SCIENTIFIC AQUATIC SERVICES

WATERCOURSE REHABILITATION AND MANAGEMENT PLAN FOR THE PROPOSED VORNA VALLEY SPARK SCHOOL, GAUTENG PROVINCE.

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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, animals 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".
Facultative species:	Species usually found in wetlands (76%-99% of occurrences) but occasionally found in non-wetland areas
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 soil).
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, regardless of the level of alien infestation and where the topsoil has not been lawfully disturbed during the preceding ten years.
Plant species Management Plan	The application of management principles to conserve, protect, enhance and restore landscape resources impacted by natural events and anthropogenic activities.
Seasonal zone of wetness:	The zone of a wetland that lies between the Temporary and Permanent zones and is characterised by saturation from three to ten months of the year, within 50 cm of the surface
Temporary zone of wetness:	the outer zone of a wetland characterised by saturation within 50 cm of the surface for less than three months of the year
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 soil, which may in turn have an influence on the ecological characteristics and functioning of wetlands.

LIST OF ACRONYMS

AIP	Alien Invasive Plant
AIPCP	Alien Invasive Plant Species Control Plan
BAS	Best Attainable State
CVB	Channelled Valley Bottom
DWA	Department of Water Affairs
DWAF	Department of Water Affairs and Forestry
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EC	Electrical Conductivity
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
EMPr	Environmental Management Programme
EO	Environmental Officer
FEPA	Freshwater Ecosystem Priority Areas
GA	General Authorisation
GDARD	Gauteng Department of Agriculture and Rural Development
GN	Government Notice
ha	Hectare
HSS	Hillslope Seep
kg	Kilogram
Kg/ha	Kilograms per hectare
km	Kilometre
Kv	Kilovolt
m	Meter
MW	Megawatt
NBA	National biodiversity Assessment
NDL	Non-perennial Drainage Line
NEMA	National Environmental Management Act
NEMBA	National Environmental Management: Biodiversity Act
NFA	National Forest Act
NFEPA	National Freshwater Ecosystem Priority Areas
NWA	National Water Act
O&M	Operation and Maintenance
PES	Present Ecological State
PSMP	Plant Species Management Plan
REC	Recommended Ecological Category
RMO	Recommended Management Objective
RQIS	Research Quality Information Services
SACNASP	South African Council for Natural Scientific Professions
SAS	Scientific Aquatic Services (Pty) Ltd
SCC	Species of Conservation Concern
STS	Scientific Terrestrial Services
SWMP	Stormwater Management Plan
TDS	Total Dissolved Solids
TNCO	Transvaal Nature Conservation Ordinance
TOPS	Threatened or Protected Species
UCVB	Unchannelled Valley Bottom
WRMP	Watercourse Rehabilitation and Management Plan
WUA	Water Use Authorisation
ZoR	Zone of Regulation

1. INTRODUCTION

Scientific Aquatic Services (SAS) was appointed to conduct a Watercourse Rehabilitation and Management Plan (WRMP) as part of the Water Use Authorisation (WUA) process for the proposed Vorna Valley Spark School, in the Carlswald suburb of Midrand, Gauteng Province. The proposed development is located on the TLC Stables property, and will henceforth be referred to as the "study area". The proposed development consists of the following components:

- Buildings;
- Sports fields/Multisport areas;
- Swimming pool;
- Water tanks;
- Sewer infrastructure associated with the buildings; and
- Roads and parking areas.

An existing crossing over a watercourse (characterised as a non-perennial river and described further in Section 1.2) is proposed to be upgraded, thus necessitating activities inside the delineated extent thereof. The sewer infrastructure for the proposed development will tie into the existing sewer line located on the property.

To assess the possible impacts associated with the proposed project, a 500 m radius around the study area (hereafter referred to as the "investigation area") was used as the area beyond the study area boundaries within which regulated zones of freshwater ecosystems could occur, in accordance with Government Notice 4167 (GN 4167) of 2023 as it relates to the National Water Act, 1998 (Act No. 36 of 1998) as amended (NWA).

The location and extent of the study and associated investigation area are depicted in Figures 1-2 below.

1.1 Background and Rationale

This WRMP was compiled to provide mitigation measures to manage and rehabilitate the potential impacts to the freshwater ecosystems within the vicinity of the proposed development. **The rehabilitation measures set out in this report deals with the development in its entirety, and as such is applicable to all the freshwater ecosystems in the study area**. While only limited activities are proposed to take place inside the freshwater ecosystem habitats, some of the proposed infrastructure is planned within the immediate

vicinity of freshwater ecosystems, and rehabilitation actions are therefore required to prevent large-scale catchment erosion and proliferation of alien invasive vegetation, which may have negative edge effects on the watercourse habitat. The WRMP follows a system that seeks to achieve a required end state and describes how activities that have or could have a negative impact on freshwater ecosystems will be controlled and monitored and identifies the responsible parties and relevant timeframes (where applicable) which will be tasked with implementing these measures. The key aims of the WRMP include:

- Maintenance of the present state of the freshwater ecology associated with the portions of the freshwater ecosystems potentially impacted by the proposed development activities (Section 3);
- Minimise impacts as a result of the proposed development activities on the freshwater ecosystems in the receiving environment including impacts such as erosion and sedimentation as well as impacts on water quality, all of which have the potential to affect habitat and biota within the freshwater ecosystem;
- The plan also aims to minimise impacts on goods and services provision by the freshwater ecosystems;
- Provide a plant species management plan (PSMP) which includes a rescue and relocation plan for indigenous vegetation, control of alien and invasive species as well as a revegetation plan of the disturbed freshwater area (Section 3.2.2);
- Prudent monitoring to ensure timeous detection of, and response to damage caused by the proposed development activities and the development of infrastructure (Section 3.2.4); and
- Provide recommendations for future rehabilitation activities.

This WRMP advocates the use of several environmental management tools and mitigatory measures appropriate to the overall planning process of the construction, operational and rehabilitation phases of the proposed development activities and must be implemented by the proponent as soon as it has been approved by all relevant authorities.

Please refer to **Appendix B** for a detailed description of the Watercourse Rehabilitation and Management Plan Framework.

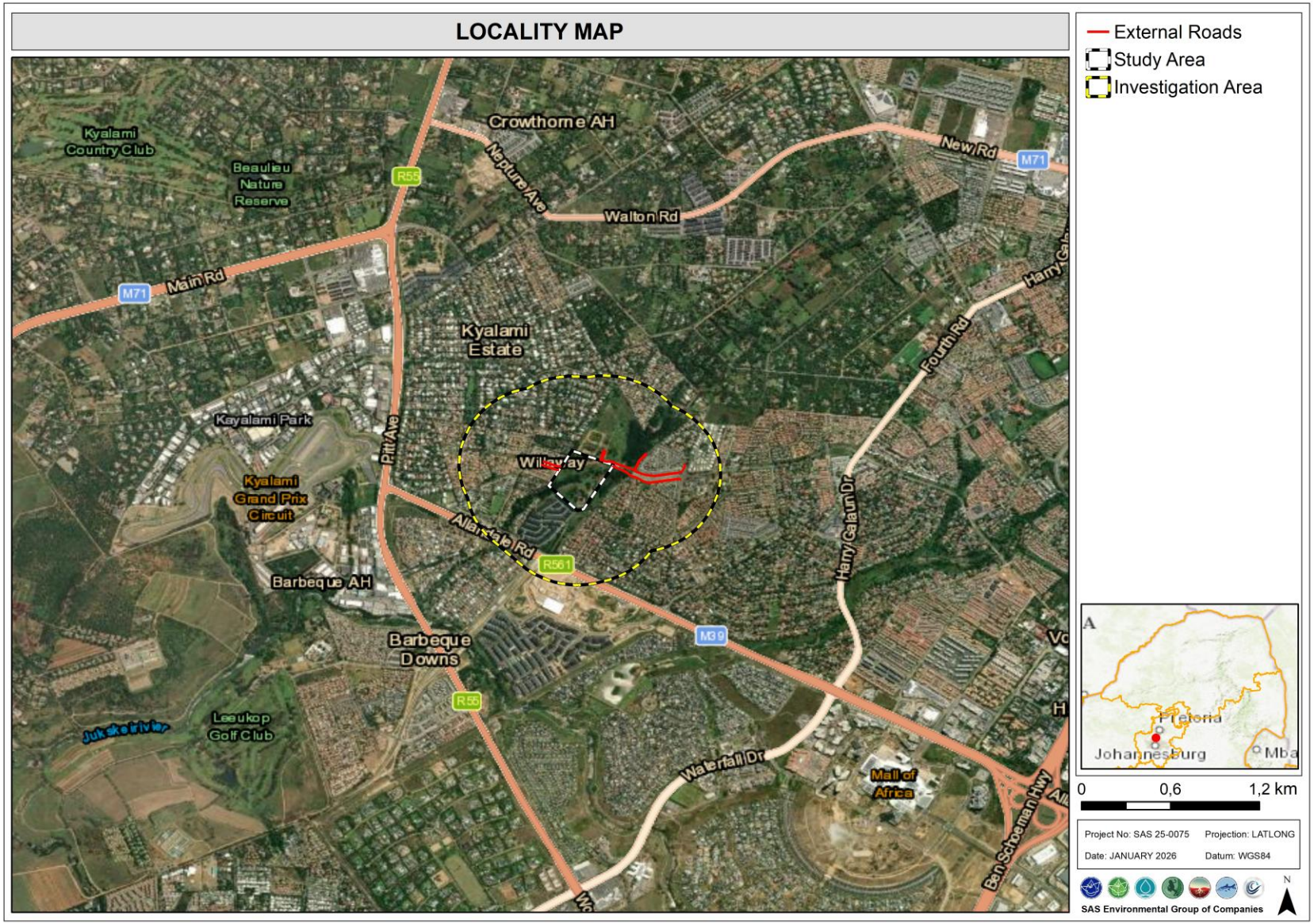


Figure 1: A digital satellite image depicting the location of the study area and associated investigation area.

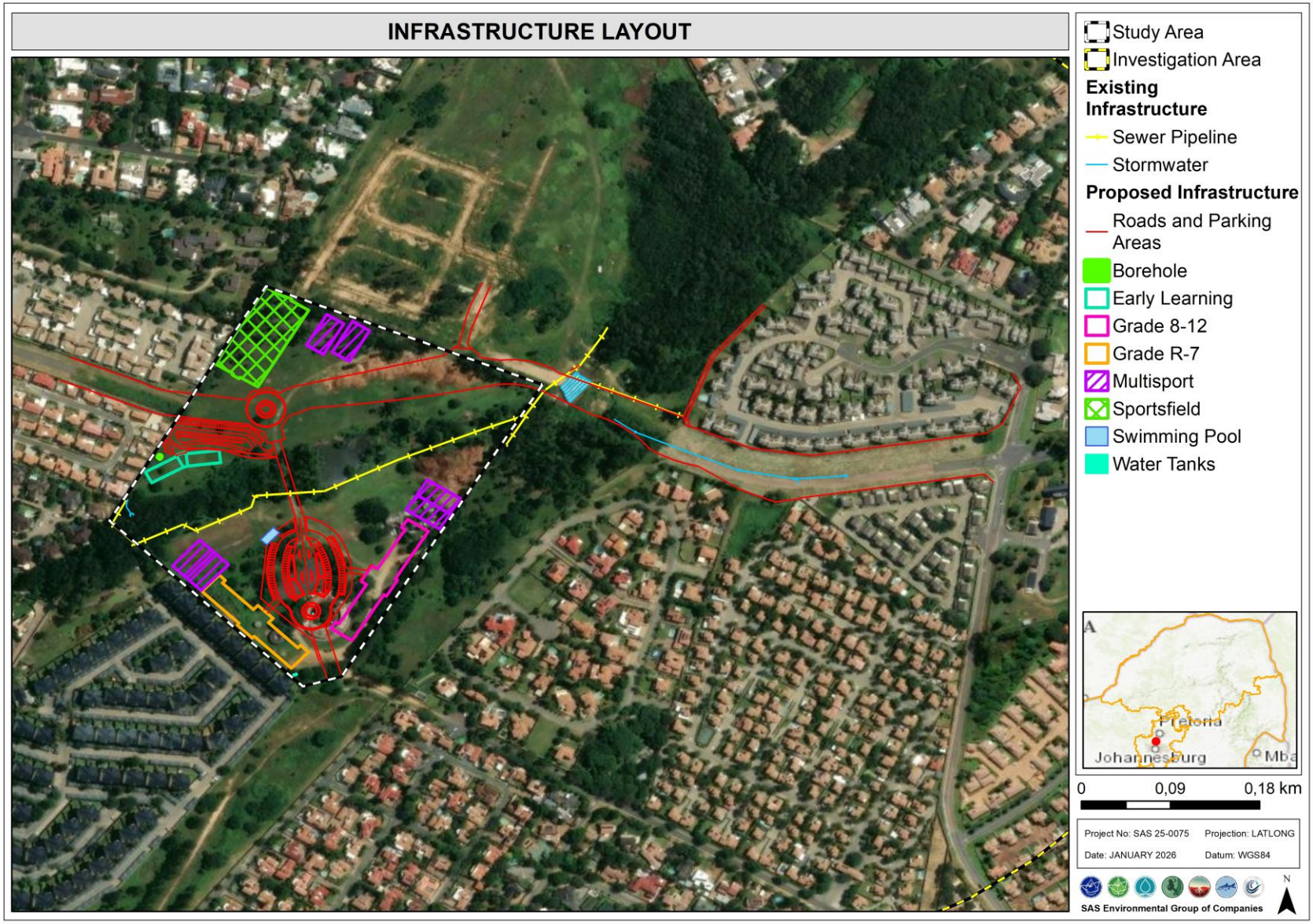


Figure 2: The proposed layout of the proposed development and associated infrastructure as provided by the proponent.

1.2 Receiving Freshwater Environment

A background study of relevant national, provincial and municipal datasets (such as the National Freshwater Ecosystem Priority Areas [NFEPA] 2011 database; The National Biodiversity Assessment [NBA] 2018 database and the Gauteng Conservation Plan (C-Plan, 2023) was undertaken to aid in defining presence of any freshwater ecosystems prior to the site survey of the study area (see Table 1) as well as the associated 500 m investigation area. As stated in Section 1.1 above, the rehabilitation measures set out in this report deals with the development in its entirety, and as such, the background information for the entire study area was considered. The databases indicated the following applicable important background information:

Table 1: Freshwater related conservation characteristics associated with the study and investigation areas.

Database	Site description
Gauteng Conservation Plan (C-Plan, 2023)	The database indicates the study area and portions of the investigation area in the north and south as Irreplaceable CBA 1 site. The rest of the study area and investigation area are not classed. They were determined as irreplaceable status areas through the MARXAN Mean Summed Solution and MARXAN Summed Best Solution analysis, Gauteng ecological corridor network 2023, ridges, and Aquatic Ecosystem Life Zones Biodiversity and Land Cover Criteria. **CBAs** are areas included in the C-Plan Map because of their biodiversity importance and contribution to achieving conservation targets. They should be maintained in a natural state, with no further loss of habitat and no deterioration in ecological condition. CBA1: Irreplaceable Sites: Mandatory sites required to meet conservation targets where there are no other options to meet these targets (i.e., the remaining extent of the biodiversity feature is at or less than the conservation target). Typically, CBA1 sites include Critically Endangered and Endangered Ecosystems and known populations of threatened species.
NFEPA (2011); NBA (2018)	According to the NFEPA Database, a channelled valley bottom (CVB) wetland is indicated within the study area and another west and north east of the study area within the investigation area. All wetlands are indicated as Heavily to Critically Modified (Class Z). As per the NFEPA database, no rivers flow within the study area or the associated investigation area. According to the NBA 2018: SAIIAE Rivers Database, no rivers flow within the study area or the investigation area. The Draft National Wetland Map 6 database indicates a CVB wetland to traverse the study area and investigation area. Two seep wetlands adjacent to the CVB wetland, east and north of the study area are also indicated by the database. An unchannelled valley bottom (UCVB) wetland is indicated to flow west of the study area within the investigation area. The CVB that traverses the study area, the UCVB west of the study area, and the eastern seep that also traverses the study area are indicated by the database as Largely to Critically Modified (Present Ecological State [PES]: D/E/F). The northern seep is indicated as Moderately Modified (PES C). All the wetlands are indicated as Critically Endangered in terms of its Ecological Threat Status (ETS). The CVB and UCVB wetlands are Not Protected while the seep wetlands are Poorly Protected in terms of their Ecological Protection Level (EPL). According to the Artificial Wetlands Database, two dams are indicated to overlay the CVB wetland traversing the investigation area. One of the dams is within the study area.
Wetland Vegetation (NFEPA, 2011)	The entire study area and investigation area are situated within the Mesic Highveld Grassland Group 3 WetVeg Group, indicated as Least Threatened (LT) by Mbona *et al.* (2015).

A site assessment was conducted by SAS on the 19th of June 2025 during which numerous freshwater ecosystems were identified within the study area. The Hydrogeomorphic (HGM) units classified within the study area and the associated investigation area included:

- One Channelled Valley Bottom (CVB) wetland;
- One Hillslope Seep (HSS) wetland; and
- One Non-Perennial Drainage Line (NDL), i.e. a tributary of the Jukskei River.

A detailed description of the freshwater ecosystems is available in the freshwater ecosystem assessment for the project (SAS, 2026a).

The Present Ecological State (PES) of the above-mentioned freshwater ecosystems were assessed according to the resource directed measures guideline as advocated by Macfarlane *et al.* (2008). The Ecological Importance and Sensitivity (EIS) of the freshwater ecosystems were also determined according to the method described by Rountree and Kotze, (2013). Finally, the ecosystem services provided by the relevant freshwater ecosystems according to the method of Kotze *et al*. (2020) (Version 2) were determined in which services to the ecology and to the people are assessed. The results of these assessments are presented in the table below.

Table 2: Summary of the PES, and EIS of the freshwater ecosystems associated with the study area.

Freshwater Ecosystem	PES	Ecoservice Provisioning	EIS	REC / RMO / BAS*
Channelled Valley Bottom (CVB) Wetland	Category D (Largely Modified)	Moderately Low-Very Low	Moderate	REC Category: D; RMO: D (Maintain); BAS: D
Hillslope Seep (HSS) Wetland	Category D (Largely Modified)	Moderate-Very Low	Low	REC Category: D; RMO: D (Maintain); BAS: D
Non-Perennial Drainage Line (NDL)	Riparian IHI: Category D/E (Largely to Seriously Modified) VEGRAI: Category E (Seriously Modified)	Moderately Low-Very Low	Moderate	REC Category: D; RMO: D (Improve); BAS: D

The delineated freshwater ecosystems in relation to the proposed development is conceptually depicted in Figure 3 overleaf.

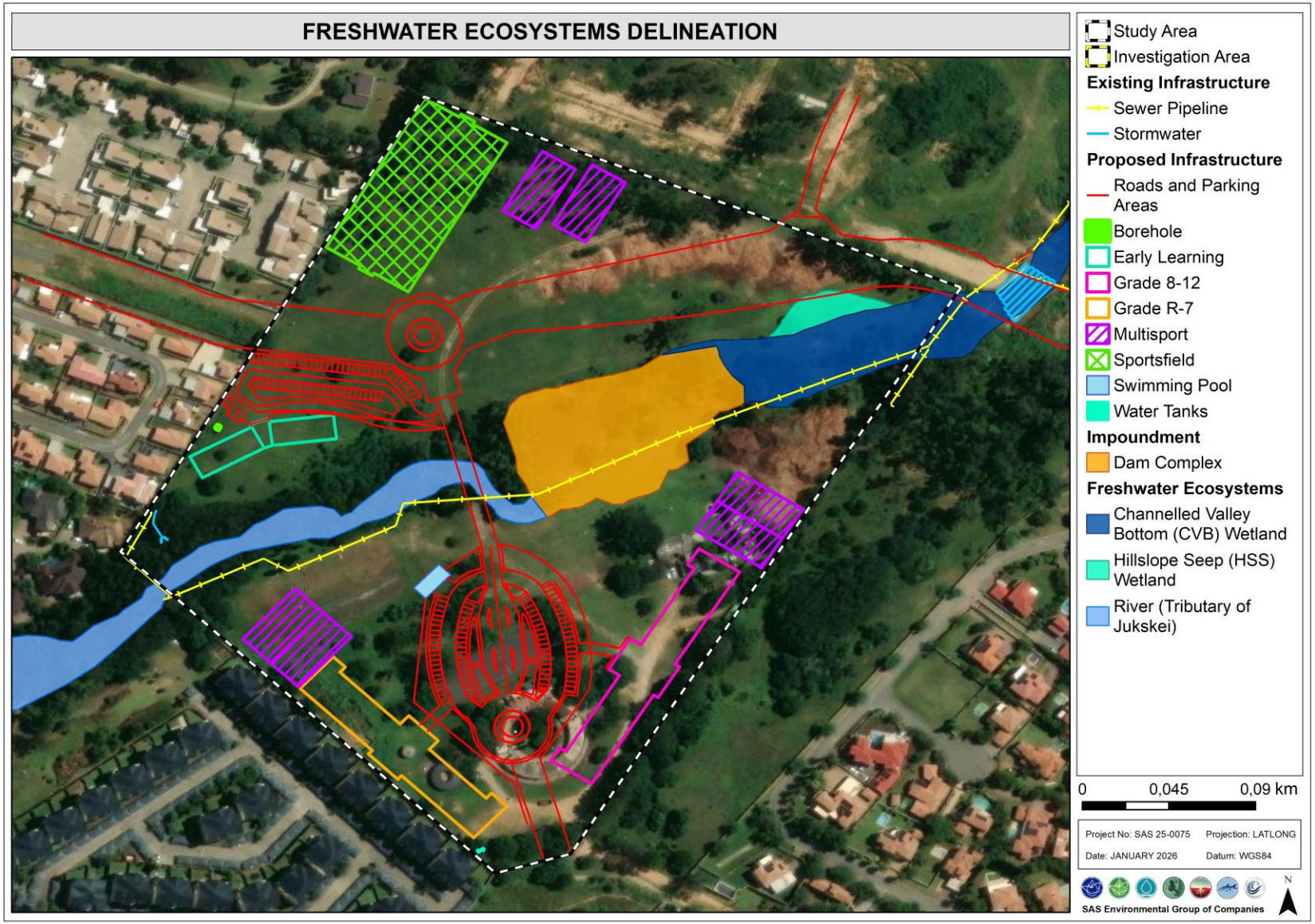


Figure 3: The location of the delineated freshwater ecosystems in relation to the proposed development.

2. LEGAL FRAMEWORK FOR THE WATERCOURSE REHABILITATION AND MANAGEMENT PLAN

The following legislative documents were considered and the aspects which are pertinent to freshwater ecosystem management including the rehabilitation of disturbed areas, were utilised.

- The Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996);
- The National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA);
- National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA);
- National Environmental Management: Biodiversity Act, 2014 (Alien and Invasive Species Regulations, 2014);
- The National Water Act, 1998 (Act No. 36 of 1998) (NWA) as amended; and
- Government Notice 4167 as published in the Government Gazette 49833 of 2023 as it relates to the NWA, as amended).

Section 21 of the National Water Act (Act No. 36 of 1998) as amended, lists the following activities as water uses:

- Section 21 (c): impeding or diverting the flow of water in a watercourse; and
- Section 21(i): altering the bed, banks, course or characteristics of a watercourse.

The rehabilitation process is set to minimise the impacts of the proposed development activities on the identified wetlands. The activities related to the proposed development are expected to **occur within the regulated areas of watercourses** and these activities therefore trigger a Section 21(c) and (i) water use as it refers to the National Water Act, 1998 (Act No. 36 of 1998) as amended, as well as Activities 12, 14 and 19 (potentially Activity 10) of the Environmental Impact Assessment Regulations Listing Notice 1 and 3 of 2014 (as amended) as it relates to the National Environmental Management Act, 1998, as amended (Act No. 107 of 1998). The conditions for Section 21(c) and (i) activities, in terms of Government Notice 4167 of 2023 require that a WRMP be developed.

The definition and motivation for a regulated zone of activity and specified buffer zones for the protection of the assessed freshwater ecosystems can be summarised as follows:

Table 3: Articles of Legislation and the relevant zones of regulation applicable to each article.

Regulatory authorisation required	Zone of applicability
Water Use Authorisation Application in terms of the National Water Act, 1998 (Act No. 36 of 1998) as amended). **Department of Water and Sanitation (DWS)**	**Government Notice 4167 as published in the Government Gazette 49833 of 2023 as it relates to the National Water Act, 1998 (Act No. 36 of 1998) as amended.** Government Notice 4167 as published in the Government Gazette 49833 of 08 January 2024 as it relates to the National Water Act, 1998 (Act No.36 of 1998) as amended. In accordance with GN 4167, 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 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 distance from the edge of a watercourse where the edge of the watercourse (excluding flood plains) is the first identifiable annual bank fill flood bench; or • **In respect of a wetland, a 500 m radius around the delineated boundary (extent) of any wetland, including pans.**
Listed activities in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) EIA Regulations (2014), as amended (2017). ***(The activities which might trigger the required authorisations must be determined by the EAP in consultation with the relevant authorities).***	**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 in 2017)** The development of— (ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs—; a) within a watercourse; b) in front of a development setback; or c) if no development setback exists, **within 32 metres of a watercourse, measured from the edge of a watercourse.** excluding— (cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies; (ee) where such development occurs within existing roads, road reserves or railway line reserves; or (ff) the development of temporary infrastructure or structures where such infrastructure or structures will be removed within 6 weeks of the commencement of development and where indigenous vegetation will not be cleared. **Activity 12 of Listing Notice 3** The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. **Activity 14** of Listing Notice 3 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 10 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.* c. Gauteng *iv. Sites identified as Critical Biodiversity Areas (CBAs) or Ecological Support Areas (ESAs) in the Gauteng Conservation Plan or in bioregional plans.*
GDARD Requirements for Biodiversity Assessments, Version 3 (2014).	The Gauteng Department of Agriculture and Rural Development (GDARD) Requirements for Biodiversity Assessments, Version 3 (2014) specifies buffer widths for sensitive features. For rivers (non-perennial / perennial) riparian zones and wetlands, buffer zones must be designated as sensitive according to the following mapping rules. • The riparian zone/wetland must be delineated according to "DWAF, 2003: A Practical Guideline Procedure for the Identification and Delineation of Wetlands and Riparian Zones".

Regulatory authorisation required	Zone of applicability
	• A 100m buffer zone from the edge of the riparian zone for rivers/streams outside urban areas must apply. • **A 30 m buffer for wetlands occurring inside urban areas must apply.** The Guidelines highlight that these buffer zones are essential to ensure healthy functioning and maintenance of aquatic ecosystems and function as wildlife corridors and refugia.

Based on the above, the relevant Zones of Regulation (ZoR) are interpreted to be the following:

- NEMA **32 m ZoR** (NEMA EIA Regulations), applicable to all identified freshwater ecosystem HGM units;
- GN 4167 **500 m ZoR** (NWA Regulations), applicable to the wetlands; and
- The **1 in 100 year floodline**, applicable to the Non-Perennial Drainage Line.

In addition, the following GDARD buffer zone may be applicable:

- A **30 m** buffer for wetlands occurring inside urban areas in line with the GDARD Requirements for Biodiversity Assessments.

The scientific Buffer Guideline Tool (Macfarlane & Bredin 2017b) was applied to the freshwater ecosystems in the study area. The buffer guideline provides an Excel™ based Buffer Zone Tool to determine suitable buffer zone requirements. Table 4 details the results of the refined buffer assessment. For a more detailed description of the methods followed for the ecological buffer calculation, refer to the site-specific freshwater ecosystem assessment report (SAS, 2026a).

Table 4. Buffers as recommended by the buffer tool for the study area freshwater ecosystems.

Freshwater Ecosystem	Construction phase buffer	Operational Phase buffer	Final aquatic impact buffer
Channelled Valley Bottom (CVB) Wetland	15m	15m	**15m**
Hillslope Seep (HSS) Wetland	15m	15m	**15m**
Non-perennial Drainage Line (NDL)	15m	15m	**15m**

Note that while the dam situated inside the CVB wetland is technically an artificial feature and does not form part of the natural wetland habitat, a **10 m 'best practice' buffer** was assigned to the dam, given its high connectivity to the natural freshwater ecosystems in the study area.

The respective zones of regulation and buffer areas as stipulated above are depicted in Figures 4 -7 below. Please refer to **Appendix C** for additional legislative requirements.

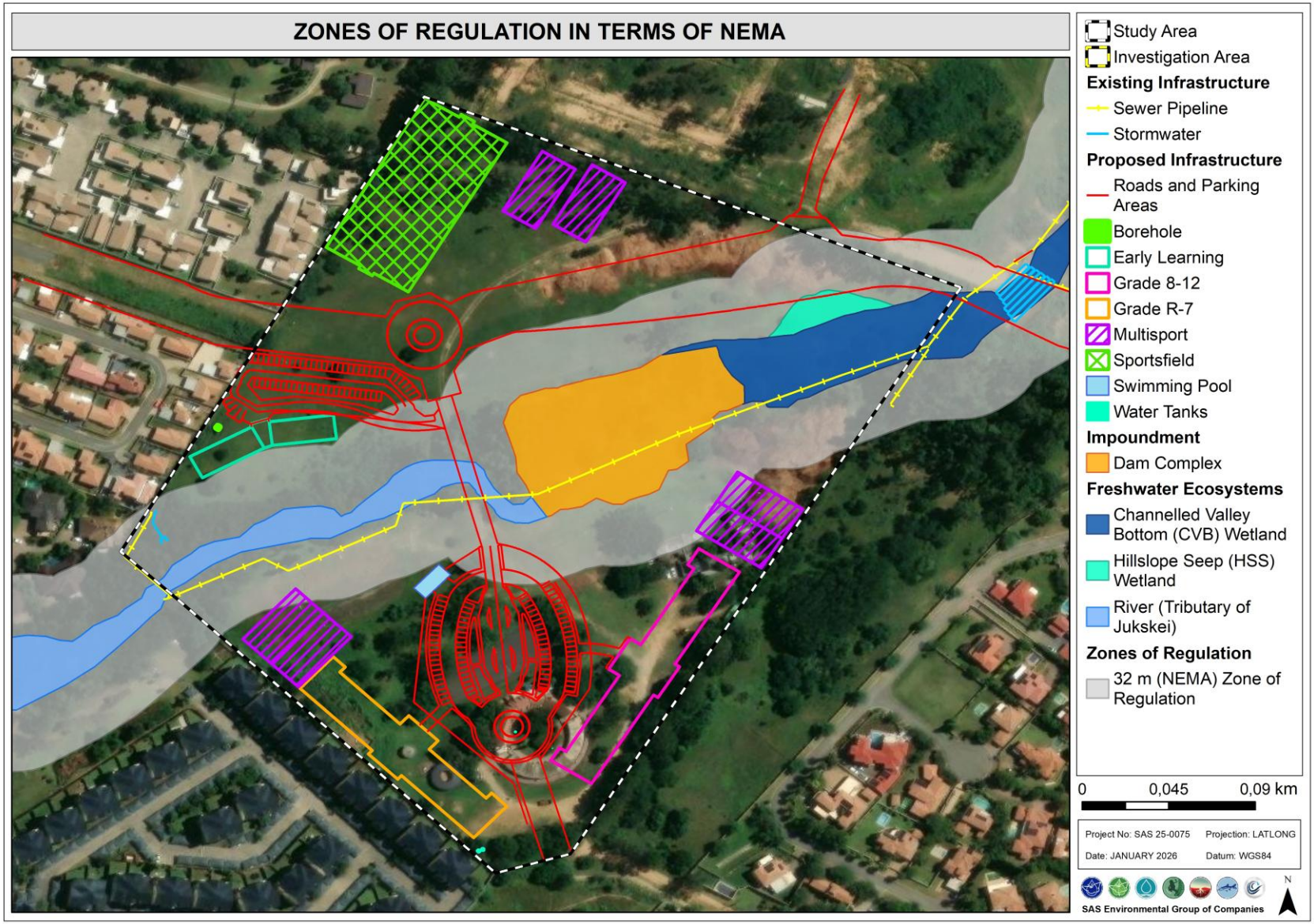


Figure 4: The zones of regulation in terms of NEMA associated with the study area.

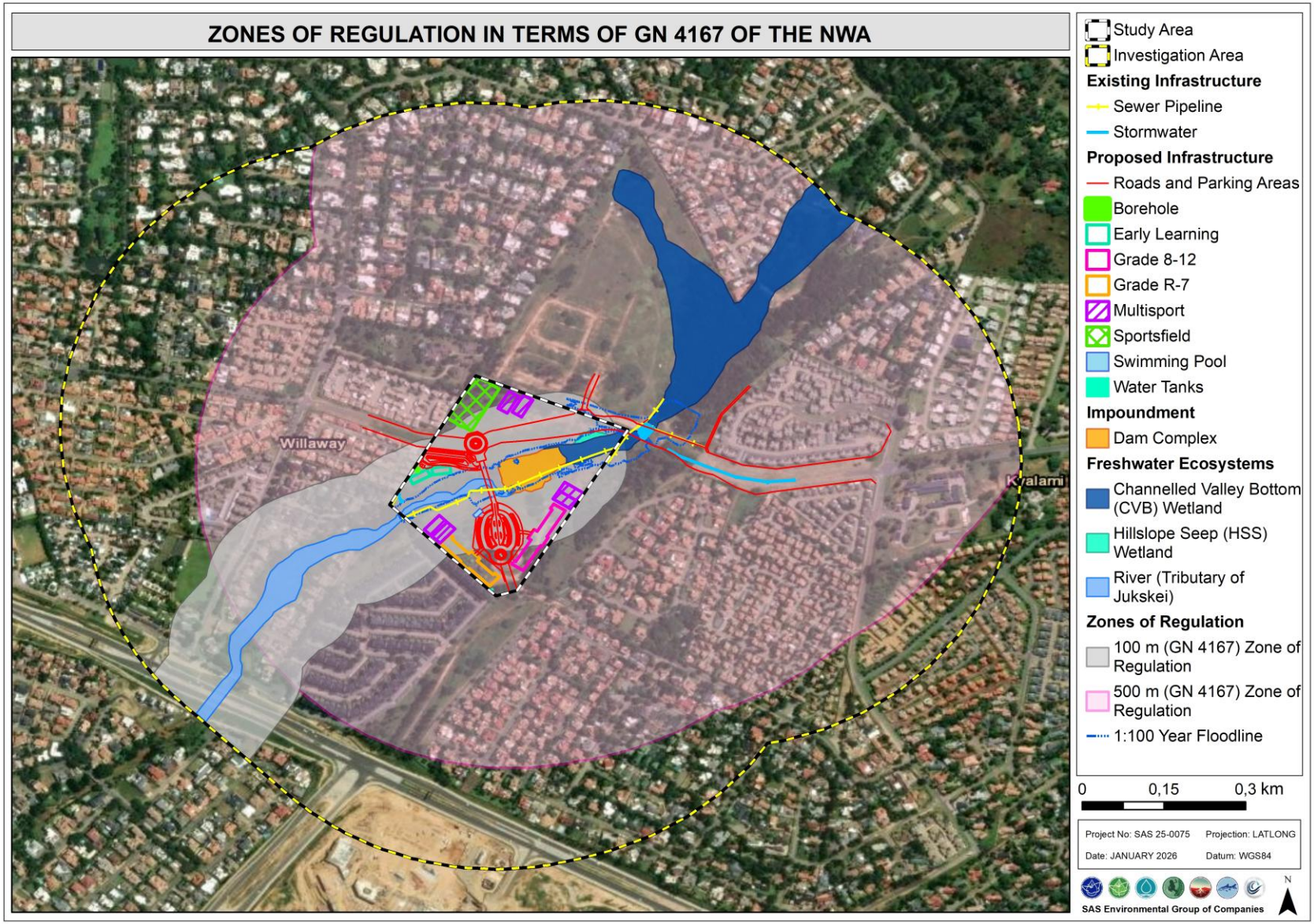


Figure 5: Overview of the GN 4167 zones of regulation in terms of the NWA associated with the study and investigation area.

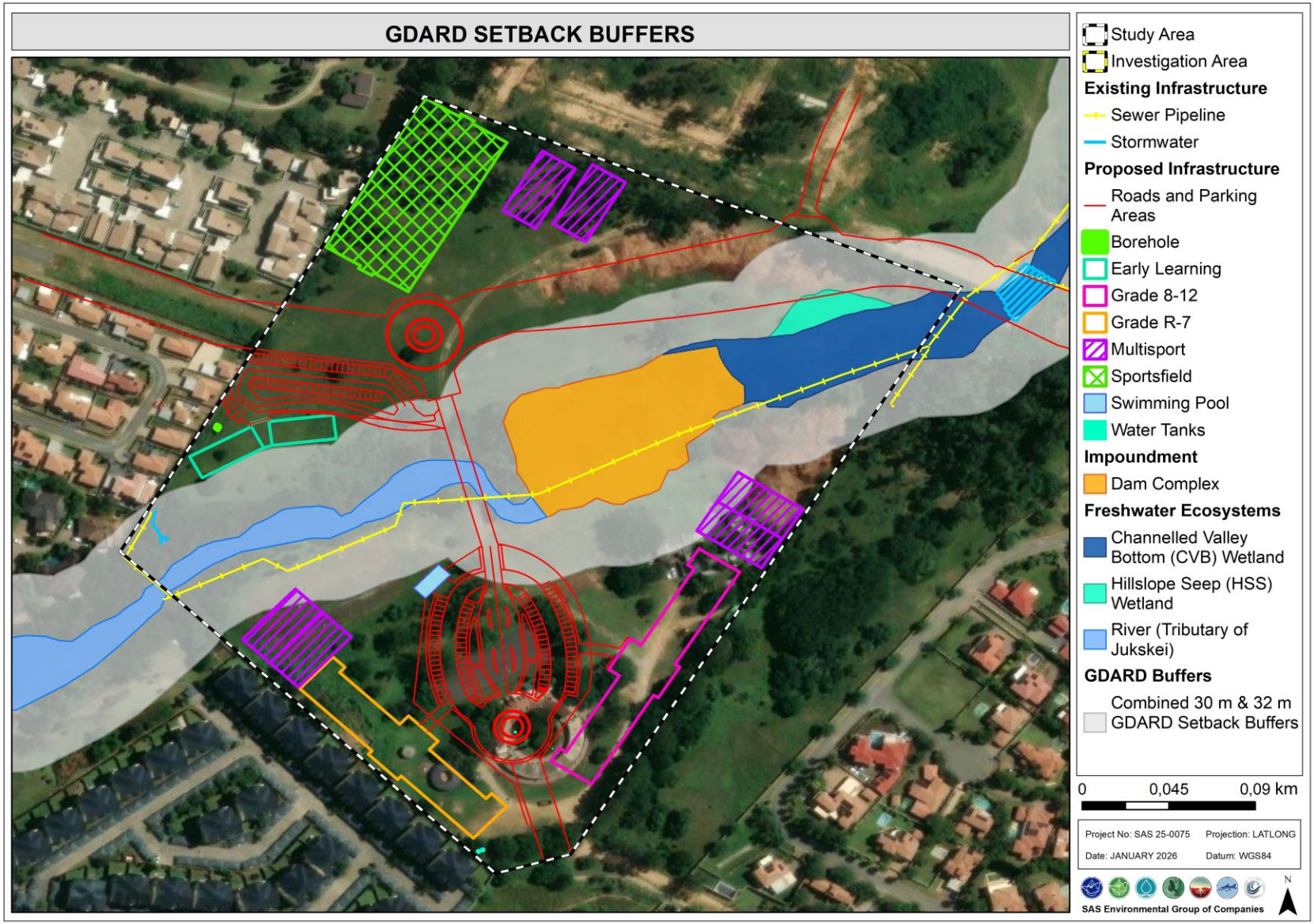


Figure 6: The applicable GDARD buffer zone associated with the study area.

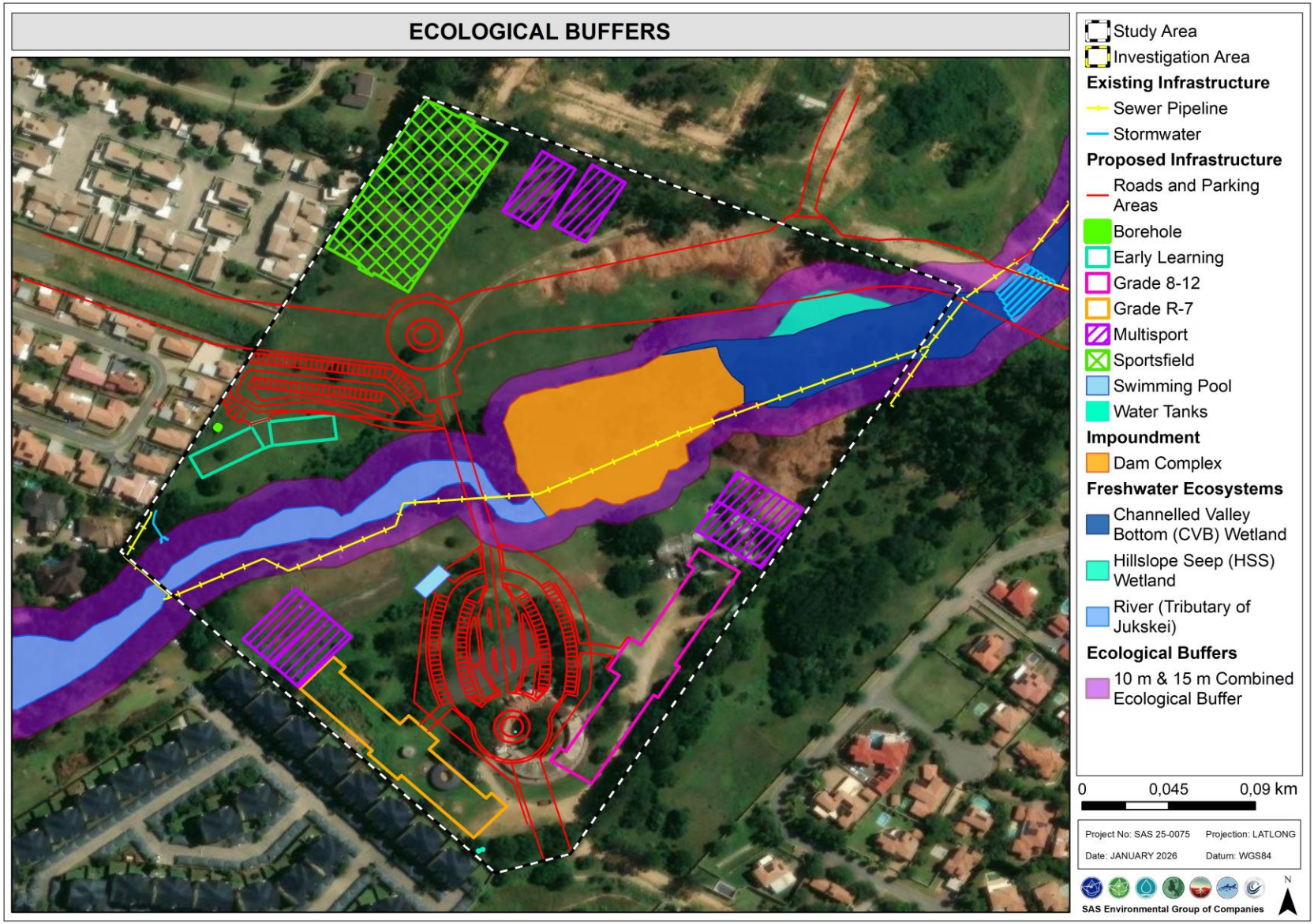


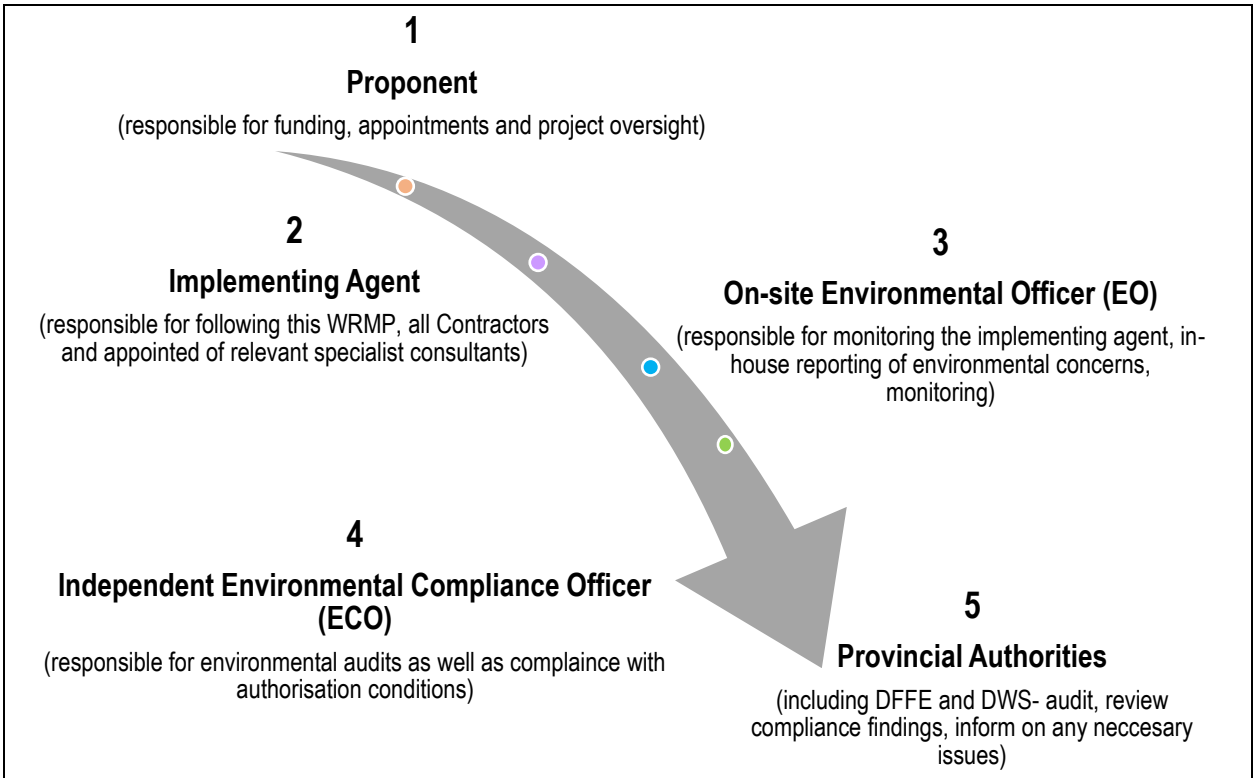
Figure 7: The ecological buffers associated with the freshwater ecosystems located inside the study area.

3. WATERCOURSE REHABILITATION AND MANAGEMENT PLAN

3.1 Roles and Responsibilities

Table 5 provides a summary of the various parties that are involved with the implementation of this WRMP as well as their responsibilities.

Table 5: Summary of various parties involved with the implementation of this WRMP.

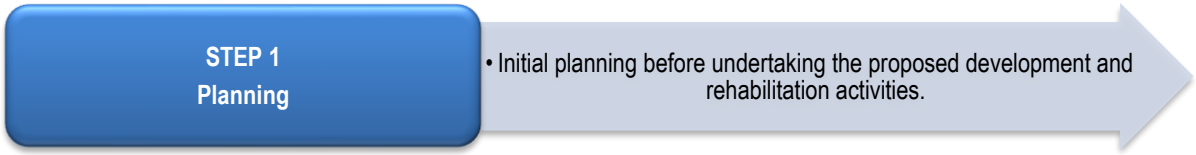


Party	Responsibility
Proponent	• The Proponent must ensure sufficient funding for the implementation and long-term maintenance of the mandated rehabilitation requirements as stipulated in this report; • The Proponent will be responsible for the appointment of an Environmental Control Officer (ECO) to monitor compliance with EA conditions, the WRMP specifications and the rehabilitation requirements; • The Proponent will be responsible for ensuring the Implementing Agent receives a copy of this document and understand its contents; and • The proponent must give the authority to the on-site ECO to stop works on site should he/she feel that there is a serious threat to or impact on the surrounding environment.
Implementing Agent	• An overarching Contractor should be appointed as the Implementing Agent, to manage all sub-contractors and to appoint the EO; • The Implementing Agent must ensure that all sub-contractor/s take full responsibility for each of his/her employees and any penalties imposed; • The Implementing Agent must immediately inform the Proponent and ECO if any changes to the project are envisaged and if any aspects of this implementation plan or the EA cannot be complied with; • It is the responsibility of the Implementing Agent to ensure that the measures stipulated within this WRMP are adhered to; and

	• Should the Implementing Agent require clarity on any aspect of this WRMP, the Implementing Agent must contact the on-site ECO for advice or alternatively, a suitably qualified specialist. **Training of Rehabilitation Workers** The Implementing Agency (through the EO) is to facilitate an initial environmental induction to all sub-contractors and associated workers in environmental awareness, including minimisation of disturbance to areas of increased ecological sensitivity, as well as fauna and flora with a no poaching policy, management of waste and prevention of water pollution. Furthermore, the Implementing Agent is to ensure that all operational workers have received basic training on fire management and prevention measures and be aware of any emergency protocols required. **Contractor Performance** The Implementing Agent must ensure that the relevant sub-contractors adhere to the conditions of this Implementation Plan. Should the Contractor require clarity on any aspect of this WRMP, the Contractor must contact the Implementing Agent directly, who, if needed, can consult with the specialists involved in the WRMP. Should the on-site EO feel that the conditions of the WRMP is not being met by the Contractor(s), the on-site EO has been given the authority by the Proponent to stop works if in his/her opinion there is/may be a serious threat to or impact on the surrounding environment and instruct the contractor(s) on suitable rectification and remediation actions that must be implemented immediately.
On-site Environmental Officer (EO)	The on-site EO is the person responsible for the day-to-day monitoring of the Implementing Agent's activities and for ensuring environmental management and control on the site. The on-site EO should ideally be appointed before the start of construction works so as to record baseline conditions and will be responsible for ensuring that all rehabilitation activities are implemented. The on-site EO is mandated to do the following: • Ensure that all Implementing Agent's employees are fully aware of their environmental responsibilities and the sensitivities of the site. This should take the form of an initial environmental awareness-training program in which requirements of this document will be explained; • Monitor site activities on a regular basis to ensure that there is minimal unintended environmental impact to the surrounding areas as well as the areas to be rehabilitated; • Monitor the site activities and rehabilitation actions in line with this WRMP as well as any relevant licences/EA.; • The on-site EO should have all relevant contact details for the team responsible for implementation of this plan and any rapid response units, as needed should additional clarity be required; • Ensure that a 'hotline' exists for reporting incidents, specifically unplanned/uncontrolled fires breaking out and resolving any problems rapidly; • Monitor all proposed activities and ensure efficient remediation/mitigation measures are implemented, as deemed necessary. A monthly monitoring report must be compiled.
Environmental Compliance Officer (ECO)	The ECO must be suitably qualified with relevant experience to undertake external assessments of compliance with the conditions stipulated within the Environmental Authorisation (EA) and relevant Water Use Authorisation (WUA). The ECO will: • Conduct all compliance assessments in line with the relevant authorisation requirements and a review of management and rehabilitation measures as detailed in the WRMP; • Undertake a compliance site assessment to assess compliance and to discuss the findings with the on-site EO; and • Compile a relevant compliance monitoring report which is to be submitted to the relevant provincial authorities.
Contractor	• The Contractor/s in this case refers to any contractor/s on site, including the development staff / contractor/s and sub-contractors on any item of infrastructure being erected or demolished; • Such contractor/s will take full responsibility for each of his/her employees and any penalties imposed; • The Contractor must immediately inform the Project Manager and ECO if any changes to the project are envisaged and if any aspects of this WRMP cannot be complied with; • It is the responsibility of the Contractor/s to ensure that the measures stipulated within this WRMP are adhered to; and • Should the Contractor require clarity on any aspect of the WRMP the Contractor must contact the ECO for advice.

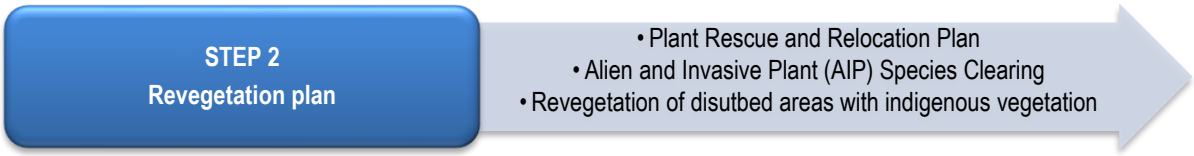
3.2 Site Specific Rehabilitation, Implementation and Management Plan

This Implementation plan is based on a four-step approach, which includes:

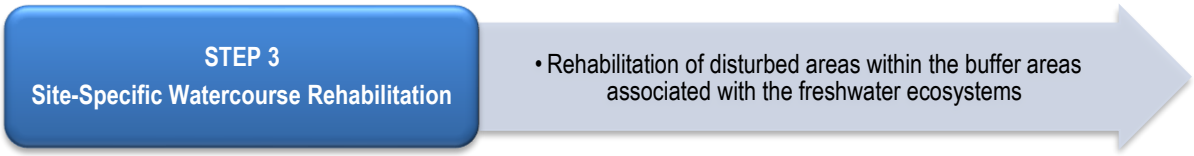


All plans and authorisations must be in place prior to commencement of the proposed development and rehabilitation activities. This includes but is not limited to:

a) Obtaining all required authorisations and permits;
b) Appointment of a Contractor and ECO;
c) Planning for on-site requirements;
d) Inform all construction staff and the rehabilitation team of the contents and importance of the Rehabilitation and Management Plan; and
e) Timeframes and budgetary allowances.



Before any rehabilitation activities can commence, all Alien Invasive Plants (AIPs) must be cleared from the area, in line with the Alien Invasive Plant Control and Management Plan (AIPCP) developed for the site and the area revegetated with suitable indigenous vegetation.



The rehabilitation of disturbed areas within the buffer areas surrounding the freshwater ecosystems.

Prudent monitoring of the rehabilitated areas associated with the freshwater ecosystems is of utmost importance. A list of monitoring and auditing requirements has been provided to maximise the success of the implementation of the control measures.

These steps have been expanded upon in greater detail in the sections that follow.

3.2.1 Step 1: Planning

Step 1: Planning
1.1 Obtaining all relevant authorisations and permits Before rehabilitation activities can commence all necessary permits and authorisations will be required, including but not limited to: ➢ Environmental Authorisation (EA) and Water Use Authorisation (WUA) for all rehabilitation activities, if applicable. **1.2. Appointment of a Contractor and all required specialists** During the planning phase, certain aspects need to be considered to effectively implement this plan. This includes: ➢ Appointment of a suitably qualified Contractor(s) to undertake the required work; ➢ Appointment of an ECO to audit and monitor the rehabilitation activities as well as to undertake the required post rehabilitation monitoring; ➢ The ECO is to compile a monthly audit report indicating all observations, actions and any remediation measures that were implemented and the reports are to be submitted to the competent authorises; and ➢ Should the Contractor not have the appropriate expertise for implementation of this plan then it is the responsibility of the Contractor to appoint a suitably qualified freshwater ecologist to oversee the implementation. **1.3. Planning for on-site requirements** The objectives and control measures (Table 8) must be implemented as part of the planning phase. In terms of planning of construction phase activities, cognisance must be given to the best time for construction (winter months) and the best time for re-vegetation (spring-early summer). Preferably, construction must be timed to finish at the end of the winter dry season, so that re-vegetation can commence soon after to minimise the time that soils are exposed.

3.2.2 Step 2: Revegetation Plan

The following revegetation methods are to be applied within any disturbed areas, with particular focus on the freshwater ecosystem habitat and associated relevant zones of regulation, and associated ecological buffer areas:

- Any Species of Conservation Concern (SCC) as applicable to the Gauteng Province, encountered within the freshwater ecosystems and the associated ecological buffer must be marked and may not be removed, prior to undertaking AIP clearing and rehabilitation activities;

- Removal of AIP species within the freshwater ecosystems and associated ecological buffer (terrestrial) area; and
- Revegetate the terrestrial buffer area with indigenous species with a high basal cover which will reduce the velocity and volume of runoff from hardened surfaces in the catchment before it reaches the wetland.

3.2.2.1 SCC marking, rescue and relocation

The following legislative requirements were considered as part of the Rescue and Relocation plan:

- National Environmental Management Act (Act No. 107 of 1998) (NEMA);
- National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (NEMBA);
- Conservation of Agricultural Resources Act (Act No. 43 of 1983) (CARA);
- The National Forests Act (Act No. 84 of 1998) (NFA); and
- The Gauteng Conservation Bill of 2014.

No listed SCCs were found to be associated with the wetlands or surrounding area, and it is considered unlikely that any will be found due to the general disturbed nature of the site (STS, 2026). However, any SCCs that may yet be encountered must be marked and may not be removed or disturbed during the rehabilitation activities.

All protected species as listed in the NEMBA Threatened or Protected Species (TOPS) list (GN R152 of 2007), Protected trees on the National Forest Act (NFA) List of Protected Tree Species (GN 1935 of 2022) and Specially Protected and Protected Species (Transvaal Nature Conservation Ordinance (TNCO)) protected must be marked and relocated if found to be present inside the proposed footprint area. Removal, relocation and/or damaging of provincially protected species will require permit applications and/or authorisations from the relevant Gauteng Nature Conservation Department.

3.2.2.2 Alien and Invasive Plant Species Clearing

Indigenous vegetation clearing and excavation activities associated with the proposed construction will inevitably result in increased opportunities for alien vegetation to enter and establish within close proximity of the freshwater ecosystems. All areas disturbed during the proposed activities will need to be kept clear of AIPs, prior to the commencement of the re-vegetation activities (in areas where no infrastructure is proposed). A list of AIP species encountered during the site visit is provided in Table 6 below along with recommended control measures to be implemented in **Appendix D**. Please refer to the site-specific floral report (STS, 2026) for a detailed description and extents of the relevant terrestrial habitats (i.e. Modified/Transformed and Secondary Grassland).

Due to the high densities of AIP species already present in the freshwater habitat, it may not be practical, or favourable, to remove all established vegetation from the freshwater habitat, given the significant vegetation losses that will result, and which may in turn have significant impacts on the stability and sediment balance of the relevant watercourses. Furthermore, given the high densities of AIPs in the general catchment area, re-infestation is generally unavoidable. AIP clearance must therefore be focussed on those areas where AIPs present significant problems with regard to blocking flow or where they contribute to destabilisation of the watercourse margins/banks. Any new infestations, for example in areas that will be disturbed as part of the proposed activities, must also be avoided. In general, National Environmental Management: Biodiversity Act (NEMBA) listed invaders (i.e., more aggressive invaders are often Category 1b) and species at greater risk of spread to the freshwater ecosystem habitat, must be prioritised for control.

Table 6: List of AIP species confirmed within the study area (includes the wetlands and buffer areas) (STS, 2026).

Scientific name	NEMBA Status[1]	Modified / Transformed	Freshwater Habitat	Secondary Grassland	Probability of spread to freshwater ecosystems
WOODY SPECIES					
Cestrum cf. parqui	1b	x			High
Eucalyptus camaldulensis	1b within- (i) riparian areas	x	x		High
Melia azedarach	1b (within a watercourse) 3 in urban areas	x	x		High
Morus alba	3	x	x		High
Pinus sp.	Species-dependent	x			Low
Populus × canescens	2	x	x		High
Quercus robur	Not listed	x			Low
Robinia pseudoacacia	1b	x	x	x	Medium
Solanum mauritianum	1b	x	x		High
Tecoma stans	1b	x	x		High
Ulmus parvifolia	Not Listed	x			Low
HERBACEOUS SPECIES					
Achyranthes aspera	Not Listed	x	x		Low

[1] **Category 1a** species are those targeted for urgent national eradication;
Category 1b species must be controlled as part of a national management programme, and cannot be traded or otherwise allowed to spread;
Category 2 species are the same as category 1b species, except that permits can be issued for their usage (e.g., invasive tree species can still be used in commercial forestry, providing a permit is issued that specifies where they may be grown and that permit holders "Unless otherwise specified in the Notice, any species listed as a Category 2 Listed Invasive Species that occurs outside the specified area contemplated in sub-regulation (1), must, for purposes of these regulations, be considered to be a Category 1b Listed Invasive Species and must be managed according to Regulation 3"); and
Category 3 are listed invasive species that can be kept without permits, although they may not be traded or further propagated, and must be considered a Category 1b species if they occur in riparian zones.

Scientific name	NEMBA Status[1]	Modified / Transformed	Freshwater Habitat	Secondary Grassland	Probability of spread to freshwater ecosystems
Alternanthera pungens	Not Listed	x			Low
Amaranthus cf. hybridus	Not Listed	x			Low
Araujia sericifera	1b	x	x		High
Bidens pilosa	Not Listed	x	x	x	High
Datura stramonium	1b	x	x		High
Erigeron cf. bonariensis	Not Listed		x	x	High
Flaveria bidentis	1b	x	x		High
Glandularia aristigera	Not Listed			x	Low
Heliotropium amplexicaule	Not Listed	x			Low
Ipomoea purpurea	1b	x			Medium
Malva cf. parviflora	Not Listed	x			Low
Plantago major	Not Listed		x		High
Richardia brasiliensis	Not Listed	x		x	High
Schkuhria pinnata	Not Listed	x		x	Medium
Solanum chenopodioides	Not Listed		x		High
Tagetes minuta	Not Listed	x	x		High
Trifolium repens	Not Listed		x		High
Verbena bonariensis	1b		x	x	High
Zinnia peruviana	Not Listed			x	Medium
SUCCULENT SPECIES					
Yucca cf. aloifolia	Not Listed	x			Low
GRAMINOID SPECIES					
Cenchrus clandestinus	Category 1b in protected areas and wetlands	x	x		Medium
Eragrostis minor	Not Listed	x			Low
Paspalum urvillei	Not Listed	x	x		Medium

3.2.2.3 Revegetation Recommendations

As part of the NEMA Section 28 Duty of Care, cleared/disturbed areas where vegetation has been lost within the freshwater ecosystem habitat and associated ecological buffer areas must be revegetated after the application of topsoil and stabilising of the soil. Allowing vegetation regrowth naturally without intervention will almost certainly result in the establishment and densification of AIPs, which may outcompete indigenous species and then proliferate and spread to adjacent areas.

Plugs may be sourced from a local nursery. Examples of indigenous grass, reed, sedge and forb species which may be utilised during revegetation, and the densities in which they should be planted, are provided in Table 7 below.

Table 7: Examples of indigenous plant species which may be utilised during revegetation within the terrestrial areas adjacent to the wetlands and within the wetlands.

Applicable Habitat	Recommended Species	
Sedges and grasses (freshwater ecosystem habitats)	• *Andropogon eucomus* • *Andropogon huillensis* • *Brachiaria nigropedata* • *Cynodon dactylon* • *Cyperus congestus* • *Juncus effusus*	• *Leersia hexandra* • *Panicum coloratum* • *Pycreus nitidus* • *Urochloa mosambicensis* • *Urochloa panicoides*
Graminoids (terrestrial areas: 15 m ecological buffer)	• *Aristida congesta* subsp. *barbicollis* • *Aristida congesta* subsp. *congesta* • *Chloris pycnothrix* • *Eragrostis chloromelas* • *Eragrostis gummiflua*	• *Eragrostis plana* • *Eragrostis racemosa* • *Hyparrhenia hirta* • *Sporobolus africanus* • *Themeda triandra*
Herbaceous species (terrestrial areas within the 15 m ecological buffer)	• *Helichrysum nudifolium* • *Helichrysum rugulosum*	• *Hilliardiella elaeagnoides* • *Leonotis martinicensis*
Shade tree species (to be planted in low densities in recreational areas)	• *Combretum erythrophyllum* • *Celtis africana* (not *C. sinensis, C. australis* or hybrids) • *Searsia lancea*	• *Vachellia karroo* • *Ziziphus mucronata*

Pennisetum clandestinum (Kikuyu) or other exotic lawn grasses, alien and invasive plant species or exotic ornamental plant species must not be used for revegetation. Potentially invasive and robust reed species e.g. *Phragmites australis* (Common reed) and *Typha capensis* (Bulrush) must preferably also not be planted, although may be allowed to re-establish naturally. The Mayford Biomosome Grassland Reclamation Mix is an effective, easily accessible, and convenient product to use, and may also be used during the revegetation activities to establish a pioneer basal cover for areas devoid of vegetation.

Recommended planting densities:

- Tree/shrub species may be planted in selected areas near benches or picnic areas to provide shade, although woody densities must be kept to a minimum. As such, the vegetation component of the rehabilitated site should remain predominantly grassy.
- Grass, Reeds and Sedges: seedlings to a density of at least 24 kg/ha. Final species-specific composition and ratios to be refined by the appointed contractor with knowledge of local vegetation;
- Herbaceous species: in groupings of 3-7 at a density of at least 100 plants/ha.

Plants must be watered immediately after planting and regularly thereafter to aid in establishment. Revegetation must take place in spring as far as possible (between September and October) to ensure maximum survival rates of planted species.

Please refer to the Landscape Plan for further information (SAS, 2026b).

3.2.3 Step 3: Site-Specific Watercourse Rehabilitation

A detailed site-specific WRMP has been developed for the proposed development activities which may impact the freshwater ecosystems in the study area. The rehabilitation measures set out in this report deals with the entire development, and as such is applicable to all the freshwater ecosystems in the study area. Successful rehabilitation depends on cogent conceptual planning, research and design flexibility. Site specific mitigation measures and rehabilitation activities (Table 8) are provided below and are visually depicted in the Landscape Plan (SAS, 2026b).

Should the Implementing Agent not have the relevant expertise, it is recommended that the rehabilitation be overseen by a suitably qualified freshwater specialist to ensure maximum service provision is achieved over the long-term in terms of hydrology, geomorphology, water quality and biota.

Table 8: Specific post-construction rehabilitation activities to be implemented for the proposed development.

Objective/ Requirement	Rehabilitation Actions
All mitigation measures as outlined in the Freshwater Ecosystem Assessment report (SAS, 2026a) must be strictly adhered to and must be read in conjunction with the recommendations as outlined below.	
Rehabilitation actions for existing issues on site (not directly related to the construction and operational phases of the proposed development). Recommended as part of the NEMA Section 28 Duty of Care stipulation.	**Removal/reduction of stockpiled material:** ➢ Two areas were noted where composting takes place and where topsoil is stored on site (Figure 8). The stockpiles are in some cases located within close proximity to and directly upslope of the CVB wetland. Surface runoff from the stockpiles is also not in any way prevented from entering the wetland. It is highly recommended that the stockpile material be removed from the 15 m ecological buffer. This may be done gradually by utilising the material for landscaping on the property, and by avoiding the further addition of material, thereby systematically reducing the size of the stockpiles. If undertaken gradually in this manner, a temporary silt trap must be erected downgradient of the stockpiles, to minimise the risk of sediment being transported to the wetland. If a composting or soil discard area is required for the operational phase of the development, a new area needs to be found outside the ecological buffer area of the freshwater ecosystem habitats on site.  **Figure 8: Topsoil and compost are stockpiled on site. While none of the stockpiles are located inside the freshwater ecosystems, some are within the 15 m ecological buffer areas and inside the immediate catchment areas of the freshwater ecosystems.** **Maintenance and rectification of bank stabilisation structures** ➢ Some bank stabilisation was previously attempted on the NDL system by means of gabion baskets, which have since started to fail due to undercutting of the structures (Figure 9). Structures installed for bank stabilisation (i.e. gabion baskets) must be maintained, or where these structures have become unstable, be re-stabilised or replaced with new structures. If left unattended, the gabions may collapse into the stream channel, thereby creating additional blockages to flow. ➢ It is recommended that the damaged cages be removed and that the subsoil be stabilised with geotextiles after which the basket structures may be replaced. **AIP control:** ➢ Some areas were noted in the Non-Perennial Drainage Line (NDL) where woody AIPs block streamflow or redirect flow into the streambanks, thereby contributing to the destabilisation of the

Objective/ Requirement	Rehabilitation Actions
	streambank (Figure 9), it is highly recommended that in these areas where woody AIPs block streamflow the trees be removed, thereby restoring a free-flowing system.  **Figure 9: An example of a problematic area identified on site in need of rehabilitation in the NDL system. The yellow arrow indicates an area where undercutting of the gabion is taking place. The gabions have become unstable and are thus contributing little to bank stabilisation in their current condition. The blue arrows indicate some examples where AIP tree branches have fallen into the stream, thereby blocking flow in the system.** **Solid waste removal from the streambed:** ➢ A significant volume of solid waste was noted to be present in the CVB and NDL systems on site (Figure 10). Besides being unsightly, this may have a negative effect on the flow patterns in the system if large items or entangled masses of waste and vegetation block streamflow. Much of the solid waste originates from the upstream catchment, and not inside the study area. However, it is highly recommended that an effort is made by the proponent to clear waste from the stream channel on a frequent basis. It is also suggested that the proponent investigate the practicality and viability of installing an appropriate litter trap within the boundary wall / fence of the development at the upstream point where the watercourse enters the property. Whilst this will require regular monitoring and clearing of litter, it will assist in preventing dispersal of litter within the reach of the system within the property. ➢ Alternatively, regular clean-up actions may be arranged with the aim of reducing the amount of waste in the system. This will achieve increased aesthetic value, thus encouraging community utilisation of the open space areas within the development.

Objective/ Requirement	Rehabilitation Actions

Figure 10: Solid waste washed down from further upstream is an unsightly issue in the watercourse system in the study area, and in some cases, large items washed downstream contribute to the blockage of flow in the stream channel.

Desilting of the dam basin and stabilisation of the dam wall

- It was noted during the site assessment that the basin of the existing dam on the property contains a significant silt load (Figure 11), which reduces the water holding capacity of the dam and decreases the ability of the dam to absorb stormflows. It is highly recommended that the dam basin be desilted, thereby increasing the dam's ability to act as a attenuating structure on the property. The following mitigation measures must be applied in the event of dam desilting:
    - Sediment removal must be undertaken during the dry, winter season, except if there is excessive sediment deposition leading to blockages and flow impediment due to high rainfall during the summer season. It must be ensured that the spillway remain clear of sediment build up.
    - Vehicles must not create new roadways through the freshwater ecosystem unless absolutely necessary. The use of the existing designated maintenance road must be utilised as far as possible.
    - As far as feasibly possible, manual labour must be utilised instead of mechanical methods (unless sediment loads are extensive – such as in the dam itself).
    - No sediment may be disposed of downstream or surrounding the dam. Sediment must be disposed of in a suitable location where no runoff of sediment is possible into the freshwater environment or back into the dam. Consideration may be given to utilising the sediment as part of the desired landscaping on the property.

Objective/ Requirement	Rehabilitation Actions

Figure 11: The existing dam on the property contains large volumes of silt (yellow arrow) and it is highly recommended that the dam basin be desilted to improve the water holding capacity of the dam, and to increase the effectivity of the dam as an attenuating structure on the property.

- Besides the need for desilting of the dam basin, the dam wall and particularly the dam spillway areas are neglected and requires stabilisation. This may be done through the installation of coir-logs with stakes, biodegradable hessian sheeting with coir logs, brush cutting with additional cobbles and soil; or step-cutting and revegetation of each step (Figure 12 below). Coir-logs are a natural fibre product (such as straw or coconut fibre) that biodegrades with time. Vegetation can be planted within the coir logs and/or soil and seeds filled within the centre (refer to revegetation recommendations).

Figure 12: Examples of various erosion control techniques that can be utilised to prevent or control erosion on the dam wall.

- The outlet flows from the off-stream (side-channel spillway) outlet must also be stabilised and attenuated. This can simply be done by means of the strategic placement of rocks/cobbles within the flow channel. Any sloping areas adjacent the outlet structure may similarly be packed with

Objective/ Requirement	Rehabilitation Actions
	rocks to create soil stability and facilitate the re-establishment of vegetation in this area (Figure 13).  **Figure 13: An example of rock placement around a dam outlet. Rock packing together with good vegetation cover will assist in preventing erosion within the discharge area. More rocks may be added within the canal bed at the outflow point to further attenuate outflow.**
General post construction rehabilitation actions related to the proposed development activities.	**Rehabilitation of disturbed soils post-construction** ➢ Compaction must be prevented as far as possible, and it must be ensured that the disturbed areas are reshaped to a natural slope and landscape which blends with the greater landscape. ➢ Soil surrounding the wingwalls of the culverts (where applicable) must be suitably backfilled and sloped (minimum of a 1:4 ratio) and concrete aprons as well as gabion mattresses should be installed both up and downstream for energy dissipation and sediment trapping. **Indigenous vegetation re-establishment** ➢ As part of the rehabilitation process, all disturbed areas, as well as those areas where AIP have been removed, must be re-instated with indigenous vegetation. Revegetation must start as soon as possible after soil profiling so as to reduce the duration of exposure of bare ground , which could lead to erosion and sedimentation of the area. ➢ Any area where active erosion is observed must also be immediately rehabilitated in such a way as to ensure that the hydrology of the area is re-instated to conditions which are as natural as possible. **AIP control** ➢ Proper implementation of the revegetation plan should minimize the proliferation of alien invasive species. However, if the presence of AIPs is noted, the alien and invasive floral species control guidelines must be followed with immediate effect (**Appendix D**). **It is highly recommended that the catchment area of the freshwater ecosystems also be carefully monitored for the potential onset of gully erosion. Control mechanisms for gully erosion in terrestrial areas may include the following:** ➢ **Brush layering** is when branches are placed perpendicular to the slope contour. This method is effective for earth reinforcement and mass stability. Brush layers break up the slope length, prevent surface erosion and reinforce the soil with branch stems and roots, providing resistance to sliding or shear displacement. Brush layers also trap debris, aid infiltration on dry slopes, dry excessively wet sites, and mitigate slope seepage by acting as horizontal drains. Brush layers facilitate vegetation establishment by providing a stable slope and a favourable microclimate for growth of vegetation (USEPA, 2005) (Figure 14). Note that if plant material from alien woody species is used,

<table>
<tr><th>Objective/ Requirement</th><th>Rehabilitation Actions</th></tr>
<tr><td></td><td>it must be ensured that no live material (which may root), or seed material is present which may then aid the establishment of the alien species within the area to be rehabilitated.
➢ Live gully repair is a technique that is similar to branch packing but is used to repair rills and gullies. Live gully repairs offer immediate reinforcement and reduce the velocity of concentrated flows. They also provide a filter barrier that reduces further rill and gully erosion and must be used where gully erosion is taking place on the project footprint (USEPA, 2005).
 
Figure 14: An example of brush layering to curb erosion.

➢ Additional erosion control measures which may be suitable for implementation are provided in Appendix E;
➢ Ensure that no further incision or canalisation occurs within the wetland. If incision is identified, remediation must commence immediately, and the surrounding area is to be reprofiled to a slope not greater than a 4:1 slope (a 5:1 is however, considered preferable), covered with a commercially available geotextile as described above, which is to be staked to the surface of the slopes until native wetland vegetation can be re-instated (Please see Step 2 above- Revegetation Plan).
➢ Actions to be taken to prevent any further erosion from occurring within the rehabilitated areas are as follows:
o Re-vegetating the disturbed and rehabilitated areas (Please see Step 2 above- Revegetation Plan).
o Ensure no AIP species proliferate within the disturbed area.
o Stabilise the soil through the use of geotextiles, especially effective with growing vegetation.
o Apply a layer of mulch to the rehabilitated areas to allow the soil to slowly soak up the water and reduce the impact of rain on bare soil.</td></tr>
<tr><td>Rehabilitation activities specific to the road crossing to be upgraded.</td><td>Ensure that all obstructions to streamflow are removed
➢ Any sandbags/cobbles used for stream diversion (if applicable) must be gradually removed, allowing the stream to flow freely through the completed culvert system. It must be ensured that all materials used for temporary stream diversion are removed from the streambed, therefore ensuring that the streamflow is not obstructed.
Revegetate any marginal areas adjacent to the upgraded road surface:
➢ If there are any disturbed or cleared areas outside the completed road surface after construction is completed these areas must be re-instated with indigenous vegetation if it is deemed unlikely that indigenous vegetation will not re-establish naturally. Revegetation must start as soon as possible after soil profiling so as to reduce the duration exposure of bare ground, which could lead to erosion and sedimentation of the area.
Stormwater runoff control:</td></tr>
</table>

Objective/ Requirement	Rehabilitation Actions
	➢ Sheet runoff from the road surface must be appropriately managed. As such, the areas where stormwater runoff from the road surface enters the receiving environment must be attenuated by means of the strategic placement of rocks or cobbles to ensure that preferential flow paths and scour of the streambed does not occur as a result of stormflows.
Final post-construction activities	**Post-construction clean-up** ➢ Clean-up operations must follow the completion of construction activities. ➢ Waste material associated with construction (such as concrete/grout spilled within the construction area, building rubble, plastic, binding wire, and empty containers) must be removed and taken to a suitably licensed waste disposal site. Under no circumstances must rubble be discarded within the demarcated freshwater ecosystem habitat or ecological buffer area. **Final landscaping** ➢ It is recommended that additional microhabitats be created to provide breeding and nesting habitats for avifaunal and smaller, common faunal species. Any tree stumps/logs should be retained (provided that stumps are not those of alien species which may coppice), and additional rocks/logs (from the immediate vicinity if possible) placed throughout the open space area. Additions such as bat/owl boxes could also be considered to encourage local species back to the area. ➢ To increase the socio-economic value of the freshwater ecosystem habitat on site, it is proposed that the freshwater ecosystem habitat and associated ecological buffer areas be instated as green spaces, with benches/picnic areas and recreational facilities to encourage positive utilisation of the space (Figure 15). This will add incentive for the upkeep and maintenance of the freshwater ecosystem habitat. Some shade trees may be planted in this area, although only native species (e.g. *Celtis africana, Combretum erythrophyllum* and *Searsia lancea*) must be planted (refer to revegetation plan, Section 3.2.2). The planting of invasive groundcover species such as Kikuyu (*Pennisetum clandestinum*) must be avoided.  **Figure 15: An example of an open green space associated with an attenuation pond area, with benches and rocks that may be utilised by the community.**

The rehabilitation recommendations provided above are considered suitable to minimise impacts on the receiving freshwater environment provided that the activities are well implemented and managed. To ensure appropriate designs and construction processes, the design and method statement should be signed off by the freshwater specialist.

Since there is some degree of risk to the biodiversity in the vicinity of the proposed activities, even with well designed, implemented and managed ecological management systems, monitoring is considered essential in both the construction and operational phases with specific mention of monitoring of erosion, sedimentation, and proliferation of alien vegetation. Such monitoring must be undertaken using fixed-point photography, at the beginning and end of the summer period (i.e. at the beginning of October, and the end of March, annually) as well as after rainfall events, and these records must form part of the overall EMPr. Should problems be identified, proactive measures to minimise erosion and sedimentation must immediately be implemented.

3.2.4 Step 4: Construction and operational phase management and monitoring

Prudent monitoring of the infrastructure (particularly stormwater management infrastructure) and rehabilitated areas are of utmost importance, as this will ensure a continual flow of data, enabling all parties involved to accurately assess and manage the progress of the rehabilitation interventions and any arising issues. To ensure the accurate gathering of data, the following techniques and guidelines are recommended:

- Site walk-through surveys must be applied as the preferred method of monitoring (at specified frequencies) with specific focus on:
  - Erosion monitoring (for the duration of the rainy season);
  - Sedimentation (for the duration of the rainy season);
  - Alien and invasive vegetation proliferation (at the start and end of the growing season); and
  - Surface water monitoring of the depression wetlands (if surface water is present).
- General habitat unit overviews as well as specific monitoring of wetland integrity, drivers and functionality must be undertaken;
- Consideration must be given to proper dates for data gathering. Many species are for example dormant and belowground in the winter months, and will be missed if surveys are conducted during this time;
- All data gathered must be measurable (qualitative and quantitative);
- Monitoring actions must be repeatable;
- Data must be auditable; and
- Reports must present and interpret the data obtained.

Table 9 provides a summary of the monitoring plan including a guide to monitoring localities, the frequency of data capture and assessment as well as reporting frequencies.

Table 9: Monitoring actions for the affected freshwater ecosystems associated with the proposed development.

Aspect	Monitoring Location	Frequency of sampling	Frequency of Reporting
AIP control	1. Screening of the entire rehabilitation area(s); 2. Logging locations of any newly recruited individuals or species to be treated/removed.	1. Before the initial AIP clearing a baseline assessment must be taken to indicate densities and species; 2. After the initial AIP clearing densities must be re-recorded, including all methods and chemicals used; 3. Quarterly assessment during the first year post rehabilitation. Densities and locations of newly coppiced AIPs to be recorded; and 4. Annually during the growing season for the second and third year, post rehabilitation to ensure long-term maintenance measures are effective.	1. Before and after AIP clearing report must be compiled; 2. Quarterly report during the first year post AIP clearing; and 3. Annually during each growing season, for at least 3 years post rehabilitation – report must include information from before and after mobilisation of follow-up clearing teams.
Vegetation monitoring	1. The rehabilitated areas where revegetation was undertaken.	1. First month after revegetation, weekly inspection must be undertaken to determine the success rate of plant species relocation; 2. After first month of revegetation inspection must be done on a monthly basis during the growing season; 3. After first year, monitoring must be carried out on an annual basis during the growing season; and 4. Fixed point photography plots must be undertaken along a transect of the rehabilitated area. This must be done on the same place and time of year on an annual basis.	1. Before commencement of rehabilitation activities, a report must be compiled listing existing species as well as any endangered species that may need to be rescued. 2. Monthly for 6 months after the re-instatement; and 3. Annually during each growing season, for at least 3 years post rehabilitation.
Water quality (within the CVB wetland and NDL system when surface water is present in the latter).	1. *in situ* water quality testing must be undertaken before construction commences to establish a baseline condition (as close to the commencement of activities as possible); 2. For consistency, the same points should be used for each repeat sample.	1. Water within the wetlands and water being discharged (stormwater) must be tested (where available) one month before the rehabilitation process begins, and at least once a month during the rehabilitation process and should include as a minimum: a. pH (allowable limit 6.5 – 8.0); b. Electrical Conductivity (EC) (limit: ≤110 in line with the Resource Quality Objectives for the Vaal catchment); c. Temperature; d. Total Dissolved Solids (TDS); e. Dissolved Oxygen (DO) and f. Turbidity.	1. Results must be included in the monthly monitoring report compiled by the appointed ECO or suitably qualified specialist. Data must be compared to the licenced conditions and used to identify any corrective or management actions required.
Edge effects as a result of the proposed rehabilitation activities.	1. All areas within the defined 50 m GDARD buffer areas of the wetlands.	1. Weekly for the duration of the rehabilitation implementation; 2. After every major rainfall event to ensure no excess sedimentation of the wetlands occur.	1. Monthly monitoring report compiled by the appointed ECO.

Aspect	Monitoring Location	Frequency of sampling	Frequency of Reporting
Erosion	1. All rehabilitated areas; 2. All areas disturbed by rehabilitation activities.	1. Weekly during rehabilitation activities; 2. After every major rainstorm and / flood for the first wet season post rehabilitation.	1. Monthly monitoring report compiled by the appointed ECO.
Freshwater ecosystem ecological condition.	1. Within the wetlands.	1. Annually, before rehabilitation activities and for at least two growth seasons post rehabilitation.	1. Before commencement of rehabilitation activities, a report must be compiled providing the ecological condition of the wetlands, including PES, EIS, Eco Service provisioning. 2. Annually during each growing season, for at least 3 years post rehabilitation.

***Note: This monitoring plan must be implemented by a competent person and submit the findings to the responsible authority for evaluation.**

4. CONCLUSION

Scientific Aquatic Services (SAS) was appointed to conduct a Watercourse Rehabilitation and Management Plan (WRMP) as part of the Water Use Authorisation (WUA) process for the proposed Vorna Valley Spark School, in the Carlswald suburb of Midrand, Gauteng Province. The proposed development is located on the TLC Stables property. The proposed development area will henceforth be referred to as the “study area”.

The Rehabilitation Plan fits into the overall planning process of the proposed activities and must be strictly adhered to once approved by the relevant authorities. This plan however relies on cogent planning and careful, considerate implementation. The plan is also dynamic, and adaptive management must be applied, based on the monitoring data, to ensure that the plan reaches the defined objectives through applying practical site-specific lessons learned throughout the implementation process. Therefore, if the recommendations outlined in the rehabilitation plan are effectively implemented, the Recommended Management Objective (RMO) of maintaining the current ecological integrity of the wetlands within the study area can be achieved.

REFERENCES

Campbell P.J. (2000) *Rehabilitation Recommendations after Alien Plant Control*. Plant Protection Research Institute, Agricultural Research Council, Hilton.

Department of Water Affairs and Forestry (DWAF). 2007. *Manual for the assessment of a Wetland Habitat Integrity for South African floodplain and channelled bottom wetland types*_by M. Rountree (ed); C.P. Todd, C.J. Kleynhans, A.L. Batchelor, M. D. Louw, D. Kotze, D. Walters, S. Schroeder, P. Illgner, M. Uys, and G.C. Marneweck. Report No. N/0000/00/WEI/0407. Resource Quality Services, Department of Water Affairs and Forestry, Pretoria, South Africa.

Food and Agricultural Organisation of the United States. 2001. Small dams and weirs in earth and gabion materials. Report AGL/MISC/32/2001 prepared by Land and Water Development Division, Rome, Italy.

Kotze D.C., Marneweck G.C., Batchelor A.L., Lindley D.S. and Collins N.B. 2009. WET-EcoServices: A technique for rapidly assessing ecosystem services supplied by wetlands. WRC Report No. TT 339/09. Water Research Commission, Pretoria.

Macfarlane, D. & Bredin. I. 2017a. Buffer Zone Guidelines for Wetlands, Rivers and Estuaries Part 1: Technical manual. Eco-Pulse Environmental Consulting Services Institute of Natural Resources. WRC Report No. TT 715-1-17.

Macfarlane, D. & Bredin. I. 2017b. Buffer Zone Guidelines for Wetlands, Rivers and Estuaries Part 2: Practical Guide. Eco-Pulse Environmental Consulting Services Institute of Natural Resources. WRC Report No. TT 715/2/17.

Mucina, L. & Rutherford, M.C. (Eds). 2012. *The Vegetation of South Africa, Lesotho and Swaziland*. Strelitzia 19. South African National Biodiversity Institute, Pretoria, RSA.

National Environmental Management Act (NEMA) 107 of 1998.

National Environmental Management: Biodiversity Act (Act 10 of 2004) and the associated Alien and Invasive Species Regulations (GN R598 of 2014).

NBA: Driver A., Sink, K.J., Nel, J.N., Holness, S., Van Niekerk, L., Daniels, F., Jonas, Z., Majiedt, P.A., Harris, L. & Maze, K. 2012. National Biodiversity Assessment 2011: An assessment of South Africa's biodiversity and ecosystems. Synthesis Report. South African National Biodiversity Institute and Department of Environmental Affairs, Pretoria. Online available: http://bgis.sanbi.org/NBA/project.asp

National Environmental Management: Biodiversity Act (Act No.10 of 2004) (NEMBA)

NFEPA: Driver, A., Nel, J.L., Snaddon, K., Murray, K., Roux, D.J., Hill, L., Swartz, E.R., Manuel, J. and Funke, N. 2011. Implementation Manual for Freshwater Ecosystem Priority Areas. Water Research Commission. Report No. 1801/1/11. Online available: http://bgis.sanbi.org/nfepa/project.asp.

Scientific Aquatic Services (SAS) 2026a. Freshwater Ecosystem Assessment As Part Of The Environmental And Water Use Authorisation Processes For The Proposed Vorna Valley Spark School, Gauteng Province. Report Reference: SAS 25-0085.

Scientific Aquatic Services (SAS) 2026b. Vorna Valley Spark School Landscape Plan. Reference: SAS 25-0085.

Scientific Terrestrial Services (STS) 2026. Terrestrial Biodiversity Assessment As Part Of The Environmental Authorisation Process For The Proposed Vorna Valley Spark School, Gauteng Province. Report Reference: STS 25-2027.

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 (Pty) Ltd and its staff reserve the right, at their sole discretion, to 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 – WATERCOURSE REHABILITATION AND MANAGEMENT PLAN FRAMEWORK

Principles of the Watercourse Rehabilitation and Management Plan

To assist in achieving the objectives of the WRMP, a set of principles were applied which contributed to formulating action plans and specific management measures.

Loss of biodiversity puts aspects of the economy, well-being and quality of life at risk, and reduces socio-economic options for future generations. This is of particular concern for the poor in rural areas who have limited assets and are more dependent on common property resources for their livelihoods. The importance of maintaining biodiversity and intact ecosystems for ensuring the on-going provision of ecosystem services, and the consequences of ecosystem change for human well-being, were detailed in a global assessment entitled the Millennium Ecosystem Assessment (MEA, 2005), which established a scientific basis for the need for action to enhance management and conservation of biodiversity.

Sustainable development is enshrined in South Africa's Constitution and laws. The need to sustain biodiversity is directly or indirectly referred to in a number of Acts, such as the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) and is fundamental to the notion of sustainable development. In addition, international guidelines and commitments, as well as national policies and strategies are important in creating a shared vision for sustainable development in South Africa.
Impacts on biodiversity can mainly take place in four ways:

- **Direct impacts:** are impacts directly related to the proposed development activities including project aspects such as site clearing and diversion/abstraction of water.
- **Indirect impacts:** are impacts associated with the zone of influence associated with the proposed development activities, such as the surrounding terrestrial areas and downstream areas of freshwater ecosystems.
- **Induced impacts:** impacts that directly attributable to the proposed development activities but are expected to occur due to the activities of the proposed development activities. Factors included here are existing surrounding mining and agricultural activities and hardened surface within the catchment.
- **Cumulative impacts:** can be defined as the sum of the impact of the proposed development activities as well as the impacts from past, existing and reasonably foreseeable future projects that would affect the same biodiversity resources.

Given the limited resources available for biodiversity management and conservation, as well as the need for development, efforts to conserve biodiversity need to be strategic, focused and supportive of sustainable development. This is a fundamental principle underpinning South Africa's approach to the management and conservation of its biodiversity and has resulted in the identification of spatial biodiversity priorities or biodiversity priority areas.

'Mitigation' is a broad term that covers all components of the 'mitigation hierarchy' defined hereunder. It involves selecting and implementing measures – amongst others – to conserve biodiversity and to protect the users of biodiversity and other affected stakeholders from potentially adverse impacts resulting from anthropogenic activities. The aim is to prevent adverse impacts from occurring or, where this is unavoidable, to limit their significance to an acceptable level.

The mitigation hierarchy, as advocated by the DEA *et al.* (2013) in general consists of the following in order of which impacts should be mitigated:

1. **Avoid/prevent impact:** can be done through utilising alternative sites, technology and scale of projects to prevent impacts. In some cases, if impacts are expected to be too high, the "no project" option should also be considered, especially where it is expected that recommended mitigations measures will not be adequate to limit environmental damage and eco-service provision to suitable levels;
2. **Minimise impact:** can be done through the utilisation of alternatives that will ensure that impacts on biodiversity and ecosystem service provision are reduced. Impact minimisation is considered an essential part of any development project;

3. **Rehabilitate impact:** is applicable to areas where impact avoidance and minimisation are unavoidable. As such, impacted areas must be returned to conditions which are ecologically similar to the pre-project condition or an agreed post project land use, for example arable land. Rehabilitation cannot, however, be considered as the primary mitigation tool as even with significant resources and effort of rehabilitation usually does not lead to adequate replication of the diversity and complexity of the natural system. Rehabilitation often only restores ecological functions to some degree to avoid ongoing negative impacts and to minimise aesthetic damage to the setting of a project. Practical rehabilitation should consist of the following phases in best practice:
    a. **Structural rehabilitation** which includes physical rehabilitation of areas by means of earthworks, potential stabilisation of areas as well as any other activities required to develop a long term sustainable ecological structure;
    b. **Functional rehabilitation** which focuses on ensuring that the ecological functionality of the ecological resources associated with the proposed development activities and its footprint supports the intended land uses. In this regard, special mention is made of the need to ensure the continued functioning and integrity of the freshwater ecosystems throughout and after the rehabilitation phase.
    c. **Biodiversity reinstatement** which focuses on ensuring that a reasonable level of biodiversity is re-instated to a level that supports the local land uses. In this regard special mention is made of re-instating vegetation to levels which will allow the natural climax vegetation community or community suitable for supporting the intended land use.
    d. **Species reinstatement** which focuses on the re-introduction of any ecologically important species which may be important for socio-cultural reasons, ecosystem functioning reasons and for conservation reasons. Species reinstatement need only occur if deemed necessary.
4. **Offset impact:** The significance of residual impacts should be identified on a regional as well as national scale when considering biodiversity conservation initiatives. If the residual impacts lead to irreversible loss of irreplaceable biodiversity, the residual impacts should be considered to be of a *very high significance* and offset initiatives are not considered an appropriate way to deal with the magnitude and/or significance of the biodiversity loss. In the case of residual impacts determined to have *medium to high significance*, an offset initiative may be investigated. If the residual biodiversity impacts are considered of low significance no biodiversity offset is required.

A summary of how the above relates specifically to the proposed development activities in terms of measures which must be applied in order to ensure the minimisation of negative impacts and maximisation of positive impacts as a result of the proposed development activities is provided below:

- **Avoiding impacts** by not performing environmentally detrimental actions;
- **Minimising impacts** by limiting aspects of an action, optimising processes, structural elements and other design features; and
- **Rectifying impacts** through rehabilitation, restoration, etc. of the affected environment.

Objectives of the Surface Water Rehabilitation and Management Plan

The objectives of the WRMP are to:

- Meet the requirements of relevant local and regional authorities;
- Identify a range of mitigation measures which could reduce and mitigate the potential impacts on the receiving environment to minimal or acceptable levels;
- To re-introduce indigenous floral species, once construction is completed;
- To provide improved and more suitable habitat for faunal species;
- Detail specific actions deemed necessary to assist in mitigating the potential environmental impacts on the freshwater ecosystems;
- Ensure as far as practicable the measures contained in this report are implemented; and
- Propose mechanisms for monitoring compliance with the WRMP and reporting thereon.

APPENDIX C – LEGAL REQUIREMENTS

The table below presents each legislative document and the aspects, which are pertinent to water resource management, including the rehabilitation of disturbed areas to a level that will promote improved water quality and aquatic ecology.

The Constitution of the Republic of South Africa, 1996 (Act No. 108 of 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 normalization 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.
The National Environmental Management Act, 1998 (Act No. 107 of 1998)	The National Environmental Management Act, 1998 (Act No. 107 of 1998) and the associated Regulations as amended in 2017, refer specifically to biodiversity management in the following Clause: (4)(a) *Sustainable* development requires the consideration of all relevant factors including, (i) that the disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied. This Maintenance and Management Plan has been developed in fulfilment of the requirements as defined in the Environmental Impact Assessments EIA Regulations, 2014 (as amended) (No. R. 327) where a "maintenance management plan" is defined as a management plan maintenance purposes defined or adopted by the competent authority.
The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)	The objectives of this act are (within the framework of the National Environmental Management Act) to provide for: ➢ the management and conservation of biological diversity within the Republic of South Africa and of the components of such diversity; ➢ the use of indigenous biological resources in a sustainable manner; ➢ the fair and equitable sharing among stakeholders of benefits arising from bio prospecting involving indigenous biological resources; ➢ to give effect to 'ratified international agreements' relating to biodiversity which are binding to the Republic; ➢ to provide for co-operative governance in biodiversity management and conservation; and ➢ to provide for a South African National Biodiversity Institute to assist in achieving the objectives of this Act. This act alludes to the fact that management of biodiversity must take place to ensure that the biodiversity of surrounding areas is not negatively impacted upon, by any activity being undertaken, in order to ensure the fair and equitable sharing among stakeholders of benefits arising from indigenous biological resources. Furthermore, a person may not carry out a restricted activity involving either: a) a specimen of a listed threatened or protected species; b) specimen of an alien species; or c) a specimen of a listed invasive species without a permit. Permits for the above may only be issued after an assessment of risks and potential impacts on biodiversity is carried out. Before issuing a permit, the issuing authority may in writing require the applicant to furnish it, at the applicant's expense, with such independent risk assessment or expert evidence as the issuing authority may determine. The Minister may also prohibit the carrying out of any activity, which may negatively impact on the survival of a listed threatened

	or protected species or prohibit the carrying out of such activity without a permit. Provision is made for appeals against the decision to issue/refuse/cancel a permit or conditions thereof. ***National Environmental Management: Biodiversity Act (NEMBA) (Alien and Invasive Species Regulations, 2014)*** 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. In terms of alien and invasive species. This act in terms of alien and invasive species aim 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. Alien species are defined, in terms of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) 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, 2014): ➢ **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. ➢ **Category 3**: Ornamentally used plants that may no longer be planted. See **Appendix D** for further details pertaining to Alien and Invasive Vegetation control.
The Protected Areas Act (Act No. 57 of 2003) (In conjunction with the National Environmental Management: Biodiversity Act of 2004)	To provide for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes; for the establishment of a national register of all national, provincial and local protected areas; for the management of those areas in accordance with national norms and standards; for intergovernmental co-operation and public consultation in matters concerning protected areas; and for matters in connection therewith. This Act, as with the forestry act alludes to the fact that the conservation status of all vegetation types needs to be considered when any development is taking place to ensure that adequate conservation of all vegetation types is ensured.
The Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983)	Amendments to regulations under the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) ensures that landowners are legally responsible for the control of invasive alien plants on their properties. The CARA legislation divides alien plants into weeds and invader plants, with *weeds* regarded as alien plants with no known useful economic purpose, while *invader plants* may serve useful purposes as ornamentals, as sources of timber and may provide many other benefits, despite their aggressive nature.
The National Water Act, 1998 (Act No. 36 of 1998) as amended	The purpose of the National Water Act, 1998 (Act No. 36 of 1998) (NWA) as amended, is to ensure that the nation's water resources are protected, used, developed, conserved, managed and controlled. The National Water Act, 1998 (Act No. 36 of 1998) as amended, also provides for water use licenses which an operation will have to apply for, before commencing with any Section 21 water use activity. Various conditions may be attached to these licenses and a breach thereof will result in criminal and civil liability. The conditions attached to water use licenses will function alongside the additional protective measures, duty of care and statutory liability provisions provided by the NWA and other legislation to regulate a whole array of water issues.

	Accordingly, and in terms of the *Guide to the National Water Act*, "water use" refers to doing something that has an impact on the water resource, for example: ➢ The amount of water in the resource; ➢ The quality of water in the resource; and ➢ The environment surrounding the resource. Section 4 governs the entitlement to use water and states that water may only be used if it is a Schedule 1 use, a continuance of an existing lawful use (ELU), or authorised in terms of a general authorisation (GA) or license. A water use may therefore not be implemented unless it is properly authorised through one of these types of authorisations. The National Water Act, 1998 (Act No. 36 of 1998) as amended, 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). A watercourse is defined as: 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 a watercourse.
Government Notice 4167 as published in the Government Gazette 49833 of 08 December 2023 as it relates to the NWA (Act 36 of 1998) as amended	GN 4167 outlines the parameters and process of a General Authorisation (GA), which replaces the need to apply for a licence in terms of Section 40 of the NWA, provided that the water use is within the limits and conditions of the GA. The notice **replaces GN 509 of 2016.** The GA sets out the need to determine the regulated area of a watercourse, as well as the degree of risk posed by an activity/ies related to a particular water use. In accordance with GN 4167 of December 2023, the 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 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 distance from the edge of a watercourse where the edge of the watercourse (excluding flood plains) is the first identifiable annual bank fill flood bench; or c) In respect of a wetland, a 500 m radius around the delineated boundary (extent) of any wetland, including pans. The GA only applies to the use of water in terms of Section 21(c) and (i) of the NWA where the risk class is **LOW** as determined through the application of the Risk Matrix as prescribed in the Notice. The GA also does not apply where other Section 21 water uses are triggered, does not apply for most sewage infrastructure and pipelines carrying hazardous materials, water uses associated with hazardous materials, water uses associated with water and wastewater treatment works, and for most mining-related water uses. The GA may be exercised as follows: i) Section 21(c) or (i) water use activities that are determined to pose a LOW Risk as determined through the application of the Risk Matrix as prescribed in the Notice can be undertaken subject to the general conditions of the GA; ii) Section 21(c) or (i) water use activities set out in Appendix D1 of the Notice can be undertaken *without* being subject to the requirement of a risk assessment and subject to the general conditions of the GA. Such water use activities in Appendix D1 include *inter alia* emergency river crossings, fence erection, solar renewable infrastructure that has no direct impact on watercourses and mini-scale hydropower developments; iii) Prescribed water use activities undertaken by certain State Owned Entities as detailed in Appendix D2 of the Notice can be undertaken *without* being subject to the requirement of a risk assessment and subject to the general conditions of the GA;

	iv) Maintenance work associated with an 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 can be undertaken ; v) River and stormwater management activities including maintenance of infrastructure as contained in a river management plan or similar management plan, may be conducted subject to the approval of such a plan by the relevant DWS regional office or catchment management agency; vi) Rehabilitation of wetlands or rivers where such rehabilitation activities has a LOW risk class as determined through the Risk Matrix can be conducted; and vii) Emergency work arising from an emergency situation and or incident associated with the persons' existing lawful water use entitlement can be undertaken, provided that all work is executed and reported in the manner prescribed in the Emergency protocol contained in Appendix C of the Notice. A 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 with the water use as contemplated in the GA.

APPENDIX D – ALIEN AND INVASIVE FLORAL SPECIES CONTROL

The dominant alien floral species are predominantly associated with disturbance and should be identified by the environmental manager prior to the commencement of construction. An Alien and Invasive Plant (AIP) species control program should be developed for control of these species. The basic principles of a control program are presented below.

AIP control programs must include the following three phases (Campbell, 2000):

- Initial Control Phase: The existing population must be drastically reduced.
- Follow-up Control Phase: Control of coppice regrowth, root suckers and seedlings.
- Maintenance Phase: Low AIP density and numbers with a low annual control cost.

During this phase, AIP are no longer considered a problem. It is important to monitor the situation of infestation during the growing season of the plants as to avoid re-infestation and to keep the control cost at a minimum.

Control Methods

To control AIP successfully, one must use a number of control methods. When using herbicides, the recommendations that are stated on the label of the specific product must be adhered to (Campbell, 2000).

Integrated control strategies

A combination of the most suitable and effective methods should be used to control a specific species in a particular situation. The following selection of suitable control methods should take into account the following (Campbell, 2000):

- Species of alien and invasive weeds;
- The type of growth form (i.e. seedling, sapling, shrub or tree);
- The density of infestation;
- Terrain where the infestation is present;
- Rehabilitation requirements
- What resources are available;
- Speed or urgency that the control of the infestation requires – physical removal and biological control will take longer than chemical control.

Initial control phase

- **Hand pull:** saplings and seedlings must be pulled out by hand and regrowth must be controlled with herbicide (Campbell, 2000). All guidelines for the application of herbicide listed in this Rehabilitation Plan must be adhered to;
- **Frill:** a cane knife is used to cut frills into the stem. Herbicide must be applied (1-2 mm per frill) and must be done in 30min after frilling; and
- **Soil application:** herbicide is applied to the soil and taken up by the plants roots.

Methods for controlling Coppice, saplings and seedlings:

AIP infestation can comprise of different growing forms, and some of the growth forms cannot be utilised. These plants need to be cut with a brush cutter and the stumps treated with herbicide that was mixed with a dye to show where treatment was done (however stumps must not be removed as they significantly contribute to soil stability).

Integrated strategies to control alien shrubs	**Alien shrubs that are less than 1 m in height (Campbell, 2000)**
	Foliar application must be used in the general control of alien shrubs that are less than 1 m in height. Registered herbicide must be used and where grass is present, selective broadleaf herbicide that will not impact on the grass. When grass is not present, a selective or non-selective registered herbicide must be used. For dense seedling growth that are of uniform height a flat fan nozzle with knapsack must be used. For seedling growth that are of uneven height, root suckers, short saplings, and coppice growth a cone nozzle must be used.
	Alien shrubs that are taller than 1 m (Campbell, 2000)
	• Shrubs that are taller than 1 m must be reduced cutting using brush cutter or cane knifes. • When large areas with dense growth are present a tractor mounted gyro-motor must be used. • For low – medium density infestation a cut stump treatment must be used. Stumps that are must be treated immediately. The best time to treat is during the active growing season. • Medium – High-density infestations must be slashed to knee height so that the plants can coppice. The best time to do this is during the winter months as the plants are dormant and the coppice will come out during the active growing period after good rain. The coppice must be sprayed when enough leaves are present to absorb the herbicide and a dye must also be used to indicate treated areas. • Pathways must be cut to increase exposed areas so that a foliar spray treatment is more effective without compromising the indigenous vegetation. • Mechanical uprooting of shrubs is not always a preferred method because the soil is disturbed, and this increases the risk of alien vegetation infestation. Erosion is also promoted by this activity, and soil loss will occur. Mechanical uprooting can be done in areas that have a dense grass cover, as the roots of the grass will keep the soil intact. After uprooting the soil must be leveled and if grass seeds are present, some grass seeds must be placed on these areas to promote grass regrowth.
Integrated strategies to control alien herbs (Campbell, 2000)	**Chemical Control**
	• Alien herbs are soft non-woody species. • Some of the alien herbs have registered herbicides to control them and are either pre- or post-emergent herbicides. • When alien herbs are associated with woody alien plant, herbicides that are registered to control woody alien species are often used to control alien herbs. Alternatively, glyphosate can be used as it is often registered for both alien herb and alien woody species.

Follow up control (Campbell, 2000).

Introduction

Follow-up control is essential to control alien saplings, seedlings and coppice regrowth to achieve and sustain the progress that was made with the initial control work in the initial phase. If the follow up control phase is neglected, the alien infestation will become worse and denser than before the eradication process started. It is essential to sustain the follow up phase because it will prevent the suppression of alien seedlings on planted grasses.

Follow up treatment control must use the following methods:

- Chemical control methods: Only use registered herbicides to control any alien species. Instruction on the herbicide labels must be followed carefully.
- Mechanical control methods
- Biological control methods that are available.

Control methods for dense regrowth: After initial control operations dense regrowth may arise as new regrowth will sprout in the form of stump coppice, seedlings and root suckers.	
Chemical control / foliar application:	Plants that are less than 1 m in height must be controlled by foliar application. Dense seedling growth must be controlled with knapsack sprayers with a flat fan nozzle. If grass is present, the use of a registered selective herbicide must be used so as to not harm the grass, and if grass is not present a registered non-selective or selective herbicide can be used. Suitable dye must be used at all times to limit over- or under spray of areas.
Mechanical control:	Areas with dense seedlings should not be uprooted or hoed out, as these areas will result in soil disturbance and will in return promote flushes and germination of alien seedling growth. When stump density is high, plants should not be cut. This is impractical and there will be many untreated stumps. Instead cut the stumps in dense areas with brush cutters and remove the top growth. Stumps will start to coppice and foliar spay must be used to control the coppice regrowth.
Control methods for low-medium density regrowth: Neglecting to control low-medium density regrowth will result in densification and spreading as well as additional control costs.	
Chemical control:	Cut stump method must be used and stumps must be cut up to a height of 15 cm and must be sprayed within an hour of cutting the plant with a registered herbicide. Herbicide must be applied with knapsack sprayers set to a low pressure, using cone nozzles e.g. TG1 or CE1. Hand sprayers can also be used to apply herbicide. A suitable dye must be used to ensure all stumps are treated. Only the cut surface must be treated with herbicide and the side of the stumps must not be treated. Foliar spray can be applied to regrowth that is up to the height of 1m. Herbicide must be applied using knapsacks with solid cone nozzle and must be mixed with a suitable dye to prevent over- or under spraying of treated areas.
Mechanical control:	Seedlings can be removed from wet soil by hand pulling. Gloves can be used for hand protection during the operation.

APPENDIX E – EROSION AND SEDIMENTATION CONTROL GUIDELINES

Geomeshes, geomats or geomatrixes
Geomeshes (two-dimensional) and Geomats or Geomatrixes (three-dimensional) are used to interact with young seedlings by providing a stable surface through which seedlings can take root and grow to provide a vegetative ground cover.

Those made from natural fibres such as jute, coir and hemp are in the form of a mesh that allows the seedlings to grow through it. They are biodegradable and their stabilising influence diminishes as the ability of the rooted vegetation to take over the protective role increases. The biodegradable natural materials should only be used where slopes are stable in terms of mass stability and sufficiently shallow to ensure that the re-establishing vegetation will be secure in the long term. Where slopes are stable in terms of mass stability but too steep to guarantee the long term security of soil and vegetation cover synthetic geomats and geomeshes can contribute to the longer term protection of the soil surface and vegetation layer. Geomats are three-dimensional random open-knit structures with a thickness of up to 20mm (**Figure E1**). They are rolled out and pegged down onto the slope and then seeded and filled with topsoil, which is held in the mat. The mat remains under the vegetation providing continuing reinforcement in the root zone (*Food and Agricultural Orgnaisation, 2001).*

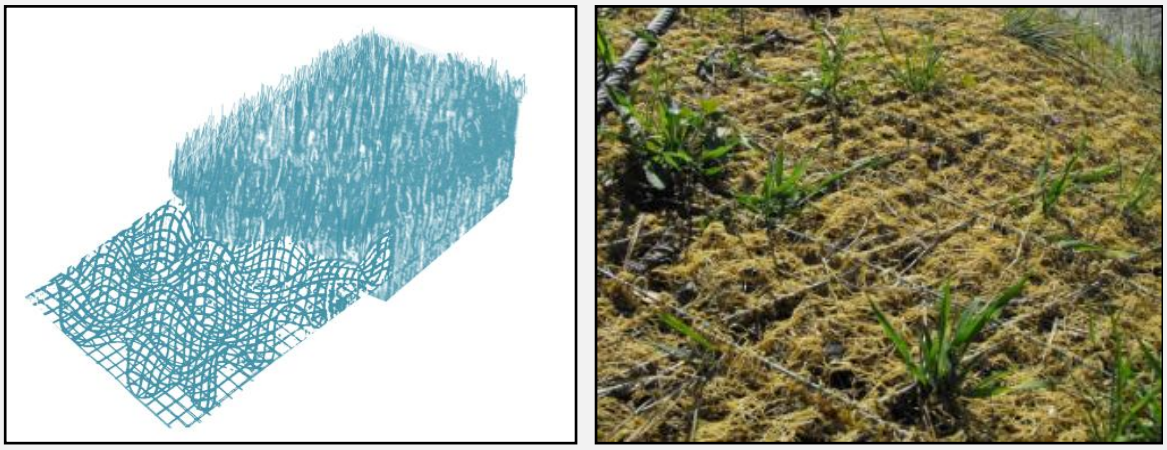

Figure E1: Schematic drawing of geomat (Food and Agricultural Organisation, 2001) and photographic illustration of a geomat.

Brush layering is when branches are placed perpendicular to the slope contour. This method is effective for earth reinforcement and mass stability. Brush layers break up the slope length, preventing surface erosion, and reinforce the soil with branch stems and roots, providing resistance to sliding or shear displacement. Brush layers also trap debris, aid infiltration on dry slopes, dry excessively wet sites, and mitigate slope seepage by acting as horizontal drains. Brush layers facilitate vegetation establishment by providing a stable slope and a favourable microclimate for the growth of vegetation (USEPA, 2005).

Live gully repair is a technique that is similar to branch packing but is used to repair rills and gullies. Live gully repairs offer immediate reinforcement and reduce the velocity of concentrated flows. They also provide a filter barrier that reduces further rill and gully erosion and must be used where gully erosion is taking place on the project footprint (USEPA 2005).