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FRESHWATER ECOSYSTEM ASSESSMENT AS PART OF THE ENVIRONMENTAL AUTHORISATION (EA) PROCESS FOR THE PROPOSED MOGALAKWENA THIRD CONCENTRATOR (M3C) PRE-ASSEMBLY YARD FOR THE ANGLO-PLATINUM MOGALAKWENA MINE NEAR MOKOPANE, LIMPOPO PROVINCE.

Prepared for

SRK Consultants (Pty) Ltd

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EXECUTIVE SUMMARY

Mogalakwena Mine intends to construct a pre-assembly yard to augment current operations. The Mogalakwena Third Concentrator (M3C) pre-assembly yard (hereafter the 'study area') is located on the farm Vaalkop 819 associated with the Mogalakwena Mine, approximately 3.6 km west of the N11 highway and approximately 22 km north of the town of Mokopane, and 8 km north-west of the town of Mahwereleng-B, within the Mogalakwena Local Municipality. The study area is situated between 165 m and 430 m north and slightly upgradient of the Groot Sandsloot River, however it is not located within the Zones of Regulation applicable to the river as stipulated by the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA), Government Notice 509 as published in the Government Gazette 40229 of 2016 as it relates to the National Water Act, 1998 (Act No. 36 of 1998) and Government Notice 704 as published in the Government Gazette 20119 of 1999 as it relates to the National Water Act, 1998 (Act No. 36 of 1998).

The reach of the river associated with the study area (i.e. to the east of Bakenberg Road) has been modified over the course of several decades, primarily by the construction of various instream impoundments (most notably the DWS Vaalkop No. 2 Dam) 600 m east of the study area). As a result, ecological integrity has decreased, in turn lowering the capacity of the river to provide key ecological services, particularly as the river is non-perennial and ecological service provision is therefore seasonally driven. It is nevertheless considered ecologically important, primarily as it is a major tributary of the Mogalakwena River which in turn is a major tributary of the Limpopo River.

Since the study area is located outside of all applicable zones of regulation in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), Government Notice 509 as published in the Government Gazette 40229 of 2016 and Government Notice 704 Regulations as published in the Government Gazette 20119 of 1999 as they relate to the National Water Act, 1998 (Act 36 of 1998), no direct impacts to the river as a result of the proposed project activities within the study area are anticipated. Provided that basic good-practice mitigation measures (please refer to Appendix F) are implemented throughout the life of the development to prevent and minimise the risk and significance of potential indirect impacts, it is the specialist's opinion that the proposed project does not pose a significant quantum of risk to the Groot-Sandsloot River and that the proposed development may be considered for authorisation.

MANAGEMENT SUMMARY

Scientific Aquatic Services (SAS) was appointed by SRK Consulting (South Africa) (Pty) Ltd. to conduct a freshwater ecosystem assessment as part of the Environmental Authorisation (EA) and Water Use Authorisation processes for the proposed M3C pre-assembly yard project located on the farm Vaalkop 819 associated with the Mogalakwena Mine near Mokopane in the Limpopo province. The proposed Mogalakwena M3C pre-assembly yard project is located approximately 3.6 km west of the N11 highway and approximately 22 km north of the town of Mokopane, and 8 km north-west of the town of Mahwereleng-B, within the Mogalakwena Local Municipality. The project boundary where the proposed project is located is hereafter referred to as the "study area".

The purpose of this report is to define the ecology of the area in terms of freshwater ecosystem characteristics, including mapping of the freshwater ecosystems, discuss key ecological drivers and to define the Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS), as well as the socio-cultural and ecological service provision of the freshwater ecosystems utilising current industry "best practice" assessment methods in order to ascertain what, if any, impact the activities will have on the freshwater ecosystems associated with the study area. Additionally, this report aims to define the Recommended Management Objectives (RMO), Recommended Ecological Category (REC)

and Best Attainable State (BAS) for the freshwater ecosystems. The assessment took the following approach:

- A desktop study was conducted, in which possible freshwater ecosystems were identified for on-site investigation, and relevant national and provincial databases were consulted;
- During the site assessment, no freshwater ecosystems were identified within the study area, however a single freshwater ecosystem, namely the Groot Sandsloot River, was identified between 165 m and 430 m south (and slightly downgradient) of the study area;
- The river was delineated, ground-truthed and assessed in detail during a single site assessment conducted in November 2021;
- The river was classified according to the Ollis et al. (2013) classification system; and
- The characteristics of the river were defined including the PES, EIS, REC, RMO and BAS.

The results of the field assessment are presented in Section 4 and Appendix E of this report, and are summarised in the table below:

Table A: Summary of the assessment results.

Freshwater Ecosystem	Present Ecological State (PES) / Ecostatus	Ecoservices	Ecological Importance and Sensitivity (EIS)	Recommended Ecological Category / Recommended Management Objective / Best Attainable State
Groot Sandsloot	Category C/D (Moderately to largely Modified)	Moderately Low / low	Moderate	REC Category: C/D BAS Category: C RMO: Maintain
Extent of modification anticipated	**Low** The study area is located outside the applicable zones of regulation in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), Government Notice 509 as published in the Government Gazette 40229 of 2016 and Government Notice 704 Regulations as published in the Government Gazette 20119 of 1999 as they relate to the National Water Act, 1998 (Act 36 of 1998) (please refer to Section 5 for details). Therefore, no direct impacts to the river relating to the proposed activities within the study area are anticipated. However, the study area is situated slightly upgradient of the river, and therefore indirect impacts such as increased inputs of water may potentially occur. Provided that appropriate mitigation measures are implemented throughout the life of the proposed project, particularly during the operational phase, the extent of modification anticipated is likely to be negligible to low and no significant quantum of risk to the river is anticipated as a consequence.			

As the proposed development is located outside of the applicable Zones of Regulation in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), Government Notice 509 as published in the Government Gazette 40229 of 2016 and Government Notice 704 Regulations as published in the Government Gazette 20119 of 1999 as they relate to the National Water Act, 1998 (Act 36 of 1998), the DWS Risk Assessment Matrix (2016) was not undertaken. No direct impacts to the Groot-Sandsloot River are anticipated since no project components will be associated with the river.

Although the study area is situated slightly upgradient of the Groot-Sandsloot River, a wide (10 m) gravel road forms the southern boundary of the study area and provides an initial buffer between the study area and the river for any potential indirect impacts such as stormwater runoff. In addition, the implementation of well-designed, site specific, good-practice mitigation measures within the study area for the life of the development will further reduce the likelihood of potential indirect impacts. Provided that this occurs it is the specialist's opinion that no significant quantum of risk is posed by the proposed development within the study area, and that the development may be considered for authorisation. Key mitigation measures include, but are not limited to:

- Vegetation clearing to be limited to the proposed project footprint areas including those associated with any proposed stormwater infrastructure, and vegetation outside of the study area, particularly to the south, must remain intact to retain a natural buffer zone;
- Topsoil stripped within the study area must be stockpiled for rehabilitation, and stockpiles must be located in the northern portion of the study area. Topsoil stockpile slope monitoring should be carried out regularly to manage the slope angle and height. The slope of the stockpile areas should not be excessively steep in order minimise erosion risk;
- Dust suppression measures must be put into place during site clearing and vegetation removal activities;

- It must be ensured that where berms and/or cut off trenches (if any) are developed around the study area they are sufficient in design and size to capture any sediment and water runoff and stop such spreading into the surrounding soil in line with the requirements of GN704 of 1999 as it relates to the National Water Act, 1998 (Act 36 of 1998);
- Any stormwater outlets for the release of 'clean' water (if planned) should be constructed from energy dissipating structures (such as Armorflex or reno mattresses) to reduce the velocity of water outflow; and
- Although the activities within the proposed M3C are not directly related to mining activities, any water which may potentially reach the river and cause contamination (defined as "dirty water" by GN704 of 1999 as it relates to the National Water Act, 1998 (Act 36 of 1998)) emanating from the study area should be captured and re-used as process water of the mine.

DOCUMENT GUIDE

The table below provides the specialist report requirements for the assessment and reporting of impacts on aquatic biodiversity in terms of Government Notice 320 as promulgated in Government Gazette 43110 of 20 March 2020 in line with the Department of Environmental Affairs screening tool requirements, as it relates to the National Environmental Management Act, 1998 (Act No. 107 of 1998).

No.	Requirements	Section in report
2.1	Assessment must be undertaken by a suitably qualified SACNASP registered specialist	Front Page and Appendix E
2.2	Description of the preferred development site, including the following aspects-	
2.2.1	a. Aquatic ecosystem type b. Presence of aquatic species and composition of aquatic species communities, their habitat, distribution, and movement patterns	Section 4
2.2.2	Threat status, according to the national web based environmental screening tool of the species and ecosystems, including listed ecosystems as well as locally important habitat types identified	Section 3 and 4
2.2.3	National and Provincial priority status of the aquatic ecosystem (i.e. is this a wetland or river Freshwater Ecosystem Priority Area (FEPA), a FEPA sub- catchment, a Strategic Water Source Area (SWSA), a priority estuary, whether or not they are free-flowing rivers, wetland clusters, etc., a CBA or an ESA; including for all a description of the criteria for their given status	Section 3
2.2.4	A description of the Ecological Importance and Sensitivity of the aquatic ecosystem including: a. The description (spatially, if possible) of the ecosystem processes that operate in relation to the aquatic ecosystems on and immediately adjacent to the site (e.g. movement of surface and subsurface water, recharge, discharge, sediment transport, etc.); b. The historic ecological condition (reference) as well as Present Ecological State (PES) of rivers (in-stream, riparian and floodplain habitat), wetlands and/or estuaries in terms of possible changes to the channel, flow regime (surface and groundwater)	Section 3
2.3	Identify any alternative development footprints within the preferred development site which would be of a "low" sensitivity as identified by the national web based environmental screening tool and verified through the Initial Site Sensitivity Verification	Section 5
2.4	Assessment of impacts - a detailed assessment of the potential impact(s) of the proposed development on the following very high sensitivity areas/ features:	Section 6
2.4.1	Is the development consistent with maintaining the priority aquatic ecosystem in its current state and according to the stated goal?	Section 6
2.4.2	Is the development consistent with maintaining the Resource Quality Objectives for the aquatic ecosystems present?	Section 6
2.4.3	How will the development impact on fixed and dynamic ecological processes that operate within or across the site, including: a. Impacts on hydrological functioning at a landscape level and across the site which can arise from changes to flood regimes (e.g. suppression of floods, loss of flood attenuation capacity, unseasonal flooding or destruction of floodplain processes); b. Change in the sediment regime (e.g. sand movement, meandering river mouth/estuary, changing flooding or sedimentation patterns) of the aquatic ecosystem and its sub-catchment; c. The extent of the modification in relation to the overall aquatic ecosystem (i.e. at the source, upstream or downstream portion, in the temporary / seasonal / permanent zone of a wetland, in the riparian zone or within the channel of a watercourse, etc.). d. Assessment of the risks associated with water use/s and related activities.	Section 6
2.4.4	How will the development impact on the functionality of the aquatic feature including: a. Base flows (e.g. too little/too much water in terms of characteristics and requirements of system); b. Quantity of water including change in the hydrological regime or hydroperiod of the aquatic ecosystem (e.g. seasonal to temporary or permanent; impact of over abstraction or instream or off-stream impoundment of a wetland or river); c. Change in the hydrogeomorphic typing of the aquatic ecosystem (e.g. change from an unchannelled valley-bottom wetland to a channelled valley-bottom wetland); d. Quality of water (e.g. due to increased sediment load, contamination by chemical and/or organic effluent, and/or eutrophication); and e. Fragmentation (e.g. road or pipeline crossing a wetland) and loss of ecological connectivity (lateral and longitudinal).	Section 6
2.4.5	How will the development impact on key ecosystem regulating and supporting services especially Flood attenuation; Streamflow regulation; Sediment trapping; Phosphate assimilation; Nitrate assimilation; Toxicant assimilation; Erosion control; and Carbon storage.	Section 6
2.4.6	How will the development impact community composition (numbers and density of species) and integrity (condition, viability, predator-prey ratios, dispersal rates, etc.) of the faunal and vegetation communities inhabiting the site?	Section 6

2.4.7	In addition to the above, where applicable, impacts to the frequency of estuary mouth closure should be considered, in relation to size of the estuary; availability of sediment; wave action in the mouth; protection of the mouth; beach slope; volume of mean annual runoff; and extent of saline intrusion (especially relevant to permanently open systems).	Section 6
3.	**The report must contain as a minimum the following information:**	
3.1	Contact details and curriculum vitae of the specialist including SACNASP registration number and field of expertise and their curriculum vitae;	Appendix G
3.2	A signed statement of independence by the specialist;	Appendix G
3.3	The duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;	Section 2
3.4	The methodology used to undertake the impact assessment and site inspection, including equipment and modelling used, where relevant;	Section 1.2, 2 and Appendix C
3.5	A description of the assumptions made and any uncertainties or gaps in knowledge or data as well as a statement of the timing and intensity of site inspection observations;	Section 1.3
3.6	Areas not suitable for development, to be avoided during construction and operation (where relevant);	Section 5
3.7	Additional environmental impacts expected from the proposed development based on those already evident on the site and a discussion on the cumulative impacts;	Section 5
3.8	A suitable construction and operational buffer for the aquatic ecosystem, using the accepted protocol;	Section 5
3.9	Impact management actions and impact management outcomes proposed by the specialist for inclusion in the EMPr;	Section 5 and 6
3.10	A motivation where the development footprint identified as per 2.3 were not considered stating reasons why these were not being considered; and	Section 7
3.11	A reasoned opinion, based on the finding of the specialist assessment, regarding the acceptability or not, of the development and if the development should receive approval, and any conditions to which the statement is subjected.	Section 7
3.12	A suitable construction and operational buffer for the aquatic ecosystem, using the accepted methodologies.	Section 5
3.13	Proposed impact management actions and impact management outcomes for inclusion in the Environmental Management Programme (EMPr).	Section 6
3.14	A motivation must be provided if there were development footprints identified as per paragraph 2.3 for reporting in terms of Section 24(5)(a) and (h) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) that were identified as having a “low” aquatic biodiversity and sensitivity and that were not considered appropriate.	
3.15	A substantiated statement, based on the findings of the specialist assessment, regarding the acceptability or not of the proposed development and if the proposed development should receive approval or not.	Section 7
3.16	Any conditions to which this statement is subjected.	Section 7

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GLOSSARY OF TERMS

Alien vegetation:	Plants that do not occur naturally within the area but have been introduced either intentionally or unintentionally. Vegetation species that originate from outside of the borders of the biome -usually international in origin.
Biodiversity:	The number and variety of living organisms on earth, the millions of plants, animans and micro-organisms, the genes they contain, the evolutionary history and potential they encompass and the ecosystems, ecological processes and landscape of which they are integral parts.
Buffer:	A strip of land surrounding a wetland or riparian area in which activities are controlled or restricted, in order to reduce the impact of adjacent land uses on the wetland or riparian area.
Catchment:	The area where water is collected by the natural landscape, where all rain and run-off water ultimately flows into a river, wetland, lake, and ocean or contributes to the groundwater system.
Delineation (of a wetland):	To determine the boundary of a wetland based on soil, vegetation and/or hydrological indicators.
Ecoregion:	An ecoregion is a "recurring pattern of ecosystems associated with characteristic combinations of soil and landform that characterise that region".
Endorheic	As it relates to a depression wetland: inward-draining with no transport of water into downstream systems via subsurface or surface flow. Water leaves via evapotranspiration and infiltration only.
Facultative species:	Species usually found in wetlands (76%-99% of occurrences) but occasionally found in non-wetland areas.
Groundwater:	Subsurface water in the saturated zone below the water table.
Hydromorphic soil:	A soil that in its undrained condition is saturated or flooded long enough to develop anaerobic conditions favouring the growth and regeneration of hydrophytic vegetation (vegetation adapted to living in anaerobic soils).
Hydrology:	The study of the occurrence, distribution and movement of water over, on and under the land surface.
Indigenous vegetation:	Vegetation occurring naturally within a defined area.
Mottles:	Soils with variegated colour patterns are described as being mottled, with the "background colour" referred to as the matrix and the spots or blotches of colour referred to as mottles.
Obligate species:	Species almost always found in wetlands (>99% of occurrences).
Perennial:	Flows all year round.
RAMSAR:	The Ramsar Convention (The Convention on Wetlands of International Importance, especially as Waterfowl Habitat) is an international treaty for the conservation and sustainable utilisation of wetlands, i.e., to stem the progressive encroachment on and loss of wetlands now and in the future, recognising the fundamental ecological functions of wetlands and their economic, cultural, scientific, and recreational value. It is named after the city of Ramsar in Iran, where the Convention was signed in 1971.
Watercourse:	In terms of the definition contained within the National Water Act, a watercourse means: • A river or spring; • A natural channel which water flows regularly or intermittently; • A wetland, dam or lake into which, or from which, water flows; and • Any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse; • and a reference to a watercourse includes, where relevant, its bed and banks
Wetland Vegetation (WetVeg) type:	Broad groupings of wetland vegetation, reflecting differences in regional context, such as geology, climate, and soils, which may in turn have an influence on the ecological characteristics and functioning of wetlands.

ACRONYMS

°C	Degrees Celsius.
BAR	Basic Assessment Report
CBA	Critical Biodiversity Area
CSIR	Council of Scientific and Industrial Research
DWA	Department of Water Affairs
DWAF	Department of Water Affairs and Forestry
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
EC	Ecological Class or Electrical Conductivity (use to be defined in relevant sections)
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
EMC	Ecological Management Class
ESA	Ecological Support Area
EWR	Ecological Water Requirements
FEPA	Freshwater Ecosystem Priority Areas
GIS	Geographic Information System
GN	Government Notice
GPS	Global Positioning System
HGM	Hydrogeomorphic
m	Meter
MAP	Mean Annual Precipitation
NEMA	National Environmental Management Act
NFEPA	National Freshwater Ecosystem Priority Areas
NBA	National Biodiversity Assessment
NWA	National Water Act
PES	Present Ecological State
REC	Recommended Ecological Category
RMO	Resource Management Objective
RQIS	Research Quality Information Services
SACNASP	South African Council for Natural Scientific Professions
SANBI	South African National Biodiversity Institute
SAS	Scientific Aquatic Services
SQR	Sub quaternary catchment reach
subWMA	Sub-Water Management Area
WetVeg Groups	Wetland Vegetation Groups
WMA	Water Management Areas
WMS	Water Management System
WRC	Water Research Commission

1 INTRODUCTION

1.1 Background

Scientific Aquatic Services (SAS) was appointed by SRK Consulting (South Africa) (Pty) Ltd. to conduct a freshwater ecosystem assessment as part of the Environmental Authorisation (EA) process for the proposed Mogalakwena Third Concentrator (M3C) pre-assembly yard project located on the farm Vaalkop 819 associated with the Mogalakwena Mine near Mokopane in the Limpopo Province. The proposed Mogalakwena M3C pre-assembly yard project is located approximately 3.6 km west of the N11 highway and approximately 22 km north of the town of Mokopane, and 8 km north-west of the town of Mahwereleng-B, within the Mogalakwena Local Municipality. The project boundary where the proposed project is located is hereafter referred to as the “study area”.

To identify all freshwater ecosystems that may potentially be impacted by the proposed Mogalakwena M3C pre-assembly yard project (hereafter “the proposed project”), a 500 m “zone of investigation” around the study area, in accordance with Government Notice (GN) 509 of 2016 as it relates to the National Water Act, 1998 (Act No. 36 of 1998) (NWA) was used as a guide in which to assess possible sensitivities of the receiving environment. This 500 m “zone of investigation” will henceforth be referred to as the ‘investigation area’.

The purpose of this report is to define the ecology of the area in terms of freshwater ecosystems characteristics, including mapping of the freshwater ecosystems, discuss key ecological drivers and to define the Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS), as well as the socio-cultural and ecological service provision of the freshwater ecosystems utilising current industry “best practice” assessment methods in order to ascertain what, if any, impact the activities will have on the freshwater ecosystems associated with the proposed project. Additionally, this report aims to define the Recommended Management Objectives (RMO) and Recommended Ecological Category (REC) for the freshwater ecosystems.

The objective of the study is to provide detailed information when considering the existing activities in the vicinity of the freshwater ecosystems, to ensure the ongoing functioning of the ecosystem such that local and regional conservation requirements and the provision of ecological services in the local area are supported while considering the need for sustainable economic development.

The Department of Water and Sanitation (DWS) Risk Assessment Matrix as promulgated in Government Notice 509, published in the Government Gazette 40229 of 2016 as it relates to the National Water Act, 1998 (Act No. 36 of 1998) was not applied, as although the identified watercourse is situated within the 500 m investigation area, the study area is situated outside the applicable Zone of Regulation around the watercourse (100 m). Please refer to Section 5 for more detail in this regard. Nevertheless, whilst direct impacts to the watercourse are not anticipated, mitigation measures were developed to reduce the risk of any potential indirect impacts (please refer to Section 6).

This report, after consideration and a description of the ecological integrity of the study area, must guide the Environmental Assessment Practitioner (EAP), and the relevant specialist, by means of the presentation of results and recommendations, as to the final design of the layout for the proposed project.

Figure 1: Digital satellite image indicating the location of the study and investigation areas in relation to the surrounding area.

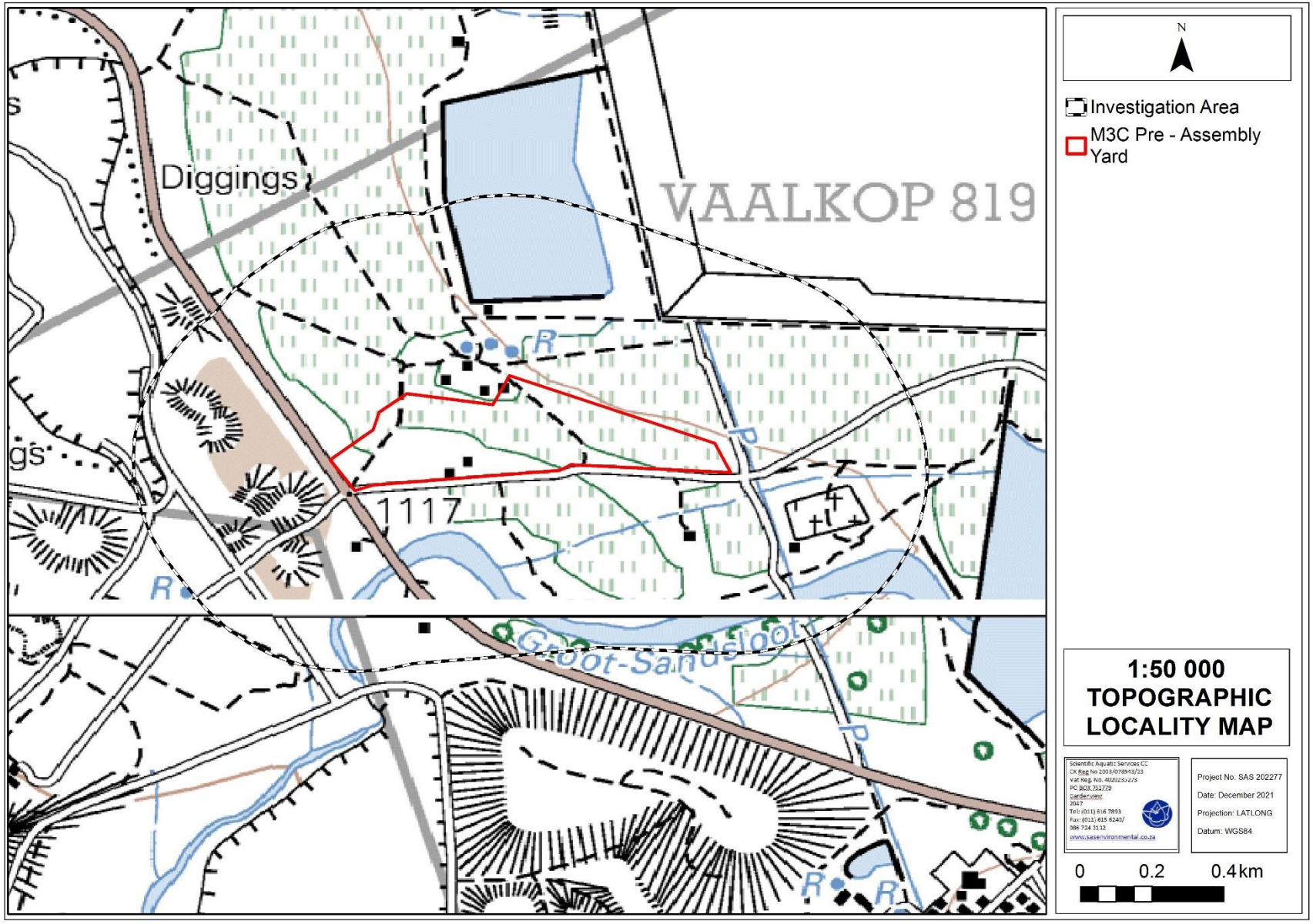

Figure 2: The study and investigation areas indicated on a 1:50 000 topographic map.

1.2 Project Description

In 2019, an environmental authorisation (EA) amendment process was undertaken to authorise several new activities and associated infrastructure at Mogalakwena Complex for the expansion of its existing operations in order to improve production capacity. A new third concentrator plant (known as the M3C) and associated water management infrastructure formed part of the authorisation process which was approved in August 2020. In addition to this a contractor's laydown area was also approved however according to AAP this area is not sufficient for the proposed M3C pre-assembly activities and an additional area is required.
In order to support the construction of the M3C, an additional footprint area of approximately 18 hectares is required to accommodate the necessary temporary construction facilities, the laydown of equipment and materials as well as the pre-assembly of structures required for the M3C (conveyors, gantries and pipe racks).

Mogalakwena Complex would like to establish a pre-assembly yard to the south of the existing return water dam which is within the mine lease area on the Farm Vaalkop 819 LR. The area is bordered on the western side by Bakenberg Road and the main Mogalakwena North Concentrator access road, to the south by the Ga-Molekana gravel access road and on the northern side by existing contractor laydown facilities and tanks directly adjacent to the proposed buffer dam. The area is bordered on the eastern side by a 22kV Eskom line which branches off from the 132kV Eskom overhead powerline.

1.3 Scope of Work

Specific outcomes in terms of this report are outlined below:

- A background study of relevant national, provincial and municipal datasets (such as the National Freshwater Ecosystem Priority Areas [NFEPA] 2011 database; the Department of Water and Sanitation Research Quality Information Services [DWS RQIS PES/EIS], 2014 database, the Limpopo Conservation Plan (Limpopo - CPLAN, 2013) and National Biodiversity Assessment (NBA) 2018 was undertaken to aid in defining the PES and EIS of the freshwater ecosystems;
- All freshwater ecosystems within the investigation area were delineated using desktop methods in accordance with GN509 of 2016 as it relates to activities as stipulated in the National Water Act, 1998 (Act No. 36 of 1998) and verified where possible

according to the "Department of Water Affairs and Forestry (DWAF)[1] (2005)[2]: A practical field procedure for identification of wetlands and riparian areas". Aspects such as soil morphological characteristics, vegetation types and wetness were used to verify the freshwater ecosystems;

- The freshwater ecosystem classification assessment was undertaken according to the Classification System for Wetlands and other Aquatic Ecosystems in South Africa. User Manual: Inland systems (Ollis *et al*., 2013);
- The EIS of the freshwater ecosystem was determined according to the method described by Rountree and Kotze*,* (2013);
- The PES and general habitat integrity of the freshwater ecosystem was assessed using the Index of Habitat Integrity (Kleynhans et al. 2008);
- The freshwater ecosystem was mapped according to the hydrogeomorphic unit in relation to the proposed project. In addition to the freshwater ecosystem boundaries, the appropriate provincial recommended buffers and legislated zones of regulation were depicted where applicable;
- Allocation of a suitable RMO, REC and Best Attainable State (BAS) to the freshwater ecosystem based on the results obtained from the PES and EIS assessments; and
- To present management and mitigation measures which should be implemented going forward to assist in minimising the impact on the receiving environment.

1.4 Assumptions and Limitations

The following assumptions and limitations are applicable to this report:

- No freshwater ecosystems were identified within the proposed project footprint, or within 150 m thereof. A single freshwater ecosystem, namely the Groot Sandsloot River, was identified within 500 m of the proposed project footprint and was subsequently assessed, and where accessible was ground-truthed. However, portions of the river were delineated in fulfilment of GN509 of the National Water Act, 1998 (Act No. 36 of 1998) using various desktop methods including use of topographic maps, historical and current digital satellite imagery and aerial photograph;
- The delineations as presented in this report are regarded as a best estimate of the freshwater ecosystem boundaries based on the site conditions present at the time of assessment;

[1] The Department of Water Affairs and Forestry (DWAF) was formerly known as the Department of Water Affairs (DWA) and subsequently as the Department of Water and Sanitation (DWS). For the purposes of referencing in this report, the name under which the Department was known during the time of publication of reference material, will be used.

[2] Even though an updated manual is available since 2008 (Updated Manual for the Identification and Delineation of Wetlands and Riparian Areas), this is still considered a draft document currently under review.

- Global Positioning System (GPS) technology is inherently inaccurate and some inaccuracies due to the use of handheld GPS instrumentation may occur. If more accurate assessments are required, the freshwater ecosystems will need to be surveyed and pegged according to surveying principles and with survey equipment;
- Wetland, riparian and terrestrial ecosystem zones create transitional areas where an ecotone is formed as vegetation species change from terrestrial to obligate/facultative species. Within this transition zone, some variation of opinion on the freshwater ecosystem boundary may occur. However, if the DWAF (2008) method is followed, all assessors should get largely similar results;
- With ecology being dynamic and complex, certain aspects (some of which may be important) may have been overlooked. A more reliable assessment of the biota would require seasonal sampling, with sampling being undertaken under both low flow and high flow conditions. However, it is expected that the existing activities have been accurately assessed and considered, based on the field observations and the consideration of existing studies and monitoring data in terms of aquatic, riparian and wetland ecology; and
- With regards to data sources used to provide background information on the sensitivity of the assessed areas, it is important to note that although all data sources provide useful and often verifiable, high quality data, the various databases used do not always provide an entirely accurate indication of the study area's actual site characteristics at the scale required to inform the environmental authorisation processes.

1.5 Legislative Requirements and Provincial Guidelines

The following legislative requirements and relevant provincial guidelines were taken into consideration during the assessment. A detailed description of these legislative requirements is presented in Appendix B:

- Constitution of the Republic of South Africa, 1996[3];
- The National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA);
- The National Water Act, 1998 (Act No. 36 of 1998) (NWA);
- Government Notice 704 as published in the Government Gazette 20119 of 1999 as it relates to the National Water Act, 1998 (Act No. 36 of 1998);
- Government Notice 509 as published in the Government Gazette 40229 of 2016 as it relates to the National Water Act, 1998 (Act No. 36 of 1998);

[3] Since 1996, the Constitution has been amended by seventeen amendments acts. The Constitution is formally entitled the 'Constitution of the Republic of South Africa, 19996". It was previously also numbered as if it were an Act of Parliament – Act No. 108 of 1996 – but since the passage of the Citation of Constitutional Laws Act, neither it nor the acts amending it are allocated act numbers.

- The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA);
- The National Environmental Management: Biodiversity Act: Alien and Invasive Species Regulations, 2014;
- The Limpopo Environmental Management Act, 2003 (Act No.7 of 2003) (LEMA); and
- The Department of Environment, Forestry and Fisheries (DEFF), (2020) National Web-based Environmental Screening Tool (hereafter the "screening tool").

2 ASSESSMENT APPROACH

2.1 Freshwater Ecosystem Definition

For the purposes of this investigation, the definitions associated with a watercourse were taken as per that in the National Water Act, 1998 (Act No. 36 of 1998). The definitions are as follows:

A **watercourse** means:
(a) a river or spring;
(b) a natural channel in which water flows regularly or intermittently;
(c) a wetland, lake or dam into which, or from which, water flows; and
(d) any collection of water which the Minister may, by notice in the *Gazette,* declare to be a watercourse, and a reference to a watercourse includes where relevant, its bed and banks.

Wetland habitat is "land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil."

Riparian habitat includes the physical structure and associated vegetation of the areas associated with a watercourse which are commonly characterized by alluvial soils, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent areas.

2.2 Freshwater Ecosystem Field Verification

As mentioned in Section 1.3 use was made of historical aerial photographs, historical and current digital satellite imagery, topographic maps, and available provincial and national wetland databases to aid in the delineation of the freshwater ecosystem associated with the

proposed project following the field assessment. The following was taken into consideration when utilising the above during delineation:

- Linear features: since water flows/moves through the landscape, freshwater ecosystems often have a distinct linear element to their signature which makes them discernible on aerial photography or satellite imagery;
- Vegetation associated with freshwater ecosystems: a distinct increase in density as well as shrub size near flow paths;
- Hue: water flow paths often show as white/grey or black and outcrops or bare soil displaying varying chroma created by varying vegetation cover, geology and soil conditions. Changes in the hue of vegetation with freshwater ecosystem vegetation often indicated on black and white images as areas of darker hue (dark grey and black). In colour imagery these areas mostly show up as darker green and olive colours or brighter green colours in relation to adjacent areas where there is less soil moisture or surface water present; and
- Texture: with areas displaying various textures, created by varying vegetation cover and soil conditions.

The freshwater ecosystem delineation was verified in the field at pre-selected points, and this delineation took place according to the method presented in the “Updated manual for the identification and delineation of wetland and riparian resources” (DWAF, 2008). The foundation of the method is based on the fact that freshwater ecosystems have several distinguishing factors including the following:

- Landscape position;
- The presence of water at or near the ground surface;
- Distinctive hydromorphic soil;
- Vegetation adapted to saturated soil; and
- The presence of alluvial soil in stream systems.

A field assessment was undertaken on the 25th of November 2021 at the start of the summer rainfall season, during which the presence of any riparian or wetland characteristics as defined by DWAF (2008) and by the National Water Act, 1998 (Act No. 36 of 1998) were noted (please refer to Section 4 of this report). In addition to the delineation process, detailed assessments of the delineated freshwater ecosystem was undertaken, at which time, factors affecting the integrity of the freshwater ecosystem were taken into consideration and aided in the determination of the functioning and the ecological and socio-cultural services provided by the freshwater ecosystem. A detailed explanation of the methods of assessment undertaken is provided in Appendix C of this report.

2.3 Sensitivity Mapping

The freshwater ecosystem associated with the proposed project was delineated on a desktop basis, with the delineation being ground-truthed in the field at certain pre-selected points where possible with the use of a Global Positioning System (GPS). Geographic Information System (GIS) was used to project the feature onto digital satellite imagery and topographic maps. The sensitivity map presented in Section 5 should guide the design and layout of the proposed project.

2.4 Risk Assessment and Recommendations

Following the completion of the assessment, the requirement for a risk assessment was considered. Although the identified watercourse is situated within the 500 m investigation area, the study area is situated outside the applicable Zones of Regulation around the watercourse in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), Government Notice 509 as published in the Government Gazette 40229 of 2016 and Government Notice 704 Regulations as published in the Government Gazette 20119 of 1999 as they relate to the National Water Act, 1998 (Act 36 of 1998). Please refer to Section 5 for more detail in this regard. Nevertheless, recommendations were developed to address and mitigate potential indirect impacts associated with the proposed project throughout the life of the proposed project and in particular during construction and operation. The detailed site-specific mitigation measures are outlined as part of a risk statement provided in Section 6 of this report.

3 RESULTS OF THE DESKTOP ANALYSIS

3.1 Analyses of Relevant Databases

The following section contains data accessed as part of the desktop assessment and are presented as a “dashboard style” report (Table 1). The dashboard report aims to present concise summaries of the data on as few pages as possible to allow for integration of results by the reader to take place. Where required, further discussion and interpretation is provided.

It is important to note that although all data sources used provide useful and often verifiable, high quality data, the various databases used do not always provide an entirely accurate indication of the assessed areas actual site characteristics at the scale required to inform the environmental authorisation and/or water use licensing application processes. Nevertheless, this information is considered useful as background information to the study, is important in

legislative contextualisation of risk and impact, and was used as a guideline to inform the assessment and to focus on areas and aspects of increased conservation importance. It must, however, be noted that site verification of key areas may potentially contradict the information contained in the relevant databases, in which case the site verified information must carry more weight in the decision-making process. Actual site conditions at the time of the assessment may differ to the background information provided by various datasets. Please refer to Section 4 for details pertaining to the site investigation.

Table 1: Desktop data (from available databases only) relating to the character of the freshwater ecosystems associated with the study area and surrounding region.

Aquatic ecoregion and sub-regions in which the study area is located.	
Ecoregion	Limpopo Plain
Catchment	Limpopo
Quaternary Catchment	A61G
WMA	Limpopo
Sub-Water Management Area (SubWMA)	Mogalakwena
Dominant characteristics of the Limpopo Plain Ecoregion Level II (1.03) (Kleynhans *et al.*, 2007a).	
Dominant primary terrain morphology	Slightly undulating plains
Dominant primary vegetation types	Sweet Bushveld
Altitude (m a.m.s.l)	500 to 1300
MAP (mm)	300 to 500
Coefficient of Variation (% of MAP)	25 to 39
Rainfall concentration index	60 to >65
Rainfall seasonality	Early to mid-summer
Mean annual temp. (°C)	25 to 39
Winter temperature (July)	2 to 24
Summer temperature (Feb)	18 to 22
Median annual simulated runoff (mm)	16 to 32
Ecological Status of the most proximal sub-quaternary reach (DWS, 2014).	
Sub-quaternary reach Point	**A61G – 00266 Groot Sandsloot River (6.5 km south west of the study area)**
Assessed by expert?	**Yes**
PES Category Median	**Class E (Seriously Modified)**

Detail of the study areas in terms of the National Freshwater Ecosystem Priority Area (NFEPA) (2011) database.	
FEPACODE	The study area falls within an area defined as a **FEPA Code 4 catchment.** Code 4 River FEPAs are important Upstream Management Catchment Areas. Upstream Management Areas are sub-quaternary catchments in which human activities need to be managed to prevent degradation of downstream river FEPAs and Fish Support Areas. Upstream Management Areas do not include management areas for wetland FEPAs, which need to be determined at a finer scale.
NFEPA Wetlands and Rivers (Figure 3)	No natural or artificial wetlands are indicated by the NFEPA database within the study area or within the investigation area. The Groot Sandsloot River is indicated by the database approximately 400 m south of the study area, although the closest field delineated reach is approximately 165 m from the study area.
Wetland vegetation Type	The majority of the study area falls within the Central Bushveld Group 4 Wetland Vegetation Type which is considered Vulnerable (VU) and poorly protected (Mbona *et al*, 2015).
Detail of the study areas in terms of the Limpopo Conservation Plan (2018) .	
Critical Biodiversity Area (CBA) 1 and No Natural Remaining (NNR) (Figure 4)	The study area and the majority of the investigation area are defined as a **Category 1 CBA.** These are "Irreplaceable" areas, which are required to meet biodiversity pattern and/or ecological processes targets; and with no alternative sites available to meet targets. The remaining portions of the investigation area are defined as Other Natural Areas, Ecological Support Areas 2, and No Natural Remaining (NNR).
National Biodiversity Assessment (2018): South African Inventory of Inland Aquatic Ecosystems (SAIIAE).	
An open reservoir was identified within the investigation area according to the NBA (2018): SAIIAE artificial features database. The Groot Sandsloot River is located 400 m south of the study area. No natural wetlands were identified by the database.	
Importance of the study area according to the Mining and Biodiversity Guidelines (2013) .	
The study area falls within an area considered to be of **High Biodiversity Importance**. High Biodiversity Importance areas include areas where mining options may be limited in these areas, and red flags for mining projects are possible. Authorisations may set limits and specify biodiversity offsets that would be written into licence agreements and/or authorisations.	

Stream Order	**1**	National Web-based Screening Tool (2021).	
Mean Ecological Importance (EI) Class	**Moderate**	The screening tool is intended to allow for pre-screening of sensitivities in the landscape to be assessed within the EA process. this assists with implementing the mitigation hierarchy by allowing developers to adjust their proposed development footprint to avoid sensitive areas.	
Mean Ecological Sensitivity (ES) Class	**Very Low**		
Default Ecological Class (based on median PES and highest EI or ES mean)	**Class C (Moderately Modified)**	For the aquatic biodiversity theme, the study area is considered to have an overall **low aquatic sensitivity.**	
Strategic Water Source Areas for Surface Water (2017)			
Surface water SWSAs are defined as areas of land that supply a disproportionate (i.e., relatively large) quantity of mean annual surface water runoff in relation to their size. They include transboundary areas that extend into Lesotho and Swaziland. The sub-national Water Source Areas (WSAs) are not nationally strategic as defined in the report but were included to provide a complete coverage.		Name and Criteria	The study area does not fall within a SWSA.

DWS = Department of Water and Sanitation; EI = Ecological Importance; ES = Ecological Sensitivity; m.a.m.s.l = Metres above Mean Sea Level; MAP = Mean Annual Precipitation; mm = millimetres; NFEPA = National Freshwater Ecosystem Priority Areas; PES = Present Ecological State; WMA = Water Management Area

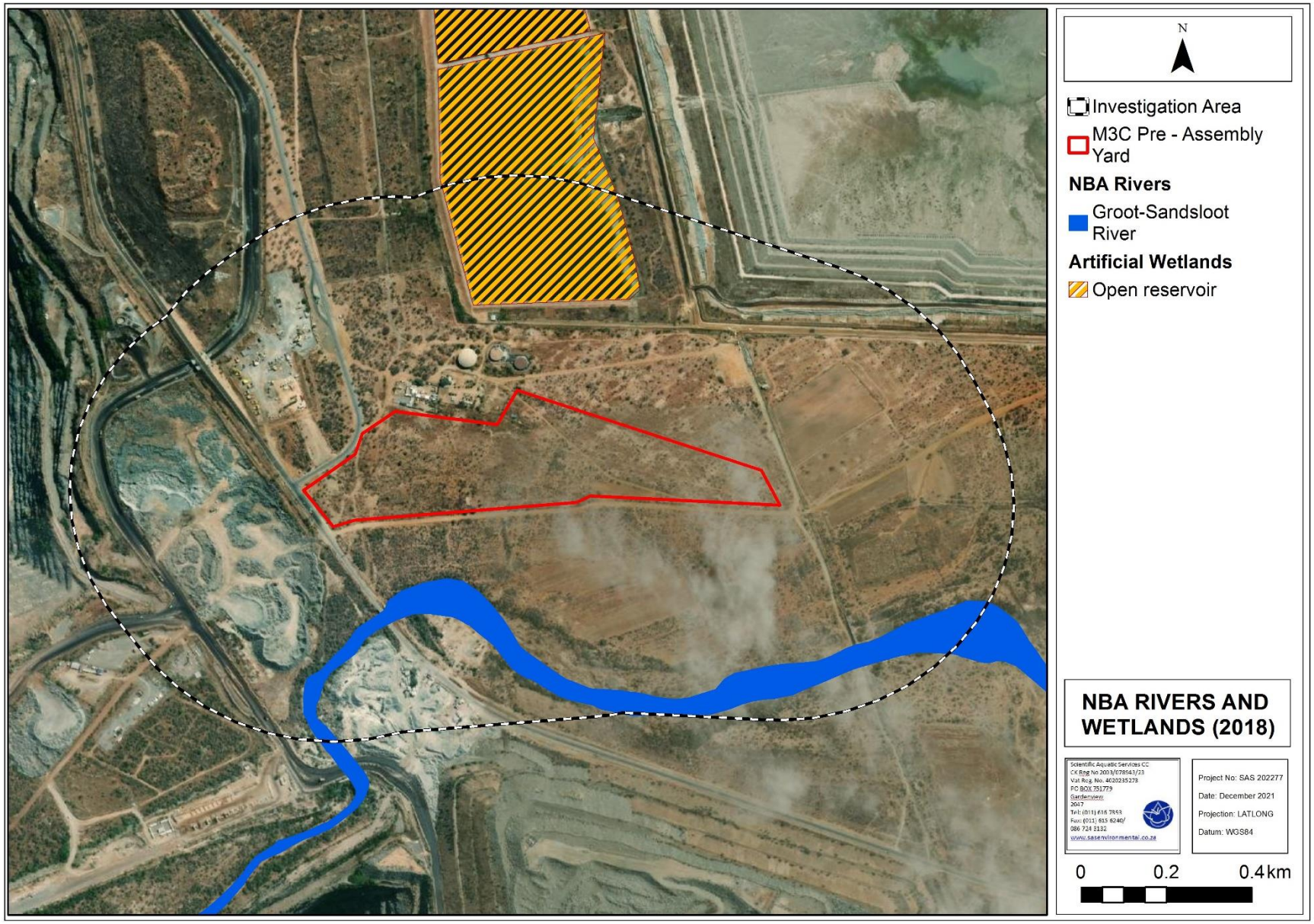

Figure 3: Hydrogeomorphic (HGM) unit indicated by the National Biodiversity Assessment (NBA) (2018) relative to the study and investigation areas.

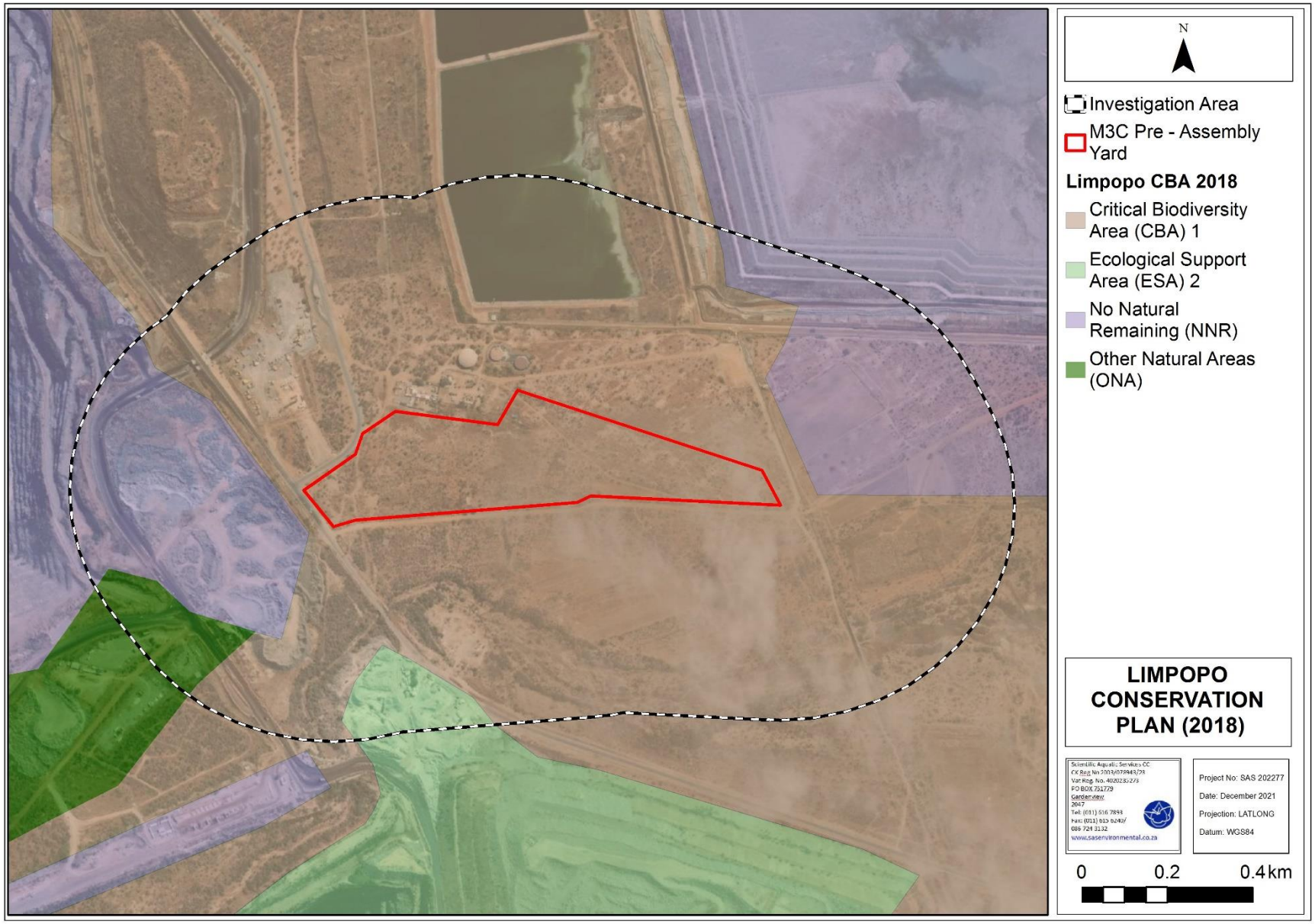

Figure 4: Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs) associated with the study and investigation areas according to the Limpopo Conservation Plan.

3.2 Ecological Status of Sub-Quaternary Catchments [Department of Water and Sanitation (DWS) Resource Quality Services (RQS) PES/EIS database]

Table 2: Summary of the ecological status of the sub-quaternary catchment (SQ) reach associated with the study area based on the DWS RQS PES/EIS database

Ecological status	A61G – 00266 (Groot Sandsloot River)
Synopsis	
PES Category Median	Seriously Modified (Class E)
Mean EI[4] class	Moderate
Mean ES[5] class	Very Low
Length	39.71
Stream order	1
Default EC[6]	Moderate (Class C)
PES[7] Details	
Instream habitat continuity MOD[8]	Large
RIP/wetland zone continuity MOD	Serious
Potential instream habitat MOD activities	Serious
Riparian/wetland zone MOD	Serious
Potential flow MOD activities	Large
Potential physico-chemical MOD activities	Large
EI Details	
Fish spp/SQ	-
Fish average confidence	-
Fish representivity per secondary class	-
Fish rarity per secondary class	-
Invertebrate taxa/SQ	-
Invertebrate average confidence	-
Invertebrate representivity per secondary class	-
Invertebrate rarity per secondary class	-
EI importance: riparian-wetland-instream vertebrates (excluding fish) rating	Low
Habitat diversity class	Very High
Habitat size (length) class	Moderate
Instream migration link class	Moderate
Riparian-wetland zone migration link	Low
Riparian-wetland zone habitat integrity class	Low
Instream habitat integrity class	Low
Riparian-wetland natural vegetation rating based on percentage natural vegetation in 500m	High
Riparian-wetland natural vegetation rating based on expert rating	Low
ES Details	
Fish physical-chemical sensitivity description	-
Fish no-flow sensitivity	-
Invertebrates physical-chemical sensitivity description	-
Invertebrates velocity sensitivity	Very Low
Riparian-wetland-instream vertebrates (excluding fish) intolerance water level/flow changes description	Very Low
Stream size sensitivity to modified flow/water level changes description	Low
Riparian-wetland vegetation intolerance to water level changes description	Low

[4] EI = Ecological Importance
[5] ES = Ecological Sensitivity
[6] EC = Ecological Category; default based on median PES and highest of EI or ES means
[7] PES = Present Ecological State; confirmed in database that assessments were performed by expert assessors
[8] MOD = Modification

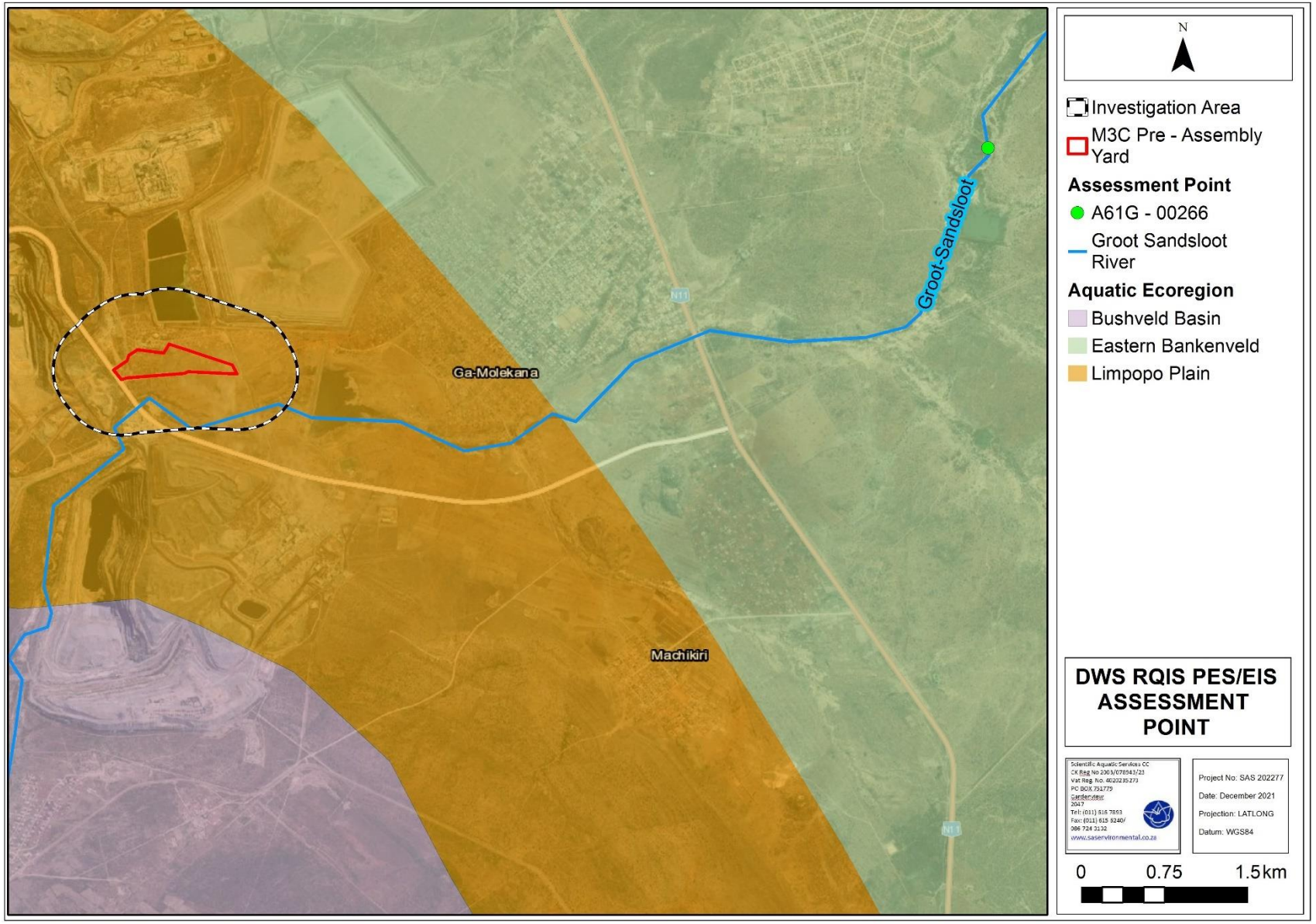

Figure 5: Location of the sub-quaternary reach (SQR) monitoring point in relation to the study area.

4 RESULTS: FRESHWATER ECOSYSTEM ASSESSMENT

4.1 Freshwater Ecosystem Characterisation

In preparation for the field assessment, aerial photographs, digital satellite imagery and provincial and national wetland databases (as outlined in Section 2 of this report) were used to identify areas of interest at a desktop level. All possible measures were undertaken to ensure all freshwater ecosystems which may be affected by the proposed project were identified, delineated and assessed.

During the assessment, a single freshwater ecosystem, namely the Groot Sandsloot River, was identified between 165 m and 430 m south and downgradient of the study area. This freshwater ecosystem was classified according to the Classification System (Ollis *et al*., 2013) as an Inland System, falling within the Limpopo Plain Aquatic Ecoregion. The wetland vegetation group associated with the study area was the Central Bushveld Group 4 WetVeg type which is considered to be Vulnerable according to Mbona *et al.* (2015). At Levels 3 (Landscape Unit) and 4 (HGM Type) of the Classification System, the system was classified as summarised in Table 2 below.

Table 3: Characterisation of the freshwater ecosystems associated with the proposed project according to the Classification System (Ollis *et. al*., 2013).

Freshwater Ecosystem	Level 3: Landscape unit	Level 4: HGM Type
Groot Sandsloot River	**Valley floor:** The base of a valley, situated between two distinct valley side-slopes.	**River**: A linear landform with clearly discernible bed and banks, which permanently or periodically carries a concentrated flow of water. A river is taken to include both the active channel and the riparian zone as a unit.

4.2 Freshwater Ecosystem Delineation

As noted in Section 2.1, the freshwater ecosystem associated with the proposed project was initially delineated using desktop methods (use of aerial photographs, digital satellite imagery and topographical maps), and refined in the field by ground-truthing the desktop delineation at certain pre-selected points where access limitations (mostly relating to bush densification and the presence of heritage sites) did not pose any challenges. The delineation as presented in this report is thus regarded as a best estimate of the freshwater ecosystem boundaries based on the site conditions present at the time of assessment.

The following indicators were used to delineate the boundaries of the riparian zone associated with the Groot Sandsloot River:

- Terrain units were used as the primary indicator, particularly low-lying areas where water is likely to collect and/or move through the landscape within the study and investigation areas; and
- Vegetation was utilised as the secondary indicator. Although the riparian zone was indistinct in the eastern portion of the assessed reach, this was attributed to the effects of the large impoundment situated approximately 600 m east of the study area, which has resulted in loss of recharge and altered flow patterns.

The delineated extent of the Groot Sandsloot River associated with the study area is depicted in the figure below.

4.3 Field Verification Results

Following the site visit, various assessments were undertaken to determine the PES, EIS, and ecological service provision of the identified freshwater ecosystem as well as to assign an appropriate REC, RMO and BAS as described in Section 1.2 of this report. The details pertaining to the method of assessment used to assess the freshwater ecosystem are contained in Appendix C of this report.

Figure 6: The location of the reach of the Groot Sandsloot River associated with the proposed project.

Table 4: Summary of the assessment of the reach of the Groot Sandsloot River associated with the study and investigation areas.

Ecological & socio-cultural service provision graph:
Present State Assessment

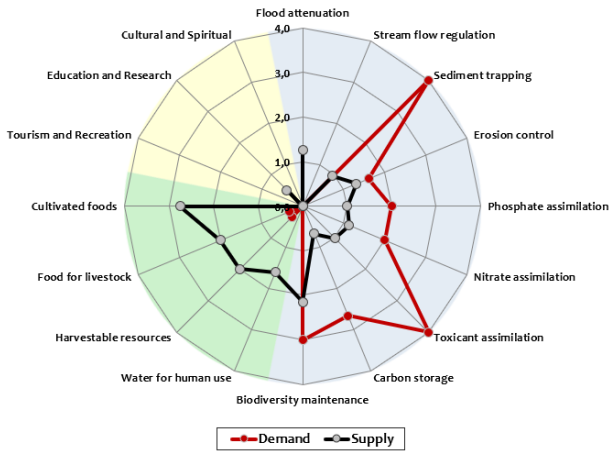

Figure 7: Representative photographs of the reach of the Groot Sandsloot River associated with the proposed project, illustrating the weakly-defined riparian zone in the portion east of the study area (left) whilst to the west of the study area the riparian zone is more distinctly formed.

IHI and VEGRAI discussion	**Riparian IHI Category: C/D** **VEGRAI Category: C** The riparian zone has been modified in various ways. The large impoundment to the east of the study area has resulted in loss of recharge to the downstream reach (i.e. the reach associated with the investigation area) which in turn has led to reduced recruitment of riparian vegetation. Additionally, the upper portion of the assessed reach (i.e. the eastern portion) is characterised by bank incision, and what appears to be historical indiscriminate disposal of soil, resulting in altered topography. The lower (western) portion of the reach has been altered by mining activities and the low-level crossing of Bakenberg Road.	**Ecoservice provision**	**Moderately low / low** As a non-perennial system, ecological service provision is decreased as delivery of key ecoservices is reliant on the presence of water. Nevertheless, the assessed reach of the river is considered important in terms of sediment trapping, harvestable resources (e.g. firewood) and biodiversity maintenance. It may be seasonally important for the provision of water, however local communities are unlikely to be reliant on it for recreation, tourism, or education particularly given the proximity of mining operations.
EIS discussion	**EIS Category: Moderate** The Groot Sandsloot River is one of the primary drainage systems of the area, and is a major tributary of the Mogalakwena River, located approximately 8.5 km south-west of the study area which in turn is a major tributary of the Limpopo River. Therefore, the river is considered ecologically important for its contribution to the ecological functioning of the downstream system, although its capacity to do so has been compromised. It is also considered important as a faunal migratory corridor, providing connectivity between the remaining natural areas outside of the various mining activities in the area.	**REC, RMO & BAS Category**	**REC: C/D** **BAS: C** **RMO: Maintain** Direct impacts associated with the proposed project are not anticipated, therefore maintaining the PES and EIS of the reach of the Groot-Sandsloot associated with the study area is feasible. Any future projects within the regulated zones around the river must however be assessed on an individual basis to ensure that such activities do not impact on the river.
Freshwater ecosystem drivers and receptors discussion (hydraulic regime, geomorphological processes, water quality and habitat and biota):			

The primary modifier of the hydraulic regime of the river is the DWS Vaalkop No. 2 Dam situated to the east of the study and investigation areas as this has prevented flow from reaching the downstream reaches of the river, potentially exacerbating the naturally non-perennial conditions particularly in terms of the composition and structure of the associated riparian zone. Although an earthen canal has been created to channel water from the dam into the river downstream of the impoundment, the outlet of this channel could not be located during the site visit and does not appear to be effective. The remains of historical agricultural furrows were also noted, but these no longer appear to be functional and therefore no longer impact on the hydraulic functioning of the river.

The geomorphological processes have similarly been affected by anthropogenic activities, in particular increased sediment inputs due to airborne dust from surrounding mining activities, and disturbances to soil caused by increased vehicular and foot traffic within the catchment. During the site assessment, several herds of domestic livestock were observed within the study area and along the Groot Sandsloot River; the concentration of these animals in a relatively small area has led to overgrazing and trampling, contributing to the overall disturbance of soil and absence of protective vegetative cover.

The river was dry at the time of assessment, and thus water quality parameters could not be determined. It is likely that when present, surface water quality is impaired due to the various disturbances in the catchment including increased availability of toxins and hydrocarbons from general vehicular traffic in the catchment, as well as sediment.

Despite the decreased ecological integrity of the river, it nevertheless provides suitable breeding and foraging habitat for less sensitive faunal species as well as providing an important migratory corridor between the remaining open spaces. The riparian zone predominantly comprised indigenous woody species albeit dominated by *Dichrostachys cinerea*, potentially an indication of disturbance and bush encroachment.

Extent of modification anticipated	**Negligible / Low** Although the identified watercourse is situated within the 500 m investigation area, the study area is located outside the applicable zones of regulation in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), Government Notice 509 as published in the Government Gazette 40229 of 2016 and Government Notice 704 Regulations as published in the Government Gazette 20119 of 1999 as they relate to the National Water Act, 1998 (Act No. 36 of 1998) (please refer to Section 5 for details). Therefore, no direct impacts to the river relating to the proposed activities within the study area are anticipated. However, the study area is situated slightly upgradient of the river, and therefore indirect impacts such as increased inputs of water may potentially occur. Provided that appropriate mitigation measures are implemented throughout the life of the proposed project, particularly during the operational phase, the extent of modification anticipated is likely to be negligible to low and no fragmentation of the watercourse is anticipated.
Impact Significance & Business Case:	
No significant quantum of risk	The study area is situated between 165 m to 430 m from the river, and as such, no direct impacts are anticipated, nor is a significant quantum of risk arising from indirect impacts expected due to the distance as well as the presence of a wide (10 m) gravel road between the study area and the river, which will intercept any potential indirect impacts such as runoff originating from the study area. Nevertheless, mitigation measures must be focused on the prevention of indirect impacts to the river. Recommended mitigation measures are provided in the risk statement in Section 6, and include, but are not limited to: ➢ Vegetation clearing to be limited to the proposed project footprint areas including those associated with any proposed stormwater infrastructure; ➢ Topsoil stripped within the study area must be stockpiled for rehabilitation, and stockpiles must be located in the northern portion of the study area; ➢ Dust suppression measures must be put into place during site clearing and vegetation removal activities; ➢ It must be ensured that where berms and/or cut off trenches (if any) are developed around the study area they are sufficient in design and size to capture any sediment and water runoff and stop such spreading into the surrounding soil in line with the requirements of GN704 of 1999 as it relates to the National Water Act, 1998 (Act 36 of 1998); ➢ Any stormwater outlets for the release of 'clean' water (if planned) should be constructed from energy dissipating structures (such as Armorflex or reno mattresses) to reduce the velocity of water outflow; and ➢ "Dirty water" (as defined by GN704 of 1999 as it relates to the National Water Act, 1998 (Act 36 of 1998)) emanating from the study area should be captured and re-used as process water of the mine.

5 LEGISLATIVE REQUIREMENTS, NATIONAL AND PROVINCIAL GUIDELINES PERTAINING TO THE APPLICATION OF BUFFER ZONES

According to Macfarlane *et al.* (2015) the definition of a buffer zone is variable, depending on the purpose of the buffer zone. However, in summary, it is considered to be "a strip of land with a use, function or zoning specifically designed to protect one area of land against impacts from another". Buffer zones are considered important to provide protection of basic ecosystem processes (in this case, the protection of aquatic and wetland ecological services), reduce impacts on water resources arising from upstream activities (e.g. by removing or filtering sediment and pollutants), provision of habitat for aquatic and wetland species as well as for certain terrestrial species, and a range of ancillary societal benefits (Macfarlane *et. al,* 2015). It should be noted, however, that buffer zones are not considered to be effective mitigation against impacts such as hydrological changes arising from stream flow reduction, impoundments or abstraction, nor are they considered to be effective in the management of point-source discharges or contamination of groundwater, both of which require site-specific mitigation measures (Macfarlane *et. al,* 2015).

The definition and motivation for a regulated zone of activity for the protection of the freshwater ecosystems are summarised in the table below, however it is important to note that none of the zones of regulation summarised below are triggered, and this information is provided to enable informed decision-making.

Table 5: Articles of Legislation and the relevant zones of regulation applicable to each article.

Regulatory authorisation required	Zone of applicability
Water Use License Application in terms of the National Water Act, 1998 (Act No. 36 of 1998). **(Department of Water and Sanitation.)**	**Government Notice 509 as published in the Government Gazette 40229 of 2016 as it relates to the National Water Act, 1998 (Act No.36 of 1998)** In accordance with GN509 of 2016 as it relates to the National Water Act, 1998 (Act No. 36 of 1998), a regulated area of a watercourse in terms of water uses as listed in Section 21(c) and 21(i) is defined as: • the outer edge of the 1 in 100-year flood line and/or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, lake or dam; • in the absence of a determined 1 in 100-year flood line or riparian area the area within **100 m from the edge of a watercourse** where the edge of the watercourse is the first identifiable annual bank fill flood bench; or • a 500 m radius from the delineated boundary (extent) of any wetland or pan in terms of this regulation. **Government Notice 704 Regulations as published in the Government Gazette 20119 of 1999 as it relates to the National Water Act, 1998 (Act 36 of 1998) regarding the use of water for mining and related activities aimed at the protection of water resources.** These Regulations were put in place in order to prevent the pollution of water resources and protect water resources in areas where mining activity is taking

Regulatory authorisation required	Zone of applicability
	place from impacts generally associated with mining. It is recommended that the proposed mining activities comply with Regulation GN 704 of the National Water Act, 1998 (Act No. 36 of 1998) which contains regulations on use of water for mining and related activities aimed at the protection of water resources. GN 704 states that: *No person in control of a mine or activity may:* *(a) locate or place any residue deposit, dam, reservoir, together with any associated structure or any other facility within the **1:100 year floodline or within a horizontal distance of 100 metres from any watercourse** or estuary, borehole or well, excluding boreholes or wells drilled specifically to monitor the pollution of groundwater, or on waterlogged ground, or on ground likely to become waterlogged, undermined, unstable or cracked;* According to the above, the activity footprint must fall outside of the 1:100 year floodline of the aquatic resource or 100 m from the edge of the resource, whichever distance is the greatest.
Listed activities in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) EIA Regulations (2014), as amended must be taken into consideration if any activities (for example, access roads) are to take place within the applicable zone of regulation. This must be determined by the EAP in consultation with the relevant authorities. **(Department of Environment, Forestry and Fisheries.)**	**Activity 12** of Listing Notice 1 (GN 327) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) EIA regulations, 2014 (as amended) states that: *The development of:* *(xii) Infrastructure or structures with a physical footprint of 100 square meters or more;* *Where such development occurs—* *a) Within a watercourse;* *b) In front of a development setback; or* *c) If no development setback has been adopted, within **32 meters of a watercourse**, measured from the edge of a watercourse.*

In terms of GN509 of the National Water Act, 1998 (Act No. 36 of 1998), a 100 m zone of regulation is applicable to any riparian area, in the absence of a modelled 1:100 year floodline. The 100 m zone of regulation is also applicable in terms of GN704 of the National Water Act, 1998 (Act No. 36 of 1998), whilst a 32 m zone of regulation in accordance with the National Environmental Management Act, 1998 (Act No. 107 of 1998) is also applicable. The study area and therefore the proposed activities therein, are situated outside of all of these zones of regulation. Nevertheless, it is essential that strict implementation of well-developed, cogent mitigation measures takes place, to prevent indirect and unnecessary impacts on the Groot Sandsloot River, in line with the Anglo-American Net-positive impact (NPI) approach to biodiversity maintenance.

The respective zones of regulation as stipulated above are depicted in Figure 8 below.

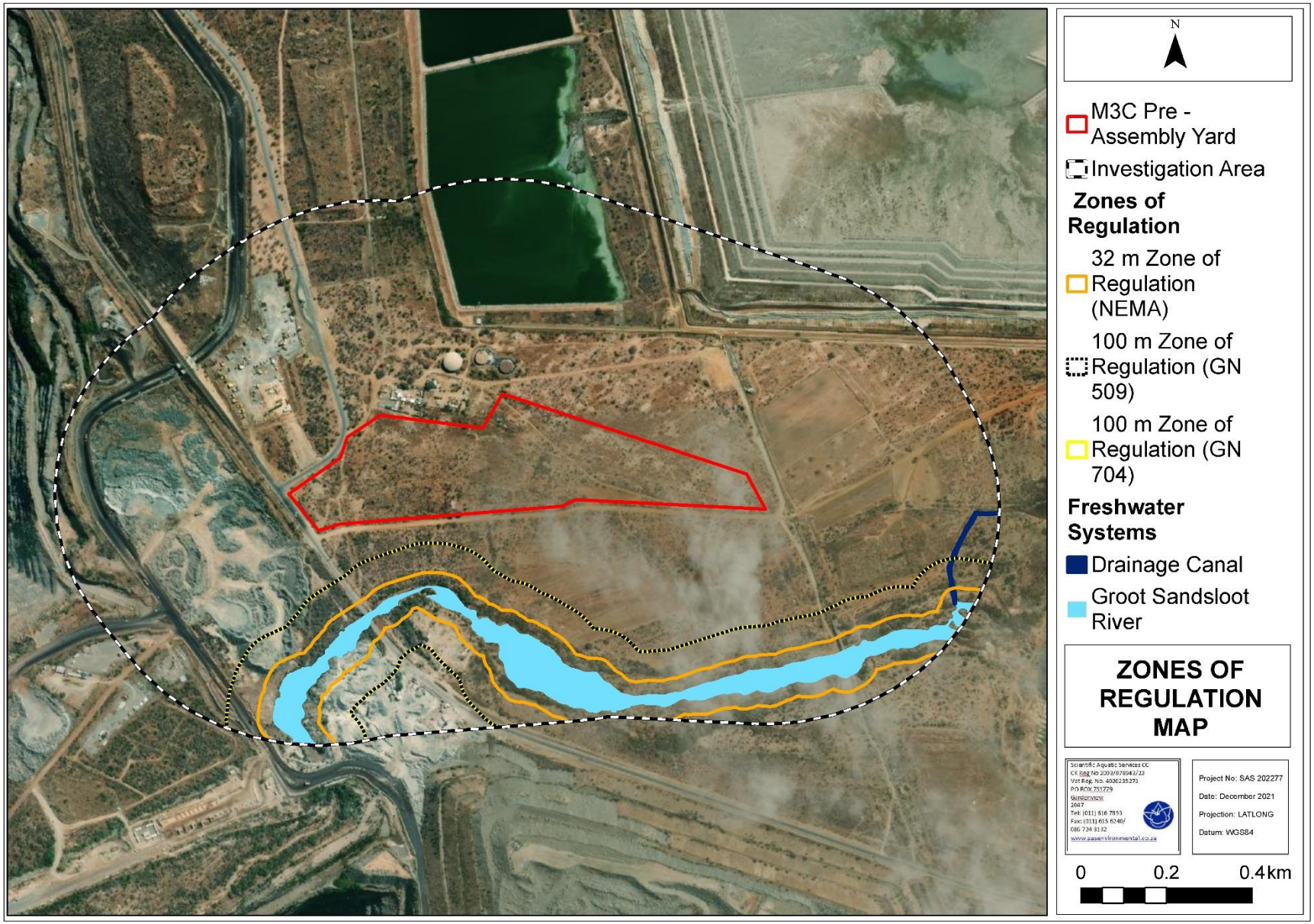

Figure 8: Conceptual presentation of the zones of regulation in terms of GN509 of 2016 and GN704 of 1999 as they relate to the NWA, and in terms of NEMA in relation to the delineated freshwater ecosystem.

6 RISK STATEMENT

The DWS approved Risk Assessment Matrix as promulgated in Government Notice 509 as published in the Government Gazette 40229 of 2016 as it relates to the National Water Act, 1998 (Act No. 36 of 1998) was not undertaken, since the study area is not located within any of the Zones of Regulation applicable to the Groot Sandsloot River, as outlined in Section 5 and as a result, no direct impacts to the river are anticipated. Due to the distance of the river from the study area, as well as the presence of informal 'buffers' including a 10 m gravel road and dense vegetation between the study area and the river which will intercept any potential indirect impacts such as runoff from the study area, no significant quantum of risk is anticipated. Nevertheless, it is critical that well-developed, site-specific, 'good practice' mitigation measures be implemented throughout the life of the proposed project to ensure that indirect impacts are prevented. Recommended measures include:

- Vegetation clearing to be limited to the proposed project footprint areas including those associated with any proposed stormwater infrastructure, and vegetation outside of the study area, particularly to the south, must remain intact to retain a natural buffer zone;
- Topsoil stripped within the study area must be stockpiled for rehabilitation, and stockpiles must be located in the northern portion of the study area. Topsoil stockpile slope monitoring should be carried out regularly to manage the slope angle and height. The slope of the stockpile areas should not be excessively steep in order minimise erosion risk;
- Dust suppression measures must be put into place during site clearing and vegetation removal activities;
- It must be ensured that where berms and/or cut off trenches (if any) are developed around the study area they are sufficient in design and size to capture any sediment and water runoff and stop such spreading into the surrounding soil in line with the requirements of GN704 of 1999 as it relates to the National Water Act, 1998 (Act 36 of 1998);
- Any stormwater outlets for the release of 'clean' water (if planned) should be constructed from energy dissipating structures (such as Armorflex or reno mattresses) to reduce the velocity of water outflow; and
- "Dirty water" (as defined by GN704 of 1999 as it relates to the National Water Act, 1998 (Act 36 of 1998)) emanating from the study area should be captured and re-used as process water of the mine.

6.1 Cumulative Impacts

Cumulative impacts are activities and their associated impacts on the past, present and foreseeable future, both spatially and temporally, considered together with the impacts identified in Section 5.1 above. Freshwater ecosystems within the region are under continued threat due to growing mining intensification and increased demand for human settlements which further increases grazing pressures in the surrounding landscape.

Direct and indirect impacts identified within freshwater ecosystems bordering current or historical agricultural activities include an increase in alien and invasive species entering the system due to regular disturbance of soil and removal of indigenous vegetation. Mining activities in the area according to historical imagery data have caused a significant change in in the extent of freshwater ecosystems in the area.

Ongoing and future mining activities within the catchment are also expected to contribute to future loss of catchment yield, increased sediment inputs (either through stormwater runoff or wind borne) and altered water quality in particular increased inputs of various toxicants and sediment, leading to increased EC, turbidity, smothering of biota and altered habitat (for example, increased proliferation of nutrient-loving aquatic flora.

The proposed Mogalakwena M3C pre-assembly yard is not expected to impact negatively on the Groot-Sandsloot River, nor is it likely to contribute to cumulative impacts on the system, provided that appropriate mitigation measures are implemented throughout the life of the proposed project. Continued rehabilitation efforts such as long-term alien vegetation management and reinstatement of indigenous vegetation around the study area will assist in ensuring that any potential runoff is minimised and these rehabilitation measures will contribute towards maintaining the ecological functioning of the freshwater systems. It is also essential that the mine adheres to existing management measures associated with activities unrelated to the proposed M3C pre-assembly yard, such as ensuring that clean and dirty water management systems are maintained and expanded if necessary, ensuring that all pollution containment facilities can accommodate a minimum 1:50 year flood event and are appropriately aligned, and where possible, accommodate new infrastructure in already disturbed areas to minimise the footprint of disturbance. It is also recommended that provision for rehabilitation of affected reaches of the Groot-Sandsloot River and where necessary, its tributaries, be made.

7 CONCLUSION

During the site assessment undertaken in November 2021, the Groot-Sandsloot River was identified between 165 m and 430 m south of the study area. An assessment of the PES and EIS was undertaken, the results of which are presented in Section 4 and summarised in Table 6 below. The Groot-Sandsloot River has been subjected to numerous impacts over several decades resulting in lowered ecological integrity.

Table 6: Summary of results of the field assessment as discussed in Section 4.

Freshwater Ecosystem	Present Ecological State (PES) / Ecostatus	Ecoservices	Ecological Importance and Sensitivity (EIS)	Recommended Ecological Category / Recommended Management Objective / Best Attainable State
Groot Sandsloot	Category C/D (Moderately to largely Modified)	Moderately Low / low	Moderate	REC Category: C/D BAS Category: C RMO: Maintain
Extent of modification anticipated	**Low** The study area is located outside the applicable zones of regulation in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), Government Notice 509 as published in the Government Gazette 40229 of 2016 and Government Notice 704 Regulations as published in the Government Gazette 20119 of 1999 as they relate to the National Water Act, 1998 (Act 36 of 1998) (please refer to Section 5 for details). Therefore, no direct impacts to the river relating to the proposed activities within the study area are anticipated. However, the study area is situated slightly upgradient of the river, and therefore indirect impacts such as increased inputs of water may potentially occur. Provided that appropriate mitigation measures are implemented throughout the life of the proposed project, particularly during the operational phase, the extent of modification anticipated is likely to be negligible to low and no significant quantum of risk to the river is anticipated as a consequence.			

Although the river is located within 500 m of the study area, the proposed project footprint is not located within the applicable Zones of Regulation around the watercourse in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), Government Notice 509 as published in the Government Gazette 40229 of 2016 and Government Notice 704 Regulations as published in the Government Gazette 20119 of 1999 as they relate to the National Water Act, 1998 (Act 36 of 1998). Therefore, the DWS Risk Assessment Matrix was not applied as the perceived quantum of risk to the river is negligible. Nevertheless, mitigation measures were developed to minimise the significance of any potential indirect impacts. Provided that these mitigation measures are implemented throughout the life of the proposed project, it is the specialist's opinion that the proposed project does not pose a significant

quantum of risk to the Groot-Sandsloot River and that the proposed development may be considered for authorisation.

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APPENDIX A – Terms of Use and Indemnity

INDEMNITY AND TERMS OF USE OF THIS REPORT

The findings, results, observations, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge as well as available information. The report is based on survey and assessment techniques which are limited by time and budgetary constraints relevant to the type and level of investigation undertaken and SAS and its staff reserve the right to, at their sole discretion, modify aspects of the report including the recommendations if and when new information may become available from ongoing research or further work in this field, or pertaining to this investigation.

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APPENDIX B – Legislation

LEGISLATIVE REQUIREMENTS

The Constitution of the Republic of South Africa, 1996	The environment and the health and well-being of people are safeguarded under the Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996) by way of section 24. Section 24(a) guarantees a right to an environment that is not harmful to human health or well-being and to environmental protection for the benefit of present and future generations. Section 24(b) directs the state to take reasonable legislative and other measures to prevent pollution, promote conservation, and secure the ecologically sustainable development and use of natural resources (including water and mineral resources) while promoting justifiable economic and social development. Section 27 guarantees every person the right of access to sufficient water, and the state is obliged to take reasonable legislative and other measures within its available resources to achieve the progressive realisation of this right. Section 27 is defined as a socio-economic right and not an environmental right. However, read with section 24 it requires of the state to ensure that water is conserved and protected and that sufficient access to the resource is provided. Water regulation in South Africa places a great emphasis on protecting the resource and on providing access to water for everyone.
National Environmental Management Act (NEMA) (Act No. 107 of 1998)	The National Environmental Management Act (NEMA) (Act 107 of 1998) and the associated Regulations as amended in 2017, states that prior to any development taking place within a wetland or riparian area, an environmental authorisation process needs to be followed. This could follow either the Basic Assessment Report (BAR) process or the Environmental Impact Assessment (EIA) process depending on the scale of the impact. Provincial regulations must also be considered.
The National Water Act (NWA) (Act No. 36 of 1998)	The National Water Act (NWA) (Act 36 of 1998) recognises that the entire ecosystem and not just the water itself in any given water resource constitutes the resource and as such needs to be conserved. No activity may therefore take place within a watercourse unless it is authorised by the Department of Water and Sanitation (DWS). Any area within a wetland or riparian zone is therefore excluded from development unless authorisation is obtained from the DWS in terms of Section 21 (c) & (i).
National Environmental Management: Biodiversity Act (2004) (Act 10 of 2004) (NEMBA)	**Ecosystems that are threatened or in need of protection** (1) (a) The Minister may, by notice in the Gazette, publish a national list of ecosystems that are threatened and in need of protection. *(b)* An MEC for environmental affairs in a province may, by notice in *the Gazette,* publish a provincial list of ecosystems in the province that are threatened and in need of protection. (2) The following categories of ecosystems may be listed in terms of subsection (1): *(a)* critically endangered ecosystems, being ecosystems that have undergone severe degradation of ecological structure, function or composition as a result of human intervention and are subject to an extremely high risk of irreversible transformation; *(b)* endangered ecosystems, being ecosystems that have undergone degradation of ecological structure, function or composition as a result of human intervention, although they are not critically endangered ecosystems; (c) vulnerable ecosystems, being ecosystems that have a high risk of undergoing significant degradation of ecological structure, function or composition as a result of human intervention, although they are not critically endangered ecosystems or endangered ecosystems; and *(d)* protected ecosystems, being ecosystems that are of high conservation value or of high national or provincial importance, although they are not listed in terms of paragraphs *(a), (b)* or (c).
Government Notice 598 Alien and Invasive Species Regulations (2014), including the Government Notice 864 Alien Invasive Species List as published in the Government Gazette 40166 of 2016, as it relates to the National	NEMBA is administered by the Department of Environmental Affairs and aims to provide for the management and conservation of South Africa's biodiversity within the framework of the NEMA. This act in terms of alien and invasive species aims to: ➢ Prevent the unauthorized introduction and spread of alien and invasive species to ecosystems and habitats where they do not naturally occur, ➢ Manage and control alien and invasive species, to prevent or minimize harm to the environment and biodiversity; and ➢ Eradicate alien species and invasive species from ecosystems and habitats where they may harm such ecosystems or habitats.

Environmental Management Biodiversity Act, 2004 (Act No 10 of 2004)	Alien species are defined, in terms of the NEMBA as: (a) A species that is not an indigenous species; or (b) An indigenous species translocated or intended to be translocated to a place outside its natural distribution range in nature, but not an indigenous species that has extended its natural distribution range by natural means of migration or dispersal without human intervention. Categories according to NEMBA (Alien and Invasive Species Regulations, 2017): ➢ **Category 1a:** Invasive species that require compulsory control; ➢ **Category 1b:** Invasive species that require control by means of an invasive species management programme; ➢ **Category 2:** Commercially used plants that may be grown in demarcated areas, provided that there is a permit and that steps are taken to prevent their spread; and ➢ **Category 3:** Ornamentally used plants that may no longer be planted.
Government Notice 509 as published in the Government Gazette 40229 of 2016 as it relates to the NWA (Act 36 of 1998)	In accordance with Regulation GN509 of 2016, a regulated area of a watercourse for section 21c and 21i of the NWA, 1998 is defined as: a) The outer edge of the 1 in 100 year flood line and/or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, lake or dam; b) In the absence of a determined 1 in 100 year flood line or riparian area the area within 100 m from the edge of a watercourse where the edge of the watercourse is the first identifiable annual bank fill flood bench; or c) A 500 m radius from the delineated boundary (extent) of any wetland or pan. This notice **replaces GN1199** and may be exercised as follows: i) Exercise the water use activities in terms of Section 21(c) and (i) of the Act as set out in the table below, subject to the conditions of this authorisation; ii) Use water in terms of section 21(c) or (i) of the Act if it has a low risk class as determines through the Risk Matrix; iii) Do maintenance with their existing lawful water use in terms of section 21(c) or (i) of the Act that has a LOW risk class as determined through the Risk Matrix; iv) Conduct river and stormwater management activities as contained in a river management plan; v) Conduct rehabilitation of wetlands or rivers where such rehabilitation activities has a LOW risk class as determined through the Risk Matrix; and vi) Conduct emergency work arising from an emergency situation or incident associated with the persons' existing lawful water use, provided that all work is executed and reported in the manner prescribed in the Emergency protocol. A General Authorisation (GA) issued as per this notice will require the proponent to adhere with specific conditions, rehabilitation criteria and monitoring and reporting programme. Furthermore, the water user must ensure that there is a sufficient budget to complete, rehabilitate and maintain the water use as set out in this GA. Upon completion of the registration, the responsible authority will provide a certificate of registration to the water user within 30 working days of the submission. On written receipt of a registration certificate from the Department, the person will be regarded as a registered water user and can commence within the water use as contemplated in the GA.
National Environmental Management: Waste Act, No 59 of 2008 (NEMWA)	NEMWA, which reforms the law regulating waste management in order to protect the health and the environment by providing reasonable measures for the prevention of pollution; provides for national norms and standards for regulating the management of waste by all spheres of government, and provides for the licensing and control of waste management activities.

APPENDIX C – Method of Assessment

1. Desktop Study

Prior to the commencement of the field assessment, a background study, including a literature review, was conducted in order to determine the ecoregion and ecostatus of the larger aquatic system within which the watercourses present or in close proximity of the study area are located. Aspects considered as part of the literature review are discussed in the sections that follow.

1.1 National Freshwater Ecosystem Priority Areas (NFEPA, 2011)

The NFEPA project is a multi-partner project between the Council of Scientific and Industrial Research (CSIR), Water Research Commission (WRC), South African National Biodiversity Institute (SANBI), DWA, South African Institute of Aquatic Biodiversity (SAIAB) and South African National Parks (SANParks). The project responds to the reported degradation of freshwater ecosystem condition and associated biodiversity, both globally and in South Africa. It uses systematic conservation planning to provide strategic spatial priorities of conserving South Africa's freshwater biodiversity, within the context of equitable social and economic development.

The NFEPA project aims to identify a national network of freshwater conservation areas and to explore institutional mechanisms for their implementation. Freshwater ecosystems provide a valuable, natural resource with economic, aesthetic, spiritual, cultural and recreational value. However, the integrity of freshwater ecosystems in South Africa is declining at an alarming rate, largely as a consequence of a variety of challenges that are practical (managing vast areas of land to maintain connectivity between freshwater ecosystems), socio-economic (competition between stakeholders for utilisation) and institutional (building appropriate governance and co-management mechanisms).

The NFEPA database was searched for information in terms of conservation status of rivers, wetland habitat and wetland features present in the vicinity of or within the study area.

2. Classification System for Wetlands and other Aquatic Ecosystems in South Africa

The watercourses encountered within the study area were assessed using the Classification System for Wetlands and other Aquatic Ecosystems in South Africa. User Manual: Inland Systems (Ollis *et al*., 2013), hereafter referred to as the "Classification System". A summary of Levels 1 to 4 of the classification system are presented in Table C1 and C2, below.

Table C1: Proposed classification structure for Inland Systems, up to Level 3.

WETLAND / AQUATIC ECOSYSTEM CONTEXT		
LEVEL 1: SYSTEM	**LEVEL 2: REGIONAL SETTING**	**LEVEL 3: LANDSCAPE UNIT**
Inland Systems	DWA Level 1 Ecoregions OR NFEPA WetVeg Groups OR Other special framework	Valley Floor
		Slope
		Plain
		Bench (Hilltop / Saddle / Shelf)

Table C2: Hydrogeomorphic (HGM) Unit for the Inland System, showing the primary HGM Types at Level 4A and the subcategories at Level 4B to 4C.

FUNCTIONAL UNIT		
LEVEL 4: HYDROGEOMORPHIC (HGM) UNIT		
HGM type	Longitudinal zonation/ Landform / Outflow drainage	Landform / Inflow drainage
A	**B**	**C**
River	Mountain headwater stream	Active channel
		Riparian zone
	Mountain stream	Active channel
		Riparian zone
	Transitional	Active channel
		Riparian zone
	Upper foothills	Active channel
		Riparian zone
	Lower foothills	Active channel
		Riparian zone
	Lowland river	Active channel
		Riparian zone
	Rejuvenated bedrock fall	Active channel
		Riparian zone
	Rejuvenated foothills	Active channel
		Riparian zone
	Upland floodplain	Active channel
		Riparian zone
Channelled valley-bottom wetland	(not applicable)	(not applicable)
Unchannelled valley-bottom wetland	(not applicable)	(not applicable)
Floodplain wetland	Floodplain depression	(not applicable)
	Floodplain flat	(not applicable)
Depression	Exorheic	With channelled inflow
		Without channelled inflow
	Endorheic	With channelled inflow
		Without channelled inflow
	Dammed	With channelled inflow
		Without channelled inflow
Seep	With channelled outflow	(not applicable)
	Without channelled outflow	(not applicable)
Wetland flat	(not applicable)	(not applicable)

Level 1: Inland systems

From the Classification System, Inland Systems are defined as aquatic ecosystems that have no existing connection to the ocean[9] (i.e. characterised by the complete absence of marine exchange and/or tidal influence) but which are inundated or saturated with water, either permanently or periodically. It is important to bear in mind, however, that certain Inland Systems may have had a historical connection to the ocean, which in some cases may have been relatively recent.

[9] Most rivers are indirectly connected to the ocean via an estuary at the downstream end, but where marine exchange (i.e. the presence of seawater) or tidal fluctuations are detectable in a river channel that is permanently or periodically connected to the ocean, it is defined as part of the estuary.

Level 2: Ecoregions & NFEPA Wetland Vegetation Groups

For Inland Systems, the regional spatial framework that has been included at Level 2 of the classification system is that of DWA's Level 1 Ecoregions for aquatic ecosystems (Kleynhans *et al.,* 2005). There is a total of 31 Ecoregions across South Africa, including Lesotho and Swaziland. DWA Ecoregions have most commonly been used to categorise the regional setting for national and regional water resource management applications, especially in relation to rivers.

The Vegetation Map of South Africa, Swaziland and Lesotho (Mucina & Rutherford, 2006) group's vegetation types across the country according to Biomes, which are then divided into Bioregions. To categorise the regional setting for the wetland component of the National Freshwater Ecosystem Priority Areas (NFEPA) project, wetland vegetation groups (referred to as WetVeg Groups) were derived by further splitting bioregions into smaller groups through expert input (Nel *et al*., 2011). There are currently 133 NFEPA WetVeg Groups. It is envisaged that these groups could be used as a special framework for the classification of wetlands in national- and regional-scale conservation planning and wetland management initiatives.

Level 3: Landscape Setting

At Level 3 of the Classification System, for Inland Systems, a distinction is made between four Landscape Units (Table C1) on the basis of the landscape setting (i.e. topographical position) within which an HGM Unit is situated, as follows (Ollis *et al.,* 2013):

- **Slope:** an included stretch of ground that is not part of a valley floor, which is typically located on the side of a mountain, hill or valley;
- **Valley floor:** The base of a valley, situated between two distinct valley side-slopes;
- **Plain:** an extensive area of low relief characterised by relatively level, gently undulating or uniformly sloping land; and
- **Bench (hilltop/saddle/shelf):** an area of mostly level or nearly level high ground (relative to the broad surroundings), including hilltops/crests (areas at the top of a mountain or hill flanked by down-slopes in all directions), saddles (relatively high-lying areas flanked by down-slopes on two sides in one direction and up-slopes on two sides in an approximately perpendicular direction), and shelves/terraces/ledges (relatively high-lying, localised flat areas along a slope, representing a break in slope with an up-slope one side and a down-slope on the other side in the same direction).

Level 4: Hydrogeomorphic Units

Seven primary HGM Types are recognised for Inland Systems at Level 4A of the Classification System (Table C2), on the basis of hydrology and geomorphology (Ollis *et al*., 2013), namely:

- **River:** a linear landform with clearly discernible bed and banks, which permanently or periodically carries a concentrated flow of water;
- **Channelled valley-bottom wetland:** a valley-bottom wetland with a river channel running through it;
- **Unchannelled valley-bottom wetland:** a valley-bottom wetland without a river channel running through it;
- **Floodplain wetland:** the mostly flat or gently sloping land adjacent to and formed by an alluvial river channel, under its present climate and sediment load, which is subject to periodic inundation by over-topping of the channel bank;
- **Depression:** a landform with closed elevation contours that increases in depth from the perimeter to a central area of greatest depth, and within which water typically accumulates.
- **Wetland Flat:** a level or near-level wetland area that is not fed by water from a river channel, and which is typically situated on a plain or a bench. Closed elevation contours are not evident around the edge of a wetland flat; and
- **Seep:** a wetland area located on (gently to steeply) sloping land, which is dominated by the colluvial (i.e. gravity-driven), unidirectional movement of material down-slope. Seeps are often located on the side-slopes of a valley but they do not, typically, extend into a valley floor.

The above terms have been used for the primary HGM Units in the classification system to try and ensure consistency with the wetland classification terms currently in common usage in South Africa.

Similar terminology (but excluding categories for “channel”, “flat” and “valleyhead seep”) is used, for example, in the recently developed tools produced as part of the Wetland Management Series including WET-Health (Macfarlane *et al*., 2008), WET-IHI (DWAF, 2007) and WET-EcoServices (Kotze *et al*., 2009).

1. Index of Habitat Integrity

The general habitat integrity of each site was discussed based on the application of the Index of Habitat Integrity (Kleynhans et al. 2008). It is important to assess the habitat at each site in order to aid in the interpretation of the results of the community integrity assessments, by taking habitat conditions and impacts into consideration. This method describes the Present Ecological State (PES) of both the in-stream and riparian habitat at each site. The method classifies habitat integrity into one of six classes, ranging from unmodified/natural (Class A) to critically modified (Class F), as indicated in Table C3 below.

Table C3: Classification of Present State Classes in terms of Habitat Integrity [Kleynhans et al. 2008]

Class	Description	Score (% of total)
A	Unmodified, natural.	90 - 100
B	Largely natural with few modifications. The flow regime has been only slightly modified and pollution is limited to sediment. A small change in natural habitats may have taken place. However, the ecosystem functions are essentially unchanged.	80 - 89
C	Moderately modified. Loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged.	60 - 79
D	Largely modified. A large loss of natural habitat, biota and basic ecosystem functions has occurred.	40 – 59
E	Seriously modified. The loss of natural habitat, biota and basic ecosystem functions is extensive.	20 – 39
F	Critically / Extremely modified. Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural habitat and biota. In the worst instances the basic ecosystem functions have been destroyed and the changes are irreversible.	0 - 19

3. The Riparian Vegetation Response Assessment Index (VEGRAI)

VEGRAI is designed for qualitative assessment of the response of riparian vegetation to impacts in such a way that qualitative ratings translate into quantitative and defensible results (Kleynhans *et al.*, 2007a). Results are defensible because their generation can be traced through an outlined process (a suite of rules that convert assessor estimates into ratings and convert multiple ratings into an Ecological Category).

Riparian vegetation is described in the National Water Act (NWA; Act 36 of 1998) as follows: ‘riparian habitat’ includes the physical structure and associated vegetation of the areas associated with a watercourse which are commonly characterised by alluvial soil, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent land areas.

Table C4: Descriptions of the A-F ecological categories.

Ecological category	Description	Score (% of total)
A	Unmodified, natural.	90-100
B	Largely natural with few modifications. A small change in natural habitat and biota may have taken place but the ecosystem functions are essentially unchanged.	80-89
C	Moderately modified. Loss and change of natural habitat have occurred, but the basic ecosystem functions are still predominately unchanged.	60-79
D	Largely modified. A large loss of natural habitat, biota and basic ecosystem functions has occurred.	40-59

E	Seriously modified. The loss of natural habitat, biota and basic ecosystem functions is extensive.	20-39
F	Critically modified. Modifications have reached a critical level and the lotic system has been modified completely with an almost complete loss of natural habitat and biota. In the worst instances, the basic ecosystem functions have been destroyed and the changes are irreversible	0-19

4. Freshwater Ecosystem Function Assessment

"The importance of a water resource, in ecological social or economic terms, acts as a modifying or motivating determinant in the selection of the management class".[10] The assessment of the ecosystem services supplied by the identified freshwater features was conducted according to the guidelines as described by Kotze *et al.* (2020). An assessment was undertaken that examines and rates 16 different ecosystem services, selected for their specific relevance to the South African situation, as follows:

- Flood attenuation;
- Stream flow regulation;
- Sediment trapping;
- Phosphate assimilation;
- Nitrate assimilation;
- Toxicant assimilation;
- Erosion control;
- Carbon storage;
- Biodiversity maintenance;
- Provision of water for human use;
- Provision of harvestable resources;
- Food for livestock;
- Provision of cultivated foods;
- Cultural and spiritual experience;
- Tourism and recreation; and
- Education and research.

For each ecosystem service, indicator scores are combined automatically in an algorithm given in the spreadsheet that has been designed to reflect the relative importance and interactions of the attributes represented by the indicators to arrive at an overall supply score. In addition, the demand for the ecosystem service is assessed based on the wetland's catchment context (e.g. toxicant sources upstream), the number of beneficiaries and their level of dependency, which are also all rated on a five-point scale. Again, an algorithm automatically combines the indicator scores relevant to demand to generate a demand score.

*It is important to note that when assessing riparian zones associated with riverine habitats, the contribution of the riparian zone to streamflow regulation is omitted, owing to a lack of relevant studies (Kotze *et al*, 2020).

Table C5: Integrating scores for supply and demand to obtain and overall importance score

Integrating scores for supply & demand to obtain an overall importance score						
		Supply				
		Very Low	Low	Moderate	High	Very High
Demand		0	1	2	3	4
Very Low	0	0,0	0,0	0,5	1,5	2,5
Low	1	0,0	0,0	1,0	2,0	3,0
Moderate	2	0,0	0,5	1,5	2,5	3,5
High	3	0,0	1,0	2,0	3,0	4,0
Very High	4	0,5	1,5	2,5	3,5	4,0

A single overall importance score is generated for each ecosystem service by combining the supply and demand scores. This aggregation therefore places somewhat more emphasis on supply than demand, with the supply score acting as the starting score for a "moderate" demand scenario. The

[10] Department of Water Affairs and Forestry, South Africa Version 1.0 of Resource Directed Measures for Protection of Water Resources, 1999

importance score is, however, adjusted by up to one class up where demand is “very high” and by up to one class down where demand is “very low”. The overall importance score can then be used to derive an importance category for reporting purposes.

Table C6: Classes for determining the likely extent to which a benefit is being supplied.

Importance Category		Description
Very Low	0-0.79	The importance of services supplied is very low relative to that supplied by other wetlands.
Low	0.8 – 1.29	The importance of services supplied is low relative to that supplied by other wetlands.
Moderately-Low	1.3 – 1.69	The importance of services supplied is moderately-low relative to that supplied by other wetlands.
Moderate	1.7 – 2.29	The importance of services supplied is moderate relative to that supplied by other wetlands.
Moderately-High	2.3 – 2.69	The importance of services supplied is moderately-high relative to that supplied by other wetlands.
High	2.7 – 3.19	The importance of services supplied is high relative to that supplied by other wetlands.
Very High	3.2 - 4.0	The importance of services supplied is very high relative to that supplied by other wetlands.

5. Ecological Importance and Sensitivity (EIS) (Rountree & Kotze, 2013)

The purposed of assessing importance and sensitivity of water resources is to be able to identify those systems that provide higher than average ecosystem services, biodiversity support functions or are especially sensitive to impacts. Water resources with higher ecological importance may require managing such water resources in a better condition than the present to ensure the continued provision of ecosystem benefits in the long term (Rountree & Kotze, 2013).

In order to align the outputs of the Ecoservices assessment (i.e. ecological and socio-cultural service provision) with methods used by the DWA (now the DWS) used to assess the EIS of other watercourse types, a tool was developed using criteria from both WET-Ecoservices (Kotze, *et, al,* 2009) and earlier DWA EIA assessment tools. Thus, three proposed suites of important criteria for assessing the Importance and Sensitivity for wetlands were proposed, namely:

- Ecological Importance and Sensitivity, incorporating the traditionally examined criteria used in EIS assessments of other water resources by DWA and thus enabling consistent assessment approaches across water resource types;
- Hydro-functional importance, taking into consideration water quality, flood attenuation and sediment trapping ecosystem services that the wetland may provide; and
- Importance in terms of socio-cultural benefits, including the subsistence and cultural benefits provided by the wetland system.

The highest of these three suites of scores is then used to determine the overall Importance and Sensitivity category (Table C6) of the wetland system being assessed.

Table C7: Ecological Importance and Sensitivity Categories and the interpretation of median scores for biota and habitat determinants (adapted from Kleynhans, 1999).

EIS Category	Range of Mean	Recommended Ecological Management Class
Very high Wetlands that are considered ecologically important and sensitive on a national or even international level. The biodiversity of these wetlands is usually very sensitive to flow and habitat modifications.	>3 and <=4	A
High Wetlands that are considered to be ecologically important and sensitive. The biodiversity of these wetlands may be sensitive to flow and habitat modifications.	>2 and <=3	B
Moderate Wetlands that are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these wetlands is not usually sensitive to flow and habitat modifications.	>1 and <=2	C
Low/marginal Wetlands that are not ecologically important and sensitive at any scale. The biodiversity of these wetlands is ubiquitous and not sensitive to flow and habitat modifications.	>0 and <=1	D

6. Recommended Management Objective (RMO) and Recommended Ecological Category (REC) Determination

"A high management class relates to the flow that will ensure a high degree of sustainability and a low risk of ecosystem failure. A low management class will ensure marginal maintenance of sustainability but carries a higher risk of ecosystem failure" (DWA, 1999).

The RMO (table below) was determined based on the results obtained from the PES, reference conditions and EIS of the watercourse (sections above), with the objective of either maintaining, or improving the ecological integrity of the watercourse in order to ensure continued ecological functionality.

Table C8: Recommended management objectives (RMO) for water resources based on PES & EIS scores.

PES			Ecological and Importance Sensitivity (EIS)			
			Very High	High	Moderate	Low
	A	Pristine	A Maintain	A Maintain	A Maintain	A Maintain
	B	Natural	A Improve	A/B Improve	B Maintain	B Maintain
	C	Good	A Improve	B/C Improve	C Maintain	C Maintain
	D	Fair	C Improve	C/D Improve	D Maintain	D Maintain
	E/F	Poor	D* Improve	E/F* Improve	E/F* Maintain	E/F* Maintain

***PES Categories E and F are considered ecologically unnacceptable (Malan and Day, 2012) and therefore, should a watercourse fall into one of these PES categories, an REC class D is allocated by default, as the minimum acceptable PES category.**

A watercourse may receive the same class for the REC as the PES if the watercourse is deemed in good condition, and therefore must stay in good condition. Otherwise, an appropriate REC should be assigned in order to prevent any further degradation as well as enhance the PES of the watercourse.

Table C9: Description of Recommended Ecological Category (REC) classes.

Class	Description
A	Unmodified, natural
B	Largely natural with few modifications
C	Moderately modified
D	Largely modified

7. Freshwater ecosystem delineation

The freshwater ecosystem delineation took place according to the method presented in the "Updated manual for the identification and delineation of wetland and riparian resources" published by DWAF in 2008. The foundation of the method is based on the fact that wetlands and riparian zones have several distinguishing factors including the following:

- The presence of water at or near the ground surface;
- Distinctive hydromorphic soils;
- Vegetation adapted to saturated soils; and
- The presence of alluvial soils in stream systems.

According to the DWA (2005) like wetlands, riparian areas have their own unique set of indicators. It is possible to delineate riparian areas by checking for the presence of these indicators. Some areas may display both wetland and riparian indicators and can accordingly be classified as both. If you are adjacent to a watercourse, it is important to check for the presence of the riparian indicators described below, in addition to checking for wetland indicators, to detect riparian areas that do not qualify as wetlands. The delineation process requires that the following be taken into account:

- topography associated with the watercourse;
- vegetation; and
- alluvial soils and deposited material.

By observing the evidence of these features in the form of indicators, wetlands and riparian zones can be delineated and identified. If the use of these indicators and the interpretation of the findings are applied correctly, then the resulting delineation can be considered accurate (DWA, 2005).

APPENDIX D – Results of Field Investigation

PRESENT ECOLOGICAL STATE (PES) AND ECOLOGICAL IMPORTANCE AND SENSITIVITY (EIS) RESULTS

Table E1: Presentation of the results of the IHI assessment applied to the Groot Sandsloot River.

RIPARIAN IHI	
Base Flows	-3,0
Zero Flows	0,0
Moderate Floods	2,5
Large Floods	2,0
HYDROLOGY RATING	**2,1**
Substrate Exposure (marginal)	2,0
Substrate Exposure (non-marginal)	2,0
Invasive Alien Vegetation (marginal)	2,0
Invasive Alien Vegetation (non-marginal)	2,0
Erosion (marginal)	2,0
Erosion (non-marginal)	2,0
Physico-Chemical (marginal)	1,5
Physico-Chemical (non-marginal)	1,0
Marginal	2,0
Non-marginal	2,0
BANK STRUCTURE RATING	**2,0**
Longitudinal Connectivity	2,0
Lateral Connectivity	2,0
CONNECTIVITY RATING	**2,0**
RIPARIAN IHI %	**59,4**
RIPARIAN IHI EC	**C/D**
RIPARIAN CONFIDENCE	**2,0**

Table E2: Presentation of the results of the VEGRAI assessment applied to the Groot Sandsloot River.

LEVEL 3 ASSESSMENT					
METRIC GROUP	**CALCULATED RATING**	**WEIGHTED RATING**	**CONFIDENCE**	**RANK**	**% WEIGHT**
MARGINAL	63,7	39,8	3,0	1,0	100,0
NON MARGINAL	68,5	25,7	3,0	2,0	60,0
2,0					160,0
LEVEL 3 VEGRAI (%)				65,5	
VEGRAI EC				**C**	
AVERAGE CONFIDENCE				3,0	

Table E3: Presentation of the results of the Ecoservices assessment applied to the Groot Sandsloot River.

		Present State			
ECOSYSTEM SERVICE		Supply	Demand	Importance Score	Importance
REGULATING AND SUPPORTING SERVICES	Flood attenuation	1,3	0,0	0,0	Very Low
	Stream flow regulation	-	-	#VALUE!	#VALUE!
	Sediment trapping	1,0	4,0	1,5	Moderately Low
	Erosion control	1,3	1,6	0,6	Very Low
	Phosphate assimilation	1,0	2,0	0,5	Very Low
	Nitrate assimilation	1,1	2,0	0,6	Very Low
	Toxicant assimilation	1,0	4,0	1,5	Moderately Low
	Carbon storage	0,7	2,7	0,5	Very Low
	Biodiversity maintenance	2,2	3,0	2,2	Moderate
PROVISIONING SERVICES	Water for human use	1,6	0,0	0,1	Very Low
	Harvestable resources	2,0	0,3	0,7	Very Low
	Food for livestock	2,0	0,3	0,7	Very Low
	Cultivated foods	2,8	0,0	1,3	Low
CULTURAL SERVICES	Tourism and Recreation	0,0	0,0	0,0	Very Low
	Education and Research	0,5	0,0	0,0	Very Low
	Cultural and Spiritual	0,0	0,0	0,0	Very Low

Table E4: Presentation of the results of the results of the EIS assessment of the Groot Sandsloot River.

Ecological Importance and Sensitivity			*Confidence (1-5)*
Biodiversity support		A (average)	(average)
		1,33	4,00
Presence of Red Data species		0	4
Populations of unique species		1	4
Migration/breeding/feeding sites		3	4
Landscape scale		B (average)	(average)
		1,60	4,00
Protection status of the wetland		1	4
Protection status of the vegetation type		1	4
Regional context of the ecological integrity		2	4
Size and rarity of the wetland type/s present		2	4
Diversity of habitat types		2	4
Sensitivity of the wetland		C (average)	(average)
		1,33	4,00
Sensitivity to changes in floods		2	4
Sensitivity to changes in low flows/dry season		1	4
Sensitivity to changes in water quality		1	4
ECOLOGICAL IMPORTANCE & SENSITIVITY		**(max of A,B or C)**	*(average of A, B or C)*
	Fill in highest score:	**B**	**1,33**
Moderate: Wetlands that are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these systems is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of and habitat modifications. They play a small role in moderating the quantity and quality of water of major rivers.			
Hydro-Functional Importance		Score (0-4)	*Confidence (1-5)*
Regulating & supporting benefits	**Flood attenuation**	1	4
	Streamflow regulation	0	4
	Water Quality Enhancement — ***Sediment trapping***	1	4
	Water Quality Enhancement — ***Phosphate assimilation***	1	4
	Water Quality Enhancement — ***Nitrate assimilation***	1	4
	Water Quality Enhancement — ***Toxicant assimilation***	1	4
	Water Quality Enhancement — ***Erosion control***	1	4
	Carbon storage	0	4
HYDRO-FUNCTIONAL IMPORTANCE		1	4
Direct Human Benefits		Score (0-4)	Confidence (1-5)
Subsistence benefits	***Water for human use***	0	4
	Harvestable resources	1	4
	Cultivated foods	0	4
Cultural benefits	***Cultural heritage***	0	4
	Tourism and recreation	0	4
	Education and research	0	4
DIRECT HUMAN BENEFITS		0,17	4

APPENDIX E – Impact Analysis and Mitigation Measures

General construction management and good housekeeping practices
Latent and general impacts which may affect the freshwater ecosystem ecology and biodiversity, will include any activities which take place in close proximity to the study area may impact on the receiving environment. Mitigation measures for these impacts are highlighted below and are relevant to the freshwater ecosystem identified in this report:

Development footprint
- All development footprint areas should remain as small as possible and should only encroach into the riparian freshwater ecosystem considered absolutely essential;
- The boundaries of footprint areas, including contractor laydown areas, are to be clearly defined and it should be ensured that all activities remain within defined footprint areas. Edge effects will need to be extremely carefully controlled;
- Planning of temporary roads and access routes should avoid freshwater ecosystem areas and be restricted to existing roads along the tarred access road which traverses the freshwater ecosystem;
- Appropriate sanitary facilities must be provided for the life of the repair and maintenance phase and all waste removed to an appropriate waste facility;
- All hazardous chemicals as well as stockpiles should be stored on bunded surfaces and have facilities constructed to control runoff from these areas;
- It must be ensured that all hazardous storage containers and storage areas comply with the relevant SABS standards to prevent leakage;
- No fires should be permitted in or near the construction area; and
- Ensuring that an adequate number of waste and “spill” bins are provided will also prevent litter and ensure the proper disposal of waste and spills.

Vehicle access
- All vehicles must be regularly inspected for leaks. Re-fuelling must take place on a sealed surface area to prevent ingress of hydrocarbons into the topsoil;
- In the event of a vehicle breakdown, maintenance of vehicles must take place with care and the recollection of spillage should be practiced near the surface area to prevent ingress of hydrocarbons into topsoil and subsequent habitat loss; and
- All spills should they occur, should be immediately cleaned up and treated accordingly.

Vegetation
- Proliferation of alien and invasive species is expected within any disturbed areas. Whilst not considered severe at this time, the vegetation component within the freshwater ecosystem environment is already transformed. However, alien invasive species are opportunistic, and where disturbances do occur, they will promulgate; therefore, these species should be eradicated and controlled to prevent their spread beyond the project footprint. Alien plant seed dispersal within the top layers of the soil within footprint areas, that will have an impact on future rehabilitation, has to be controlled;
- Removal of the alien and weed species encountered within the freshwater ecosystem must take place in order to comply with existing legislation (amendments to the regulations under the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) and Section 28 of the National Environmental Management Act, 1998 (Act No. 107 of 1998); and
- Species specific and area specific eradication recommendations:
  - Footprint areas should be kept as small as possible when removing alien plant species; and
  - No vehicles should be allowed to drive through designated sensitive freshwater ecosystems areas during the eradication of alien and weed species.

Soil
- As much vegetation growth as possible (of indigenous floral species) should be encouraged to protect soils and minimise runoff into the river.

APPENDIX G – Specialist information

DETAILS, EXPERTISE AND CURRICULUM VITAE OF SPECIALISTS

1. (a) (i) Details of the specialist who prepared the report

Kim Marais	BSc (Hons) Zoology (Herpetology) (University of the Witwatersrand)
Amanda Mileson	Advanced Diploma: Nature Conservation (University of South Africa)

1. (a). (ii) The expertise of that specialist to compile a specialist report including a curriculum vitae

Company of Specialist:	Scientific Aquatic Services		
Name / Contact person:	Kim Marais		
Postal address:	29 Arterial Road West, Oriel, Bedfordview		
Postal code:	2007	Cell:	071 413 2245
Telephone:	011 616 7893	Fax:	011 615 6240/ 086 724 3132
E-mail:	kim@sasenvgroup.co.za		
Qualifications	BSc (Hons) (Herpetology) (University of Johannesburg)		
Registration / Associations	Registered Professional Natural Scientist at South African Council for Natural Scientific Professions (SACNASP) Member of the South African Wetland Forum		

1. (b) a declaration that the specialist is independent in a form as may be specified by the competent authority

I, Kim Marais, declare that -

- I act as the independent specialist in this application;
- 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 relevant legislation and any guidelines that have relevance to the proposed activity;
- I will comply with the applicable legislation;
- I have not, 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

Signature of the Specialist

.

I, Amanda Mileson, declare that -

- I act as the independent specialist in this application;
- 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 relevant legislation and any guidelines that have relevance to the proposed activity;
- I will comply with the applicable legislation;
- I have not, 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

Signature of the Specialist

SAS ENVIRONMENTAL GROUP OF COMPANIES –

SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF KIM MARAIS

PERSONAL DETAILS

Position in Company	Water Resource Manager; Senior Scientist
Joined SAS Environmental Group of Companies	2015

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Professional member of the South African Council for Natural Scientific Professions (SACNASP – Reg No. 117137/17)

EDUCATION

Qualifications

BSc (Hons) Zoology (University of the Witwatersrand)	2012
BSc (Zoology and Conservation) (University of the Witwatersrand)	2011

Short Courses

Aquatic and Wetland Plant Identification (Cripsis Environment)	2019
Tools for Wetland Assessment (Rhodes University)	2018
Certificate in Environmental Law for Environmental Managers (CEM)	2014
Certificate for Introduction to Environmental Management (CEM)	2013

AREAS OF WORK EXPERIENCE

South Africa – Gauteng, Mpumalanga, KwaZulu-Natal, Northern Cape, Eastern Cape,
Africa - Uganda

KEY SPECIALIST DISCIPLINES

Biodiversity Assessments

- Biodiversity Action Plans (BAP)
- Alien and Invasive Control Plans (AICP)
- Faunal Eco Scans
- Faunal Impact Assessments

Freshwater Assessments

- Desktop Freshwater Delineation
- Freshwater Verification Assessment
- Freshwater (wetland / riparian) Delineation and Assessment
- Freshwater Eco Service and Status Determination
- Rehabilitation Assessment / Planning
- Watercourse Maintenance and Management Plans
- Freshwater Offset Plans

Aquatic Ecological Assessment and Water Quality Studies

- Riparian Vegetation Integrity (VEGRAI)
- Water quality Monitoring
- Riverine Rehabilitation Plans

Legislative Requirements, Processes and Assessments

- Water Use Applications (Water Use Licence Applications / General Authorisations)
- Water Use Audits
- Freshwater Resource Management and Monitoring as part of EMPR and WUL conditions
- Public Participation processes

SAS ENVIRONMENTAL GROUP OF COMPANIES –

SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF AMANDA MILESON

PERSONAL DETAILS

Position in Company	Senior Ecologist: Wetland Ecology
Joined SAS Environmental Group of Companies	2013

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Member of the South African Wetland Society (SAWS)

Member of the International Society of Wetland Scientists

Member of the Gauteng Wetland Forum (GWF) and Northern Cape Wetland Forum (NCWF)

EDUCATION

Qualifications

N. Dip Nature Conservation (UNISA)	2017
Advanced Diploma Nature Conservation (UNISA)	2020

Short Courses

Wetland Management: Introduction and Delineation (University of the Free State)	2018
Tools for Wetland Assessment (Rhodes University)	2017
Wetland Rehabilitation (University of the Free State)	2015

AREAS OF WORK EXPERIENCE

South Africa – Gauteng, Mpumalanga, Free State, North West, Limpopo, Northern Cape, Eastern Cape

Africa – Zimbabwe, Zambia

KEY SPECIALIST DISCIPLINES

Freshwater Assessments

- Desktop Freshwater Ecosystem Delineation
- Freshwater Ecosystem Verification Assessment
- Freshwater Ecosystem (wetland / riparian) Delineation and Assessment
- Freshwater Ecosystem EcoService and Status Determination
- Freshwater Ecosystem Rehabilitation Assessment / Planning
- Freshwater Ecosystem Maintenance and Management Plans
- Freshwater Ecosystem Plant Species Plans
- Freshwater Ecosystem Offset Plans

Biodiversity Assessments

- Biodiversity Ecological Assessments
- Biodiversity Offset Plans