Amaoti No. 3 Secondary School, Farm 842 Riet Rivier

Monitoring Plan for Water Resources

Water Use License Application

Ref: WU25762

PREPARED FOR:

The Department of Water and Sanitation (DWS)

The Department of Education (DOE)

DATE:

August 2023

PREPARED BY:

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Revision	Date	Description
Rev.01	August 2023	Prepared for Water Use License Application

TABLE OF CONTENTS

ABBREVIATIONS

CMA	Catchment Management Agency
DEA	Department of Environmental Affairs
DFFE	Department of Forestry, Fisheries and the Environment
DOE	Department of Education
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	Ecological Category
ECO	Environmental Control Officer
EDTEA	Department of Economic Development, Tourism and Environmental Affairs
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
EM	eThekwini Municipality
EMPr	Environmental Management Programme
EO	Environmental Officer
GA	General Authorisation
GN	Government Notice
KZN	KwaZulu-Natal
MOU	Memorandum of Understanding
NEMA	National Environmental Management Act
NFEPA	National Freshwater Ecosystem Priority Area
NWA	National Water Act
PES	Present Ecological State
RA	Risk Assessment
REC	Recommended Ecological Category
RQO	Resource Quality Objective
SANBI	South African National Biodiversity Institute
WMA	Water Management Area
WRC	Water Research Commission
WULA	Water Use License Application
WWTW	Wastewater Treatment Works

1 INTRODUCTION

The Coega Development Corporation (Pty) Ltd ("CDC"), as an implementing agent is assisting the KwaZulu-Natal Department of Education ("DoE"), in implementing various projects within the province of KwaZulu-Natal ("KZN"). One such project is the proposed development of Amaoti No. 3 Secondary School on farm Riet Rivier No. 842 portion 378 in ward 53 of the eThekwini Municipality, KZN. A consultation meeting with the relevant authority, the Department of Water and Sanitation ("DWS"), confirmed the project would require a water use license ("WUL") in terms of sections 21(c) and (i) of the National Water Act (Act 36 of 1998) ("NWA").

As one of the requirements of the WUL application, a water resource monitoring plan is required for the project in terms of the water uses associated with the development of the school building infrastructure and related stormwater and sewerage infrastructure. This plan has been prepared by NCC Environmental Services (Pty) Ltd ("NCC") to provide details on the applicable methods, aspects, risks associated with the construction and operation of the school and associated infrastructure and to provide recommended mitigation measures to limit the impact on the resource quality of water resources.

2 PROJECT DESCRIPTION

2.1 Water resources

A perennial watercourse, the Ohlanga River, flows more-or-less from west to east bordering the northern site boundary of the property (portion 378). Two HGM wetland units, a channelled valley bottom and a seep, are situated on the property. The hillslope seep (HGM1) adjoins the valley bottom wetland (HGM2) both of which are connected to the Ohlanga River and associated riparian zone. An additional hillslope seep (HGM3) is situated beyond the site/property boundary but within 500m from the development footprint (See **Figure 1**).

2.2 Water use activities

The infrastructure associated with the proposed development on portion 378 includes school buildings, a parking area, a grassed sport field, a multipurpose hard surface court, water pipelines, stormwater pipelines, a stormwater attenuation pond, stormwater discharge outlets, stormwater manholes, a 160mm diameter sewer pipeline, a 400mm diameter sewer pipeline and sewer manholes. It is proposed that stormwater run-off from developed/hardened surfaces is collected in a stormwater attenuation pond and released via the stormwater pipeline at a headwall with gabions. A section of the stormwater pipeline is proposed to be developed within a wetland. There is an existing municipal sewer pipeline running across the property (portion 378), where it is proposed that a section of which be abandoned and connected with proposed new sections of sewer pipeline to service the new school buildings / infrastructure (**Figure 1**). All proposed

infrastructure is situated within 500m from wetlands (the NWA-regulated area for wetlands) and a portion of the proposed stormwater pipeline and associated head wall is situated within the 1: 100 year floodline of the Ohlanga River (the NWA-regulated area for watercourses). These activities may result in the impeding and/or diverting of flow of water in a watercourse (21c water use activity) and the altering of the bed, banks, course or characteristics of a watercourse (21i water use activity).

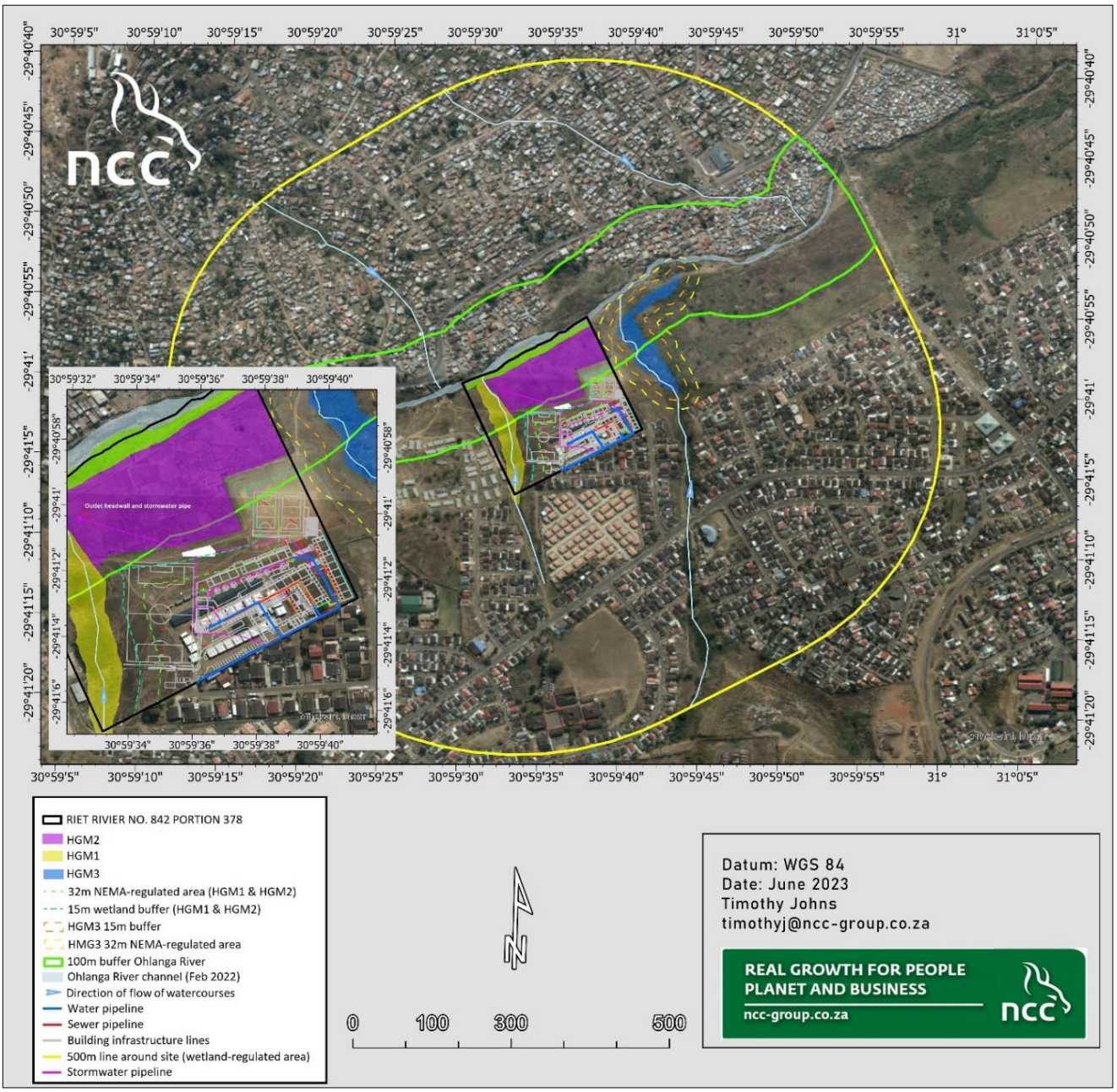

Figure 1: Master layout map showing infrastructure in relation to water resources.

2.3 Condition of water resources

A freshwater (wetland and aquatic wetland) delineation and assessment was undertaken in March 2021 and revised in March 2023. The overall Present Ecological State (PES) of wetlands were assessed to be '*Moderately modified'* with a Class "**C**" PES and a '*Moderate'* ("**C**") Ecological Importance and Sensitivity (EIS).

The main impacts on wetlands are associated with previous agricultural/cultivation activities, surrounding urbanisation (human settlement and infrastructure), exotic vegetation encroachment and vegetation removal which has modified the original (reference) condition of the wetlands and their and associated habitats. Although urban settlement has encroached ever closer to the wetlands, hard/permanent infrastructure has not yet transformed these systems with remnant patches of natural and semi-natural vegetation communities still able to provide habitats to frogs and other animals which forage and/or seek refuge in wetland habitats.

The overall Present Ecological State (PES) of the Ohlanga River is *'Largely modified'* (Class "**D**") with a significant loss of natural habitat, biota and basic ecosystem functions having already occurred. The river's beds and channels have been modified from natural conditions as a result of general land use in the upper catchment. Informal human settlement upstream often have an impact on water quality (e.g. increased turbidity due to poor land-use and farming practises) as well as introduction of pathogens due to the over-burden on existing wastewater infrastructure and expanding human population which have resulted in transformed riparian and in-stream habitats. The Ecological Importance and Sensitivity (EIS) of the river was assessed as '*Moderate'* ("**C**") in terms of its ecological sensitivity and intrinsic ability/functionality to continue to provide important ecological services and residual aquatic habitat heterogeneity, diversity and connectivity to upstream and downstream reaches of the river.

3 RISKS TO WATER RESOURCES

The potential significant risks (which are also aspects) posed to the water resources include:

- Removal of protective vegetation cover - *ecological and geomorphological impact*
- Loss of topsoil/soil compaction - *geomorphological impact*
- Erosion and sedimentation of wetland - *ecological, water quality and geomorphological impact*
- Bank modification and instability - *geomorphological and hydrological impact*
- Alien plant species invasion - *ecological impact*
- Pollution during construction due to chemical spills/incidents - *ecological and water quality impact*
- Sewerage entering water resources during operations e.g. pipe leaks - *ecological and water quality impact*

3.1 Risk Mitigation

The applicant/developer will be able to manage these risks (aspects) by implementing effective mitigation and rehabilitation measures during the various phases of the development and associated water use activities.

4 MONITORING

4.1 What is monitoring

Monitoring is defined as the regular collection of information to measure the variation from a predetermined state. In the context of this plan monitoring, is a systematic process undertaken to evaluate the condition of the water resources over the project lifecycle in terms of the outputs and outcomes of the school development project and the associated water use activities.

4.2 Why undertaken monitoring

In the context of this plan, monitoring intends to evaluate if effective mitigation and rehabilitation measures have been / are being effectively implemented. Monitoring is a tool which is used to evaluate if the condition/state of the water resources have either declined (↓), been maintained (→) or improved (↑). If effective impact mitigation and rehabilitation measures are undertaken, the characteristics and functions of water resources will be maintained for the overall benefit of both society and the ecosystems (natural environment). Monitoring is therefore a tool which can be used to evaluate if resource quality objectives (RQOs) of those water resources affected by the project are either being maintained in line with, or deviating from, the RQOs for other water resources at a broader level in the same catchment.

5 SCOPE OF PLAN

5.1 Applicability

This plan is applicable to the section 21(c) and (i) water use activities which may impede and alter the flow in water resources as a result of the construction of infrastructure within 500m of several wetlands with part of the stormwater infrastructure being directly within a wetland (HGM2) and within the 1: 100 year floodline of the Ohlanga River.

5.1.1 Construction-phase activities

The water use activities include the development of school buildings, a parking area, a grassed sport field, a multipurpose hard surface court, a water pipeline to connect to the existing municipal water mains, stormwater pipelines, a stormwater attenuation pond, stormwater discharge outlets, stormwater manholes and a network of sewer manholes and 160mm diameter sewer pipelines which will be connected with the existing municipal sewerage network i.e. the existing 400mm diameter trunk sewer pipeline on the property. A section of the existing 400mm trunk sewer line, approximately 96m in length, will be abandoned / removed and a new 400mm section installed which will be deviated slightly northwards up to a maximum of ~9m from the position of the section to be abandoned, and re-connected with the existing trunk main.

5.1.2 Operational-phase activities

The water use activities will apply based on the developed infrastructure continuing during the operational phase where repairs and maintenance activities will be necessary on a longer-term basis.

5.2 Aim

The aim of this plan is to monitor the condition, integrity and functioning (PES and EIS) of water resources during construction and in the post-development landscape (operational phase) achievable via regular monitoring and appropriate rehabilitation measures undertaken during and after construction.

5.3 Objective

The overall objective of this plan is to evaluate if impact/risk mitigation and rehabilitation measures are effectively implemented where the results of monitoring events can be used to substantiate whether water resource are being managed appropriately or whether adaptive management interventions may be required using alternative or additional mechanisms/approaches, possibly with specialist input. The objective of the plan is to provide a framework for:

- monitoring construction and operational phase impacts of water use activities on water resources;
- monitoring the effectiveness of rehabilitation measures/activities undertaken

6 ROLES AND RESPONSIBILITIES

6.1 Authority

- Water resource management, equitable allocation and beneficial use of water in the public interest.
- Determine the quantity of water in respect of which a general authorisation (GA) or a licence may be issued for using/utilising water resources.
- Ensure effective participation of stakeholders in water resource decisions.
- Undertake legal and technical review of WULA submissions.
- Provide technical and legal advice to the water use applicant.
- Subject to any authorisation of a given water use, provide conditions for such water use, as may be required.

6.2 Applicant/Water User/Licensee

- The person or organisation who funds the development and implementation of the project or activity.
- Engage with the authority to confirm the activity and any potential water use.
- Where required, prepare and submit an application (facilitated by 3rd party consultant) to the authority to use water.
- Make financial provision to comply with and meet the conditions of a water use license (WUL) or GA, whichever is applicable.

- Make financial provision for the implementation of rehabilitation measures including for any future management, maintenance and monitoring of the water use.
- Implementation of this plan.

6.3 Landowner

- The landowner (or custodian of the land) is the person or organisation with decision making capacity for the land in question, and thus ultimately accountable for what takes place on that land.

6.4 Design Engineer

- Involved during the planning and design phase of a project and the appropriate design of infrastructure.
- Ensures that relevant environmental planning and design considerations are taken into account which will not lead to degradation or deterioration of the water resources and which will ensure protection of the water resources are maintained.

6.5 Site Engineer

- Site supervision and quality control during Construction.

  *In some instances the Site Engineer may also assume the responsibilities of the Project Manager and may also be referred to in some instances as a Resident Engineer.

6.6 Project Manager

- Represents the applicant/licensee (i.e. water user) and co-ordinates all aspects of the project streamlining planning and implementation.

6.7 Contractor

- Appointed by the applicant to undertake all works related to the development (construction/installation of infrastructure) according to all approved specifications, master layout plan, design drawings, plans, method statements, license conditions, EMPr, etc.
- Implementation of this plan.

6.8 Environmental Control Officer

- Appointed by the applicant to monitor the construction construction/installation of infrastructure according to all approved specifications, master layout plan, design drawings, plans, method statements, license conditions, etc.
- Liaise with all relevant role-players including the authority, in relation to the development/project.
- Advise and report to the licensee /contractor, *inter alia* and where necessary, on the implementation of this plan.
- Undertake site visits and visual monitoring of water resources.

- Adopt methods to capture monitoring records/evidence in the form of photography using an appropriate camera by taking **fixed-point photographs** of:
  - all water resources **before** construction commences (once-off, baseline);
  - all water resources on a *monthly* basis during construction (continual, on-going monitoring);
  - any specific *problems* or *issues* observed affecting water resources e.g. erosion, alien vegetation, sewerage leaks, chemical spills, littering, waste and any other contraventions / transgressions (as and when required);
  - construction of *stormwater infrastructure* in *HGM2* on a *weekly* basis until complete (weekly);
  - *HGM2* on a *monthly* basis **after** construction of the *stormwater infrastructure* is complete (once a month for 3 months);
  - *HGM2* once every 3 months until the construction phase for the entire project is complete (quarterly);
  - all water resources on a monthly basis during site-clean up and any rehabilitation activities (as and when required);
  - all water resources once every 6 (six) months for 1 (one) year after all construction activity has been completed (operational phase monitoring).

6.9 Freshwater Ecologist

- Undertake annual monitoring of water resources (wetlands and Ohlanga River) using appropriate methods i.e. rapid PESEIS and IHI assessments to compare to the March 2021 PES and EIS classes for water resources (as described in section 2.3 above);
- Reporting to the authority;
- Where necessary, provide advice and recommendations to the licensee/contractor, *inter alia,* on the implementation of this plan.

7 MONITORING PLAN

A suitably qualified and experienced independent Environmental Control Officer (ECO) must be appointed, as per section 6.8 above, for the monitoring and reporting on the implementation of this plan, monitoring of the water use activity and the subsequent rehabilitation undertaken. In addition, a suitably qualified and experienced freshwater ecologist must be appointed to undertake the annual monitoring role as described in section 6.9 above.

The tables below (**Tables' 1** and **Table 2**) provide mitigation and management measures deemed necessary to effectively monitor, manage and maintain the characteristics and ecological functioning of water resources during the various phases from construction and installation and the final operation of the infrastructure. Indigenous vegetation species recommended for rehabilitation are provided in Appendix 1. Additional measures for rehabilitation are provided in Appendix 2.

Table 1: Construction Phase

No.	Aspect of water resource	Activities/aspects resulting in impacts	Monitoring activities and mitigation measures/ actions	Responsibility	Frequency
1	RIVER BANK / WETLAND INTEGRITY	Inappropriate construction of infrastructure leading to potential erosion and degradation of water resources - compromising their integrity	• Appoint a suitably qualified ECO to monitor and report on *inter alia* the water use activity and the implementation of this plan. • Adhere to conditions of the water use license. • Construct the infrastructure as designed during the design phase and shown in the Master Layout Plan. • Implement and adhere to the stormwater management plan. • Implement and adhere to this plan. • Adhere to all mitigation measures provided in the Risk Assessment Matrix (Refer to the Wetland Delineation and Assessment Study). • Establish and demarcate a maximum impact footprint around the site footprint with no vegetation being cleared or damaged beyond this demarcation. Only equipment and machinery required for the alteration /water use activity should operate within the delineated impact footprint. • Keep construction footprint area(s) as small as possible in the regulated area of water resources by only removing soil and vegetation and excavating only the trench for the stormwater pipeline and outlet in HGM2. • Cease construction activity during rainfall and when soils are waterlogged allowing the ground to dry out before re-commencing with construction activity. • The construction camp, storage, washing and maintenance of equipment, storage of construction materials, or chemicals, as well as any sanitation and waste management facilities should be located outside the 1: 100 year flood line and/or > 100m away from the edge of water resources and be removed within 30 days after the completion of construction. • Compile a method statement for hazardous substances. • If needed, a centralised storage area for all hazardous substances should be located >100m from the water resources on a bunded, impermeable surface to ensure that spills or leaks cause contamination of soil, groundwater or surface water resources. • Spill kits should be available at the storage and re-fuelling areas in the event of any accidental spillages or leaks. • No servicing, repairs or re-fuelling of plant, vehicles or machinery should take place within 100m from the water resource.	Water user/ Developer/ Contractor/ ECO/ Ecologist	Daily/weekly /monthly during the activities
2	SURFACE WATER QUALITY	Inappropriate construction of infrastructure leading to potential pollution of water resources, decline in water quality and negative human health effects		Water user/ Developer/ Contractor/ ECO / Ecologist	Daily/weekly/ monthly during the activities

3	WETLAND AND AQUATIC HABITAT (ECOLOGICAL) INTEGRITY	Inappropriate construction of infrastructure leading to potential degradation and loss of habitat and decline in PES	• Appropriately contain any machinery, fuel storage tanks, spills (e.g. accidental spills of hydrocarbons oils, diesel etc.) or construction materials on site (e.g. cement) in such a way as to prevent them leaking and entering water resources. • All spills and contaminated soil/materials should be cleared up immediately and disposed of appropriately (i.e. as hazardous waste). • All material excavated from HGM2 must be stored in a clearly demarcated location outside the 1:100 year flood-line until the works have been completed, upon which the excavated material must be backfilled to the location from where it was excavated. • Implement adequate erosion control measures (gabions, rock baskets, vegetation) at and around the stormwater discharge site (outlet headwall). • Install a fencing barrier (or similar) and signage preventing unnecessary access to water resources once all infrastructure is installed. • The sites of water use and all hardened surfaces must be structurally stable; not induce sedimentation, erosion or flooding; not cause a detrimental change in the quality, quantity, velocity, pattern, timing, water level and assurance of any flow; not cause a detrimental change in the stability or geomorphological structure of water resources and not create nuisance conditions or health or safety hazards. • Implement measures to prevent the transfer of invasive (non-indigenous) vegetation to the site. Do not import or use non-native seeds or plants during rehabilitation. Use the same topsoil and original seed bank and only use plants / seeds approved by the ECO/ecologist. • Roughen soil on disturbed ground surfaces to reduce surface water run-off velocity, increase infiltration rate, reduce erosion, trap sediment and prepare compacted soil surfaces for re-colonisation of vegetation. Soil compacted as a result of construction activities should be ripped and scarified. • Control any alien invasive vegetation using mechanical removal methods, not chemical (herbicide) treatment. • Where necessary re-seed / re-vegetate disturbed areas with an appropriate indigenous grass seed mix approved by the ECO (See **Appendix 1**). • Report any leaking sewerage infrastructure (pipes and manholes) to the municipality. • Stormwater infrastructure (inlets and outlets) should be maintained /cleared by regular inspections and removal of debris. Any cracks and/ or damage should be repaired prior to the summer rainfall season. • Conduct **post-construction** rehabilitation inspections at intervals once a month for 3 months, then at month 6 and finally at month 12. • Conduct a post-construction audit report on completion of rehabilitation.	Water user/ Developer/ Contractor/ ECO / Ecologist	Daily/weekly/ monthly during the activities
4	SOIL AND GROUNDWATER QUALITY	Inappropriate construction of infrastructure leading to pollution of soil and groundwater resources		Water user/ Developer/ Contractor/ ECO / Ecologist	Daily/weekly/ monthly during the activities

Table 2: Operational Phase

No.	Aspect of water resource	Aspects resulting in impacts	Monitoring activities and mitigation measures/ actions	Responsibility	Frequency
1	RIVER BANK / WETLAND INTEGRITY	Floods, erosion (natural), ageing/leaking infrastructure, vandalism, theft, general maintenance and/or infrastructure upgrade requirements	• Adhere to conditions of WUL. Stormwater drains (inlets and outlets) should be maintained by regular removal of obstructing debris and keeping the drains clear. Any leaks, cracks and/or damage should be repaired prior to the summer rainfall season. • Conduct **post-construction** monitoring at intervals once every 6 (six) months for 1 (one) year after all construction activity has been completed (operational phase monitoring). • Establish a written agreement / MOU between the municipality (infrastructure owner and service provider), the DoE (water user/licensee) and the Department of Human Settlements (landowner) for purposes of billing services and in terms of commitment and responsibility for any maintenance and repairs to infrastructure, as may be required. • Water user/licensee to report any damage to or leaks from the sewerage infrastructure to the relevant authority/service provider and arrange for maintenance and repairs, as and when required. • If any excessive erosion or instability of the water resources are observed to develop during this phase, a suitably experienced and qualified freshwater ecologist should be consulted to advise on any further or additional rehabilitation requirements. • Water user/licensee to notify the authorities (DWS) of any emergency incidents / situations which may arise related to the authorised water uses. • Water user/licensee and municipality to liaise with authority (DWS) and co-operate in undertaking any required emergency works arising from emergency situations or emergency incidents associated with the authorised water uses in terms of the NWA.	Water user / Landowner / Service Provider	As and when required, on-going
2	SURFACE WATER QUALITY	Floods, erosion (natural), ageing/leaking infrastructure, vandalism, theft, general maintenance and/or infrastructure upgrade requirements		Water user / Landowner / Service Provider	As and when required, on-going
3	WETLAND AND AQUATIC HABITAT (ECOLOGICAL) INTEGRITY	Floods, erosion (natural), ageing/leaking infrastructure, vandalism, theft, general maintenance and/or infrastructure upgrade requirements		Water user / Landowner / Service Provider	As and when required, on-going
4	SOIL AND GROUNDWATER QUALITY	Floods, erosion (natural), ageing/leaking infrastructure, vandalism, theft, general maintenance and/or infrastructure upgrade requirements		Water user / Landowner / Service Provider	As and when required, on-going

APPENDIX 1 RECOMMENDED SEED MIXES FOR REVEGETATION

Summer mix suitable for the coastal hinterland of KZN (Check availability with local nurseries).

GRASS SPECIES	**COMMON NAME**	**APPLICATION RATE (kg/ha)**
Eragrostis tef	Teff	5
Eragrostis curvula	Weeping lovegrass	10
Chloris gayana	Rhodes grass	10
Cenchrus ciliarus	Blue buffalo grass	2
Cynodon dactylon	Couch grass	10
TOTAL		**37**

Winter mix suitable for the coastal hinterland of KZN (Check availability with local nurseries).

GRASS SPECIES	**COMMON NAME**	**APPLICATION RATE (kg/ha)**
Lolium multiflorum	Italian rye grass	10
Eragrostis curvula	Weeping lovegrass	10
Chloris gayana	Rhodes grass	5
Cenchrus ciliarus	Blue buffalo grass	2
Cynodon dactylon	Couch grass	3
TOTAL		**30**

APPENDIX 2 ADDITIONAL MEASURES FOR WATER RESOURCE REHABILITATION

For rehabilitation it is important to select and correctly place plants with vigorous rooting growth characteristics that will accelerate natural plant succession and deal directly with the problem on site. Confirm what indigenous species are growing in the area requiring rehabilitation. It is always recommended to use local indigenous plant species. Wetland and riparian plants are vital for preventing erosion, they play a crucial role in the purification of water, reduce the severity of floods and regulate water especially during drought periods.

- Plants are the best and cheapest solution to addressing bank erosion and stabilising soil.
- A large variety of herbaceous plants with a dense surface root mat and ground cover are effective for stabilising soil that can erode rapidly. Examples include papyrus, bulrushes, reeds, sedges and couch grass (*Cynodon dactylon*).
- Herbaceous plants absorb the energy of fast flowing water rather than reflecting it, slowing it down so it does not cause erosion.
- Plants or grass used to stabilise banks must be planted in rows along/across the contour line, not down it, in order for such to be effective in reducing soil erosion.
- Other erosion control measures which help stabilise banks and help vegetation to establish include mesh mats made of either coir or sisal.
- Consider inserting gabion structures which assist in bank and soil stabilisation, reducing erosion and decreasing the speed of water flow. They also provide an area for vegetation to re-establish.
- Insertion of grass bales help to bind the soil and slow the rate at which water travels. The slower the water flow, the lower the erosive power of water. Binding and stabilising soil prevents the soil from being washed downstream.
- Stabilise/plug any erosion gully sides with indigenous herbaceous or woody plants, hay bales, clay plugs, gabions filled with rock, geo-textile linings, soil material or loose rocks packed against head-cut faces.
- Fence off the rehabilitated area to keep livestock grazers out including other areas that have been disturbed and which need time for vegetation to re-establish.