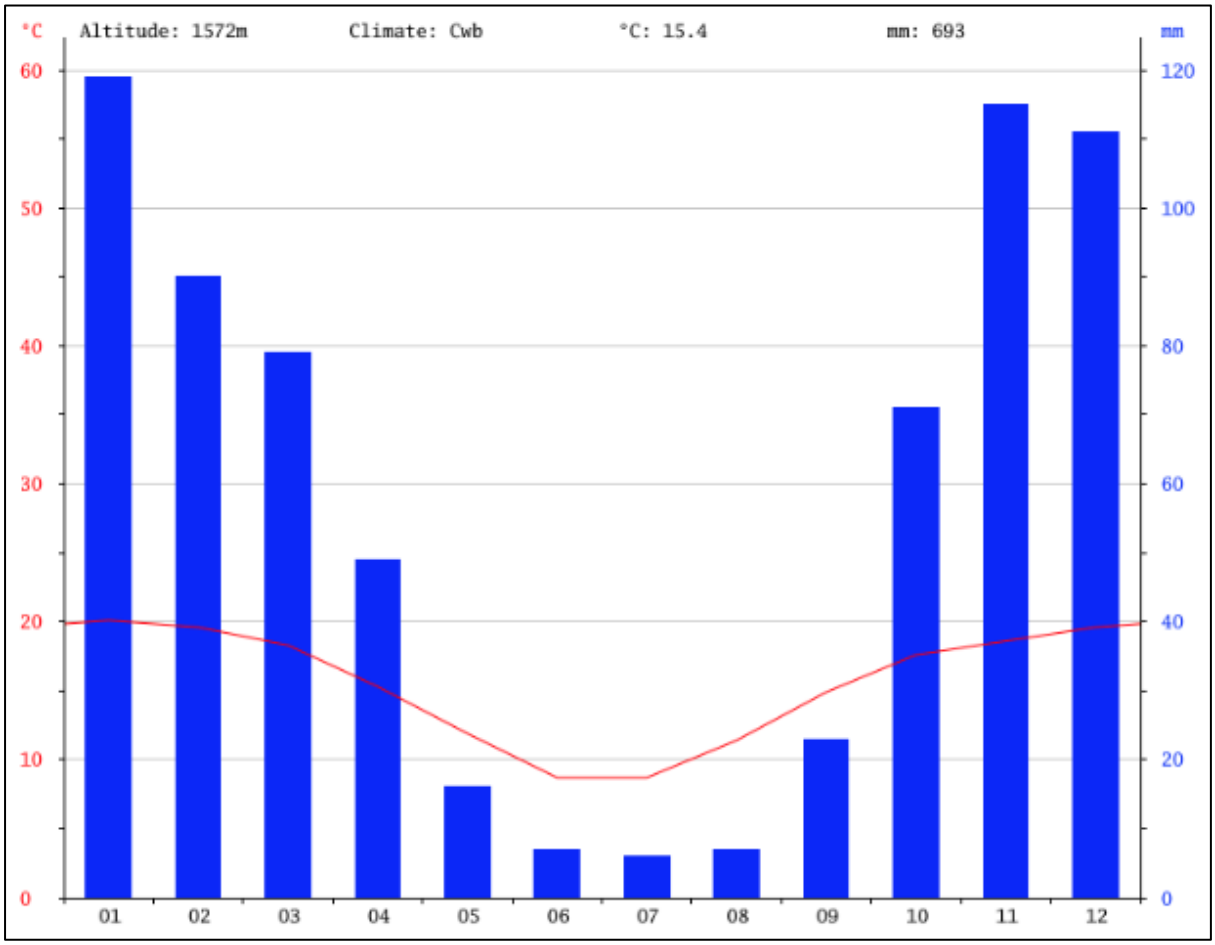

Figure 4-2: Climate diagram for Emalahleni (https://en.climate-data.org/africa/south-africa/mpumalanga/emalahleni-641/)

Table 4-1: Emalahleni avg. weather by month (https://en.climate-data.org/africa/south-africa/mpumalanga/emalahleni-641/)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg. Temp (°C)	20.1	19.6	18.3	15.3	11.9	8.7	8.7	11.4	14.9	17.6	18.6	19.6
Min. Temp (°C)	13.6	13.2	11.5	7.8	3.4	-0.3	-0.4	2.1	6.2	10.0	11.8	13.1
Max. Temp (°C)	26.6	26.1	25.2	22.9	20.4	17.8	17.8	20.7	23.7	25.3	25.4	26.2
Rainfall (mm)	119	90	79	49	16	7	6	7	23	71	115	111

Mean Annual Potential Evaporation (MAPE) for the Eastern Highveld Grassland Vegetation Unit is indicated as 1926 mm by Mucina and Rutherford (2006). Locally, evaporation for the B11K Quaternary Catchment falls below the average for the Vegetation Unit. Rainfall and Evaporation (S-pan) information for the relevant Quaternary Catchments as acquired from WR2012 is indicated in **Table 4-2** below.

Table 4-2: Quaternary Catchment Rainfall and Evaporation (WR2012)

Quaternary Catchment	S-Pan Evaporation		Rainfall	
	Evap. Zone	MAE (mm)	Rainfall Zone	MAP (mm)
B11K	4A	1700	B1C	684

4.2 WATER MANAGEMENT AREA

During 2012 the Department of Water and Sanitation (DWS) (previously the Department of Water Affairs) proposed to consolidate the original nineteen Water Management Areas (WMAs) into only nine based on the availability and allocation of funding, capacity, skills and expertise for the establishment of Catchment Management Agencies (CMAs). On 16 September 2016 the new nine WMAs were published under Government Notice No. 1056. The surface water study area falls within the boundaries of the Olifants Water Management Area (DWS, 2016a). The newly promulgated Olifants Water Management Area (WMA), as defined by the National Water Resources Strategy (NWRS) 2nd Edition (DWA, 2013), comprises the original Olifants WMA, together with the Letaba River System (previously part of the Luvuvhu/Letaba WMA). A full description of the Olifants WMA boundaries is provided in GN No. 1056. Major rivers within the WMA include the Elands, Wilge, Steelpoort, Olifants and Letaba Rivers. As per the NWRS 2nd Edition, the Olifants WMA is a highly stressed WMA, fast growing in terms of population and need for improved services. There is very little opportunity for further water resource development and no realistic opportunity to import significant volumes of additional water from elsewhere. **Figure 4-3** gives an indication of the relevant Catchment boundaries.

4.3 SURFACE WATER HYDROLOGY

As indicated in **Figure 4-3** the surface water study area falls within the B11K Quaternary Catchment of the Olifants WMA. The identified water resources, within close proximity to the project site include the Brugspruit to the east of the project site and an unnamed western tributary of the Brugspruit found to the north-west of the proposed ash dump site. These tributaries drain in a northern direction to join the Klipsruit where it further flows in a north eastern direction to ultimately confluence with the Olifants River. **Figure 4-4** provides an indication of the surface water features relevant to the study area whereas **Table 4-3** outlines these applicable drainage lines.

Table 4-3: Outline of applicable drainage lines

Quaternary Catchment	Relevant Transalloys Property	Resource Description
B11K	Portions 20, 24 & 35 of the Farm Schoongezicht 308 JS	Unnamed Tributary of the Brugspruit (confluence with Brugspruit just outside of property boundary to the north).
B11K	Portion 20 & 24 of the Farm Schoongezicht 308 JS	Brugspruit headwaters entering the property boundary from Clewer Town south of Transalloys.

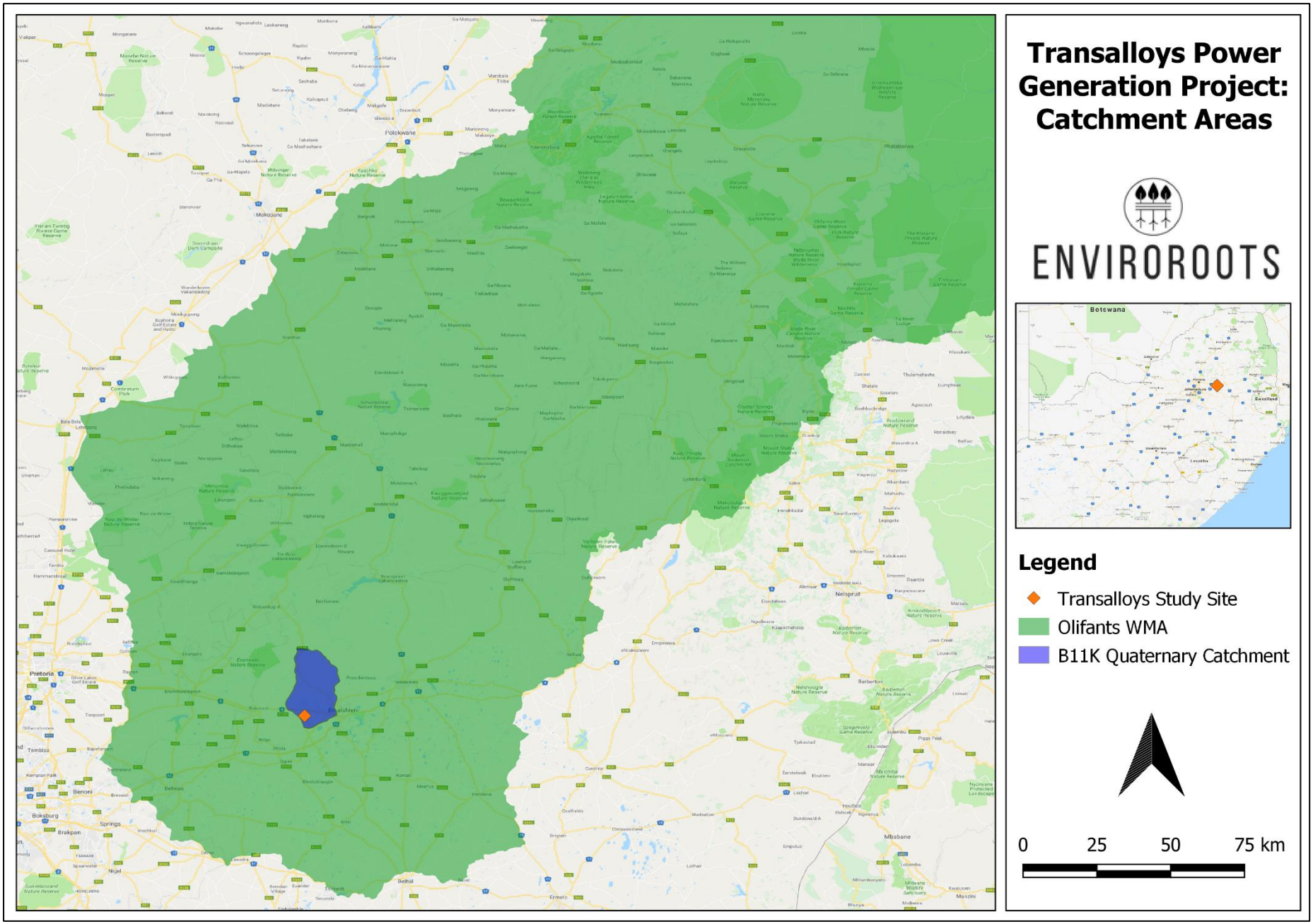

Figure 4-3: Catchment areas applicable to the study area

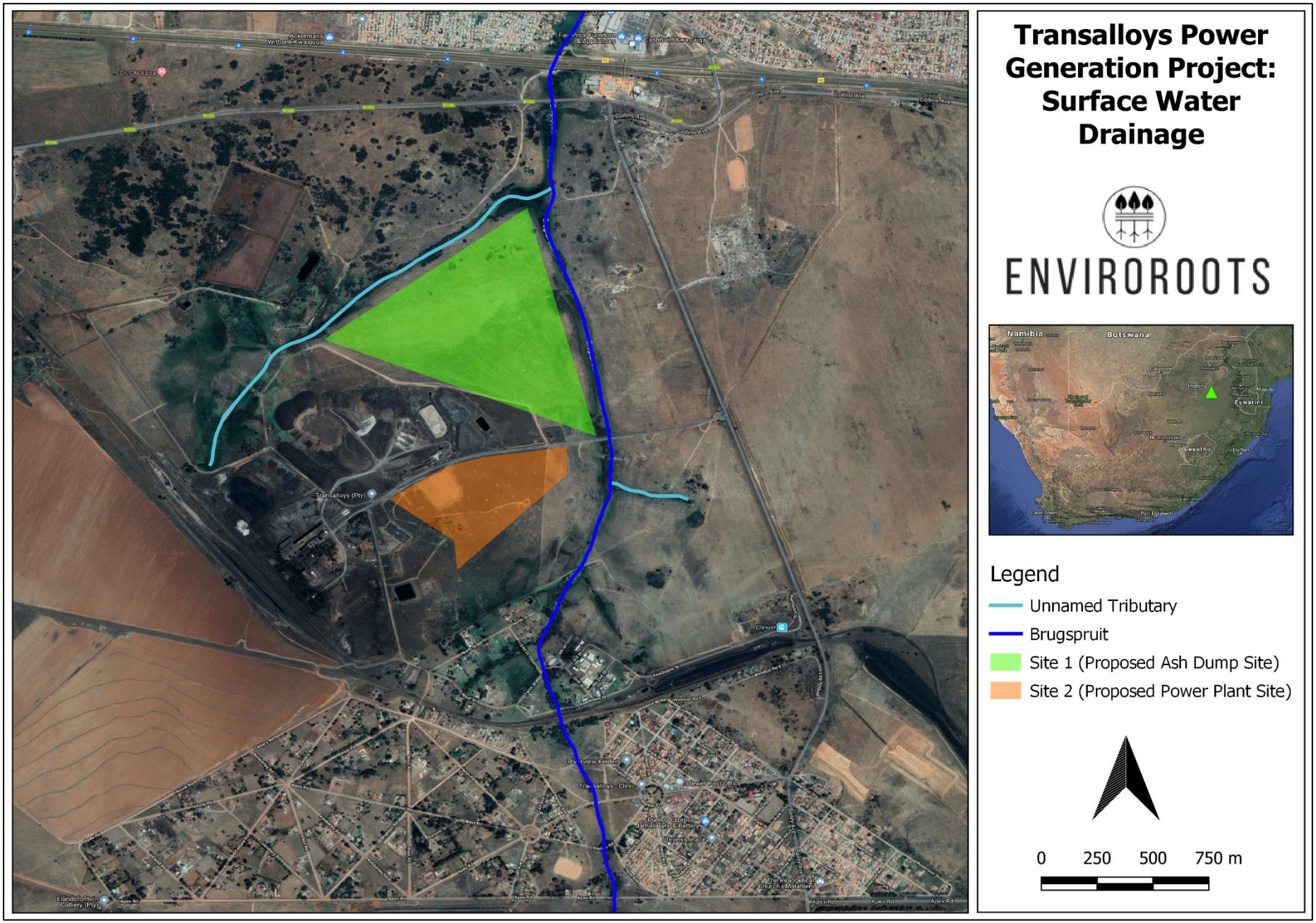

Figure 4-4: Surface water features applicable to the study area

4.4 SURFACE WATER QUALITY

A field investigation was undertaken on 17 January 2019 during which *in-situ* water quality was collected at three points along the relevant tributaries. During the site visit it was evident that alien invasive plant infestation and extensive mining activities were present within certain sections of the study boundary and that water quality were impacted by the upstream sewer pipeline discharging in the Brugspruit at Sample Point 1. It must be noted that the study sites had stagnant water in certain sections of the streams at the time at the assessment. The *in-situ* water quality was taken with the aim to measure it against *in-situ* qualities taken during previous studies conducted for the area in 2012 and in 2014. A comparison of the results is provided in **Table 4-5**. **Table 4-5** further indicates the Target Water Quality Range (TWQR) for Natural Aquatic Ecosystems and the values in red where the TWQR is exceeded. **Table 4-5** below and **Figure 4-5** indicates the locality of the monitoring points for the years of 2012, 2014 and 2019.

Table 4-4: Locality of field survey monitoring sites

Year	Sample Point Reference	Latitude	Longitude
2012	Sample Point 1	25°52'50.81"S	29° 7'28.80"E
	Sample Point 2	25°53'1.61"S	29° 7'41.34"E
	Sample Point 3	25°53'25.70"S	29° 7'49.09"E
2014	Sample Point 2.1	25°52'54.11"S	29° 7'39.46"E
	Sample Point 2.2	25°52'48.84"S	29° 7'34.48"E
	Sample Point 3.1	25°53'51.06"S	29° 7'39.70"E
	Sample Point 3.2	25°53'26.94"S	29° 7'49.24"E
2019	Sample Point 1	25°53'12.95"S	29° 6'54.93"E
	Sample Point 2	25°52'43.30"S	29° 7'39.68"E
	Sample Point 3	25°53'43.63"S	29° 7'45.76"E

In situ water quality variables taken during the three years have remained within **unacceptable** limits compared to the Target Water Quality Ranges (TWQRs) for aquatic ecosystems of South Africa. Only pH levels for the study area have decreased to within acceptable values from exceeding the TWQR in 2012.

Dissolved Oxygen levels have remained significantly below the TWQR. The maintenance of adequate Dissolved Oxygen (DO) concentrations is critical for the survival and functioning of the aquatic biota because it is required for the respiration of all aerobic organisms. DO levels less than 80% is sub-lethal and less than 60% is lethal. Violation of these minimum values, as is the case with the Brugspruit and unnamed tributary on site, is likely to cause acute toxic effects on aquatic biota. Electrical Conductivity (EC) have exceeded the TWQR, as measured in 2019, from falling within the TWQR during previous measurements. EC is a measure of the ability of water to conduct an electrical current. This ability is a result of the presence in water of ions such as carbonate, bicarbonate, chloride, sulphate, nitrate, sodium, potassium, calcium and magnesium, all of which carry an electrical charge.

Table 4-5: Water quality comparison for the surface water study area

Parameter	TWQR	Sample Point 1		Sample Point 2				Sample Point 3			
		2012	2019	2012	2014 (2.1)	2014 (2.2)	2019	2012	2014 (3.1)	2014 (3.2)	2019
pH	6.5-9.5	10.73	8.14	10.24	7.58	7.54	7.39	10.45	7.7	7.26	7.78
Temp (°C)	5-30	20.5	22.38	20.7	19.0	18.8	21	21.0	19.8	19.0	26.6
Conductivity (µS/cm)	<700	495	491	506	491	611	983	559	651	521	950
Dissolved Oxygen (mg/l)	>6	9	2.79	<1	4.45	7.91	0.41	<1	0.61	1.99	4.05
Dissolved Oxygen (%)	>80%		38.3				5.5				60.1

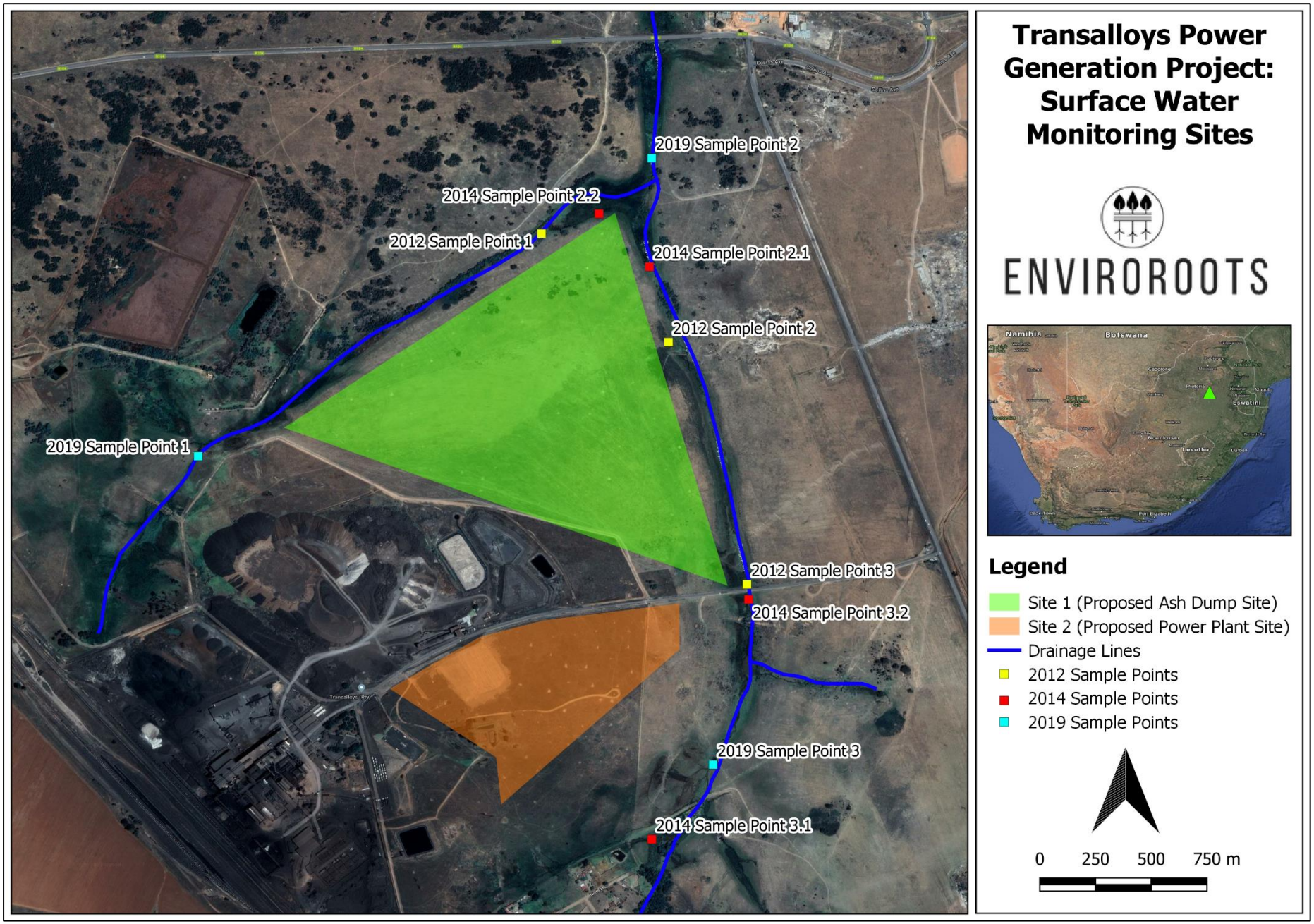

Figure 4-5: Transalloys surface water monitoring sites (2012 – 2019)

4.5 MEAN ANNUAL RUNOFF

The surface water study site is situated within the upper reaches of the Olifants WMA. Natural Mean Annual Runoff (MAR) for the Olifants WMA as per the National Water Resources Strategy (NWRS) 1st Edition (DWAF, 2004) equates to 2705 million m^3/a of which 465 million m^3/a is generated within the upper reaches of the WMA. Locally the MAR for the B11K Quaternary Catchment have shown an overall increase of 2.70% MAR for the B11K Quaternary Catchment from 1920 to 2009. Mean Annual Runoff for the relevant Quaternary Catchment as acquired from WR2012 is indicated in **Table 4-6** below.

Table 4-6: Quaternary Catchment Runoff Figures (WR2012)

Quaternary Catchment	Naturalised Flow MARs			Change in MAR (%)
	1920 – 1989 MAR (WR90) Net (mcm)	1920 – 2004 MAR (WR2005) Net (mcm)	1920 – 2009 MAR (WR2012) Net (mcm)	
B11K	17.40	22.59	23.19	2.70

4.6 RESOURCE CLASS AND RIVER HEALTH

The ecological status of a river refers to its overall condition or health, i.e. the totality of the features and characteristics of the river and its riparian areas, which manifests in its ability to support a natural array of species. This ability relates directly to the capacity of the system to provide a variety of goods and services.

An Aquatic Ecological Assessment was conducted on 17 January 2019 to determine the overall Health Class of the drainage lines on site. The full Aquatic and Wetland Assessment is attached to this report as **APPENDIX 1**. To determine the overall resource class of the surface drainage system on site the Intermediate Habitat Integrity Assessment (IHIA), the Riparian Vegetation Assessment Index (VEGRAI), the Macroinvertebrate Assessment (SASS5), the Invertebrate Habitat Assessment System (IHAS), the Macroinvertebrate Response Assessment Index (MIRAI) and the Fish Response Assessment Index (FRAI) were applied as part of the Aquatic Ecological Assessment.

Table 4-7 below summarises the findings of the Aquatic Ecological Assessment and is deemed an adequate representation of the study site as a whole. The sample points to which the above-mentioned methodologies were applied are indicated as the 2019 sample points in **Figure 4-5** and **Table 4-4**.

The overall Ecological Category of the surface water study area was determined to fall within a Class E Category, indicating a seriously modified system (refer to **Table 4-8**). The main impacts are extensive pollution from surrounding informal settlements in the form of sewage and rural runoff, the presence of alien invasive plants and surrounding mining activities. All sites were found to be **low sensitive** (EIS), due to the extensive anthropogenic activities.

Table 4-7: Findings of the Aquatic Ecological Assessment

Method	Result	Description
IHIA	E	A category of E indicates that the loss of natural habitat, biota and basic ecosystem functions is extensively transformed from reference conditions. The predominant cause for concern was erosion, alien invasive plants, mining and water pollution.
VEGRAI	E	The findings for the vegetation assessment revealed that riparian habitat of the area was seriously modified (Category E). The entire study area has, been disturbed as a result of mining, erosion, alien invasive plant species and overgrazing in the marginal and non-marginal zones.
SASS5	E/F	SASS5 scores for all three sites (Brugspruit and its tributary) were found to be in a seriously modified (Category E/F). The presence of highly pollution tolerant organisms indicates the pressure from extensive pollution upstream on both these systems. The high abundance and occurrence of *Culicidae* indicates that this system is heavily transformed. According to the SASS5 interpretation guidelines there is a major deterioration in water quality at all of the sites. The results of the *in situ* water quality and FRAI corroborate this finding. Additionally, only pollution tolerant species were found to be present at the selected sites. The complete absence of sensitive species is indicative of water quality impairment. The seriously modified SASS5 categories confirm the observation of the negative effects and presence of sewage effluent and rural settlement runoff upstream at Site 3.
IHAS	Inadequate	The habitat reaches which were assessed and found to be inadequate, where biotopes with limited habitat structures were present. The dominant feature of the invertebrate habitat is the sandy-clay substrate which dominates the streams under study. Generally, no stones in or out of current biotope were found to be available throughout the Brugspruit system.
MIRAI	Site 1 = E Site 2 = D/E Site 3 = E/F	The MIRAI assessment shows that the system is in a seriously modified state (Category E) for the study sites. The MIRAI results show that water quantity, poor water quality and mining are the primary drivers for the loss of migratory and sensitive macroinvertebrates within these systems.
FRAI	D	The adjusted FRAI results indicated that fish community is in a largely modified state (Category D) as a result of poor water quality compounded with low flows and poor habitat availability. The very low diversity of fish species confirms that the water quality as well as the instream habitat of the associated the aquatic system was heavily impacted on.

Table 4-8: Overall Ecological Category scores for all sites associated with Transalloys

INTEGRATED ECOLOGICAL CATEGORY (%)	22,07
INTEGRATED ECOSTATUS CATEGORY	E

4.7 RECEIVING WATER QUALITY OBJECTIVES

As per the NWRS, 2nd Ed., a management class and associated Reserve and Resource Quality Objectives (RQOs) have been set and approved for every significant water resource in the country. Resource Quality Objectives are regularly monitored for compliance, which informs enforcement and a strategic adaptive management cycle.

The key strategic objectives for water resource management, as per the NWRS, 2nd Ed., are to:

- Ensure sustainable management of the water resources through resource directed measures and source directed controls;
- Protect and maintain existing freshwater ecosystem priority areas in good condition and well-functioning water resource ecosystems by managing riparian and wetland buffers and critical groundwater recharge areas;
- Carry out rehabilitation of strategic water ecosystems;
- Ensure prevention of water resources from point source and non-point source pollution by managing at source;
- Create awareness among communities, business and decision makers about the value of water and ensure commitment to sustainable water use practices.
- Create an enabling environment for water resource protection through incentive-based approach to water resource management; and
- Monitor the ecological health of our resources through an Integrated Information Management System.

On 22 April 2016, the Minister of Water and Sanitation, published the Classes and Resource Quality Objectives of water resources for catchments of the Olifants WMA, as Government Notice (GN) No. 466 in Government Gazette No. 39943.

This notice provides a summary of the Resource Quality Objectives (RQOs) for Integrated Units of Analyses (IUAs). These IUAs for the Olifants WMA is indicated in **Figure 4-6**. IUAs are classified in terms of their extent of permissible utilisation and protection as either Class I: indicating high environmental protection and minimal utilisation; or Class II: indicating moderate protection and moderate utilisation; and Class III: indicating sustainable minimal protection and high utilisation.

The notice defines the RQOs for each prioritised Resource Unit (RU) for every IUA in terms of water quantity, quality, habitat and biota. RQOs have been set for the B11K Quaternary Catchment situated within IUA 1. **Table 4-9** indicated the RQOs specific to the B11K Quaternary Catchment.

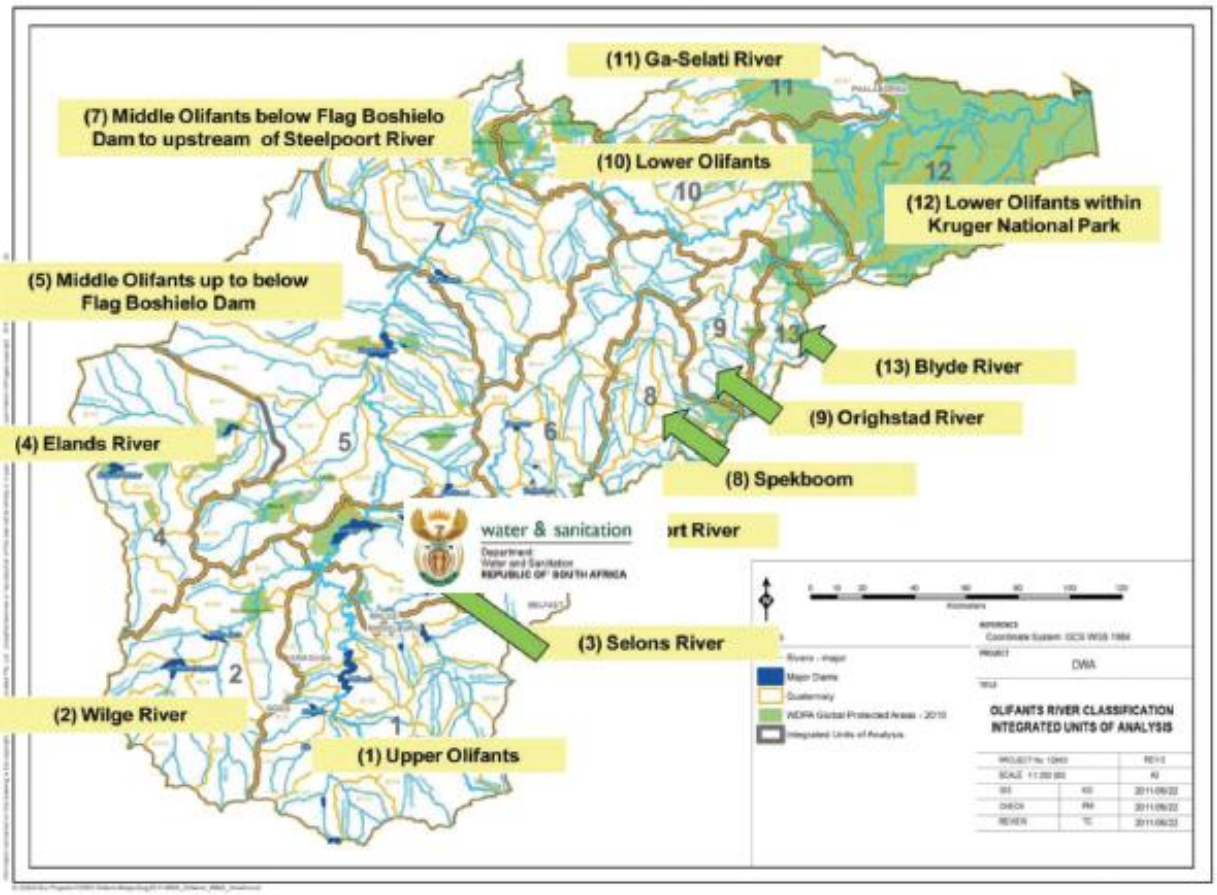

Figure 4-6: Olifants WMA Integrated Units of Analyses (DWS, 2016b)

Table 4-9: RQOs relevant to the study area (DWS, 2016b)

IUA	RU	Component	RQO
1	12	Quantity	▪ Low flows are necessary to dilute and carry away waste and to support ecosystem functioning.
		Quality	▪ The nutrient concentrations need to be improved for the ecosystem and users. ▪ Salt concentrations need to be improved to protect the ecosystem, for basic human needs, vegetable and livestock watering. ▪ Temperature and dissolved oxygen levels should not over-stress the ecosystem. ▪ Alkalinity should be stabilised at present concentrations or ideally improved to prevent acidification of the river. ▪ Toxics should not be allowed to negatively impact on the ecosystem.

4.8 RESERVE DETERMINATION

The Reserve is defined by DWS (DWA, 2013) as that portion of the natural flow that has to be available in a river or stream in order to sustain the aquatic ecology, and also to provide for basic human needs. With regard to the ecological component of the reserve the notion is that only the portion of water in excess of the ecological reserve may be abstracted from the river as utilisable yield. The Reserve Determination of water resources for the Olifants and Letaba Catchments were published on 07

September 2018 as Government Notice (GN) No. 932 in Government Gazette No. 41887. A summary of the quantity component for the rivers of the B11K (and B11L) Quaternary Catchment, thus the RU 12 of IUA 1, which includes the Ecological Water Requirement (EWR) and the Basic Human Needs (BHN) factor is indicated in **Table 4-10**. A summary of the quality component for the nearest prioritised EWR site (reference Olifants_EWR1) in turn is provided in **Table 4-11** and **Table 4-12** summarises the ecological specifications for the Klipspruit Unchannelled Valley Bottom wetland within the B11K Quaternary Catchment. Although these ecological specifications are specific to a certain wetland it is assumed that the specifications could be applied to all wetlands within the Quaternary Catchment.

Table 4-10: Summary of the quantity reserve component for the Rivers EWR & BHN (DWS, 2018)

Quaternary Catchment	Component	Ecological Reserve (%NMAR)	BHN (%NMAR)	Total Reserve (%NMAR)	NMAR (mcm)
B11K, B11L	Quantity	4.67	0.052	4.722	45.70

Table 4-11: Summary of the quality component reserve component (EWR1) (DWS, 2018)

River: Olifants		**EWR: Olifants_EWR1**
Water quality metrics		ECOSPEC: REC
Major ions	Mg	The 95th percentile of the data must be ≤ 70 mg/l
	SO_4	The 95th percentile of the data must be ≤ 250 mg/l
	Na	The 95th percentile of the data must be ≤ 115 mg/l
	Cl	The 95th percentile of the data must be ≤ 175 mg/l
	Ca	The 95th percentile of the data must be ≤ 80 mg/l
Physical variables	EC	The 95th percentile of the data must be ≤ 85 mg/l
	pH	The 5th and 95th percentile of the data must range from 5.6 – 9.2
	Temperature	Variation of 2°C or 10% from background average temp
	Dissolved Oxygen	The 5th percentile of the data must be ≥ 6.0 mg/l
	Turbidity	Vary (small amount) from natural turbidity range; minor silting of instream habitats acceptable.
Nutrients	Nitrite & Nitrate	The 50th percentile of the data must be ≤ 3.0 mg/l
	PO_4-P	The 50th percentile of the data must be ≤ 0.091 mg/l
Response variables	Chl-a phytoplankton	The 50th percentile of the data must be ≤ 20 µg/l
	Chl-a periphyton	The 50th percentile of the data must be ≤ 21 mg/m^2
	Ammonia	The 95th percentile of the data must be ≤ 43.75 µg/l
	Atrazine	The 95th percentile of the data must be ≤ 48.75 µg/l
	Fluoride	The 95th percentile of the data must be ≤ 3.52 mg/l

Table 4-12: Ecological specifications for wetlands within the B11K Quaternary Catchment (DWS, 2018)

Quaternary Catchment	Wetland	Ecological Specifications
B11K	Klipspruit wetland Unchannelled valley bottom	Maintain the existing flow distribution and retention patterns in the system.

		Currently unchannelled wetlands must be maintained as unchannelled systems. Lateral flow inputs to the wetland must be protected through application of hydrological buffers determined via hydro-pedological assessments undertaken as part of EIA and /or WUL applications, and strict licensing conditions including monitoring of the systems should apply. Rehabilitation measures should be implemented in this system to improve its current state. Maintain existing vegetation structure and composition.

4.9 SURFACE WATER USER SURVEY

The upper reaches of the Olifants River Catchment are characterised mainly by mining, agricultural and conservation activities. During 2001 a social assessment of the Olifants River was conducted to ascertain the dependence of communities and stakeholders on a healthy riverine ecosystem (Singh and van Veelen, 2001). Social use of the river was found to be incidental in the Upper Olifants catchment, but should be taken into consideration during drought periods, when boreholes are likely to dry up and people and livestock may become reliant on the river. Cultural Use can be accommodated, irrespective of the quality or flow characteristics of the river.

The land use features within the study site are mainly agriculture in the form of subsistence farming, crops and grazing. During the field investigation cattle herding were observed adjacent to the Brugspruit which flows into the Klipspruit adjacent to the farm portions, where water abstraction for agricultural activities occur. Beyond the reaches the Klipspruit reaches are dominated with coal mining activities and informal settlements. Domestic uses (further downstream) is therefore not impossible.

4.10 SENSITIVE AREAS SURVEY

4.10.1 NATIONAL FRESHWATER ECOSYSTEM PRIORITY AREAS

As per the National Freshwater Ecosystem Priority Areas (NFEPA) Atlas (Nel, *et.al.*, 2011) the water use activities at the Transalloys study site is located within a Low Priority Area (refer to **Figure 4-8**). The Brugspruit and its unnamed tributary transecting the Transalloys property is therefore not considered important or sensitive in terms of aquatic ecosystems contribution.

4.10.2 VEGETATION UNIT PROTECTION STATUS

As indicated by Mucina and Rutherford (2006) the Transalloys Smelter and proposed power generation project area is situated within the Eastern Highveld Grassland Vegetation Unit (Gm12). This Vegetation Unit is listed as Vulnerable in terms of the national list of ecosystems that are threatened and in need of protection (GN 1002 of 09 December 2011). Refer to **Figure 4-9** for an indication of the study site in relation to this Vegetation Unit.

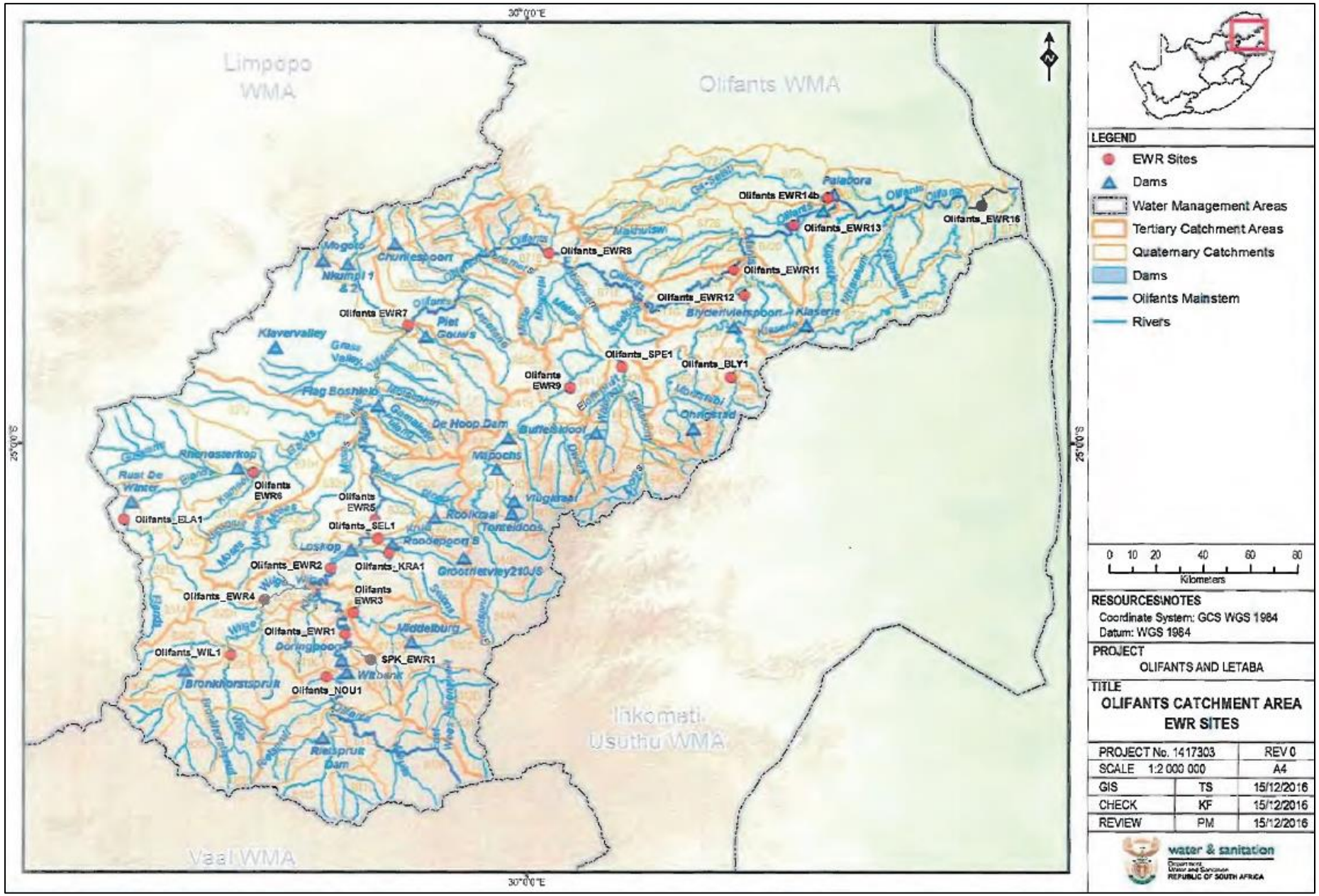

Figure 4-7: Olifants Catchment Area EWR Sites (DWS, 2018)

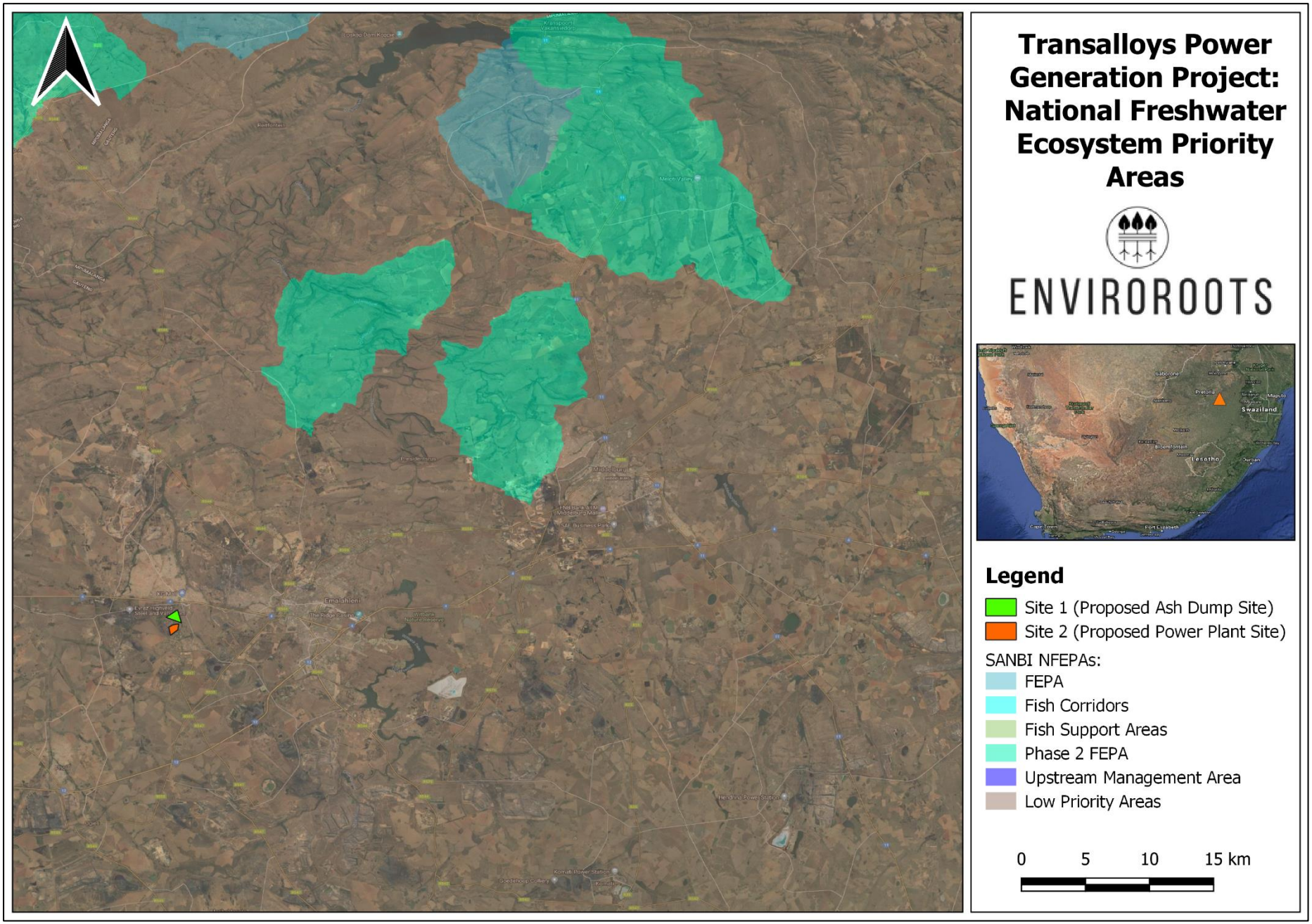

Figure 4-8: The study site in relation to river National Freshwater Ecosystem Priority Areas

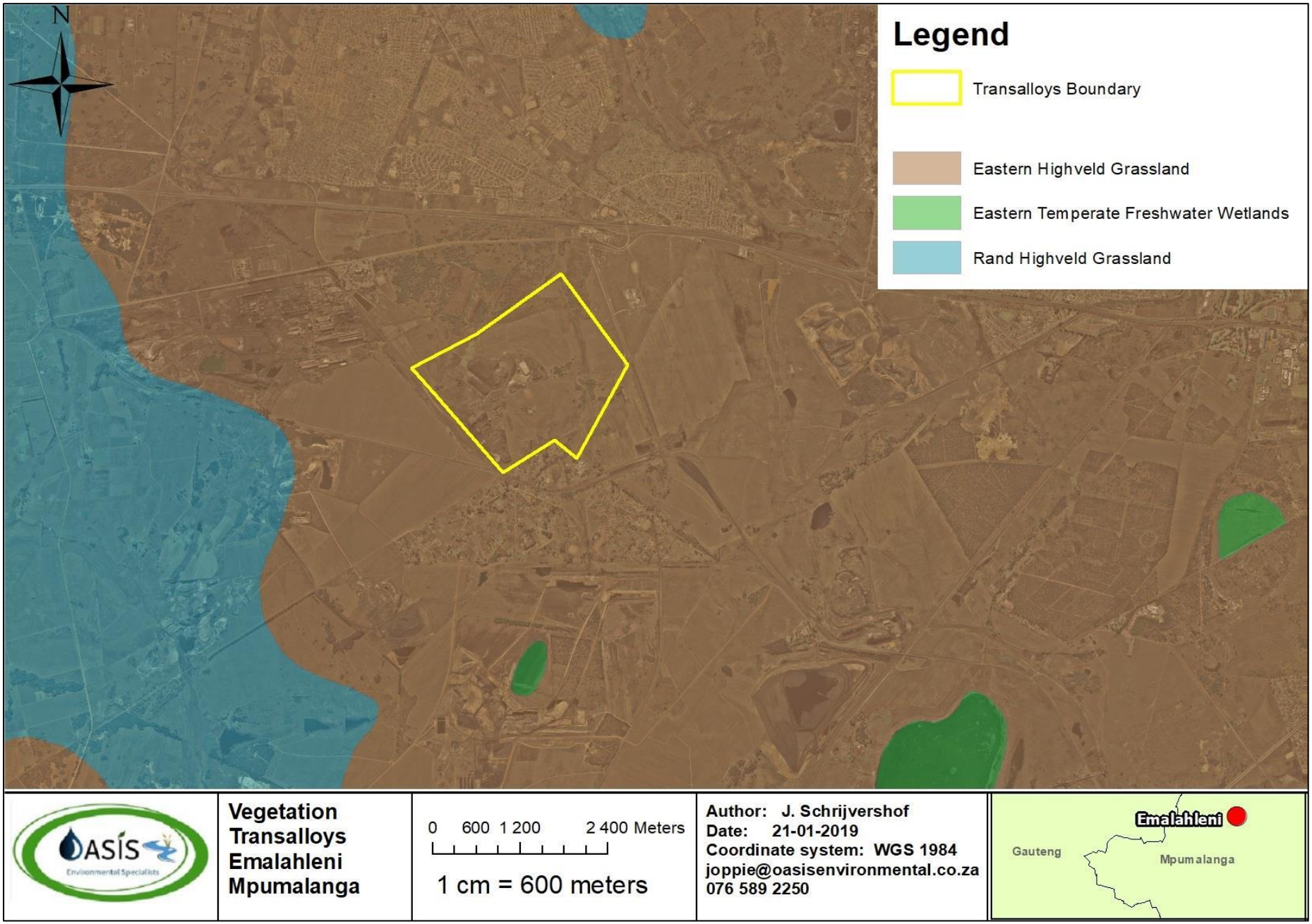

Figure 4-9: Transalloys study site Vegetation Unit (Image courtesy of Oasis Environmental as the appointed Wetland Specialists)

4.10.3 MBSP FRESHWATER ASSESSMENT

Critical Biodiversity Areas (CBA's) are terrestrial and aquatic features in the landscape that are critical for retaining biodiversity and supporting continued ecosystem functioning and services. These form the key output of a systematic conservation assessment and are the biodiversity sectors inputs into multi-sectoral planning and decision making. CBA's are therefore areas of the landscape that need to be maintained in a natural or near-natural state in order to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. In other words, if these areas are not maintained in a natural or near-natural state then biodiversity conservation targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity-compatible land uses and resource uses. In addition, the assessment also made provision for Ecological Support Areas (ESA's), which are areas that are not essential for meeting biodiversity representation targets/thresholds but which nevertheless play an important role in supporting the ecological functioning of critical biodiversity areas and/or in delivering ecosystem services that support socio-economic development, such as water provision, flood mitigation or carbon sequestration. The degree of restriction on land use and resource use in these areas may be lower than that recommended for critical biodiversity areas.

The spatial priorities are accompanied by a set of land-use guidelines with the purpose promoting the effective management of biodiversity as required in Section 41(a) of the Biodiversity Act, 2004 (Act No. 10 of 2004, as amended) and in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998, as amended). The guidelines provide advice on which land-uses and activities are most compatible with maintaining the ecological integrity of CBAs and ESAs, and other parts of the landscape, based on the desired management objectives for the land and the anticipated impact of each land-use activity on biodiversity patterns and ecological processes.

The most recent MBSP (Mpumalanga Biodiversity Sector Plan) Freshwater Assessment (2011) indicate priority areas for freshwater biodiversity in Mpumalanga. It is meant to serve as an important land-use decision support tool, and the foundation for the development of any Bioregional Plans within the Province. The resulting features are predominantly derived from the National Freshwater Ecosystem Priority Areas (FEPA) products, with some alterations and data cleaning. Layers include CBA Rivers (based on FEPA and free-flowing rivers), CBA Wetlands (based on FEPA wetlands), CBA Aquatic species (odonata & crab taxa of conservation concern only), ESA Wetland Clusters (FEPA wetland clusters), and ESA Wetlands (all other non-FEPA wetlands).

As indicated by the MBSP Freshwater Assessment (2011), the proposed Ash Dump Site (Site 1) is situated within an already heavily modified terrain, whereas the proposed Power Plant Site (Site 2) is situated within an area classified as "other natural areas" (refer to **Figure 4-10**). However, no Freshwater CBAs or ESAs are found within the immediate vicinity of the study site.

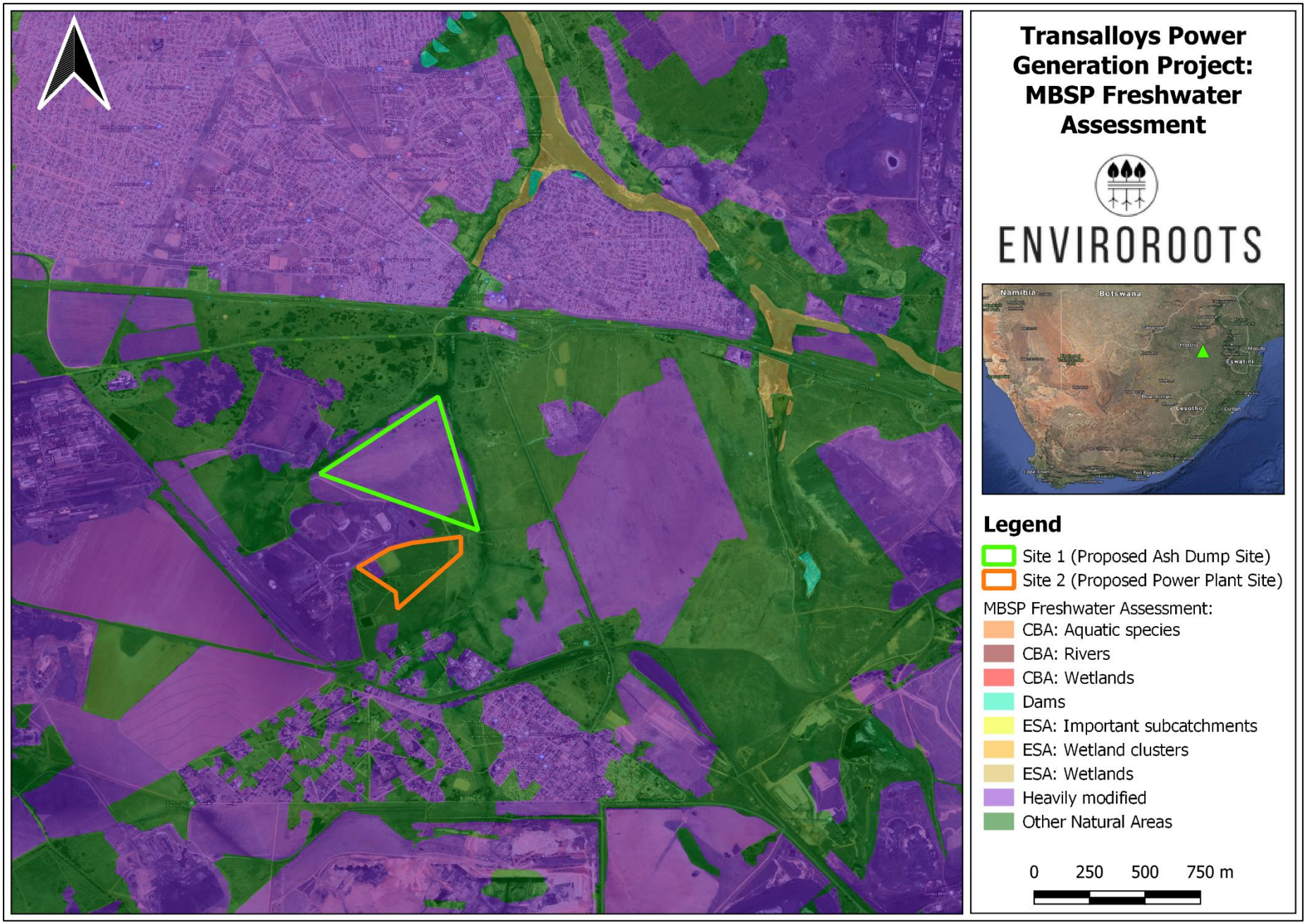

Figure 4-10: MBSP Freshwater Assessment areas relevant to the study site

4.10.4 WETLAND DELINEATION

A wetland delineation was undertaken for the Transalloys surface water study site on 17 January 2019 in accordance with the criteria set out in the DWS (formerly DWAF) guideline: A practical field procedure for identification and delineation of wetlands and riparian areas, September 2005.

The overall results for the wetland delineation and assessment in accordance with the Department of Water and Sanitation (DWS) requirements concluded that:

- Three wetland areas were delineated within a 500 m buffer surrounding the Transalloys boundary and associated infrastructure.
- The wetlands were classified into three hydrogeomorphic (HGM) units, comprising of one seepage wetland (HGM1) and two channelled valley bottom wetlands (HGM 2 and HGM 3).
- A wetland health assessment concluded the seep wetland to be **largely modified (Category D)** and the two valley bottom wetlands to be **moderately modified (Category C)**.
- The Ecological Sensitivity and Importance of the wetlands has generally been recorded as **low** as a result of the provision of natural resources and the maintenance of biodiversity that many of these wetlands provide.
- The Ecological Services of the wetlands has generally been recorded as **intermediate**.

A summary of the Present Ecological State (PES) scores for each of the three HGM units identified is provided in **Table 4-13** below. For an indication of the locality of these HGM units refer to **Figure 4-11**.

Table 4-13: Summary of PES scores for the HGM units within proximity of Transalloys

HGM Unit 01 (Seep Wetland)			
Module	**Impact Score**	**Category**	**Trajectory**
Hydrology	4,3	D	↓
Geomorphology	4,3	D	↓↓
Vegetation	3,3	C	↓
Overall Score	**4,01**	**D**	↓
HGM Unit 02 (Valley Bottom Wetland 1)			
Module	**Impact Score**	**Category**	**Trajectory**
Hydrology	3,6	D	↓
Geomorphology	2,5	B	↓
Vegetation	3	C	↓
Overall Score	**3,11**	**C**	↓
HGM Unit 03 (Valley Bottom Wetland 2)			
Module	**Impact Score**	**Category**	**Trajectory**
Hydrology	4,1	D	↓↓
Geomorphology	3,5	C	↓
Vegetation	3,9	C	↓
Overall Score	**3,87**	**C**	↓

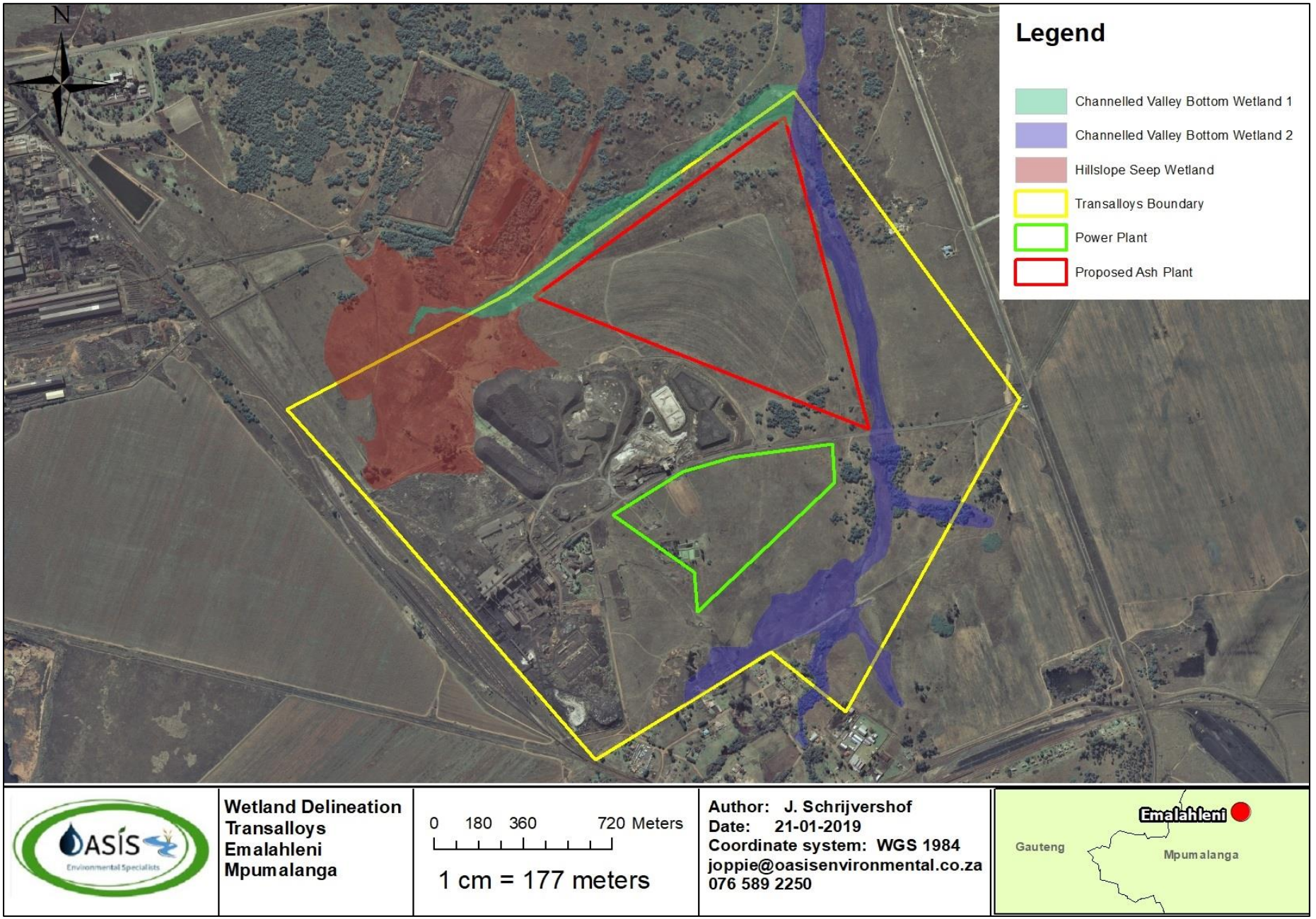

Figure 4-11: Transalloys Wetland Map (Image courtesy of Oasis Environmental as the appointed Wetland Specialists)

4.10.5 WETLAND BUFFER

The wetlands assessed within the Transalloys boundary, namely the channelled valley bottoms and seepage wetland systems is associated with the Brugspruit and its tributary and covers a great area. To protect the wetland systems and prevent further impacts, the buffer calculated for the wetland study should be implemented and adhered to by Transalloys (Pty) Ltd.

The buffer tool aims to provide a method for determining appropriate buffer-widths for developments associated with wetlands, rivers or estuaries. This method takes into account a number of different factors in determining the buffer width including the impact of the proposed activity on the water resource, climatic factors and the sensitivity of the water resource.

The calculated results indicate that a 110 m buffer is appropriate for the protection of the ecosystem services provided by the wetland systems (refer to **Figure 4-12**). Any development must occur outside of the recommended 110 m buffer zone.

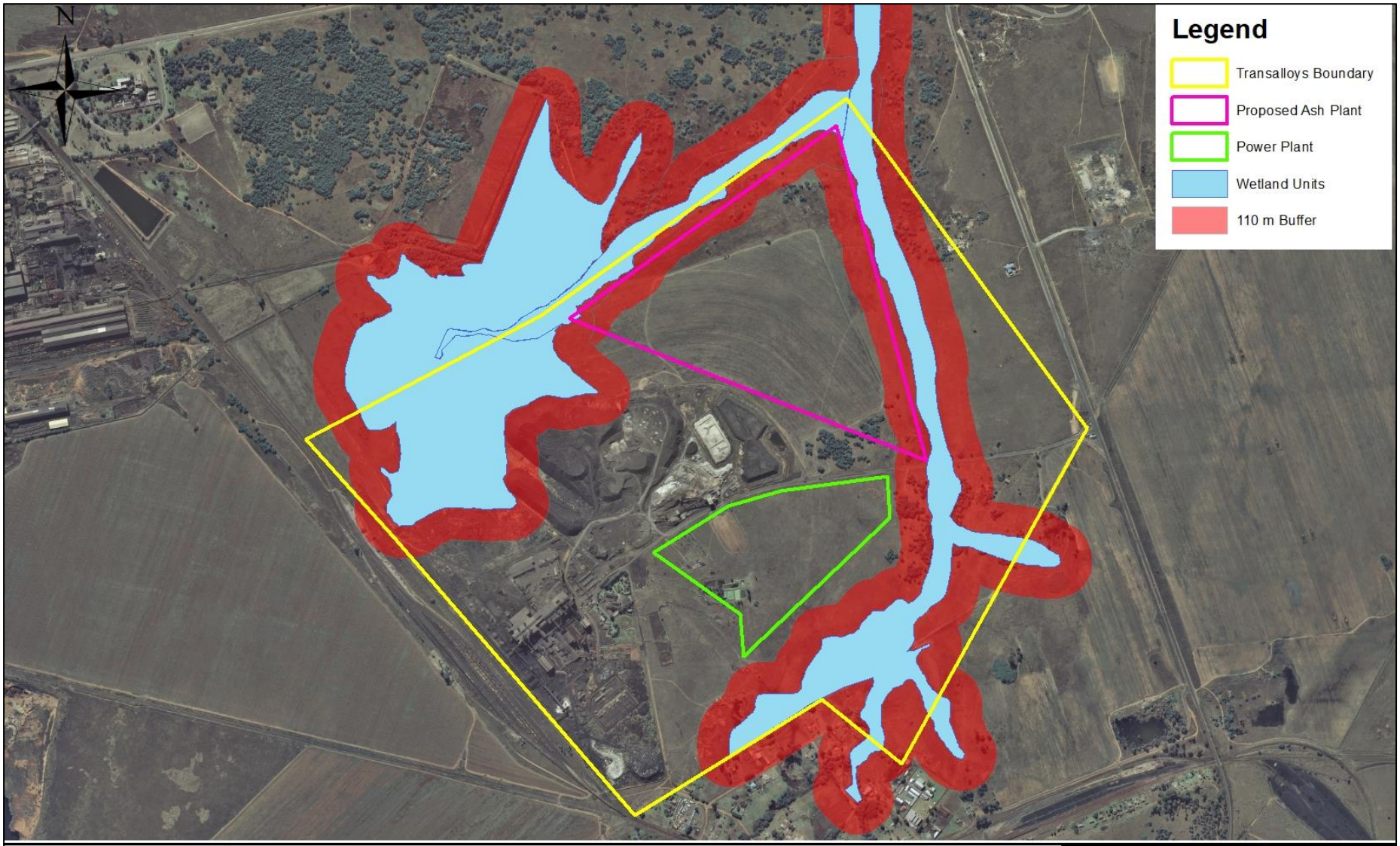

Figure 4-12: Transalloys 110 m Wetland Buffer Map (Image courtesy of Oasis Environmental as the appointed Wetland Specialists)

5 IMPACT ASSESSMENT

5.1 IMPACT ASSESSMENT METHODOLOGY

All forms of development will have an immediate effect on the natural environment. It is therefore of utmost importance to provide information on the environmental consequences these activities will have and to inform the decision-makers thereof. The assessment of aspects which might potentially impact on the environment must adhere to the minimum requirements as recorded in the EIA Regulations, 2014, and should take applicable official guidelines into account. An explanation of the impact assessment criteria that will be applied during the Environmental Assessment is provided in the sections to follow.

5.1.1 NEMA (2014) IMPACT RATINGS

As required by the 2014 NEMA regulations, impact assessment should provide quantified scores indicating the expected impact, including the cumulative impact of a proposed activity. This assessment follows the format presented below (**Table 5-1** & **Table 5-2**).

Table 5-1: Criteria for Assessment of Impacts

Severity (Magnitude)	
The severity of the impact is considered by examining whether the impact is destructive or benign, whether it destroys the impacted environment, alters its functioning, or slightly alters the environment itself. The intensity is rated as	
(I)nsignificant	The impact alters the affected environment in such a way that the natural processes or functions are not affected.
(M)oderate	The affected environment is altered, but functions and processes continue, albeit in a modified way.
(V)ery High	Function or process of the affected environment is disturbed to the extent where it temporarily or permanently ceases.
Duration	
The lifetime of the impact that is measured in relation to the lifetime of the proposed development.	
(T)emporary	The impact will either disappear with mitigation or will be mitigated through a natural process in a period shorter than that of the construction phase.
(S)hort term	The impact will be relevant through to the end of a construction phase (1.5–2 years).
(M)edium term	The impact will last up to the end of the development phases, where after it will be entirely negated.
(L)ong term	The impact will continue or last for the entire operational lifetime i.e. exceed 30 years of the development but will be mitigated by direct human action or by natural processes thereafter.
(P)ermanent	This is the only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or in such a time span that the impact is transient.
Spatial scale	

Classification of the physical and spatial scale of the impact	
(F)ootprint	The impacted area extends only as far as the activity, such as the footprint occurring within the total site area.
(S)ite	The impact could affect the whole, or a significant portion of, the site.
(R)egional	The impact could affect the area including the neighbouring farms, the transport routes and the adjoining towns.
(N)ational	The impact could have an effect that expands throughout the country (South Africa).
(I)nternational	Where the impact has international ramifications that extend beyond the boundaries of South Africa.
Probability	
This describes the likelihood of the impacts actually occurring. The impact may occur for any length of time during the life cycle of the activity, and not at any given time. The classes are rated as follows:	
(I)mprobable	The possibility of the impact occurring is none, due either to the circumstances, design or experience. The chance of this impact occurring is zero (0 %).
(P)ossible	The possibility of the impact occurring is very low, due either to the circumstances, design or experience. The chance of this impact occurring is defined as 25%.
(L)ikely	There is a possibility that the impact will occur to the extent that provisions must therefore be made. The chance of this impact occurring is defined as 50%.
(H)ighly Likely	It is most likely that the impacts will occur at some stage of the development. Plans must be drawn up before carrying out the activity. The chance of this impact occurring is defined as 75%.
(D)efinite	The impact will take place regardless of any prevention plans, and only mitigation actions or contingency plans to contain the effect can be relied on. The chance of this impact occurring is defined as 100%.

To assess each of these factors for each impact, the ranking scales indicated in **Table 5-2** were used.

Table 5-2: Assessment Criteria: Ranking Scales

PROBABILITY		**MAGNITUDE**	
Description / Meaning	Score	Description / Meaning	Score
Definite/unknown	5	Very high/unknown	10
Highly probable	4	High	8
Probable	3	Moderate	6
Improbable	2	Low	4
Very Improbable	1	Minor	2
DURATION		**EXTENT**	
Description / Meaning	Score	Description / Meaning	Score
Permanent/unknown	5	International	5
Long Term (>15 years)	4	National	4
Medium Term (5-15 years)	3	Regional	3
Short term (2-5 years)	2	Local	2
Temporary (0-1 year)	1	Footprint	1

Details of the significance of the various impacts identified are presented in **Table 5-3** and **Table 5-4**. Determination of significance refers to the foreseeable significance of the impact after the successful implementation of the necessary mitigation measures. The Significance Rating (SR) is determined as follows:

Significance Rating (SR) = (Extent + Magnitude + Duration) x Probability

Identifying the Potential Impacts without Mitigation Measures (WOM):

Following the assignment of the necessary weights to the respective aspects, criteria are summed and multiplied by their assigned probabilities, resulting in a value for each impact (prior to the implementation of mitigation measures). Significance without mitigation is rated on the following scale (**Table 5-3**):

Table 5-3: Significance Rating Scales without mitigation

SR < 30	Low (L)	Impacts with little real effect and which should not have an influence on or require modification of the project design or alternative mitigation. No mitigation is required.
30 < SR < 60	Moderate (M)	Where it could have an influence on the decision unless it is mitigated. An impact or benefit which is sufficiently important to require management. Of moderate significance - could influence the decisions about the project if left unmanaged.
SR > 60	High (H)	Impact is significant, mitigation is critical to reduce impact or risk. Resulting impact could influence the decision depending on the possible mitigation. An impact which could influence the decision about whether or not to proceed with the project.

Identifying the Potential Impacts with Mitigation Measures (WM):

In order to gain a comprehensive understanding of the overall significance of the impact, after implementation of the mitigation measures, it will be necessary to re-evaluate the impact. Significance with mitigation is rated on the following scale (**Table 5-4**):

Table 5-4: Significance Rating Scales with mitigation

SR < 30	Low (L)	The impact is mitigated to the point where it is of limited importance.
30 < SR < 60	Moderate (M)	Notwithstanding the successful implementation of the mitigation measures to reduce the negative impacts to acceptable levels, the negative impact will remain of significance. However, taken within the overall context of the project, the persistent impact does not constitute a fatal flaw.
SR > 60	High (H)	The impact is of major importance. Mitigation of the impact is not possible on a cost-effective basis. The impact is regarded as high importance and taken within the overall context of the

		project, is regarded as a fatal flaw. An impact regarded as high significance after mitigation could render the entire development option or entire project proposal unacceptable.

5.1.2 DWS (2016) IMPACT RATINGS

Risk-based management has value in providing an indication of the potential for delegating certain categories of water use "risks" to DWS regional offices or Catchment Management Agencies (CMA). Risk categories obtained through this assessment serve as a guideline to establish the appropriate channel of authorisation of these water uses.

The DWS has therefore developed a risk assessment matrix to assist in quantifying expected impacts. The scores obtained in this assessment are useful in evaluating how the proposed activities should be authorised.

The formula used to derive a risk score is as follows:
RISK = CONSEQUENCE x LIKELIHOOD
CONSEQUENCE = SEVERITY + SPATIAL SCALE + DURATION
LIKELIHOOD = FREQUENCY OF THE ACTIVITY + FREQUENCY OF THE IMPACT +LEGAL ISSUES + DETECTION

Table 5-5 below provides a description of the classes into which scores are sorted, and their implication for authorisation.

Table 5-5: An extract from DWS (2016) indicating the risk scores and classes as well as the implication for the appropriate authorisation process

Rating	Class	Management Description	Authorisation	Delegation
1-55	(L) Low Risk	Acceptable as is or consider requirement for mitigation. Impact to watercourses and resource quality small and easily mitigated. Wetlands are excluded.	GA	Regional Head
56-169	(M) Moderate Risk	Risk and impact on watercourses are notably and require mitigation measures on a higher level, which costs more and require specialist input. Wetlands are excluded.	WUL	Regional Head
170-300	(H) High Risk	Always involves wetlands. Watercourse(s) impacts by the activity are such that they impose a long-term threat on a large scale and lowering of the Reserve.	WUL	Director General

5.2 POSSIBLE IMPACTS ON THE WATER ENVIRONMENT

This section of the report evaluates the potential impacts of the proposed power generation project on the receiving water environment. The environmental impacts were calculated as per the assessment criteria specified in **Section 5.1** of this report. The Brugspruit together with its unnamed western tributary forms a tributary of the Klipspruit which ultimately feeds into the Olifants River. It is essential for the proposed power plant to adapt a pro-active management and remediation programme to ensure compliance with relevant legislation as well as to protect the Brugspruit. This would entail the implementation of appropriate pollution control measures to be enforced by approved Environmental Management Plans (EMP's) and Integrated Water and Waste Management Plans (IWWMP's) which needs to be updated on a regular basis.

The following construction activities which could potentially impact negatively on the surface water environment have been identified:

- Erosion and sedimentation due to vegetation removal, and increased runoff velocities linked to concentrated flow paths.
- Spilling and leakages of lubricants, chemicals and fuels, concrete etc. used during construction.
- Transportation of material to site and the storage of material on site.
- Dust fallout as result of construction activities.
- Alteration of the natural characteristics of water resources and ecosystem integrity.
- Alteration of natural patterns of surface runoff reaching water resources downslope/ downstream.
- Altering the patterns of diffuse surface and sub-surface flows by altering micro-topography and the permeability of soil profiles.
- Short-term reduction of flows to downstream habitat should temporary damming and abstraction of water take place.
- Establishment of alien invasive plant species.

The following operational activities which could potentially impact negatively on the surface water environment have been identified:

- Contaminated runoff and increased sedimentation from the planned infrastructure areas resulting in changes in ecosystem function.
- Risk of over-flow from the evaporation pond into the nearby drainage lines.
- Spilling and leakages of lubricants, chemicals and fuels used during operation.
- Dust fallout (including ash generated by plant) as result of activities.
- Alteration of the natural characteristics of a water resource and ecosystem integrity.
- Loss of biodiversity and sensitive aquatic species as result of sedimentation and water quality degradation.

- Alteration of natural flow patterns will occur as a result of discharged pit water.
- Establishment of alien invasive plant species.

No additional negative impacts other than already identified in the construction and operational phases have been identified. However, positive impacts should be experienced, e.g. rehabilitation of catchment area, increase in water table etc. The following activities are anticipated:

- Spilling and leakages of lubricants, chemicals and fuels.
- Transportation of material from the site.
- Dust fallout as result of activities.
- Removal of surface infrastructure.
- Rehabilitation and closure of power plant area.

5.2.1 NEMA (2014) IMPACT ASSESSMENT

The impacts are discussed in the impact assessment scores derived according to the NEMA 2014 regulations (refer to all tables under this section). The tables which follows below include all impacts identified during the previous studies. The identified impacts were re-assessed to determine whether the new proposed layout would cause a change in significance rating. Furthermore, where new impacts were identified these were included in the report additionally. All new additional mitigation measures have been underlined in the mitigation section.

5.2.1.1 CONSTRUCTION PHASE IMPACTS

Table 5-6: The effect of construction activities on the surface water quality of the Brugspruit, unnamed western tributary and surrounding wetland areas

Nature of impact: Destruction or degradation of drainage areas and consequent loss of aquatic biodiversity and integrity.				
	Authorised		**Proposed Amendment**	
	WOM	**WM**	**WOM**	**WM**
Extent	3	2	3	2
Duration	4	4	4	4
Magnitude	10	8	10	8
Probability	5	3	5	3
Significance	85 (High)	42 (Moderate)	85 (High)	42 (Moderate)
Status	Negative			
Reversibility	Low			
Irreplaceable loss of resources?	Yes	No	Yes	No
Can impacts be mitigated?	Yes			
Nature of impact: Erosion of exposed topsoil may increase suspended solids and cause siltation of watercourses.				
	Authorised		**Proposed Amendment**	
	WOM	**WM**	**WOM**	**WM**

Extent	2	2	2	2
Duration	3	2	3	2
Magnitude	6	4	6	4
Probability	5	3	5	3
Significance	55 (Moderate)	24 (Low)	55 (Moderate)	24 (Low)
Status (positive or negative)	Negative			
Reversibility	Moderate			
Irreplaceable loss of resources?	No	No	No	No
Can impacts be mitigated?	Yes			
Nature of impact: Removal of vegetation and soil may impact on the watershed feeding the watercourses associated with the study area.				
	Authorised		**Proposed Amendment**	
	WOM	**WM**	**WOM**	**WM**
Extent	2	1	2	1
Duration	3	2	3	2
Magnitude	6	4	6	4
Probability	5	2	5	2
Significance	55 (Moderate)	14 (Low)	55 (Moderate)	14 (Low)
Status (positive or negative)	Negative			
Reversibility	High			
Irreplaceable loss of resources?	No	No	No	No
Can impacts be mitigated?	Yes			
Nature of impact: Surface water resources and environmental contamination may occur as a result of leakage of hydraulic fluid, fuel and oil from vehicles. In addition, chemicals transported by heavy vehicles may spill and reach nearby water resources, similarly for concrete that is spilled.				
	Authorised		**Proposed Amendment**	
	WOM	**WM**	**WOM**	**WM**
Extent	3	2	3	2
Duration	3	3	3	3
Magnitude	8	8	8	8
Probability	4	2	4	2
Significance	56 (Moderate)	26 (Low)	56 (Moderate)	26 (Low)
Status (positive or negative)	Negative			
Reversibility	Moderate			
Irreplaceable loss of resources?	Yes	No	Yes	No
Can impacts be mitigated?	Yes			
Nature of impact: Impacts on physical and chemical surface water quality.				
	Authorised		**Proposed Amendment**	
	WOM	**WM**	**WOM**	**WM**
Extent	3	2	3	2
Duration	4	4	4	4
Magnitude	10	4	10	4

Probability	4	2	4	2
Significance	68 (High)	20 (Low)	68 (High)	20 (Low)
Status (positive or negative)	Negative			
Reversibility	Moderate			
Irreplaceable loss of resources?	Yes	No	Yes	No
Can impacts be mitigated?	Yes			

Mitigation:

- Keep area where topsoil is removed as small as possible and within the demarcated construction area.
- Any topsoil removed from the project footprint must be stockpiled separately from subsoil material and be stored suitably for use in rehabilitation activities.
- Minimise construction footprint to be outside watercourses, wetlands and riparian zones.
- Minimise disturbance to flow regime and prevent erosion.
- Construction activities to take place in the dry season.
- Inspect vehicles regularly and repair them in designated areas.
- Place trays underneath all stationary heavy vehicles that have an oil/fluid leak.
- A speed limit for all heavy vehicles of 40 km/hr should be implemented to reduce the potential of the vehicles slipping and sliding on the gravel roads thus reducing the potential for accidents to occur.
- Spill from delivery vehicles should be reported as an Environmental Incident.
- In the event that a toxic substance is spilled the Department of Water Affairs and Sanitation should be contacted together with the Police.
- Clean area where spill have occurred immediately using the correct procedures as specified on the material safety data sheet for the specific material.
- Construct dirty containment infrastructure to divert all clean water around the site.
- Containment and diversion infrastructure must be able to contain/divert the 1:50 year rainfall event.
- Storm water dams must be managed to be empty at all times.
- Proper waste management and disposal at correct facilities.
- Manage waste correctly on-site and limit distribution and pollution potential.
- Have waste management plans in place and suitable contractors to remove waste on sites from designated points.
- Dispose and manage sewerage and domestic waste correctly and safely.
- Manage product/material movements to avoid contamination of the environment.
- Immediate/emergency response to spillages and spillage kits to be kept on-site at all times.
- Apply for proper waste authorisations.
- Materials or the plant and plant infrastructure, other than sourced from the approved quarries/pits, must be sourced from a licensed commercial source.
- No washing of any construction equipment in close proximity to the Brugspruit or any wetlands is permitted.
- No releases of any substances that could be toxic to fauna or faunal habitats within the Brugspruit or any wetland areas is permitted.
- Do not locate the construction camp or any depot for any substance within a distance of 250 m from the wetland systems or 100 m from any drainage channels.
- Portable toilets must be placed on impervious level surfaces that are lipped to prevent spillage. The general consensus is that they should be within 30 m to 50 m of a work face.
- Cut-off trenches must be constructed to prevent any harmful substances from entering the wetland areas.

▪ Materials needed for construction must be stored in a construction camp in the applicable manner i.e. hazardous substances must be stored in bunded areas; sand and stone in such a manner to reduce wind and water pollution, etc. ▪ Education of workers is key to establishing good pollution prevention practices. Training programs must provide information on material handling and spill prevention and response, to better prepare employees in case of an emergency. ▪ Signs should also be placed at appropriate locations to remind workers of good housekeeping practices including litter and pollution control. ▪ The proper storage and handling of hazardous substances (hydrocarbons and chemicals) needs to be ensured. All employees handling fuels and other hazardous materials are to be properly trained. Storage containers must be regularly inspected so as to prevent leaks. ▪ Ensure that any rubbish/litter is cleared once a month as to minimise litter near the wetland areas. These will need to be cleaned out in accordance with a regular maintenance programme.
Cumulative impacts: The Brugspruit and its associated unnamed tributary has significantly been altered by historical upstream polluting activities. Evidence of continued polluting activities were observed during the field investigation. These continuing polluting activities together with inappropriate management measures at industries in the region will further deplete the natural resources in the area and alter the little remaining ecological functioning of these drainage lines and wetlands.
Residual Risk: Expected to be Moderate to Low with the implementation of mitigation measures.

Table 5-7: The effect of construction activities on the surface water quantity of the Brugspruit, unnamed western tributary and surrounding wetland areas

Nature of impact: Decrease in surface water catchment yield and water supply to downstream water users as a result of the containment of dirty storm water on site.				
	Authorised		**Proposed Amendment**	
	WOM	**WM**	**WOM**	**WM**
Extent	3	3	3	3
Duration	4	4	4	4
Magnitude	2	2	2	2
Probability	5	3	5	3
Significance	45 (Moderate)	27 (Low)	45 (Moderate)	27 (Low)
Status (positive or negative)	Negative			
Reversibility	High			
Irreplaceable loss of resources?	Yes	No	Yes	No
Can impacts be mitigated?	Yes			
Nature of impact: Construction activities and heavy vehicles movement might result in compaction of the soil, increased runoff and reduced recharge of wetlands.				
	Authorised		**Proposed Amendment**	
	WOM	**WM**	**WOM**	**WM**
Extent	3	1	3	1
Duration	4	2	4	2
Magnitude	8	6	8	6
Probability	3	2	3	2

Significance	45 (Moderate)	18 (Low)	45 (Moderate)	18 (Low)
Status (positive or negative)	Negative			
Reversibility	High			
Irreplaceable loss of resources?	Yes	No	Yes	No
Can impacts be mitigated?	Yes			
Nature of impact: Increase in demand for potable water and sewage treatment facilities due to ingress of workers to the area as result of the project.				
	Authorised		**Proposed Amendment**	
	WOM	**WM**	**WOM**	**WM**
Extent	3	2	3	2
Duration	4	2	4	2
Magnitude	8	8	8	8
Probability	5	3	5	3
Significance	75 (High)	36 (Moderate)	75 (High)	36 (Moderate)
Status (positive or negative)	Negative			
Reversibility	Low			
Irreplaceable loss of resources?	Yes	No	Yes	No
Can impacts be mitigated?	Yes			
Nature of impact: Possible canalisation, erosion and changes in sediment entering the Brugspruit wetland due to changes in water flow amounts and sedimentation characteristics that may result in desiccation of certain areas through river diversions and drainage impacts on the project area. Construction activities may result in runoff being diverted and entering the system at unexpected points, causing increased erosion and culverts forming due to increases in velocity of water as it becomes more channelled.				
	Authorised		**Proposed Amendment**	
	WOM	**WM**	**WOM**	**WM**
Extent	2	2	2	2
Duration	2	2	2	2
Magnitude	8	4	8	4
Probability	4	4	4	4
Significance	48 (Moderate)	32 (Moderate)	48 (Moderate)	32 (Moderate)
Status (positive or negative)	Negative			
Reversibility	Moderate			
Irreplaceable loss of resources?	No	No	No	No
Can impacts be mitigated?	Yes			

Mitigation:

- Keep "dirty area" to the minimum.
- Operate storm water dams to be empty.
- Minimise construction footprint to be as far as possible from any wetland area.
- Minimise disturbance to flow regime and prevent erosion.
- Construction activities to take place in the dry season.
- Ensure that the project information is provided to the Local Municipality to ensure that service provision is part of their infrastructure development plan.

▪ Discourage workers from settling in the area immediately and rather refer them to established towns and settlements. ▪ Installation of sand bags, erosion control blankets silt traps/fences at designated areas to prevent sediment movement with runoff water. ▪ Properly designed storm water measures to prevent runoff from the construction area directly into the wetland. ▪ Do not allow surface water or stormwater to be concentrated, or to flow down cut or fill slopes without erosion protection measures being in place. ▪ Bank erosion must be monitored at regular intervals during the construction/establishment (and operational) phase in order to assess whether further river bank protection/stabilisation works are required. ▪ If erosion has taken place, rehabilitation will commence as soon as possible. ▪ All roads need to be maintained and any erosion ditches forming along the road filled and compacted. ▪ Berms/ earthen walls should be vegetated in order to avoid erosion and sedimentation. ▪ Dust suppression practices, especially during the dry season. ▪ Erosion control measures at the construction sites and areas of exposed soil. ▪ Vegetation clearing must be undertaken as and when necessary in phases. The entire area must not be stripped of vegetation prior to commencing construction/establishment activities. ▪ Re-vegetation and concurrent rehabilitation to protect exposed surfaces.
Cumulative impacts: Altered drainage patterns (increases and decreases in flow), if not correctly managed could result in unwanted accumulating changes to wetland and drainage lines further downstream, which in turn would continue to alter wetlands and drainage lines even further downstream, causing a domino effect.
Residual Risk: Expected to be Moderate to Low with the implementation of mitigation measures.

Table 5-8: The effect of construction activities on the biological aspects of the Brugspruit, unnamed western tributary and surrounding wetland areas

Nature of impact: Construction activities might result in impacts to the wetland habitat integrity due to increased traffic and construction or additional personnel to the area.				
	Authorised		**Proposed Amendment**	
	WOM	**WM**	**WOM**	**WM**
Extent	2	2	2	2
Duration	2	2	2	2
Magnitude	8	8	8	8
Probability	4	2	4	2
Significance	48 (Moderate)	24 (Low)	48 (Moderate)	24 (Low)
Status (positive or negative)	Negative			
Reversibility	Low			
Irreplaceable loss of resources?	Yes	No	Yes	No
Can impacts be mitigated?	Yes			
Nature of impact: The construction activities might result in impacts to the wetland integrity due to construction of the ash dump within the wetland zone. Constructing activities and heavy construction vehicles will result				

in physical degradation of the Brugspruit wetland. Compaction and other soil degradation activities are expected to occur within this designated zone where the ash dump will be built within the wetland zone.

	Authorised		Proposed Amendment	
	WOM	**WM**	**WOM**	**WM**
Extent	2	2	2	2
Duration	2	2	2	2
Magnitude	10	8	10	8
Probability	5	5	5	5
Significance	70 (High)	60 (Moderate)	70 (High)	60 (Moderate)
Status (positive or negative)	Negative			
Reversibility	Low			
Irreplaceable loss of resources?	Yes	No	Yes	No
Can impacts be mitigated?	Yes			

Nature of impact:
The construction activities may lead to the ultimate degradation of the drainage area where increased activity is expected through construction vehicles or other alterations which will result in riparian vegetation degradation and ultimate loss of aquatic ecosystem services. Decrease in wetland functioning and changes occurring will influence the wetland services offered by the wetland and decrease in aquatic integrity and water quality downstream of the Brugspruit. This will ultimately intensify the pressure on the Klipspruit wetland and lead to the degradation thereof.

	Authorised		Proposed Amendment	
	WOM	**WM**	**WOM**	**WM**
Extent	3	3	3	3
Duration	2	2	2	2
Magnitude	8	4	8	4
Probability	4	2	4	2
Significance	52 (Moderate)	18 (Low)	52 (Moderate)	18 (Low)
Status (positive or negative)	Negative			
Reversibility	Low			
Irreplaceable loss of resources?	Yes	No	Yes	No
Can impacts be mitigated?	Yes			

Nature of impact:
Impact on wetland ecological and social services may occur as a result of the loss of biodiversity in addition, the wetland may have a reduced ability in nitrate and toxicant removal. Loss of flood attenuation could also occur if the wetland is negatively impacted.

	Authorised		Proposed Amendment	
	WOM	**WM**	**WOM**	**WM**
Extent	3	3	3	3
Duration	4	4	4	4
Magnitude	10	6	10	6
Probability	4	3	4	3
Significance	68 (High)	39 (Moderate)	68 (High)	39 (Moderate)
Status (positive or negative)	Negative			
Reversibility	Low			

Irreplaceable loss of resources?	Yes	No	Yes	No
Can impacts be mitigated?	Yes			
Nature of impact: Alien vegetation will increase in numbers if not properly managed and due to their hardy nature penetrate the wetland areas (especially if degradation is present in some areas) due to loss of natural riparian zone and changes in the population numbers and community dynamics. Invasive and/or alien species will further decline natural vegetation and indigenous species by inter-and intra-competition increase. Vegetation is already degraded in this wetland zone and management will be needed to maintain and improve its current status.				
	Authorised		**Proposed Amendment**	
	WOM	**WM**	**WOM**	**WM**
Extent	2	2	2	2
Duration	2	2	2	2
Magnitude	8	4	8	4
Probability	3	2	3	2
Significance	36 (Moderate)	16 (Low)	36 (Moderate)	16 (Low)
Status (positive or negative)	Negative			
Reversibility	Moderate			
Irreplaceable loss of resources?	Yes	No	Yes	No
Can impacts be mitigated?	Yes			
Nature of impact: Degradation and loss of plant coverage will lead to more solar penetration within the different water zones, impacting on primary production and phytoplankton within the system and a unbalance may establish within trophic levels of biodiversity leading to further degradation of the ecosystem and eventual destruction of wetland functioning and ecosystem will cease to exist.				
	Authorised		**Proposed Amendment**	
	WOM	**WM**	**WOM**	**WM**
Extent	2	2	2	2
Duration	2	2	2	2
Magnitude	6	4	6	4
Probability	3	3	3	3
Significance	30 (Low)	24 (Low)	30 (Low)	24 (Low)
Status (positive or negative)	Negative			
Reversibility	Low			
Irreplaceable loss of resources?	Yes	No	Yes	No
Can impacts be mitigated?	Yes			
Nature of impact: Possible canalisation, erosion and changes in sediment entering the Brugspruit wetland due to changes in water flow amounts and sedimentation characteristics that may result in desiccation of certain areas through river diversions and drainage impacts on the project area. Consistent supply of water to the downstream Brugspruit area might be impacted and may have unwanted impacts on the downstream wetland systems.				
	Authorised		**Proposed Amendment**	
	WOM	**WM**	**WOM**	**WM**
Extent	2	2	2	2
Duration	2	2	2	2

Magnitude	8	4	8	4
Probability	5	5	5	5
Significance	60 (High)	40 (Moderate)	60 (High)	40 (Moderate)
Status (positive or negative)	Negative			
Reversibility	Low			
Irreplaceable loss of resources?	Yes	No	Yes	No
Can impacts be mitigated?	Yes			

Mitigation:

- Minimise construction footprint to be as far as possible from any identified wetland area.
- Minimise disturbance to flow regime and prevent erosion.
- Ensure that construction activities occur only in demarcated dirty areas.
- Keep all demarcated sensitive zones outside of the construction area off limits during the construction phase of the development.
- Apply for a WUL and adhere to conditions in the WUL should construction of the plant be located within 500 m from the boundary of any wetland.
- Ensure that the project information is provided to the Local Municipality to ensure that service provision is part of their infrastructure development plan.
- Restrict workers living on the site and prevent harvesting from the wetland by the workers for firewood or any other purpose.
- Discourage workers from settling in the area immediately and rather refer them to established towns and settlements.
- Restrict activities in close proximity to wetlands an restrict all movement to designated areas.
- Control movement of construction vehicles.
- Allow wetlands to act as foraging and breeding habitat in order to maintain high levels of biodiversity.
- Re-vegetate all disturbed areas with indigenous species having an affinity for riparian zones and wetland depressions.
- Annually assess the integrity and status of the nearby wetlands and remediate any deterioration into the wetland condition. Should deterioration be observed, implement management and rehabilitation measures.
- Fence buffer zone/ footprint area off to prevent any unlawful access into the sensitive area.
- Management of local vegetation communities and preventing destruction.
- Prevent introduction of new species by irresponsibly seeding and transporting and movement of soil from different areas (topsoils brought to site from other localities usually contain dormant seeds awaiting to germinate in ideal conditions).
- Protect local vegetation populations and numbers and when replanting, the sole use of indigenous vegetation is important.
- Constant rehabilitation and re-vegetation and establishment of species in areas where destroyed.
- No harvesting or use of products from wetland and vegetation occurring in the wetland.
- Constant monitoring of vegetation communities and quick response to problems detected.
- Management of water quality entering the Brugspruit wetland system.
- Remove alien species concurrently, have Alien invasive eradication plan in place to manage and eradicate alien species within all wetlands delineated.
- Species from wetland located just downstream may be introduced in this zone which is currently degraded in terms of vegetation diversity.
- Prevent needless destruction and destructive practises during the construction phases.
- Keep to the work method statements and use experiences and professional contractors.

▪ Herbicides must be carefully applied, in order to prevent any chemicals from entering the river. Spraying of herbicides within or near to the wetland areas is strictly forbidden.
Cumulative impacts: Industrial activities might result in prolonged impacts to the wetland habitat integrity. Impacts could accumulate to form bigger more pronounced impacts on the Brugspruit wetland system. Functioning of the wetland system will decrease overtime and impacts will start to appear downstream of the wetland.
Residual Risk: Expected to be Moderate to Low with the implementation of mitigation measures.

5.2.1.2 OPERATIONAL PHASE IMPACTS

Table 5-9: The effect of operational activities on the surface water quality of the Brugspruit, unnamed western tributary and surrounding wetland areas

Nature of impact: Surface water resources and environmental contamination may occur as a result of leakage of hydraulic fluid, fuel and oil from vehicles. In addition, chemicals transported by heavy vehicles may spill and reach nearby water resources, similarly for concrete that is spilled.				
	Authorised		**Proposed Amendment**	
	WOM	**WM**	**WOM**	**WM**
Extent	1	1	1	1
Duration	1	1	1	1
Magnitude	4	4	4	4
Probability	4	3	4	3
Significance	24 (Low)	18 (Low)	24 (Low)	18 (Low)
Status (positive or negative)	Negative			
Reversibility	Moderate			
Irreplaceable loss of resources?	Yes	No	Yes	No
Can impacts be mitigated?	Yes			
Nature of impact: Impacts on physical and chemical surface water quality.				
	Authorised		**Proposed Amendment**	
	WOM	**WM**	**WOM**	**WM**
Extent	3	2	3	2
Duration	4	4	4	4
Magnitude	10	4	10	4
Probability	4	2	4	2
Significance	68 (High)	20 (Low)	68 (High)	20 (Low)
Status (positive or negative)	Negative			
Reversibility	Moderate			
Irreplaceable loss of resources?	Yes	No	Yes	No
Can impacts be mitigated?	Yes			
Nature of impact: Altered wetland patterns may lead to impacts on the continuity of the riparian zone. Activities leading to increased disturbance of soils, release of pollutants and hence water pollution may cause water quality degradation.				

	Authorised		Proposed Amendment	
	WOM	**WM**	**WOM**	**WM**
Extent	3	3	3	3
Duration	4	4	4	4
Magnitude	10	8	10	8
Probability	4	3	4	3
Significance	68 (High)	45 (Moderate)	68 (High)	45 (Moderate)
Status (positive or negative)	Negative			
Reversibility	Low			
Irreplaceable loss of resources?	Yes	No	Yes	No
Can impacts be mitigated?	Yes			

Nature of impact:
The operation of the ash dump might result in impacts to the wetland integrity due to degradation of the wetland system over the long term and also increased risk of toxicity and risk of pollution entering the wetland and therefor the Brugspruit if such a spillage should occur at any stage of the operational phase. Fly ash that enter the air may also pollute the wetlands due to the extent of wetness present and act as a pollution facilitator.

	Authorised		Proposed Amendment	
	WOM	**WM**	**WOM**	**WM**
Extent	3	3	3	3
Duration	2	2	2	2
Magnitude	10	8	10	8
Probability	4	3	4	3
Significance	60 (High)	39 (Moderate)	60 (High)	39 (Moderate)
Status (positive or negative)	Negative			
Reversibility	Low			
Irreplaceable loss of resources?	Yes	Yes	Yes	Yes
Can impacts be mitigated?	Yes			

Mitigation:

- Minimise disturbance to flow regime and prevent erosion.
- Implement water conservation and water demand management strategies.
- Where applicable, re-use water in dams first.
- A 110 m buffer should be implemented for the wetland systems.
- Runoff water from the waste dumps, stockpiles and contaminated stormwater will be channelled into pollution control dams to avoid effects on the aquatic ecosystem.
- Pollution control dams must be adequately designed to contain a 1:50 24hr storm water event. All pollution control facilities must be managed in such a way as to ensure that storage and surge capacity is available if a rainfall event occurs.
- All hazardous chemicals must be stored on bunded surfaces and material safety data sheets should be present on site for all hazardous chemicals.
- Ensure that all spills are immediately cleaned up using the correct method as specified for the specific chemical/material.
- All pollution control facilities must be analysed for its toxicity on at least three taxonomic groups using definitive screening acute toxicity testing methods at least once a year during the dry season.
- Ongoing aquatic ecological monitoring must take place on a bi-annual basis to determine trends.

▪ Surface water quality monitoring must be done upstream and downstream of the project area on a monthly basis to determine trends. Any significant change in quality from the previous month must be investigated and if the pollution originates on site an investigation as to the source of the pollution must be investigated and mitigation and rectifying measures implemented. ▪ Ensure Fly-ash management and pollution prevention and re-use is also a great possibility. ▪ Fence footprint area off to prevent any unnecessary access into the relevant wetland. ▪ Restrict all movement to designated areas. ▪ Implement concurrent rehabilitation within the areas damaged during the construction activities. ▪ Stabilise, re-shape and rehabilitate disturbed areas as soon as practically possible (within 3 weeks of disturbance) with indigenous wetland and riparian vegetation. Such rehabilitation should be informed by a suitable replanting and re-vegetation programme, sand bags, silt fencing, etc. A mix of rapidly germinating indigenous vegetation must be used. ▪ Phasing out leak-prone ash ponds and requiring the use of synthetic liners and leachate collection systems. ▪ Leakage/contaminant detection systems to be installed. ▪ Demarcated and bunded stockpiles and waste dumps will also be placed in areas where groundwater and surface water pollution can be avoided. ▪ The runoff will be routinely monitored for acidity and salinity as an early warning for potential increases in salinity or acidic drainage water. ▪ Extensive monitoring systems and groundwater monitoring. ▪ Education of workers is key to establishing good pollution prevention practices. Training programs must provide information on material handling and spill prevention and response, to better prepare employees in case of an emergency. ▪ Signs should also be placed at appropriate locations to remind workers of good housekeeping practices including litter and pollution control. ▪ The proper storage and handling of hazardous substances (hydrocarbons and chemicals) needs to be ensured. All employees handling fuels and other hazardous materials are to be properly trained. Storage containers must be regularly inspected so as to prevent leaks. ▪ Ensure that any rubbish/litter is cleared once a month as to minimise litter near the wetland areas. These will need to be cleaned out in accordance with a regular maintenance programme.
Cumulative impacts: The Brugspruit and its associated unnamed tributary has significantly been altered by historical upstream polluting activities. Evidence of continued polluting activities were observed during the field investigation. These continuing polluting activities together with inappropriate management measures at industries in the region will further deplete the natural resources in the area and alter the little remaining ecological functioning of these drainage lines and wetlands.
Residual Risk: Expected to be Moderate to Low with the implementation of mitigation measures.

Table 5-10: The effect of operational activities on the surface water quantity of the Brugspruit, unnamed western tributary and surrounding wetland areas

Nature of impact: Decrease in surface water catchment yield and water supply to downstream water users as a result of the containment of dirty storm water on site.				
	Authorised		**Proposed Amendment**	
	WOM	**WM**	**WOM**	**WM**

Extent	3	3	3	3
Duration	4	4	4	4
Magnitude	2	2	2	2
Probability	5	3	5	3
Significance	45 (Moderate)	27 (Low)	45 (Moderate)	27 (Low)
Status (positive or negative)	Negative			
Reversibility	High			
Irreplaceable loss of resources?	No	No	No	No
Can impacts be mitigated?	Yes			

Nature of impact:
Possible accelerated erosion and changes in sediment entering the Brugspruit wetland due to changes in water flow amounts in the Brugspruit river system and possible operational water discharges from the Transalloy power plant and may result in long term effects on runoff patterns into the Brugspruit and related wetland at the confluence.

	Authorised		**Proposed Amendment**	
	WOM	**WM**	**WOM**	**WM**
Extent	2	2	2	2
Duration	2	2	2	2
Magnitude	8	4	8	4
Probability	4	4	4	4
Significance	48 (Moderate)	32 (Moderate)	48 (Moderate)	32 (Moderate)
Status (positive or negative)	Negative			
Reversibility	Low			
Irreplaceable loss of resources?	Yes	No	Yes	No
Can impacts be mitigated?	Yes			

Nature of impact:
Construction activities and heavy vehicles movement might result in compaction of the soil, increased runoff and reduced recharge of wetlands.

	Authorised		**Proposed Amendment**	
	WOM	**WM**	**WOM**	**WM**
Extent	3	1	3	1
Duration	4	2	4	2
Magnitude	8	6	8	6
Probability	3	2	3	2
Significance	45 (Moderate)	18 (Low)	45 (Moderate)	18 (Low)
Status (positive or negative)	Negative			
Reversibility	High			
Irreplaceable loss of resources?	No	No	No	No
Can impacts be mitigated?	Yes			

Nature of impact:
Increase in demand for potable water and sewage treatment facilities due to ingress of workers to the area as result of the project.

	Authorised		**Proposed Amendment**	
	WOM	**WM**	**WOM**	**WM**
Extent	3	2	3	2

Duration	4	2	4	2
Magnitude	8	8	8	8
Probability	5	3	5	3
Significance	75 (High)	36 (Moderate)	75 (High)	36 (Moderate)
Status (positive or negative)	Negative			
Reversibility	Low			
Irreplaceable loss of resources?	Yes	No	Yes	No
Can impacts be mitigated?	Yes			

Mitigation:

- Keep "dirty area" to the minimum.
- Long term attenuation measures, such as attenuation/infiltration trenches, swales must be established to control stormwater from hardened surfaces so as to Sustainable Urban Drainage Systems (SUDS): All storm water runoff from the site must be supplemented by an appropriate road drainage system that must include open, grass-lined channels/swales rather than simply relying on underground piped systems or concrete V-drains. SUDS will encourage infiltration across the site, provide for the filtration and removal of pollutants and provide for some degree of flow attenuation by reducing the energy and velocity of storm water flows through increased roughness when compared with pipes and concrete V-drains.
- Installation of silt traps at designated areas to prevent sediment movement with runoff water.
- Properly designed storm water measures to prevent runoff from the construction area directly into the wetland.
- Do not allow surface water or stormwater to be concentrated, or to flow down cut or fill slopes without erosion protection measures being in place.
- Dust suppression practices, especially during the dry season.
- Erosion control measures at the construction sites and areas of exposed soil.
- Re-vegetation and concurrent rehabilitation to protect exposed surfaces.
- Stabilise, re-shape and rehabilitate disturbed areas as soon as practically possible (within 3 weeks of disturbance) with indigenous wetland and riparian vegetation. Such rehabilitation should be informed by a suitable replanting and re-vegetation programme, sand bags, silt fencing, etc. A mix of rapidly germinating indigenous vegetation must be used.
- Runoff water from the waste dumps, stockpiles and contaminated stormwater will be channelled into pollution control dams to avoid effects on the aquatic ecosystem.
- Operate storm water dams to be empty.
- Attenuation structures must be placed between the development and associated infrastructure and the river.
- Minimise disturbance to flow regime and prevent erosion.
- Discourage workers from settling in the area immediately and rather refer them to established towns and settlements.
- Aquatic biomonitoring (SASS 5 and habitat assessments) where/if flow conditions allow for effective sampling) must take place bi-annually to determine any trends in ecology and hydrology.

Cumulative impacts:

Altered drainage patterns (increases and decreases in flow), if not correctly managed could result in unwanted accumulating changes to wetland and drainage lines further downstream, which in turn would continue to alter wetlands and drainage lines even further downstream, causing a domino effect.

Residual Risk:

Expected to be Moderate to Low with the implementation of mitigation measures.

Table 5-11: The effect of operational activities on the biological aspects of the Brugspruit, unnamed western tributary and surrounding wetland areas

Nature of impact: Irresponsible operational activities may lead to the ultimate degradation of the water resource. Decrease in wetland functioning and changes occurring will influence the wetland services offered by the wetland and decrease in aquatic integrity and water quality downstream of the Brugspruit. This will ultimately intensify the pressure on the Klipspruit wetland and lead to the degradation thereof.				
	Authorised		**Proposed Amendment**	
	WOM	**WM**	**WOM**	**WM**
Extent	3	3	3	3
Duration	3	3	3	3
Magnitude	8	4	8	4
Probability	4	2	4	2
Significance	56 (Moderate)	20 (Low)	56 (Moderate)	20 (Low)
Status (positive or negative)	Negative			
Reversibility	Low			
Irreplaceable loss of resources?	Yes	No	Yes	No
Can impacts be mitigated?	Yes			

Nature of impact: Direct loss of habitat and indirect loss through sedimentation and erosion could lead to the loss of riparian vegetation and biodiversity in terms of sensitive wetland dependent faunal and flora species.				
	Authorised		**Proposed Amendment**	
	WOM	**WM**	**WOM**	**WM**
Extent	3	1	3	1
Duration	4	3	4	3
Magnitude	10	6	10	6
Probability	5	3	5	3
Significance	85 (High)	30 (Low)	85 (High)	30 (Low)
Status (positive or negative)	Negative			
Reversibility	Moderate			
Irreplaceable loss of resources?	No	No	No	No
Can impacts be mitigated?	Yes			

Nature of impact: Impact on wetland ecological and social services may occur as a result of the loss of biodiversity in addition, the wetland may have a reduced ability in nitrate and toxicant removal. Loss of flood attenuation could also occur if the wetland is negatively impacted.				
	Authorised		**Proposed Amendment**	
	WOM	**WM**	**WOM**	**WM**
Extent	3	3	3	3
Duration	4	4	4	4
Magnitude	10	6	10	6
Probability	4	3	4	3
Significance	68 (High)	39 (Moderate)	68 (High)	39 (Moderate)
Status (positive or negative)	Negative			

Reversibility	Low			
Irreplaceable loss of resources?	Yes	No	Yes	No
Can impacts be mitigated?	Yes			
Nature of impact: Alien vegetation will increase in numbers if not properly managed and due to their hardy nature penetrate the wetland areas (especially if degradation is present in some areas) due to loss of natural riparian zone and changes in the population numbers and community dynamics. Invasive and/or alien species will further decline natural vegetation and indigenous species by inter-and intra-competition increase.				
	Authorised		**Proposed Amendment**	
	WOM	**WM**	**WOM**	**WM**
Extent	2	2	2	2
Duration	4	4	4	4
Magnitude	2	2	2	2
Probability	3	3	3	3
Significance	36 (Moderate)	24 (Low)	36 (Moderate)	24 (Low)
Status (positive or negative)	Negative			
Reversibility	Moderate			
Irreplaceable loss of resources?	Yes	No	Yes	No
Can impacts be mitigated?	Yes			
Nature of impact: Degradation and loss of plant coverage will lead to more solar penetration within the different water zones, impacting on primary production and phytoplankton within the system and a unbalance may establish within trophic levels of biodiversity leading to further degradation of the ecosystem and eventual destruction of wetland functioning and ecosystem will cease to exist.				
	Authorised		**Proposed Amendment**	
	WOM	**WM**	**WOM**	**WM**
Extent	2	2	2	2
Duration	3	3	3	3
Magnitude	4	4	4	4
Probability	3	1	3	1
Significance	27 (Low)	9 (Low)	27 (Low)	9 (Low)
Status (positive or negative)	Negative			
Reversibility	Low			
Irreplaceable loss of resources?	Yes	Yes	Yes	Yes
Can impacts be mitigated?	Yes			
Nature of impact: Loss of species diversity and wetland functioning due to fluctuations in water chemistry, toxicity of water, microbial growth and algal blooms, sedimentation of wetland vegetation habitats, sedge / aquatic macro-phyte can result in a loss of sensitive vegetation species and/or communities thus impacting on the diversity of the project area.				
	Authorised		**Proposed Amendment**	
	WOM	**WM**	**WOM**	**WM**
Extent	3	2	3	2
Duration	3	3	3	3
Magnitude	8	8	8	8

Probability	4	2	4	2
Significance	56 (Moderate)	26 (Low)	56 (Moderate)	26 (Low)
Status (positive or negative)	Negative			
Reversibility	Low			
Irreplaceable loss of resources?	Yes	No	Yes	No
Can impacts be mitigated?	Yes			
Nature of impact: If coal ash and fly ash enter the systems, it may have detrimental results downstream and there is even risk of contamination of groundwater resources that is difficult, timely and expensive to treat effectively. Coal ash is filled with toxic levels of multiple pollutants—which can poison drinking water sources to a large are downstream.				
	Authorised		**Proposed Amendment**	
	WOM	**WM**	**WOM**	**WM**
Extent	3	2	3	2
Duration	3	3	3	3
Magnitude	10	8	10	8
Probability	4	3	4	3
Significance	64 (High)	39 (Moderate)	64 (High)	39 (Moderate)
Status (positive or negative)	Negative			
Reversibility	Low			
Irreplaceable loss of resources?	Yes	No	Yes	No
Can impacts be mitigated?	Yes			
Nature of impact: Operational phase activities might result in prolonged impacts to the wetland habitat integrity due to increased traffic and constant personnel at the power plant and related infrastructure. Continuous replenishment of raw material to be used in the power generation process increase activity at the site of operation. All these small impacts accumulate to form bigger more pronounced impacts on the Brugspruit wetland system. Functioning of the wetland system will decrease overtime and impacts will start to appear downstream of the wetland.				
	Authorised		**Proposed Amendment**	
	WOM	**WM**	**WOM**	**WM**
Extent	3	3	3	3
Duration	4	4	4	4
Magnitude	8	4	8	4
Probability	4	4	4	4
Significance	60 (High)	44 (Moderate)	60 (High)	44 (Moderate)
Status (positive or negative)	Negative			
Reversibility	Low			
Irreplaceable loss of resources?	Yes	No	Yes	No
Can impacts be mitigated?	Yes			
Mitigation: ▪ Discourage workers from settling in the area immediately and rather refer them to established towns and settlements. ▪ Restrict activities in close proximity to wetlands and all movement to designated areas. ▪ Control of movement of construction vehicles.				

- Prevent needless destruction and destructive practises during the operational phases.
- Allow wetlands to act as foraging and breeding habitat in order to maintain high levels of biodiversity.
- Re-vegetate all disturbed areas with indigenous species having an affinity for riparian zones and wetland depressions.
- Annually assess the integrity and status of the nearby wetlands and remediate any deterioration into the wetland condition. Should deterioration be observed, implement management and rehabilitation measures.
- Have operational policies in place prohibiting access to the Brugspruit wetland and the use of resources from the wetland.
- Restrict workers living on the site and prevent harvesting from the wetland by the workers for firewood or any other purpose.
- Possibilities of pro-active responses at this stage for e.g. rehabilitation of the downstream areas and wetland to increase capacity for absorbing impacts related to the Transalloys developments.
- Management of local vegetation communities and preventing destruction.
- Alien invasive management and eradication programmes.
- Protect local vegetation populations and numbers and when replanting, the sole use of indigenous vegetation is important.
- Focus on monitoring programme implementation and rehabilitation of areas that show changes in plant cover/open water relationship.
- Constant rehabilitation and re-vegetation and establishment of species in areas where destroyed.
- Stabilise, re-shape and rehabilitate disturbed areas as soon as practically possible (within 3 weeks of disturbance) with indigenous wetland and riparian vegetation. Such rehabilitation should be informed by a suitable replanting and re-vegetation programme, sand bags, silt fencing, etc. A mix of rapidly germinating indigenous vegetation must be used.
- Constant monitoring of vegetation communities and quick response to problems detected; and
- Management of water quality entering the Brugspruit wetland system.
- Proper waste management and disposal at correct facilities.
- Use proper synthetic liners to prevent infiltration and leaching of contaminants.
- Groundwater monitoring and surface water monitoring (extensive monitoring framework).
- Manage waste correctly on-site and limit distribution and pollution potential.
- Have waste management plans in place and suitable contractors to remove waste on sites from designated points.
- Dispose and manage sewerage and domestic waste correctly and safely.
- Dispose of coal related residue correctly and do not let it enter the natural environment on site.
- Manage product/material movements to avoid contamination of the environment.
- Use simple but effective measures such as drip trays to prevent oil and petroleum spillage.
- Immediate/emergency response to spillages and spillage kits to be kept on-site at all times.
- Apply for proper waste authorisations (if needed).
- Aquatic biomonitoring (SASS 5 and habitat assessments) where/if flow conditions allow for effective sampling) must take place bi-annually to determine any trends in ecology and hydrology.
- Ongoing alien plant control must be undertaken during the construction/establishment and operational phase and particularly in the disturbed areas as these areas will quickly be colonised by invasive alien species, especially in the riparian zone, which is particularly sensitive to AIP infestation.
- Herbicides must be carefully applied, in order to prevent any chemicals from entering the river. Spraying of herbicides within or near to the wetland areas is strictly forbidden.

Cumulative impacts: Industrial activities might result in prolonged impacts to the wetland habitat integrity. Impacts could accumulate to form bigger more pronounced impacts on the Brugspruit wetland system. Functioning of the wetland system will decrease overtime and impacts will start to appear downstream of the wetland
Residual Risk: Expected to be Moderate to Low with the implementation of mitigation measures.

5.2.1.3 CLOSURE PHASE IMPACTS

Table 5-12: The effect of closure and decommissioning on the surface water quality of the Brugspruit, unnamed western tributary and surrounding wetland areas

Nature of impact: Destruction or degradation of drainage areas and consequent loss of aquatic biodiversity and integrity.				
	Authorised		**Proposed Amendment**	
	WOM	**WM**	**WOM**	**WM**
Extent	3	2	3	2
Duration	4	4	4	4
Magnitude	10	8	10	8
Probability	5	3	5	3
Significance	85 (High)	42 (Moderate)	85 (High)	42 (Moderate)
Status (positive or negative)	Negative			
Reversibility	Low			
Irreplaceable loss of resources?	Yes	No	Yes	No
Can impacts be mitigated?	Yes			
Nature of impact: Erosion of exposed topsoil may increase suspended solids and cause siltation of watercourses.				
	Authorised		**Proposed Amendment**	
	WOM	**WM**	**WOM**	**WM**
Extent	2	2	2	2
Duration	3	2	3	2
Magnitude	6	4	6	4
Probability	5	3	5	3
Significance	55 (Moderate)	24 (Low)	55 (Moderate)	24 (Low)
Status (positive or negative)	Negative			
Reversibility	Moderate			
Irreplaceable loss of resources?	No	No	No	No
Can impacts be mitigated?	Yes			
Nature of impact: Surface water resources and environmental contamination may occur as a result of leakage of hydraulic fluid, fuel and oil from vehicles. In addition, chemicals transported by heavy vehicles may spill and reach nearby water resources, similarly for concrete that is spilled.				
	Authorised		**Proposed Amendment**	
	WOM	**WM**		**WOM**
Extent	1	1	1	1

Duration	1	1	1	1
Magnitude	4	4	4	4
Probability	4	3	4	3
Significance	24 (Low)	18 (Low)	24 (Low)	18 (Low)
Status (positive or negative)	Negative			
Reversibility	Moderate			
Irreplaceable loss of resources?	Yes	No	Yes	No
Can impacts be mitigated?	Yes			
Nature of impact: Impacts on physical and chemical surface water quality.				
	Authorised		**Proposed Amendment**	
	WOM	**WM**		**WOM**
Extent	3	2	3	2
Duration	4	4	4	4
Magnitude	10	4	10	4
Probability	4	2	4	2
Significance	68 (High)	20 (Low)	68 (High)	20 (Low)
Status (positive or negative)	Negative			
Reversibility	Moderate			
Irreplaceable loss of resources?	Yes	No	Yes	No
Can impacts be mitigated?	Yes			

Mitigation:

- Minimise disturbance to flow regime and prevent erosion.
- Decommissioning activities to take place in the dry season.
- Keep area where topsoil is removed as small as possible and within the demarcated areas.
- Any topsoil removed from the project footprint must be stockpiled separately from subsoil material and be stored suitably for use in rehabilitation activities.
- Minimise activities to be outside watercourses, wetlands and riparian zones.
- Inspect vehicles regularly and repair them in designated areas.
- Place trays underneath all stationary heavy vahicles that have an oil/fluid leak.
- A speed limit for all heavy vehicles of 40 km/hr should be implemented to reduce the potential of the vehicles slipping and sliding on the gravel roads thus reducing the potential for accidents to occur.
- Spill from delivery vehicles should be reported as an Environmental Incident.
- In the event that a toxic substance is spilled the Department of Water Affairs and Sanitation should be contacted together with the Police.
- Clean area where spill have occurred immediately using the correct procedures as specified on the material safety data sheet for the specific material.
- Maintain dirty containment infrastructure to divert all clean water around the site.
- Runoff water from the waste dumps, stockpiles and contaminated stormwater will be channelled into pollution control dams to avoid effects on the aquatic ecosystem.
- Containment and diversion infrastructure must be able to contain/divert the 1:50 year rainfall event.
- Storm water dams must be managed to be empty at all times.
- Other containment dams should be managed with a freeboard of 0.8 m.

▪ Attenuation structures must be placed between the development and associated infrastructure and the river.
Cumulative impacts: The Brugspruit and its associated unnamed tributary has significantly been altered by historical upstream polluting activities. Evidence of continued polluting activities were observed during the field investigation. These continuing polluting activities together with inappropriate management measures at industries in the region will further deplete the natural resources in the area and alter the little remaining ecological functioning of these drainage lines and wetlands.
Residual Risk: Expected to be Moderate to Low with the implementation of mitigation measures.

Table 5-13: The effect of closure and decommissioning on the surface water quantity of the Brugspruit, unnamed western tributary and surrounding wetland areas

Nature of impact: Increase in demand for potable water and sewage treatment facilities due to ingress of workers to the area as result of the project.				
	Authorised		**Proposed Amendment**	
	WOM	**WM**		**WOM**
Extent	3	2	3	2
Duration	4	2	4	2
Magnitude	8	8	8	8
Probability	5	3	5	3
Significance	75 (High)	36 (Moderate)	75 (High)	36 (Moderate)
Status (positive or negative)	Negative			
Reversibility	Low			
Irreplaceable loss of resources?	Yes	No	Yes	No
Can impacts be mitigated?	Yes			
Mitigation: ▪ Ensure that the project information is provided to the Local Municipality to ensure that service provision is part of their infrastructure development plan. ▪ Discourage workers from settling in the area immediately and rather refer them to established towns and settlements.				
Cumulative impacts: Altered drainage patterns (increases and decreases in flow), if not correctly managed could result in unwanted accumulating changes to wetland and drainage lines further downstream, which in turn would continue to alter wetlands and drainage lines even further downstream, causing a domino effect.				
Residual Risk: Expected to be Moderate with the implementation of mitigation measures.				

Table 5-14: The effect of closure and decommissioning on the biological aspects of the Brugspruit, unnamed western tributary and surrounding wetland areas

Nature of impact: Impact on wetland ecological and social services may occur as a result of the loss of biodiversity in addition, the wetland may have a reduced ability in nitrate and toxicant removal. Loss of flood attenuation could also occur if the wetland is negatively impacted.

	Authorised		Proposed Amendment	
	WOM	**WM**	**WOM**	**WM**
Extent	3	3	3	3
Duration	4	4	4	4
Magnitude	10	6	10	6
Probability	4	3	4	3
Significance	68 (High)	39 (Moderate)	68 (High)	39 (Moderate)
Status (positive or negative)	Negative			
Reversibility	Low			
Irreplaceable loss of resources?	Yes	No	Yes	No
Can impacts be mitigated?	Yes			
Nature of impact: Most of the impacts on wetland ecosystem and eco-services will occur during the construction- and operational phases. Once the Transalloys power station has been decommissioned, final steps in the rehabilitation process will take place. Invasive plant species should be controlled during this phase to avoid accumulation in degraded areas.				

	Authorised		Proposed Amendment	
	WOM	**WM**	**WOM**	**WM**
Extent	2	2	2	2
Duration	1	1	1	1
Magnitude	6	2	6	2
Probability	5	3	5	3
Significance	45 (Moderate)	15 (Low)	45 (Moderate)	15 (Low)
Status (positive or negative)	Negative			
Reversibility	Moderate			
Irreplaceable loss of resources?	No	No	No	No
Can impacts be mitigated?	Yes			
Nature of impact: Alien vegetation will increase in numbers if not properly managed and if re-establishment practices of vegetation is not a success. The monitoring and re-planting (if necessary) should be committed to by Transalloys. If degradation persists and exposed soil is available, alien penetration and success is expected. Invasive numbers are expected to increase and so will number of species. Vegetation is already degraded in this wetland zone and management will be needed to restore and improve its current status. Invasive plant species will spread via the water network and impact will reach downstream water systems and wetland communities. Birds will also spread seeds and plants within the immediate area and downstream.				

	Authorised		Proposed Amendment	
	WOM	**WM**	**WOM**	**WM**
Extent	2	2	2	2
Duration	2	2	2	2
Magnitude	4	4	4	4
Probability	4	2	4	2
Significance	32 (Moderate)	16 (Low)	32 (Moderate)	16 (Low)
Status (positive or negative)	Negative			
Reversibility	Moderate			

Irreplaceable loss of resources?	No	No	No	No
Can impacts be mitigated?	Yes			

Mitigation:

- Ensure that the project information is provided to the Local Municipality to ensure that service provision is part of their infrastructure development plan.
- Discourage workers from settling in the area immediately and rather refer them to established towns and settlements.
- Restrict activities in close proximity to wetlands and movement to designated areas.
- Allow wetlands to act as foraging and breeding habitat in order to maintain high levels of biodiversity.
- Re-vegetate all disturbed areas with indigenous species having an affinity for riparian zones and wetland depressions.
- Annually assess the integrity and status of the nearby wetlands and remediate any deterioration into the wetland condition. Should deterioration be observed, implement management and rehabilitation measures.
- Fence footprint area off to prevent any unnecessary access into the relevant wetland.
- Implement concurrent rehabilitation within the areas damaged during the closure and decommissioning activities.
- Implement final rehabilitation plan.
- Make sure all re-vegetation practices are successful and monitor the re-establishment of vegetation in damaged areas after decommissioning phase.
- Management of local vegetation communities and preventing destruction.
- Remove alien species concurrently, have Alien invasive eradication plan in place to manage and eradicate alien species within all wetlands delineated.
- Prevent introduction of new species by irresponsibly seeding and transporting and movement of soil from different areas (topsoils brought to site from other localities usually contain dormant seeds awaiting to germinate in ideal conditions).
- Protect local vegetation populations and numbers and when replanting, the sole use of indigenous vegetation is important.
- Species from wetland located just downstream may be used for introduced in wetland 5 which is currently degraded in terms of vegetation diversity.
- Herbicides must be carefully applied, in order to prevent any chemicals from entering the river. Spraying of herbicides within or near to the wetland areas is strictly forbidden.

Cumulative impacts:

Industrial activities might result in prolonged impacts to the wetland habitat integrity. Impacts could accumulate to form bigger more pronounced impacts on the Brugspruit wetland system. Functioning of the wetland system will decrease overtime and impacts will start to appear downstream of the wetland

Residual Risk:

Expected to be Moderate to Low with the implementation of mitigation measures.

5.2.2 DWS (2016) IMPACT REGISTER

The Risk Matrix spreadsheet presented in **Table 5-15** show the expected risk score categories which can be used to guide decision-making with regards to the authorisation of the proposed activities through a Water Use Licence or General Authorisation or a General Authorisation.

Table 5-15: The risk score derived from the DWS risk assessment matrix for the proposed activities. Scores assume effective mitigation

No.	Phases	Activity	Aspect	Impact	Flow Regime	Physico & Chemical (Water Quality)	Habitat (Geomorph + Vegetation)	Biota	Severity	Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	Confidence level
1	Construction phase	**Transalloys Ash and Power Plant construction of offices, buidlings etc.**	Stream Diversion	Flow alterations due to erosion and sedimentation	4	3	4	4	3,75	3	3	9,75	4	4	5	3	16	156	M	70
			Work Revetments (Rock Platform)																	
			Culvert structures																	
			Access routes for culvert																	
			Vegetation clearing																	
			Use of heavy machinery																	
2	Construction phase	**Transalloys Ash and Power Plant construction of offices, buidlings etc.**	Culvert structures	Pollution of watercourse	2	4	2	4	3	2	3	8	4	4	5	3	16	128	M	70
			Use of heavy machinery using oils and fuels during vegatation clearing																	
			Accidental spillages of chemicals, cements, oils, etc.																	
3	Construction phase	**Transalloys Ash and Power Plant construction of offices, buidlings etc.**	Access routes for culvert construction	Spread of alien vegetation	3	3	4	4	3,5	2	3	8,5	4	4	5	3	16	136	M	70
			Installation of drainage infrastructure																	
			Use of heavy machinery																	
			Bank trampling leading to erosion																	
4	Operational phase	**Transalloys activities**	Increased traffic	Flow alterations due to erosion and sedimentation	4	2	4	4	3,5	3	5	11,5	5	5	5	2	17	195,5	H	80
			Burning and handling hazardous materials																	
			Bank Erosion																	
5	Operational phase	**Transalloys activities**	Increased traffic leading to potential accidential spills of hydrocarbon materials	Pollution of watercourse	3	4	3	3	3,25	3	5	11,25	5	5	5	2	17	191,3	H	80
			Hazardous materials entering the watercourses from the Ash and Power Plant																	
			Increased road runoff during rainfall events																	
6	Operational phase	**Transalloys activities**	Increased runoff from hardened surfaces	Spread of alien vegetation	3	2	3	3	2,75	3	5	10,75	5	5	5	2	17	182,8	H	80
			Clearing of indigenous vegetation																	

6 MITIGATION MEASURES AND ACTION PLAN

It is important to note that the applicant will need to develop an Environmental Management Programme (EMP) which will describe in detail how identified impacts will be managed on site to ensure that impacts are minimised. This EMP must be approved by all relevant government departments and adhere to Section 33 of the Environmental Impact Assessment Regulations.

Table 6-1: Construction mitigation measures and action plan

Aspect	Mitigation Measure	Duration/When
Effect of construction on surface water quality	Keep area where topsoil is removed as small as possible and within the demarcated construction area.	Prior to Construction and then for the duration of Construction as required
	Any topsoil removed from the project footprint must be stockpiled separately from subsoil material and be stored suitably for use in rehabilitation activities.	Duration of Construction as required
	Minimise construction footprint to be outside watercourses, wetlands and riparian zones.	During Planning and Design prior to Construction
	Minimise disturbance to flow regime and prevent erosion.	During Planning and Design prior to Construction
	Construction activities to take place in the dry season.	Dry season
	Inspect vehicles regularly and repair them in designated areas.	Inspect daily and repair as required
	Place trays underneath all stationary heavy vehicles that have an oil/fluid leak.	As required
	A speed limit for all heavy vehicles of 40 km/hr should be implemented to reduce the potential of the vehicles slipping and sliding on the gravel roads thus reducing the potential for accidents to occur.	During Planning and Design prior to Construction
	Spill from delivery vehicles should be reported as an Environmental Incident.	As required
	In the event that a toxic substance is spilled the Department of Water Affairs and Sanitation should be contacted together with the Police.	As required
	Clean area where spill have occurred immediately using the correct procedures as specified on the material safety data sheet for the specific material.	As required
	Construct dirty containment infrastructure to divert all clean water around the site.	Design prior to Construction and implement during Construction
	Containment and diversion infrastructure must be able to contain/divert the 1:50 year rainfall event.	During Planning and Design prior to Construction
	Storm water dams must be managed to be empty at all times.	Duration of Construction

Aspect	Mitigation Measure	Duration/When
	Proper waste management and disposal at correct facilities.	As required
	Manage waste correctly on-site and limit distribution and pollution potential.	Duration of Construction
	Have waste management plans in place and suitable contractors to remove waste on sites from designated points.	Establish prior to Construction and implement for the duration of Construction
	Dispose and manage sewerage and domestic waste correctly and safely.	Duration of Construction
	Manage product/material movements to avoid contamination of the environment.	Duration of Construction
	Immediate/emergency response to spillages and spillage kits to be kept on-site at all times.	As required
	Apply for proper waste authorisations.	Prior to Construction
	Materials or the plant and plant infrastructure, other than sourced from the approved quarries/pits, must be sourced from a licensed commercial source.	Establish during Planning and Design prior to Construction
	No washing of any construction equipment in close proximity to the Brugspruit or any wetlands is permitted.	At all times
	No releases of any substances that could be toxic to fauna or faunal habitats within the Brugspruit or any wetland areas is permitted.	At all times
	Do not locate the construction camp or any depot for any substance within a distance of 250 m from the wetland systems or 100 m from any drainage channels.	Establish during Planning and Design prior to Construction
	Portable toilets must be placed on impervious level surfaces that are lipped to prevent spillage. The general consensus is that they should be within 30 m to 50 m of a work face.	Duration of Construction
	Cut-off trenches must be constructed to prevent any harmful substances from entering the wetland areas.	Design prior to Construction and implement during Construction
	Materials needed for construction must be stored in a construction camp in the applicable manner i.e. hazardous substances must be stored in bunded areas; sand and stone in such a manner to reduce wind and water pollution, etc.	Plan prior to Construction and implement during Construction
	Education of workers is key to establishing good pollution prevention practices. Training programs must provide information on material handling and spill prevention and response, to better prepare employees in case of an emergency.	Prior to Construction

Aspect	Mitigation Measure	Duration/When
	Signs should also be placed at appropriate locations to remind workers of good housekeeping practices including litter and pollution control.	Duration of Construction
	The proper storage and handling of hazardous substances (hydrocarbons and chemicals) needs to be ensured. All employees handling fuels and other hazardous materials are to be properly trained. Storage containers must be regularly inspected so as to prevent leaks.	As required (training prior to Construction)
	Ensure that any rubbish/litter is cleared once a month as to minimise litter near the wetland areas. These will need to be cleaned out in accordance with a regular maintenance programme.	Monthly
Effect of construction on surface water quantity	Keep "dirty area" to the minimum.	Plan prior to Construction and implement during Construction
	Operate storm water dams to be empty.	Duration of Construction
	Minimise construction footprint to be as far as possible from any wetland area.	During Planning and Design
	Minimise disturbance to flow regime and prevent erosion.	Duration of Construction
	Construction activities to take place in the dry season.	Dry season
	Ensure that the project information is provided to the Local Municipality to ensure that service provision is part of their infrastructure development plan.	During Planning and Design
	Discourage workers from settling in the area immediately and rather refer them to established towns and settlements.	Prior to Construction
	Installation of sand bags, erosion control blankets silt traps/fences at designated areas to prevent sediment movement with runoff water.	As required
	Properly designed storm water measures to prevent runoff from the construction area directly into the wetland.	During Planning and Design
	Do not allow surface water or stormwater to be concentrated, or to flow down cut or fill slopes without erosion protection measures being in place.	Duration of Construction
	Bank erosion must be monitored at regular intervals during the construction/establishment (and operational) phase in order to assess whether further river bank protection/stabilisation works are required.	Duration of Construction and Operation
	If erosion has taken place, rehabilitation will commence as soon as possible.	As required

Aspect	Mitigation Measure	Duration/When
	All roads need to be maintained and any erosion ditches forming along the road filled and compacted.	As required
	Berms/earthen walls should be vegetated in order to avoid erosion and sedimentation.	As required
	Dust suppression practices, especially during the dry season.	As required
	Erosion control measures at the construction sites and areas of exposed soil.	As required
	Vegetation clearing must be undertaken as and when necessary in phases. The entire area must not be stripped of vegetation prior to commencing construction/establishment activities.	As required
	Re-vegetation and concurrent rehabilitation to protect exposed surfaces.	As required
Effect on biological aspects	Minimise construction footprint to be as far as possible from any identified wetland area.	During Planning and Design
	Minimise disturbance to flow regime and prevent erosion.	Duration of Construction
	Ensure that construction activities occur only in demarcated dirty areas.	Duration of Construction
	Keep all demarcated sensitive zones outside of the construction area off limits during the construction phase of the development.	Duration of Construction
	Apply for a WUL and adhere to conditions in the WUL should construction of the plant be located within 500 m from the boundary of any wetland.	Prior to Construction
	Ensure that the project information is provided to the Local Municipality to ensure that service provision is part of their infrastructure development plan.	During Planning and Design
	Restrict workers living on the site and prevent harvesting from the wetland by the workers for firewood or any other purpose.	Duration of Construction
	Discourage workers from settling in the area immediately and rather refer them to established towns and settlements.	Prior to Construction
	Restrict activities in close proximity to wetlands an restrict all movement to designated areas.	Plan prior to Construction and implement during Construction
	Control movement of construction vehicles.	Plan prior to Construction and implement during Construction
	Allow wetlands to act as foraging and breeding habitat in order to maintain high levels of biodiversity.	At all times

Aspect	Mitigation Measure	Duration/When
	Re-vegetate all disturbed areas with indigenous species having an affinity for riparian zones and wetland depressions.	Plan prior to Construction and implement during Construction
	Annually assess the integrity and status of the nearby wetlands and remediate any deterioration into the wetland condition.	Annually
	Should deterioration be observed, implement management and rehabilitation measures.	As required
	Fence buffer zone/ footprint area off to prevent any unlawful access into the sensitive area.	Prior to Construction
	Management of local vegetation communities and preventing destruction.	Duration of Construction
	Prevent introduction of new species by irresponsibly seeding and transporting and movement of soil from different areas (topsoils brought to site from other localities usually contain dormant seeds awaiting to germinate in ideal conditions).	Plan prior to Construction and implement during Construction
	Protect local vegetation populations and numbers and when replanting, the sole use of indigenous vegetation is important.	Duration of Construction
	Constant rehabilitation and re-vegetation and establishment of species in areas where destroyed.	As required
	No harvesting or use of products from wetland and vegetation occurring in the wetland.	At all times
	Constant monitoring of vegetation communities and quick response to problems detected.	Duration of Construction
	Management of water quality entering the Brugspruit wetland system.	Duration of Construction
	Remove alien species concurrently, have Alien invasive eradication plan in place to manage and eradicate alien species within all wetlands delineated.	Compile Alien Invasive Eradication Plan prior to Construction and implement as required
	Species from wetland located just downstream may be introduced in this zone which is currently degraded in terms of vegetation diversity.	Plan prior to Construction and implement as part of Rehabilitation
	Prevent needless destruction and destructive practises during the construction phases.	Duration of Construction
	Keep to the work method statements and use experiences and professional contractors.	Duration of Construction
	Herbicides must be carefully applied, in order to prevent any chemicals from entering the river. Spraying of herbicides within or near to the wetland areas is strictly forbidden.	At all times

Table 6-2: Operational mitigation measures and action plan

Aspect	Mitigation Measure	Duration/When
Effect of operations on surface water quality	Minimise disturbance to flow regime and prevent erosion.	Duration of Operations
	Implement water conservation and water demand management strategies.	In line with WUL
	Where applicable, re-use water in dams first.	Duration of Operations
	A 110 m buffer should be implemented for the wetland systems.	Prior to Construction and maintain during Operations
	Runoff water from the waste dumps, stockpiles and contaminated stormwater will be channelled into pollution control dams to avoid effects on the aquatic ecosystem.	Design prior to Construction and maintain during Operations
	Pollution control dams must be adequately designed to contain a 1:50 24hr storm water event. All pollution control facilities must be managed in such a way as to ensure that storage and surge capacity is available if a rainfall event occurs.	During Planning and De
	All hazardous chemicals must be stored on bunded surfaces and material safety data sheets should be present on site for all hazardous chemicals.	Design prior to Construction and maintain during Operations
	Ensure that all spills are immediately cleaned up using the correct method as specified for the specific chemical/material.	As required
	All pollution control facilities must be analysed for its toxicity on at least three taxonomic groups using definitive screening acute toxicity testing methods at least once a year during the dry season.	Annually during the Dry Season
	Ongoing aquatic ecological monitoring must take place on a bi-annual basis to determine trends.	Bi-annually
	Surface water quality monitoring must be done upstream and downstream of the project area on a monthly basis to determine trends. Any significant change in quality from the previous month must be investigated and if the pollution originates on site an investigation as to the source of the pollution must be investigated and mitigation and rectifying measures implemented.	Monthly
	Ensure Fly-ash management and pollution prevention and re-use is also a great possibility.	Duration of Operations
	Fence footprint area off to prevent any unnecessary access into the relevant wetland.	During Construction and maintain during Operations
	Restrict all movement to designated areas.	Duration of Operations
	Implement concurrent rehabilitation within the areas damaged during the construction activities.	As required
	Stabilise, re-shape and rehabilitate disturbed areas as soon as practically possible (within 3 weeks of disturbance) with indigenous wetland and riparian	As required

Aspect	Mitigation Measure	Duration/When
	vegetation. Such rehabilitation should be informed by a suitable replanting and re-vegetation programme, sand bags, silt fencing, etc. A mix of rapidly germinating indigenous vegetation must be used.	
	Phasing out leak-prone ash ponds and requiring the use of synthetic liners and leachate collection systems.	Design prior to Construction and maintain for the duration of Operations
	Leakage/contaminant detection systems to be installed.	Prior to Operations
	Demarcated and bunded stockpiles and waste dumps will also be placed in areas where groundwater and surface water pollution can be avoided.	In accordance with Geohydrological Assessment
	The runoff will be routinely monitored for acidity and salinity as an early warning for potential increases in salinity or acidic drainage water.	Routinely in accordance with the EMP
	Extensive monitoring systems and groundwater monitoring.	Establish prior to Operations and implement as part of Operations
	Education of workers is key to establishing good pollution prevention practices. Training programs must provide information on material handling and spill prevention and response, to better prepare employees in case of an emergency.	Prior to Operations
	Signs should also be placed at appropriate locations to remind workers of good housekeeping practices including litter and pollution control.	Duration of Operations
	The proper storage and handling of hazardous substances (hydrocarbons and chemicals) needs to be ensured. All employees handling fuels and other hazardous materials are to be properly trained. Storage containers must be regularly inspected so as to prevent leaks.	As required (training prior to Operations)
	Ensure that any rubbish/litter is cleared once a month as to minimise litter near the wetland areas. These will need to be cleaned out in accordance with a regular maintenance programme.	Monthly
Effect of operations on surface water quantity	Keep "dirty area" to the minimum.	Duration of Operation in line with approved design
	Long term attenuation measures, such as attenuation/infiltration trenches, swales must be established to control stormwater from hardened surfaces so as to Sustainable Urban Drainage Systems (SUDS): All storm water runoff from the site must be supplemented by an appropriate road drainage system that must include open, grass-lined channels/swales rather than simply relying on	Design prior to Construction and maintain during Operations

Aspect	Mitigation Measure	Duration/When
	underground piped systems or concrete V-drains. SUDS will encourage infiltration across the site, provide for the filtration and removal of pollutants and provide for some degree of flow attenuation by reducing the energy and velocity of storm water flows through increased roughness when compared with pipes and concrete V-drains.	
	Installation of silt traps at designated areas to prevent sediment movement with runoff water.	During Construction and maintain during Operations
	Properly designed storm water measures to prevent runoff from the construction area directly into the wetland.	Implement during Construction and maintain during Operations
	Do not allow surface water or stormwater to be concentrated, or to flow down cut or fill slopes without erosion protection measures being in place.	Duration of Operations
	Dust suppression practices, especially during the dry season.	As required
	Erosion control measures at the construction sites and areas of exposed soil.	As required
	Re-vegetation and concurrent rehabilitation to protect exposed surfaces.	As required
	Stabilise, re-shape and rehabilitate disturbed areas as soon as practically possible (within 3 weeks of disturbance) with indigenous wetland and riparian vegetation. Such rehabilitation should be informed by a suitable replanting and re-vegetation programme, sand bags, silt fencing, etc. A mix of rapidly germinating indigenous vegetation must be used.	As required
	Runoff water from the waste dumps, stockpiles and contaminated stormwater will be channelled into pollution control dams to avoid effects on the aquatic ecosystem.	Design prior to Construction and maintain during Operations
	Operate storm water dams to be empty.	Duration of Operations
	Attenuation structures must be placed between the development and associated infrastructure and the river.	Design prior to Construction and maintain during Operations
	Minimise disturbance to flow regime and prevent erosion.	Design prior to Construction and maintain during Operations
	Discourage workers from settling in the area immediately and rather refer them to established towns and settlements.	Duration of Operations
	Aquatic biomonitoring (SASS 5 and habitat assessments) where/if flow conditions allow for	Bi-annually

Aspect	Mitigation Measure	Duration/When
	effective sampling) must take place bi-annually to determine any trends in ecology and hydrology.	
Effect on biological aspects	Discourage workers from settling in the area immediately and rather refer them to established towns and settlements.	Duration of Operations
	Restrict activities in close proximity to wetlands and all movement to designated areas.	Duration of Operations
	Control of movement of construction vehicles.	Plan prior to Construction and implement during Operations
	Prevent needless destruction and destructive practises during the operational phases.	Duration of Operations
	Allow wetlands to act as foraging and breeding habitat in order to maintain high levels of biodiversity.	At all times
	Re-vegetate all disturbed areas with indigenous species having an affinity for riparian zones and wetland depressions.	Plan prior to Operations and implement during Operations
	Annually assess the integrity and status of the nearby wetlands and remediate any deterioration into the wetland condition.	Annually
	Should deterioration be observed, implement management and rehabilitation measures.	As required
	Have operational policies in place prohibiting access to the Brugspruit wetland and the use of resources from the wetland.	Prior to commencement of Operations
	Restrict workers living on the site and prevent harvesting from the wetland by the workers for firewood or any other purpose.	Duration of Operations
	Possibilities of pro-active responses at this stage for e.g. rehabilitation of the downstream areas and wetland to increase capacity for absorbing impacts related to the Transalloys developments.	If desired in consultation with Specialists
	Management of local vegetation communities and preventing destruction.	Duration of Operations
	Alien invasive management and eradication programmes.	Compile prior to Operations and implement during Operations
	Protect local vegetation populations and numbers and when replanting, the sole use of indigenous vegetation is important.	Duration of Operations
	Focus on monitoring programme implementation and rehabilitation of areas that show changes in plant cover/open water relationship.	As per monitoring programme
	Constant rehabilitation and re-vegetation and establishment of species in areas where destroyed.	As required
	Stabilise, re-shape and rehabilitate disturbed areas as soon as practically possible (within 3 weeks of	As required

Aspect	Mitigation Measure	Duration/When
	disturbance) with indigenous wetland and riparian vegetation. Such rehabilitation should be informed by a suitable replanting and re-vegetation programme, sand bags, silt fencing, etc. A mix of rapidly germinating indigenous vegetation must be used.	
	Constant monitoring of vegetation communities and quick response to problems detected.	Duration of Operations
	Management of water quality entering the Brugspruit wetland system.	Duration of Operations
	Proper waste management and disposal at correct facilities.	As required
	Use proper synthetic liners to prevent infiltration and leaching of contaminants.	Plan and implement prior to Operations and maintain during Operations
	Groundwater monitoring and surface water monitoring (extensive monitoring framework).	As per Geohydrological Assessment
	Manage waste correctly on-site and limit distribution and pollution potential.	Duration of Operations
	Have waste management plans in place and suitable contractors to remove waste on sites from designated points.	Establish prior to Operations and implement for the duration of Operations
	Dispose and manage sewerage and domestic waste correctly and safely.	Duration of Operations
	Dispose of coal related residue correctly and do not let it enter the natural environment on site.	As required
	Manage product/material movements to avoid contamination of the environment.	Duration of Operations
	Use simple but effective measures such as drip trays to prevent oil and petroleum spillage.	As required
	Immediate/emergency response to spillages and spillage kits to be kept on-site at all times.	As required
	Aquatic biomonitoring (SASS 5 and habitat assessments) where/if flow conditions allow for effective sampling) must take place bi-annually to determine any trends in ecology and hydrology.	Bi-annually
	Herbicides must be carefully applied, in order to prevent any chemicals from entering the river. Spraying of herbicides within or near to the wetland areas is strictly forbidden.	As required

Table 6-3:Closure mitigation measures and action plan

Aspect	Mitigation Measure	Duration/When
Effect of closure on surface	Minimise disturbance to flow regime and prevent erosion.	Plan prior to Closure and Decommissioning
	Decommissioning activities to take place in the dry season.	Dry season

Aspect	Mitigation Measure	Duration/When
water quality and quantity	Keep area where topsoil is removed as small as possible and within the demarcated areas.	As required
	Any topsoil removed from the project footprint must be stockpiled separately from subsoil material and be stored suitably for use in rehabilitation activities.	Duration of Closure and Decommissioning
	Minimise activities to be outside watercourses, wetlands and riparian zones.	Plan prior to Closure and Decommissioning and then implement accordingly
	Inspect vehicles regularly and repair them in designated areas.	Daily
	Place trays underneath all stationary heavy vehicles that have an oil/fluid leak.	As required
	A speed limit for all heavy vehicles of 40 km/hr should be implemented to reduce the potential of the vehicles slipping and sliding on the gravel roads thus reducing the potential for accidents to occur.	During planning prior to Closure and Decommissioning
	Spill from delivery vehicles should be reported as an Environmental Incident.	As required
	In the event that a toxic substance is spilled the Department of Water Affairs and Sanitation should be contacted together with the Police.	As required
	Clean area where spill have occurred immediately using the correct procedures as specified on the material safety data sheet for the specific material.	As required
	Maintain dirty containment infrastructure to divert all clean water around the site.	Plan prior to Closure and Decommissioning and then implement accordingly
	Runoff water from the waste dumps, stockpiles and contaminated stormwater will be channelled into pollution control dams to avoid effects on the aquatic ecosystem.	Plan prior to Closure and Decommissioning and then implement accordingly
	Containment and diversion infrastructure must be able to contain/divert the 1:50 year rainfall event.	Plan prior to Closure and Decommissioning and then implement accordingly
	Storm water dams must be managed to be empty at all times.	Duration of Closure and Decommissioning
	All containment dams should be managed with a freeboard of 0.8 m.	At all times
	Attenuation structures must be placed between the development and associated infrastructure and the river.	Design prior to Closure and Decommissioning and then implement accordingly
	Discourage workers from settling in the area immediately and rather refer them to established towns and settlements.	Duration of Closure and Decommissioning
	Restrict activities in close proximity to wetlands and movement to designated areas.	Duration of Closure and Decommissioning

Aspect	Mitigation Measure	Duration/When
Effect on biological aspects	Allow wetlands to act as foraging and breeding habitat in order to maintain high levels of biodiversity.	At all times
	Re-vegetate all disturbed areas with indigenous species having an affinity for riparian zones and wetland depressions.	Plan prior to Closure and Decommissioning and then implement accordingly
	Annually assess the integrity and status of the nearby wetlands and remediate any deterioration into the wetland condition.	Annually
	Should deterioration be observed, implement management and rehabilitation measures.	As required
	Fence footprint area off to prevent any unnecessary access into the relevant wetland.	To be carried over from Operational phase
	Implement concurrent rehabilitation within the areas damaged during the closure and decommissioning activities.	As required
	Implement final rehabilitation plan.	As part of Closure and Decommissioning
	Make sure all re-vegetation practices are successful and monitor the re-establishment of vegetation in damaged areas after decommissioning phase.	Duration of Closure and Decommissioning and continue afterwards in accordance with the EMP
	Management of local vegetation communities and preventing destruction.	Duration of Closure and Decommissioning
	Remove alien species concurrently, have Alien invasive eradication plan in place to manage and eradicate alien species within all wetlands delineated;	Compile Alien Invasive Eradication Plan prior to Closure and Decommissioning and implement as required
	Prevent introduction of new species by irresponsibly seeding and transporting and movement of soil from different areas (top soils brought to site from other localities usually contain dormant seeds awaiting to germinate in ideal conditions).	Plan prior to Closure and Decommissioning and then implement accordingly
	Protect local vegetation populations and numbers and when replanting, the sole use of indigenous vegetation is important.	Duration of Closure and Decommissioning
	Species from wetland located just downstream may be used for introduced in wetland 5 which is currently degraded in terms of vegetation diversity.	Plan prior to Closure and Decommissioning and then implement accordingly
	Herbicides must be carefully applied, in order to prevent any chemicals from entering the river. Spraying of herbicides within or near to the wetland areas is strictly forbidden.	At all times

7 SURFACE WATER MONITORING

Effective surface water management and monitoring is essential for long term sustainability and protection of the receiving water environment. There is a legal obligation on the water user to establish a monitoring programme on site which needs to be registered on the National Monitoring System administered by Directorate Resource Quality Services. This would enable the Applicant and the DWS to collect data and information necessary to assess the following aspects:

- Quantity, quality and use of water in the Brugspruit;
- Quantity, quality and use of water in the unnamed western tributary;
- Compliance with RQOs;
- Status of the aquatic health system; and
- Atmospheric conditions which may influence water resources in the area.

Monitoring points should be initiated during the operational phase of the development. Once the development moves towards decommissioning and closure, the monitoring programme will have to be updated to cover the monitoring needs related to the specific closure objectives. Should any contamination at any time be detected at the compliance monitoring points, the development must immediately notify the Regional Director of DWS after which the source of contamination will be identified and measures for the prevention of the contamination (in the short term and the long term) will be implemented.

7.1 WATER QUALITY PARAMETERS TO BE ANALYSED

Minimum water quality monitoring parameters proposed to be monitored during the various phases of the development is contained in **Table 7-1** below.

Table 7-1: Surface water quality parameters to be analysed

Variable	Unit	Frequency Man-made surface water resources	Frequency Natural surface water resources
pH		Quarterly	Monthly
Electrical Conductivity as EC	mS/m	Quarterly	Monthly
Suspended Solids as SS	mg/l	Quarterly	Monthly
Total Dissolved Solids as TDS	mg/l	Quarterly	Monthly
Sulphate as SO_4	mg/l	Quarterly	Monthly
Nitrate as NO_3	mg/l	Quarterly	Monthly
Sodium as Na	mg/l	Quarterly	Monthly
Chloride as Cl	mg/l	Quarterly	Monthly
Calcium as Ca	mg/l	Quarterly	Monthly
Potassium as K	mg/l	Quarterly	Monthly
Magnesium as Mg	mg/l	Quarterly	Monthly

Variable	Unit	Frequency Man-made surface water resources	Frequency Natural surface water resources
Aluminium as Al	mg/l	Quarterly	Monthly
Iron as F	mg/l	Quarterly	Monthly
Lead as Pb	mg/l	Quarterly	Monthly
Manganese as Mn	mg/l	Quarterly	Monthly
Silicon as Si	mg/l	Quarterly	Monthly
Vanadium as V	mg/l	Quarterly	Monthly
Zinc as Zn	mg/l	Quarterly	Monthly
Chromium as Cr	mg/l	Quarterly	Monthly
Mercury	mg/l	Quarterly	Monthly
Total hardness as $CaCO_3$	mg/l	Quarterly	Monthly
Total alkalinity as $CaCO_3$	mg/l	Quarterly	Monthly
Fluoride as F	mg/l	Quarterly	Monthly
Dissolved Oxygen as DO	mg/l	Quarterly	Monthly
Chemical Oxygen Demand as COD	mg/l	Quarterly	Monthly
Ortho Phosphate as PO_4	mg/l	Quarterly	Monthly
Faecal Coliform Bacteria	/100 ml	Quarterly	Monthly
E. Coli	/100 ml	Quarterly	Monthly
Soap, oil and grease	mg/l	Quarterly	Monthly

7.2 SURFACE WATER MONITORING POINTS

The surface water monitoring points as described in **Table 7-2** were used to characterise the water resources in the project area during the 2019 field investigation. It is proposed that these points also be used for future monitoring purposes. **Figure 7-1** provides an indication of the current state for each sample point.

Table 7-2: Natural surface water sample sites (January 2019)

Sample Point Reference	Latitude	Longitude
Sample Point 1	25°53'12.95"S	29° 6'54.93"E
Sample Point 2	25°52'43.30"S	29° 7'39.68"E
Sample Point 3	25°53'43.63"S	29° 7'45.76"E

7.3 BIOMONITORING

As indicated in the Aquatic Ecological Assessment (2019) for the planned Transalloys Power Generation Project it is suggested that biomonitoring, inclusive of the Intermediate Habitat Integrity Assessment (IHIA), the Riparian Vegetation Assessment Index (VEGRAI), the Macroinvertebrate Assessment (SASS5), the Invertebrate Habitat Assessment System (IHAS), the Macroinvertebrate Response Assessment Index (MIRAI) and the Fish Response Assessment Index (FRAI), be applied as part of the Aquatic Monitoring on a bi-annual basis to establish trends. This frequency could be lessened in future as per recommendation from the Aquatic Specialist.

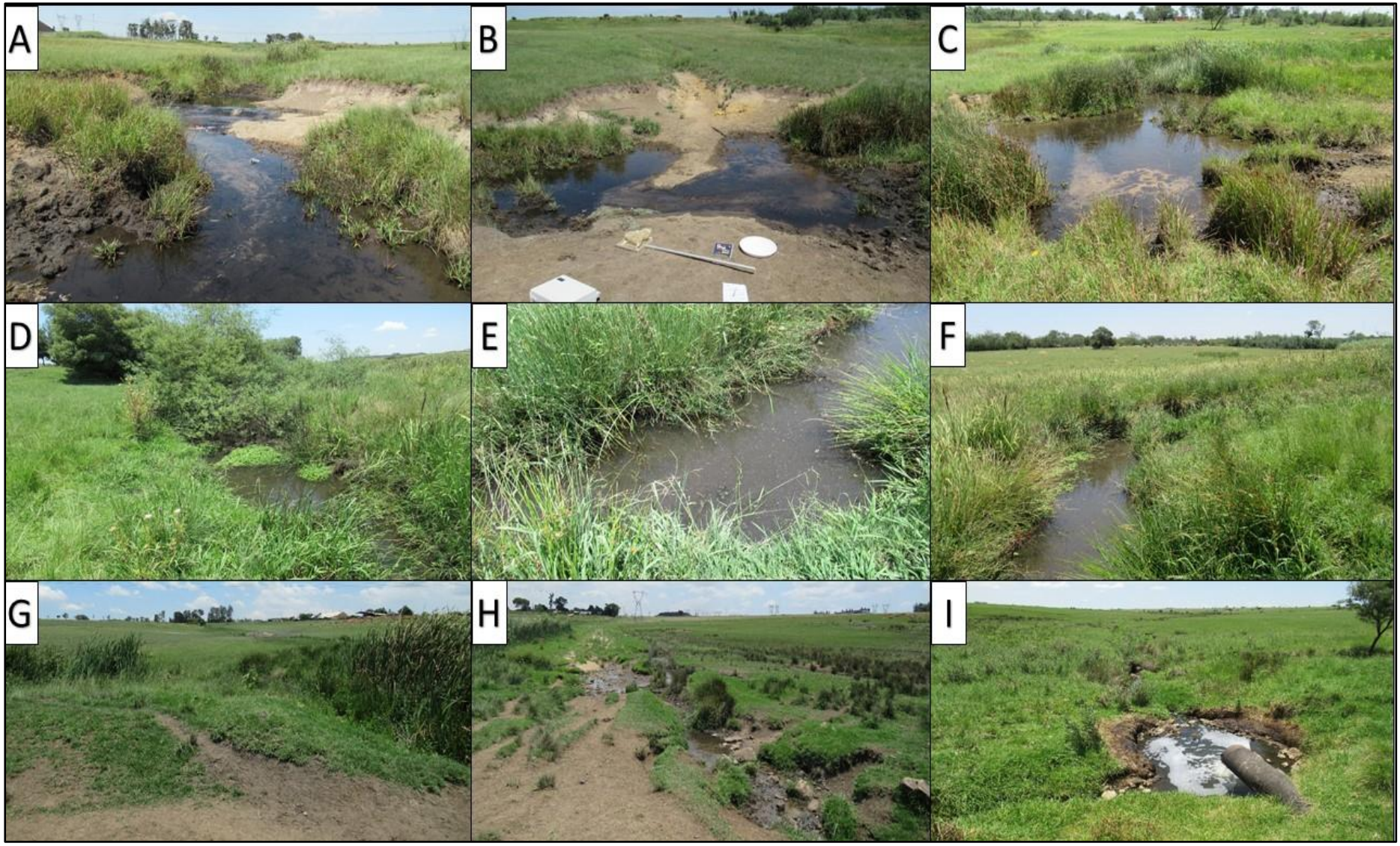

Figure 7-1: Sample Localities for the Transalloys study area where (A-C) represents the tributary of the Brugspruit (Sample point 1), (D-F) Downstream site for the Brugspruit (Sample point 2); and (G-I) the Upstream site of the Brugspruit (Sample point 3), note the sewage discharge in (I).

7.4 RUNOFF MONITORING

As a pre-cautionary measure, effective storm water management will be implemented to direct any runoff around the project site so as to ensure the discharge of clean water from the storm water system. It is proposed that grab samples be taken from the storm water system during rainfall events. The analyses of storm water discharged will provide an indication of whether the Transalloys Power Generation Project footprint area is impacting on the surface water environment. Monitoring of the storm water quality should be conducted and recorded whenever possible or in accordance with the frequency as specified in a Water Use License and should include the variables indicated in **Table 7-3** below. The water quality should be representative of upstream runoff from the surrounding area.

Table 7-3: Runoff water quality parameters to be analysed

Variable	Unit	Frequency Upstream Runoff
pH		Whenever Possible
Electrical Conductivity as EC	mS/m	Whenever Possible
Suspended Solids as SS	mg/l	Whenever Possible
Total Dissolved Solids as TDS	mg/l	Whenever Possible
Sulphate as SO_4	mg/l	Whenever Possible
Nitrate as NO_3	mg/l	Whenever Possible
Sodium as Na	mg/l	Whenever Possible
Chloride as Cl	mg/l	Whenever Possible
Calcium as Ca	mg/l	Whenever Possible
Potassium as K	mg/l	Whenever Possible
Magnesium as Mg	mg/l	Whenever Possible
Aluminium as Al	mg/l	Whenever Possible
Iron as F	mg/l	Whenever Possible
Lead as Pb	mg/l	Whenever Possible
Manganese as Mn	mg/l	Whenever Possible
Silicon as Si	mg/l	Whenever Possible
Vanadium as V	mg/l	Whenever Possible
Zinc as Zn	mg/l	Whenever Possible
Chromium as Cr	mg/l	Whenever Possible
Mercury	mg/l	Whenever Possible
Total hardness as $CaCO_3$	mg/l	Whenever Possible
Total alkalinity as $CaCO_3$	mg/l	Whenever Possible
Fluoride as F	mg/l	Whenever Possible
Dissolved Oxygen as DO	mg/l	Whenever Possible
Chemical Oxygen Demand as COD	mg/l	Whenever Possible
Ortho Phosphate as PO_4	mg/l	Whenever Possible
Faecal Coliform Bacteria	/100 ml	Whenever Possible
E. Coli	/100 ml	Whenever Possible
Soap, oil and grease	mg/l	Whenever Possible

8 CONCLUSTION AND RECOMMENDATIONS

The primary surface water impacts associated with the proposed Transalloys Power Generation Project are the potential impacts on the regional water balance, water quality degradation due to incidental waste and wastewater discharges, contaminated storm water runoff and subsequent degradation of wetlands and/or drainage lines.

In terms of findings related to the overall surface water environment relevant to the study site, the following conclusions are made:

- The surface water study area falls within the B11K Quaternary Catchment of the Olifants WMA.
- The identified water resources, within close proximity to the project site include the Brugspruit to the east of the project site and an unnamed western tributary of the Brugspruit found to the north-west of the proposed ash dump site.
- These tributaries drain in a northern direction to join the Klipsruit where it further flows in a north eastern direction to ultimately confluence with the Olifants River.
- *In situ* water quality variables taken during all three sampling years (2012, 2014 and 2019) have remained within **unacceptable** limits compared to the Target Water Quality Ranges (TWQRs) for aquatic ecosystems of South Africa.
- The overall Ecological Category of the surface water study area was determined to fall within a Class E Category, indicating a seriously modified system.
- All sites were furthermore found to be **low sensitive** (EIS), due to the extensive anthropogenic activities.
- As per the National Freshwater Ecosystem Priority Areas (NFEPA) Atlas (Nel, *et.al.*, 2011) the water use activities at the Transalloys study site is located within a Low Priority Area. The Brugspruit and its unnamed tributary transecting the Transalloys property is therefore not considered important or sensitive in terms of aquatic ecosystems contribution.
- As indicated by Mucina and Rutherford (2006) the Transalloys Smelter and proposed power generation project area is situated within the Eastern Highveld Grassland Vegetation Unit (Gm12). This Vegetation Unit is listed as Vulnerable in terms of the national list of ecosystems that are threatened and in need of protection (GN 1002 of 09 December 2011).
- As indicated by the MBSP Freshwater Assessment (2011), the proposed Ash Dump Site (Site 1) is situated within an already heavily modified terrain, whereas the proposed Power Plant Site (Site 2) is situated within an area classified as "other natural areas". However, no Freshwater CBAs or ESAs are found within the immediate vicinity of the study site.
- The overall results for the wetland delineation and assessment in accordance with the Department of Water and Sanitation (DWS) requirements concluded that:
    - Three wetland areas were delineated within a 500 m buffer surrounding the Transalloys boundary and associated infrastructure.

- The wetlands were classified into three hydrogeomorphic (HGM) units, comprising of one seepage wetland (HGM1) and two channelled valley bottom wetlands (HGM 2 and HGM 3).
- A wetland health assessment concluded the seep wetland to be **largely modified (Category D)** and the two valley bottom wetlands to be **moderately modified (Category C)**.
- The Ecological Sensitivity and Importance of the wetlands has generally been recorded as **low** as a result of the provision of natural resources and the maintenance of biodiversity that many of these wetlands provide.
- The Ecological Services of the wetlands has generally been recorded as **intermediate**.

- The calculated results indicate that a 110 m buffer is appropriate for the protection of the ecosystem services provided by the wetland systems

The overall impact on the surrounding surface water environment could be seen as significant without the appropriate mitigation measures in place. However, with the implementation of mitigation management measures the impact of the power plant on the surface water environment is ranked as Moderate to Low.

Considering that adequate hydrologic data had been gathered through specialist investigations coupled with the fact that ongoing data collection could fill the knowledge gaps, the Transalloys Power Generation Project would be in a position to implement an integrated water management plan with the main objective of reducing water resource and environmental degradation.

The Environmental Management Programme (EMP) and the Integrated Water and Waste Management Plan (IWWMP) for the proposed project should address good waste management practices, guidelines for the storage, handling, use and disposal of waste, etc. It is important that the project aim to limit impacts on the aquatic resources as far as possible in order to not only maintain its current basic ecosystem functions but strive to improve it.

All mitigation measures that were provided within this report should be implemented and included in the relevant management plans.

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APPENDIX 1:
AQUATIC ECOLOGICAL AND WETLAND ASSESSMENT (2019)