

ENVIRONMENTAL MANAGEMENT & MAINTENANCE MANAGEMENT PLAN including REHABILITATION

**For the works already undertaken as part of the erosion repairs, works to be completed and rehabilitation at the stormwater outlet at the Outeniqua Waste Water Treatment Works (WWTW),
George**



Compiled by	Hilland Environmental
Hilland reference	GEO23/1251/07
Date	December 2023
Client	George Municipality

Issued by: HillLand Environmental
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Client: George Municipality
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I, **Cathy Avierinos**, as the appointed environmental assessment practitioner ("EAP") hereby declare that:

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 - other than fair remuneration for work performed/to be performed in terms of this application, have no business, financial, personal or other interest in the activity or application and that there are no circumstances that may compromise my objectivity;
 - Work performed for this study was done in an objective manner irrespective of how such findings may be favourable or not to the client;
 - I do not have any influence over the decision-making process undertaken by the governing authorities;
 - I declare that there are no circumstances that may compromise my objectivity in undertaking this study or producing this report;
 - All facts and findings will be presented in an objective manner in accordance with my professional and scientific experience and the data derived from the study;
 - I have the necessary qualifications and experience to undertake the study;
 - All particulars furnished in this report are true and correct.

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Glossary¹

Activity means an activity identified in any notice published by the Minister or MEC in terms of section 24D(1)(a) of the Act as a listed activity or specified activity. Activity in this document refers to the activities as listed in Listing Notice 1, 2 and 3 of the Environmental Impact Assessment Regulations, 2014 (as amended).

“Bush Encroachment” means stands of plants of the kinds specified in column 1 of Table 4 of the Conservation of Agricultural Resources Act (Act No. 43 of 1983) where individual plants are closer to each other than three times the mean crown diameter.

“Diverting” as defined in the General Authorisation, in terms of section 39 of the National Water Act, 1998 (Act no 36 of 1998) for Water Uses as defined in Section 21(c) and 21(i) (GN. 509 of 26 August 2016), means to, in any manner, cause the instream flow of water to be rerouted temporarily or permanently.

Environmental Control Officer (ECO): a suitably qualified person contracted by the land owner / developer / proponent tasked with monitoring the environmental performance and compliance of contractors involved in the development / rehabilitation

“Ecological Infrastructure” refers to naturally functioning ecosystems that deliver valuable services to people, such as water and climate regulation, soil formation and disaster risk reduction.

Ecological succession: refers to more or less predictable and orderly changes in the composition or structure of an ecological community. Succession that begins in areas where no soil is initially present is called primary succession, whereas succession that begins in areas where soil is already present is called secondary succession.

“Estuary” has the meaning assigned to it in the National Environmental Management: Integrated Coastal Management Act, 2008 (Act No. 24 of 2008)

“Flood event” is the event where land is inundated by the overflowing of water from a river channel and where this event causes significant damage to infrastructure or results in watercourse erosion and/or sediment deposition.

NOTE that flooding can be a natural phenomenon in many river or wetland systems which, due to encroachment and human modification of the form and function of the affected system, may have evolved into a potential hazard to life or property.

“Flow-altering” as defined in the General Authorisation, in terms of section 39 of the National Water Act, 1998 (Act no 36 of 1998) for Water Uses as defined in Section 21(c) and 21(i) (GN. 509 of 26 August 2016), means to, in any manner, alter the instream flow route, speed or quantity of water temporarily or permanently.

“General Authorisation” in this document refers to the General Authorisation in terms of section 39 of the National Water Act, 1998 (Act no 36 of 1998) for Water Uses as defined in Section 21(c) or Section 21(i) (GN. 509 of 26 August 2016).

Habitat: An ecological or environmental area that is inhabited by a particular animal and plant species. It is the natural environment in which an organism lives, or the physical environment that surrounds a species population.

“Impeding” as defined in the General Authorisation, in terms of section 39 of the National Water Act, 1998 (Act no 36 of 1998) for Water Uses as defined in Section 21(c) and 21(i) (GN. 509 of 26 August 2016), means

¹ Adapted from DEADP information document for MMP

to, in any manner, hinder or obstruct the instream flow of water temporarily or permanently, but excludes the damming of flow so as to cause storage of water.

“Indigenous vegetation” refers to vegetation consisting of indigenous plant species occurring naturally in an area, regardless of the level of alien infestation and where the topsoil has not been lawfully disturbed during the preceding ten years.

“Maintenance” means actions performed to keep a structure or system functioning or in service on the same location, capacity and footprint.

“Maintenance Management Plan” means a management plan for maintenance purposes defined or adopted by the competent authority.

“River Management Plans” as defined in the General Authorisation, in terms of section 39 of the National Water Act, 1998 (Act no 36 of 1998) for Water Uses as defined in Section 21(c) and 21(i) (GN. 509 of 26 August 2016), any river management plan developed for the purposes of river or storm water management in any municipal/metropolitan area or described river section, river reach, entire river or sub quaternary catchment that considers the river in a catchment context.

“River reach”, a length of river characterised by a particular channel pattern and channel morphology, resulting from a uniform set of local constraints on channel form. A river reach is typically hundreds of meters in length.

“Stretch” a section of watercourse, delineated between two or more mapped coordinates, within which proposed maintenance activities are to take place as guided by an MMP.

“Thalweg” refers to the line of lowest elevation within a valley or watercourse.

“Watercourse” means:

- (a) a river or spring;
- (b) a natural channel in which water flows regularly or intermittently;
- (c) a wetland, lake or dam into which, or from which, water flows; and

any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse as defined in the National Water Act, 1998 (Act No. 36 of 1998); and

a reference to a watercourse includes, where relevant, its bed and banks.

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

ACRONYMS

BGCMA	Breede Gouritz Catchment Management Agency
CBA	Critical Biodiversity Area
DEADP	Department of Environmental Affairs & Development Planning
DWS	Department of Water & Sanitation
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
GA	General Authorisation, in terms of the National Water Act, 1998 (Act No. 36 of 1998)

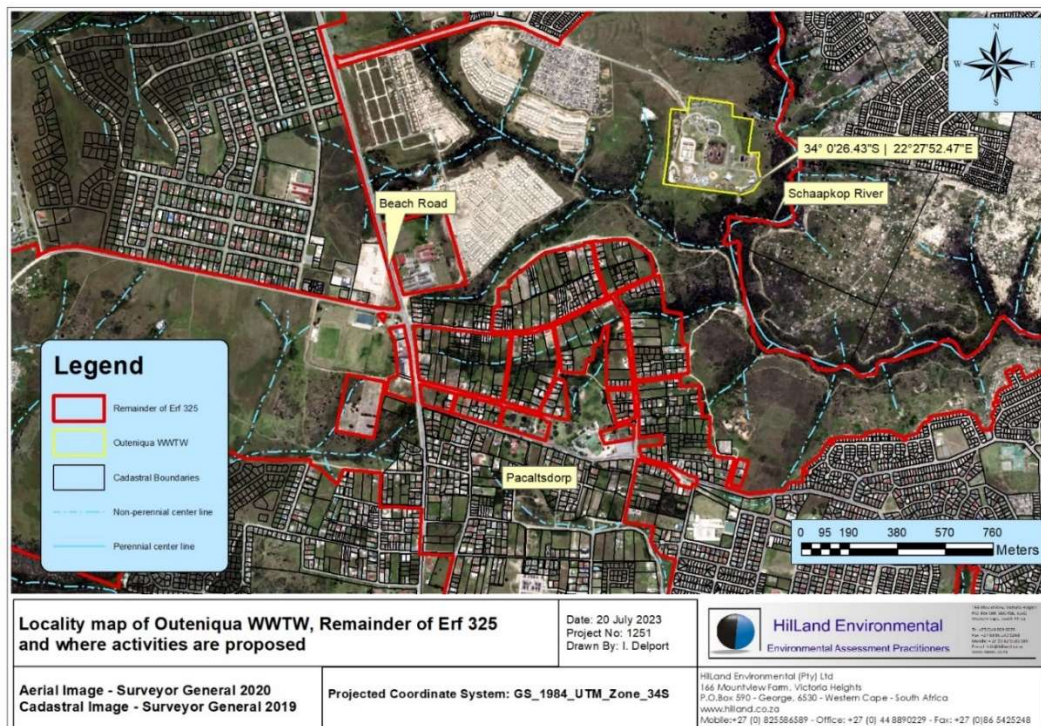
GN	Government Notice
IB	Irrigation Board
MEC	Member of Executive Council
MMP	Maintenance Management Plan
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
NEMBA	National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)
NFEPA	National Freshwater Ecosystem Priority Areas
NWA	National Water Act, 1998 (Act No. 36 of 1998)
PES	Present Ecological State
SANParks	South African National Parks Authority
SWSAs	Strategic Water Source Area
WUA	Water Users Association
WULA	Water Use Licence Application

INTRODUCTION

HillLand Environmental have been appointed as the Environmental Assessment Practitioners (EAPs) by the applicant, **George Municipality** represented by the Engineers, **Zutari**, to ensure compliance with the regulations contained in the National Environmental management Act (NEMA Act No. 107 of 1998, as amended) and the Environmental Impact Assessment Regulations (2014, as amended) for the works undertaken and proposed works at the stormwater infrastructure at the Outeniqua Waste Water Treatment Works (WWTW), Municipal erf, Remainder of Erf 325, George.

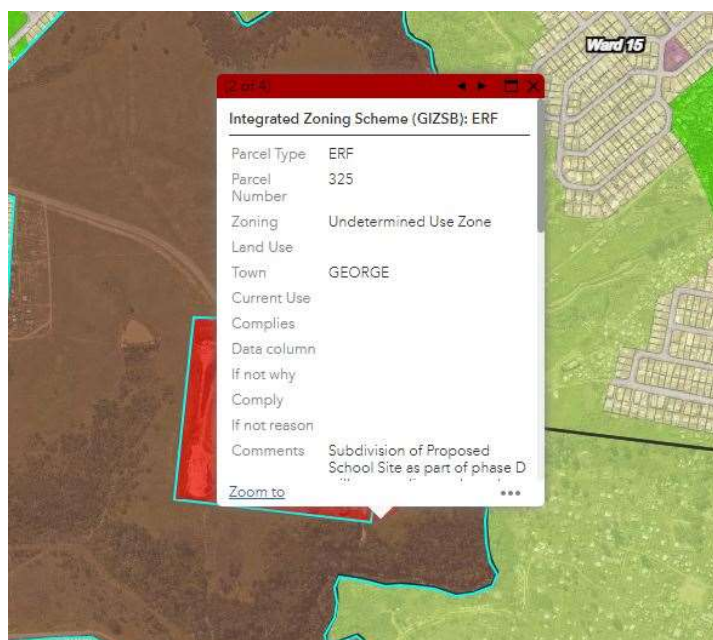
STUDY AREA AND BACKGROUND

The Remainder of Erf 325 (here after referred to as 'the property') is a Municipal erf that includes the Outeniqua Waste Water Treatment Works (WWTW) on a utility zone portion. The remainder of the erf has undetermined zoning.





Municipal zoning map showing the zoning of the WWTW – utility zone (George GIS, 2023)



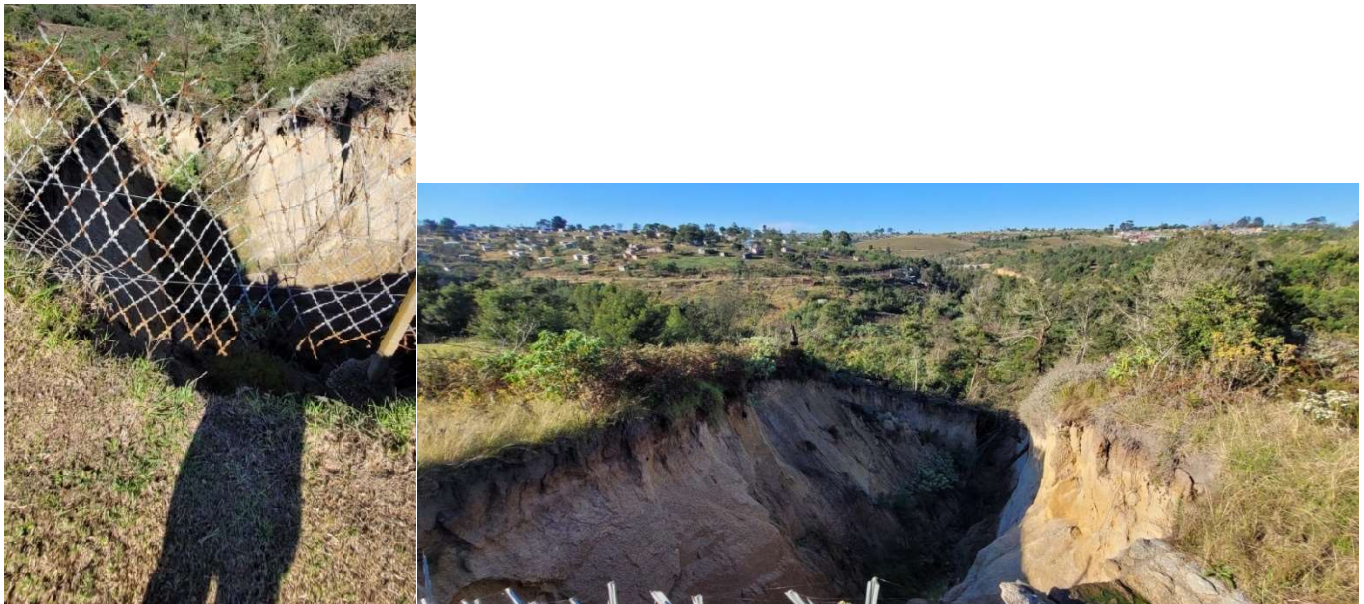
Municipal zoning map showing the zoning of the surrounding area where the stormwater outlet is located – zoning undetermined (George GIS, 2023)

- **Activities commenced with:**

The Municipal stormwater from the OWWTW was released towards the south of the facility through a storm water headwall structure.



Stormwater outlet that started eroding (photograph taken April 2020)



Donga that formed through headward erosion below the stormwater outlet (photographs taken April 2020)

The released stormwater from the structure then ran in a southerly direction towards the Schaapkop River (overland). The stormwater discharge resulted in the formation of a large erosion gully over the course of 6 or more years (signs of erosion are evident on the 2017 aerial imagery).

As with typical headward erosion, the erosion donga has migrated upslope to the point where it crossed the boundary fence of the WWTW facility and posed an immediate threat to the WWTW infrastructure. The excessively large erosion gully/donga beyond the fence lead all the way into the Schaapkop River – an elevation difference of 28m (approximately 182m to 154m at the river). The gully was 15-20m wide and extended 80m down slope towards the river.

The erosion led to the deposition of noticeable quantities of sediment into the river and as such the erosion has negatively impacted the river and it also posed a risk to the infrastructure within the WWTW.



2022 Google Earth image showing the erosion gully/donga from the WWTW

The proposal was to rehabilitate the erosion gully and construct a formal stormwater structure for the controlled release of stormwater from the facility.

The proposal was communicated with DEADP on the NEMA applicability of the scope of works. The scope of works indicated at that time included the clearance of approximately 80m² of vegetation and construction of infrastructure only above the 32m buffer area from the watercourse as works within 32m from the river and clearance of more than 300m² of indigenous vegetation would require NEMA authorisation.

Construction commenced 19th April 2023 and included an engineered gabion retaining wall (8m high) installed at contour level 160m (outside of the 32m from the watercourse, Schaapkop River). Backfilling was done behind the wall as it progressed, and the area was sloped to natural ground level (300mm thick layers with the stockpiled material and suitable imported material (minimum G9 quality)).

Basal drainage was constructed in the existing donga, consisting of slotted drainage pipes, wrapped in separation geotextile (e.g. bidim). Lined drains (from the existing lined channel inside the boundaries of the WWTW to the position of the retaining wall) were constructed at the final level of the backfilled donga. The backfilled donga area was planned to be rehabilitated.

The stormwater outlet at the top of the slope was decommissioned and the stormwater from Outeniqua WWTW (four outlets) was diverted into a new storm water pipe and discharged east of the gully. This discharge point was temporary as the intent was to link it to the new stormwater pipeline that would take the water in a controlled manner down to the new intended structure closer to the river and the river level.

The work on portion of the pipeline and the final energy dissipator and discharge structure will fall within 32m of the watercourse and will require NEMA environmental authorisation should it exceed 100m². As the separate BAR process which commenced was suspended due to the

NEMA contravention in relation to the temporary access road and clearance of more than 300m² of indigenous vegetation for the main donga rehabilitation works, the final works at the storm water outlet is included in the rehabilitation and maintenance management of this report and environmental authorisation, if required, will be issued as part of the NEMA S24G rectification process.

The temporary storm water discharge point already shows signs of erosion which poses an environmental risk as it cannot be connected to a formal system until the pipeline and outlet structure have been installed.



Retaining walls being installed to repair the existing donga (photograph taken July 2023)



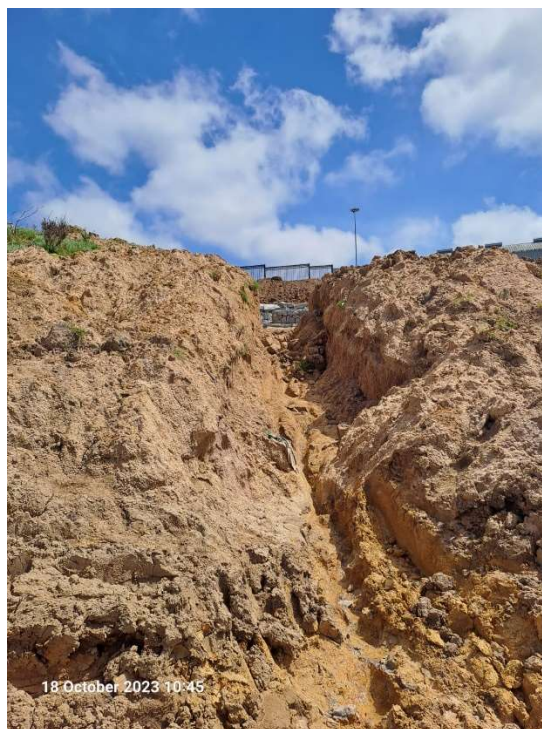
Donga/gully being filled and sloped to natural ground level (photograph taken July 2023)



Gabions installed and donga being backfilled (photograph taken 18 October 2023) - works all beyond the 32m buffer from the edge of the watercourse.



Point at which the diverted stormwater is currently released and that is eroding (photograph taken July 2023)



State of the erosion at the current outlet (photograph taken 18 October 2023)



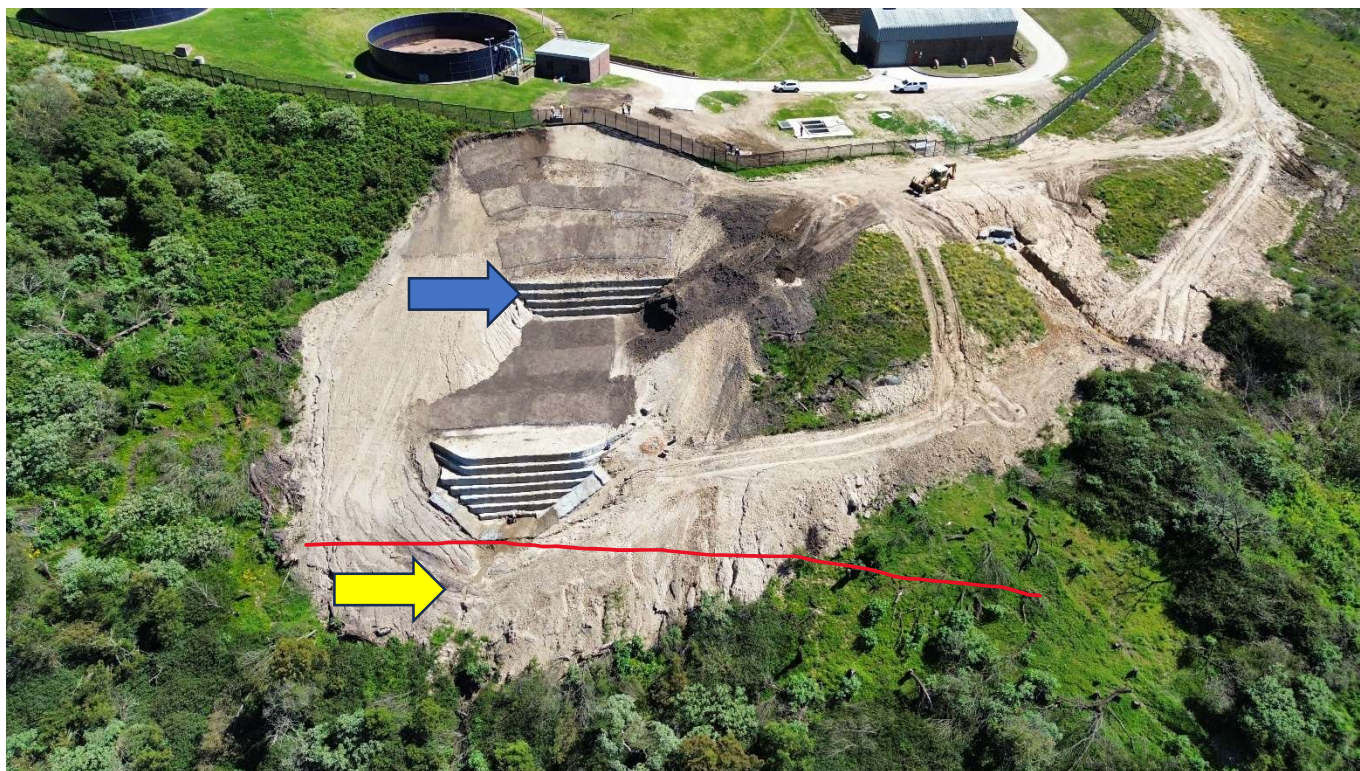
Temporary headwall and dissipator constructed at the stormwater outlet. Note there is still significant erosion below this structure and headward erosion will eventually result in the formation of a similar gully to the one that has just been the target of the rehabilitation effort (photo Zutari, November 2023)

A temporary road (wider than 4m) was created along the future pipeline route to access the site for the installation of the gabions and rehabilitation of the donga. This road will not remain and will be fully rehabilitated. It has no road reserve.



Temporary access road and route for the installation of the new stormwater pipeline

Current status following installation of structures outside the 32m riparian buffer (Photos taken by Zutari, 15 November 2023)

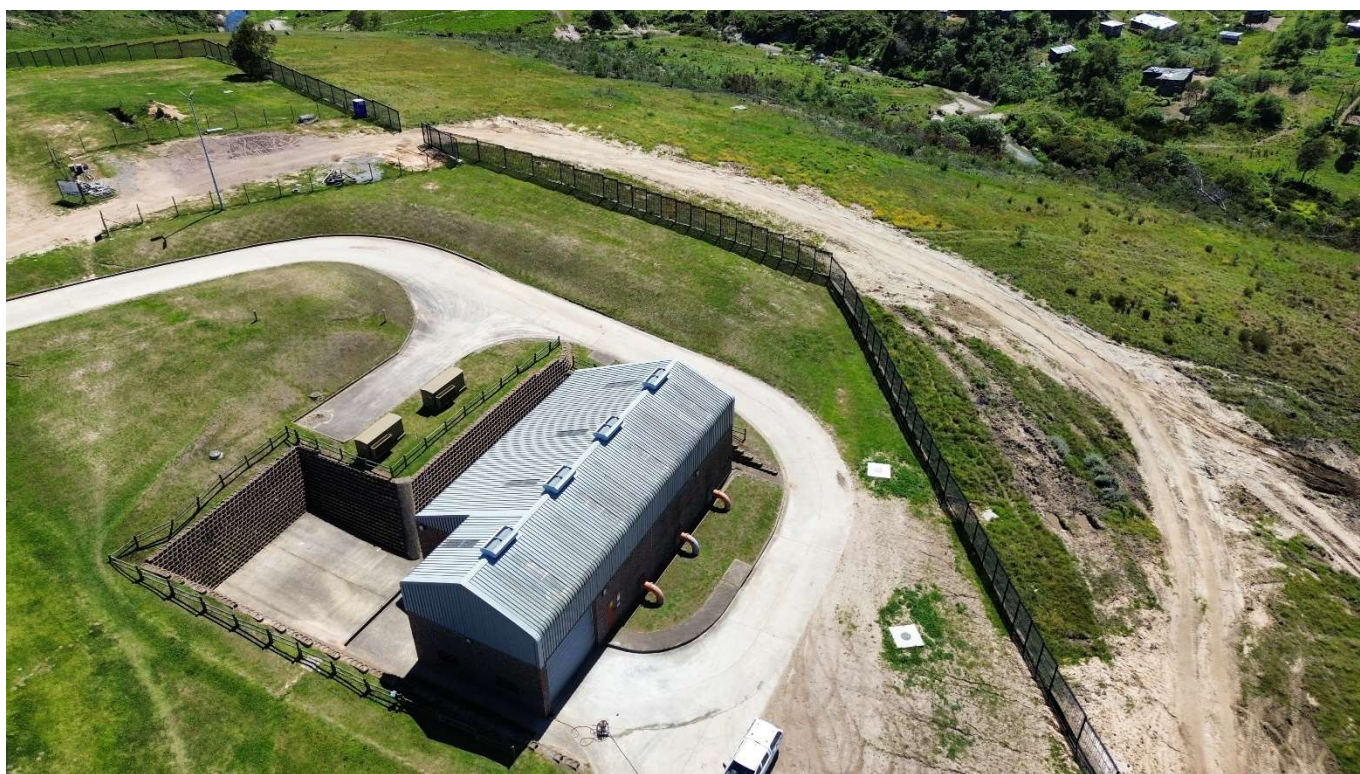


Blue arrow - Secondary 4m gabion section installed within the donga based on on-site engineering design requirements for slope stability

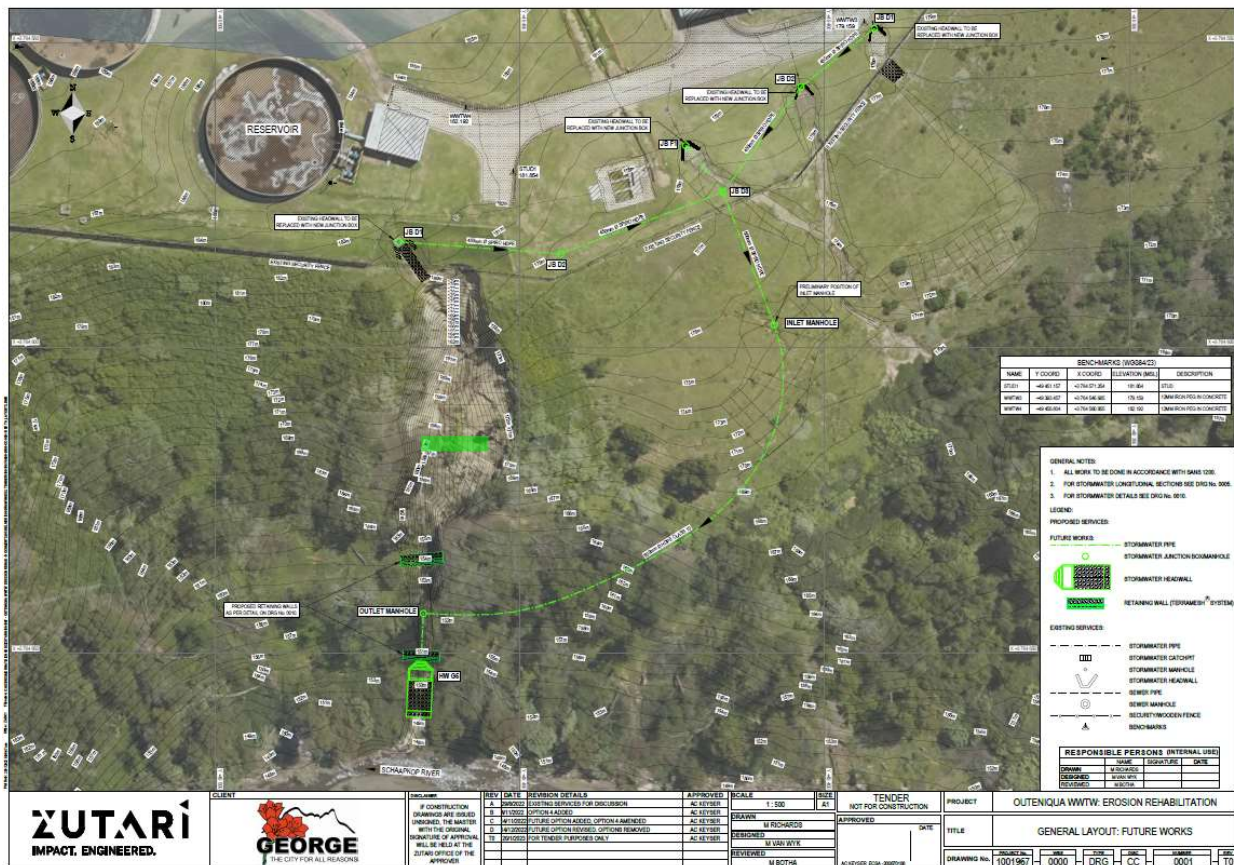
Yellow arrow - over spill of material into the 32m riparian zone which will all need to be removed as part of the rehabilitation plan.

Red line - Approximate position of the 32m riparian buffer line

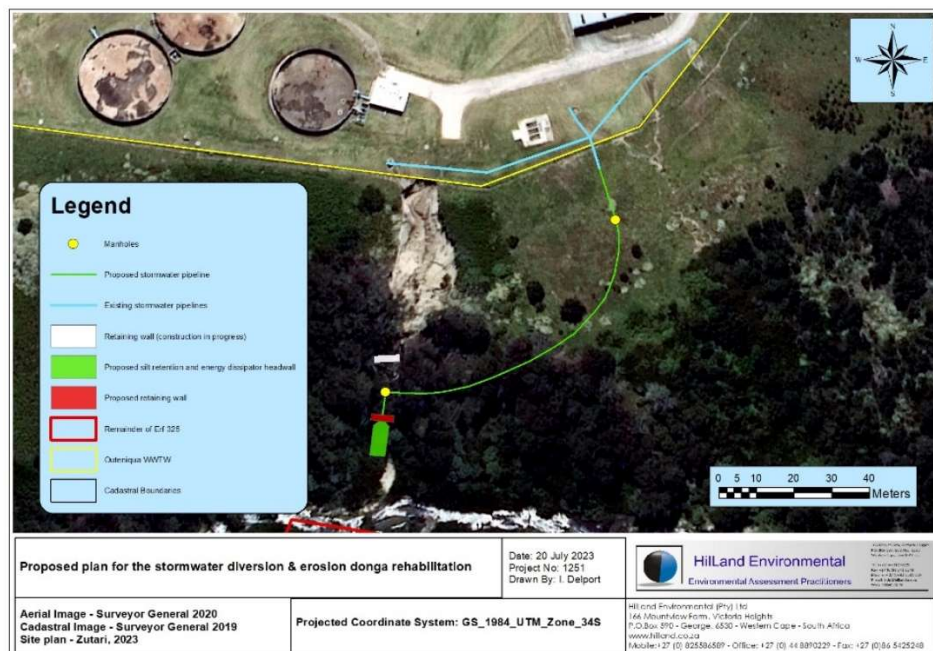




- Proposed additional activities to be undertaken**



Engineering site plan (Zutari, 2023) note the approximate location of the additional gabion steps installed within the donga during construction (green highlight)

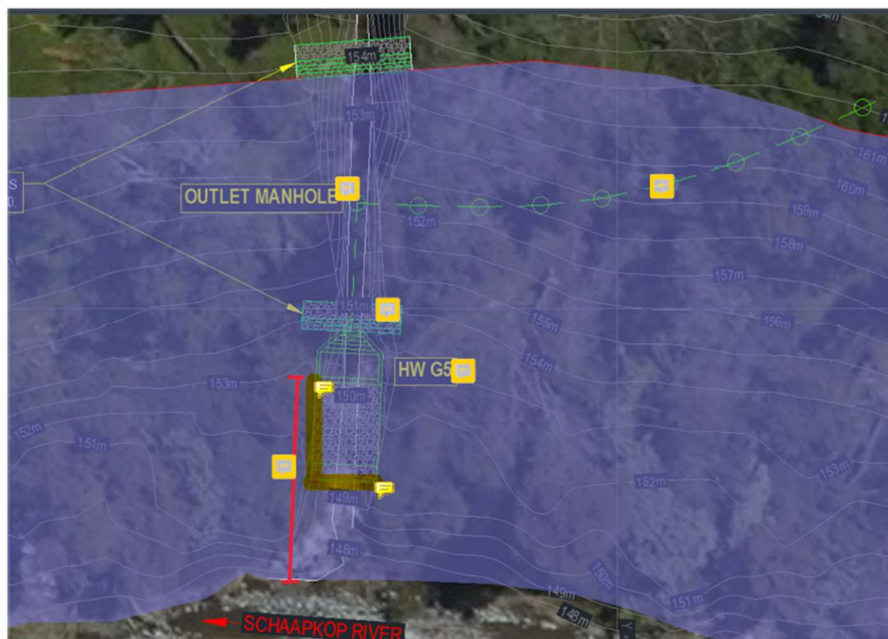


The proposal is to divert the stormwater (currently released at the eastern point) at an angled route, approximately 220m total length, to a point below the erosion donga (600mmØ HDPE pipe). The existing stormwater infrastructure has been replaced by newly constructed catchpits,

manholes, headwalls and inlet/outlet structures, connected with 450mm diameter stormwater pipes.

The pipeline will be installed within the existing temporary access road and new alignment section (within 32m of the watercourse), which is approximately 10m in width. The pipeline that will be installed will be approximately 220m in length, 600mmØ HDPE pipe with construction requiring approximately 2m working space the installation will result in approximately 440m² of disturbance for the installation of the pipeline. This area is currently already disturbed through the temporary works undertaken to date.

The road will be fully rehabilitated following construction and will not remain as a maintenance road.



Plan showing the section of the pipeline route that will be installed within 32m of the watercourse and the gabion structure and outlet that have yet to be constructed – all within 32m of the edge of the watercourse

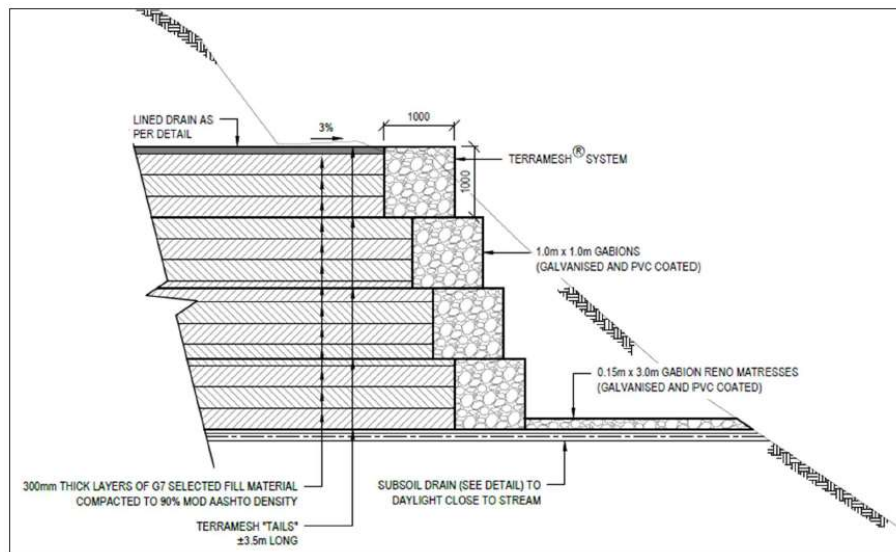


Drone photo showing the existing gabions installed (4m and 7m structures) and the approximate route of the new pipeline and outlet structure. Note that there has been no construction within the 32m buffer zone of the river, but that there has been overspill of material into this zone which needs to be rehabilitated.

The area around the donga has been reshaped as part of the rehabilitation, the material from the temporary access road and work close to the watercourse will be pulled back over the rehabilitated donga-area once construction is completed.

At the 55m contour level (15m from the watercourse) a secondary gabion wall will be constructed. It will be founded on an erosion protected layer (reno-mattress) which extends beyond the footprint of the structure on the down-slope side. Erosion protection will extend at least 3m beyond the toe of the structure.

The retaining wall will consist of approximately 8m and 4m high gabions with a 3.5m long 'tails' to be founded on 0.3m high reno mattress.



Schematic representation of the retaining wall (Zutari, 2023)

The retaining wall will be followed by the main stormwater outlet structure with an energy dissipater headwall, reno mattress and stone pitching. Discharging into the Schaapkop River will be done at river level, but set back at least 6m from the actual river.

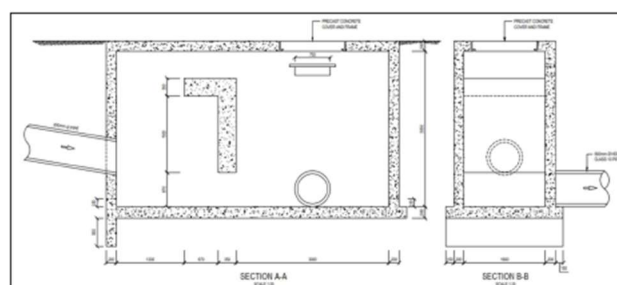


Figure 17: Details of outlet manhole/energy breaker

Details of the outlet manhole / energy breaker still to be constructed (Zutari, December 2023)

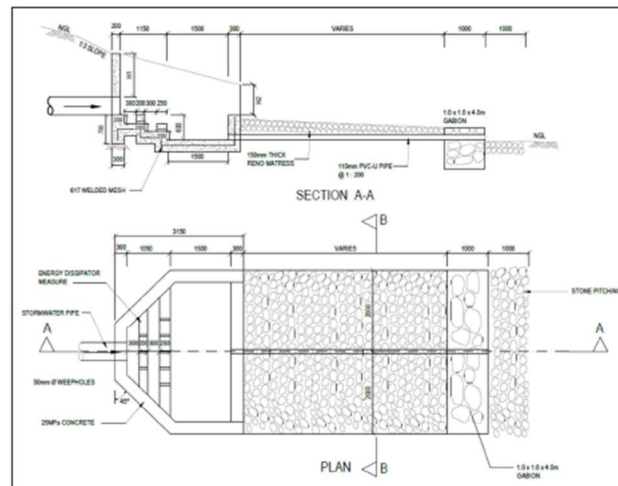


Figure 18: Detail of proposed silt retention and energy dissipator headwall

Detail of the proposed silt retention and energy dissipator headwall still to be constructed (Zutari, December 2023)

Area where the retaining wall and stormwater infrastructure will be installed leading into the river, is currently devoid of any vegetation due to the erosion and the works already undertaken.

The proposal has been assessed by an aquatic specialist. The assessment concluded that the proposal is aligned with the management objectives of urban areas in SWSAs, which aim to maintain and restore ecological landscapes responsible for yielding high volumes of water and to avoid further adverse impacts on sustained production of high-quality water.

The risk assessment confirmed that the risks to the watercourse are considered to be low and a General Authorisation (GA) in terms of the Water Act is required. A GA application was lodged with BOCMA and the GA was issued 23rd October 2023 (see appendix A).

As there are reasonable grounds to believe the cessation of the construction and rehabilitation will result in serious harm to the environment, it is proposed to continue and complete the rehabilitation works including the pipeline and the final outlet structure and then rehabilitate the whole area as per this plan.

The site is currently posing a serious risk of environmental harm and stopping the rehabilitation works (including the completion of the storm water outlet pipeline and outlet structure) is likely to result in ongoing serious environmental harm, as the diverted storm water is already creating a new erosion gully down the slope. Headward erosion is known to increase exponentially over time and the erosion and environmental risk will only increase with each rainfall event.

The NEMA BAR process was suspended and subsequently withdrawn, as it became clear that there had been unlawful commencement of a NEMA listed activity in the form of the clearance of vegetation and construction of a road and disturbance within the 32m from a watercourse zone, linked to the rehabilitation works for the donga.

Pre-compliance Notice –

A pre-compliance notice was issued on the 30th November 2023 requesting the cessation of activities, investigation of the impacts on the environment and the submission of a Method Statement for addressing and mitigating the environmental damage associated with the storm water erosion towards the river.

6. As such, you are hereby given notice of the Department's intention to issue you with a Compliance Notice in terms of section 31L of the NEMA, which will instruct you to:
- 6.1. cease with the continuation of the above listed activities, and confirm such in writing **within 7 (seven) calendar days**;
 - 6.2. investigate, assess and evaluate the impact that the listed activities has / has had on the environment;
 - 6.3. submit a **Method Statement ("MS")** addressing and mitigating the environmental degradation associated with the storm water erosion towards the river, which must be compiled by a suitably qualified and experienced independent environmental assessment practitioner to the Department within **14 (fourteen) calendar days**.

• Applicable listed activities

The following listed activities should have been authorisation prior to commencement of the remedial works:

Listing notice 1, listed activity 12:

12.	The development of— (i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or (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— (aa) the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour; (bb) where such development activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies; (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; (dd) where such development occurs within an urban area;	The required storm water infrastructure within 32m of the watercourse together with the temporary access road, will exceed 100m² within 32m of the watercourse. The permanent final design of the infrastructure within 32m of the river does not exceed 100m² The permanent infrastructure is less than 100m² - rectification will not be required and rehabilitation of any temporary disturbances must be undertaken The current construction and temporary access road has resulted in spillage of material into the 32m zone which will need to be removed and rehabilitated during the rehabilitation phase.
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	(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 the development and where indigenous vegetation will not be cleared.	
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Listing notice 3, listed activities 4 & 12:

4.	The development of a road wider than 4 metres with a reserve less than 13,5 metres.	i. Western Cape i. Areas zoned for use as public open space or equivalent zoning; ii. Areas outside urban areas; (aa) Areas containing indigenous vegetation; (bb) Areas on the estuary side of the development setback line or in an estuarine functional zone where no such setback line has been determined; or iii. Inside urban areas: (aa) Areas zoned for conservation use; or (bb) Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority.	The temporary access road already constructed to access the site for the rehabilitation works that have taken place to date. The temporary road is more than 4m wide and went through an area containing indigenous vegetation. The road however does not have a road reserve of less than 13.5m as it is a temporary road and will be fully rehabilitated on completion of construction of the storm water system. Rectification is not required, rehabilitation is essential, this includes the removal of material that spilled over the slope and into the riparian zone.
12.	The clearance of an area of 300 square metres or more of indigenous vegetation <u>except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan.</u>	i. Western Cape i. Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004; ii. Within critical biodiversity areas identified in bioregional plans; iii. Within the littoral active zone or 100 metres inland from high water mark of the sea or an estuarine functional zone, whichever distance is the greater, excluding where such removal will occur behind the development setback line on erven in urban areas; iv. On land, where, at the time of the coming into effect of this Notice or thereafter such land was zoned open space, conservation or had an equivalent zoning; or	The rehabilitation works should have taken place in accordance with a maintenance management plan – this did not take place and must now be rehabilitated in accordance with a maintenance management plan and method statement as requested by DEADP. This includes the rehabilitation of ALL areas that have been disturbed during the temporary works undertaken to date and during the final completion of the works still to be completed.

		v. On land designated for protection or conservation purposes in an Environmental Management Framework adopted in the prescribed manner, or a Spatial Development Framework adopted by the MEC or Minister.	
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TERMS OF REFERENCE

The Terms of Reference of this rehabilitation plan is to assess the impact of the current activities and risks to the environment and to recommend the rehabilitation measures required to mitigate such impacts and provide a method statement for the rehabilitation measures proposed.

ASSESSMENT OF IMPACTS

The following immediate impacts exist on the site:

- Damage to indigenous vegetation

Indigenous vegetation disturbed / lost as a result of activities undertaken This activity is short term, site specific, fully reversable and could have been avoided through sound environmental management and mitigation. Spillage of material beyond the working area due to the adverse weather conditions resulted in disturbance in excess of what was originally anticipated.	Action required: - complete the remedial works that remove the erosion risk and rehabilitate the entire area disturbed by following the rehabilitation measures proposed. This includes rehabilitation of all areas where material has spilled beyond the required working zone and into the riparian zone, the temporary access areas, the temporary stormwater diversion areas etc. Outcome: area stable (no further risk of erosion) and revegetated with similar or better status indigenous vegetation than the immediately surrounding area.
Critically endangered ecosystem loss The activity has not impacted on the ecosystem status as the area had already been transformed and the ecosystem status altered. Unfortunately this assessment of the current ecosystem status and lack of Garden Route Granite Fynbos was not followed up with confirmation from CapeNature as to the status of the ecosystem. As such all vegetation clearing is assumed to have had an impact on a potential endangered ecosystem. Through sound rehabilitation and management it will be possible to mitigate and reverse this previous loss and attempt to restore the ecosystem that should have been on site.	Action required: the area was assessed for the Garden Route Granite Fynbos prior to commencing and it was determined by Ms P Burgoyne that this ecosystem was no longer intact or represented on site. Outcome: the rehabilitation undertaken will allow for connectivity with the surrounding ecosystem and there is then the potential that a larger restoration project linked to alien management could facilitate rehabilitation of the endangered ecosystem in the long term.
Ongoing loss of indigenous vegetation through the erosion taking place on site and alien vegetation infestation in the area. This impact has been partially caused through the actions undertaken on site. Erosion currently as a result of the incomplete storm water management system and erosion through the rehabilitation not being implemented and no environmental control measures in place on site during the initial construction activities.	Action required: prevent any further erosion by completing the storm water management infrastructure required and ensure the implementation of the rehabilitation proposed and ongoing alien clearing Outcome: area supporting indigenous vegetation, no longer an erosion risk or creeping headward erosion risk and removal and control of alien vegetation which threatens the ecosystem.

Failure to implement any environmental management on site while the contractor was busy resulted in impacts which could easily have been avoided (defined work area, defined no-go zones, installation of silt fencing, prevention of movement of silt, prevention of movement outside the working zone etc). This was a general neglect in terms of the NEMA duty of care.

This activity is short term, site specific, fully reversible and could have been avoided through sound environmental management and mitigation

- Erosion risk and sediment movement into the riparian zone

A full aquatic specialist assessment was commissioned and is attached (Appendix B). In summary the following impacts were assessed.

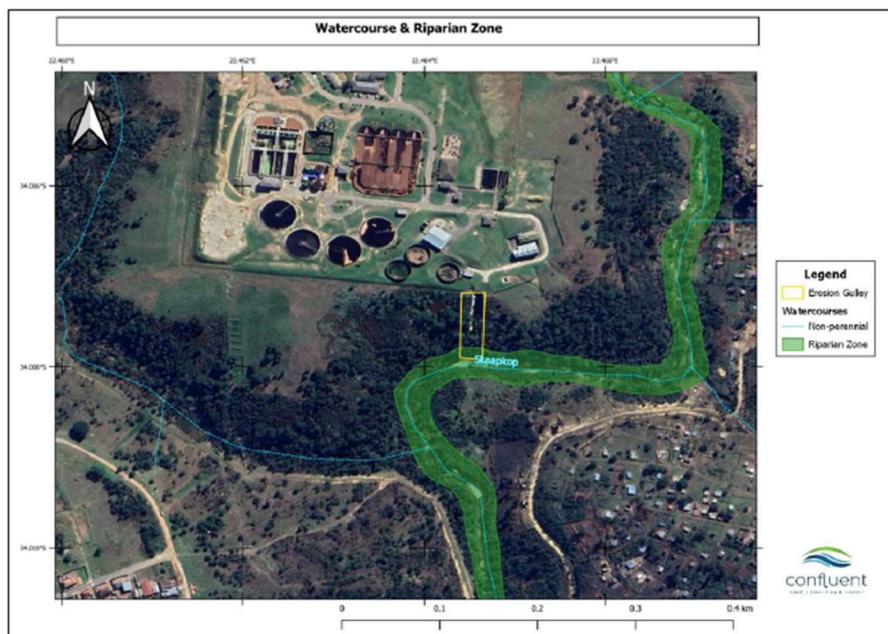


Figure 14: Map indicating the delineated extent of the riparian zone of the Skaapkop River.

[16]



The specialist assessment confirmed that the Skaapkop River is heavily modified from its natural condition and the Present Ecological State (PES) has been determined as D (Largely modified). There is an indication of a high silt load below the erosion gully in the form of noticeable sand banks immediately downstream of the erosion source, sedimentation is however high due to erosion within the entire catchment area. The riparian zone is heavily invaded by alien species.

The Ecological Importance and Sensitivity (EIS) of the river has been determined to be Moderate as it provides an important habitat and diversity of habitat for aquatic biota at a local scale.

Impacts associated with the completion of the construction:

6.1 Construction Phase

Impact 1: Modification of aquatic habitat (riparian zone and banks of watercourse) caused by construction of stormwater outlet.

Some riparian vegetation may need to be cleared to accommodate the stormwater outlet structure. The construction of the outlet headwall structure will result in a permanent loss of a small section of riparian habitat as vegetation will not be able to re-establish within the construction footprint. The intensity of the impact is however not considered to be high given that the vegetation is heavily invaded by alien invasive species.

	Without Mitigation	With Mitigation
Intensity	Very low	Negligible
Duration	Permanent	Permanent
Extent	Very limited	Very limited
Probability	Certain	Certain
Significance	-70: Minor	-63: Minor
Reversibility	High	High
Irreplaceability	Low	Low
Confidence	High	High

Mitigation:

- Areas where instream construction activities will take place must be confined to clearly demarcated areas so as to prevent unnecessary disturbance of instream and riparian habitat outside of these areas;
- Prevent uncontrolled access of vehicles through the river and riparian zone that can cause a significant adverse impact on the hydrology and alluvial soil structure of these areas;
- No equipment or materials to be stored or stockpiled within the delineated area of the river;

- Reshape the banks to ensure even contours and prevent concentrated flow paths that may cause erosion; and
- Following completion of construction, any exposed earth should be promptly rehabilitated by planting suitable vegetation (vigorous indigenous grasses) to protect the exposed soil.

Impact 2: Sedimentation of river habitat caused by excavation of the slope and stockpiling of soil during construction.

Excavation of the slope and banks will expose soil which could wash down the steep slope and into the watercourse.

	Without Mitigation	With Mitigation
Intensity	High	Moderate
Duration	Medium term	Short term
Extent	Limited	Limited
Probability	Certain	Likely
Significance	-77: Moderate	-45: Minor
Reversibility	High	High
Irreplaceability	Low	Low
Confidence	High	High

Mitigation:

- Silt traps and fences must be placed across preferential flow paths to prevent further erosion and sedimentation of the river during construction;
- A construction schedule must be developed and clearly defined so as to avoid multiple sites being exposed and unattended to at any moment in time. The completion date for each phase of development must be indicated and all clearing, excavation, and stabilisation operations must be completed before moving onto the next phase;
- All removed soil and material must not be stockpiled within the delineated riparian zone of the river. All stockpiles must, as far as possible, be protected from erosion, stored on flat areas where run-off will be minimised, and be surrounded by bunds;
- Topsoil must be stockpiled separately from subsoil;
- The area(s) chosen for the stockpiling of imported building materials should be demarcated, and notices put up declaring what must be stockpiled where; and
- Following completion of construction, any exposed earth should be promptly rehabilitated by planting suitable vegetation (vigorous indigenous grasses) to protect the exposed soil.

Impact 3: Pollution of wetland habitat caused by spills and leaks of hydrocarbons (fuel and oil) from construction vehicles and machinery and generation of waste from construction workers.

Construction vehicles and machinery operating in close proximity to the wetlands could potentially cause pollution due to spills and/or leaks of hydrocarbons (fuel and oil).

	Without Mitigation	With Mitigation
Intensity	Moderate	Low
Duration	Short term	Brief
Extent	Limited	Very limited
Probability	Likely	Unlikely
Significance	-45: Minor	-18: Negligible
Reversibility	High	High
Irreplaceability	Low	Low
Confidence	High	High

Mitigation:

- Excavators and all other machinery and vehicles must be checked for oil and fuel leaks daily. No machinery or vehicles with leaks are permitted to work in the watercourse;
- No fuel storage, refuelling, vehicle maintenance or vehicle depots to be allowed within 30 m of the delineated riparian zone of the river;
- Refuelling and fuel storage areas, and areas used for the servicing or parking of vehicles and machinery, must be located on impervious bases and should have bunds around them (sized to contain 110 % of the tank capacity) to contain any possible spills. These areas must not be located within any natural drainage areas or preferential flow paths and must be located on flat terrain (i.e. not on the steep slope);
- Chemical toilets should be provided on-site at 1 toilet per 10 persons;
- Waste from chemical toilets must be disposed of regularly (at least once a week) in a responsible manner by a registered waste contractor;
- Cement/concrete used in the construction must not be mixed on bare ground or within the watercourse. An impermeable/bunded area must be established in such a way that cement slurry, runoff and cement water will be contained and will not flow into the surrounding environment, the stream or riparian zone or contaminate the soil;
- Workers must be properly instructed in the proper care of the environment, especially with respect to poaching, disturbance of nesting and roosting areas, disposal of human waste, garbage etc;
- All waste generated on-site during construction must be adequately managed; and
- Separation and recycling of different waste materials should be supported.

6.2 Operational Phase

Impact 4: Modification to Instream Habitat Caused by Discharge of stormwater runoff into Skaapkop River.

The most serious impacts related to stormwater discharge relate the input of high volumes of water at high velocity, which frequently results in the erosion of the bed and banks of receiving watercourses. In this respect the proposed stormwater outlet includes energy dissipation structures designed to reduce the velocity of the water discharged which will help to prevent erosion problems. For this reason, the proposed design is considered as positive impact relative to the current scenario (i.e. heavily eroded gulley depositing high quantities of sediment into the river). More direct, controlled discharge of stormwater into the river could however lead to unanticipated erosion of the bed and banks due to high volumes of discharge.

	Without Mitigation	With Mitigation
Intensity	Low	Low
Duration	Ongoing	Ongoing
Extent	Limited	Limited
Probability	Probably	Unlikely
Significance	-44: Minor	-33: Minor
Reversibility	High	High
Irreplaceability	Low	Low
Confidence	High	High

Mitigation:

- The stormwater outlet structure must be inspected on a routine basis to ensure that is free of any blockages and debris and is operating according to design specifications;
- The bed and banks of the river must be routinely inspected (especially following heavy rainfall events) to ensure that the outlet structure is not causing unnecessary erosion of the bed and banks of the river. Any erosion observed must immediately be attended to through appointment of a suitably qualified aquatic specialist.

Impact 5: Sedimentation of river caused by inadequate revegetation of the gulley and access road.

The area requiring infilling covers a large area over a steep slope. Failure to revegetate the slope and access road will most likely lead to continued erosion of the slope over time. In addition, the rehabilitated area is likely to become heavily invaded by alien invasive tree species. Dense thickets of alien vegetation tend to result in poor vegetative ground cover, which could also result in erosion of the steep slope over the long-term.

	Without Mitigation	With Mitigation
Intensity	High	Low
Duration	Ongoing	Ongoing
Extent	Limited	Very limited
Probability	Almost certain	Unlikely
Significance	-78: Moderate	-30: Negligible
Reversibility	High	High

Irreplaceability	Low	Low
Confidence	High	High
Mitigation: • Subsoil must be used for infilling and reshaping the slope and access road, and topsoil applied as a final layer for revegetation; • Following the completion of infilling and reshaping, the area must be promptly revegetated by planting suitable vegetation (vigorous indigenous grasses) to protect the exposed soil; • The slope must be seeded with a fast-growing indigenous fynbos reclamation mix. For example, the seed company Sakata produces a mix of perennial grasses consisting of <i>Eragrostis curvula</i>, <i>Digitaria erianthus</i>, <i>Cynodon dactylon</i>, <i>Cenchrus ciliaris</i> and <i>Eragrostis tef</i> and is considered ideal for the purposes of this project; • Seeding of the slope must ensure an even distribution of seed. In this respect hydroseeding is preferable; • The slope must be protected by rolled erosion control mats. Biodegradable rolled erosion control mats must be used. For example, SoilSaver® is made from a biodegradable 100% jute yarn woven to form a 65 % open mesh structure which is ideal for erosion control. These mats conserve moisture and hold seeds and soil firmly in place. The open structure provides space for plant propagation and growth and most importantly biodegrade over time; • Wooden stakes must be used to anchor erosion control mats as there is a high probability that metal stakes will be stolen; • All soil stockpiles must be removed from the slope (or used to fill in the erosion gully); • The revegetated area must be routinely inspected to ensure that revegetation of the slope is successful and to identify (and rehabilitate) any areas that start to erode; and • An alien invasive plant management plan must be implemented to prevent the establishment of alien invasive tree species across the slope.		

8 CONCLUSION

The erosion gully presents a considerable risk to the WWTW infrastructure and to the integrity of the bed and banks of the Skaapkop River. While the proposed rerouting of the stormwater system and associated construction of the headwall outlet structure will result in modifications to the riparian zone and banks of the Skaapkop River, these are considered acceptable for the following reasons:

- Rerouting of stormwater will result in an improvement in the manner in which stormwater from the site is managed;
- Rerouting of stormwater will avoid further erosion of the steep slopes and therefore prevent the continued deposition of high quantities of sediment into the Skaapkop River; and
- The Skaapkop River is already a highly modified system and it is very unlikely that the proposed project will result in any further degradation of the river or cause a decline in its PES or EIS. In contrast, impacts are considered to negligible to minor, and as per point b) above, the project is likely to result in a localized improvement in the condition of the river.

The project is therefore aligned with the management objectives of urban areas in SWSAs, which aim to maintain and restore ecological landscapes responsible for yielding high volumes of water and to avoid further adverse impacts on the sustained production of high-quality water. The output of the DWS Risk Assessment matrix compliments the findings of the impact assessment and risks to the watercourse are considered to be low. The proposed project will therefore require a General Authorisation and not a Water Use License.

GENERAL ENVIRONMENTAL MANAGEMENT AND MITIGATION MEASURES FOR IMPLEMENTATION

CONSTRUCTION PROGRAMME

Programme necessary to ensure that rehabilitation can continue in areas where work is not required in order to reduce the areas of exposed sediments where erosion risk is high while at the same time containing the area where the contractor can work, defining the disturbance zone, limiting activities and impacts to that working zone and programming rehabilitation to follow immediately with the construction works.

ENVIRONMENTAL CONTROL OFFICER (ECO) AND ENVIRONMENTAL INDUCTION (EDUCATION)

An Environmental Control Officer (ECO) **must** be appointed to oversee the completion of the installation of the stormwater infrastructure and rehabilitation of the site.

It will be the ECO's responsibility to ensure that the mitigation and rehabilitation measures referred to in this report are implemented and complied with by the applicant and contractor(s).

The applicant will be responsible for the remuneration of the ECO and any other expenses encountered in the process of environmental monitoring of this project.

As there were no environmental oversight during the current works, environmental induction will be essential before continuation of the project. The contractor and staff must be briefed by the ECO in an environmental education programme regarding the environmental status and requirements of the site. This will include providing general guidelines for minimising environmental damage during the construction, as well as education with regards to basic environmental ethics, such as prevention of littering, lighting fires etc. The ECO need to highlight where silt fencing will be required for the installation process.

Records of environmental training (attendance register and training content) must be kept.

GENERAL ENVIRONMENTAL REQUIREMENTS

ABLUTION FACILITIES

The contractor must provide chemical ablution facilities for all construction personnel working on-site. One (1) facility for every 10 persons on site is required. Toilets must be of a neat construction and must be provided with doors and locks and must be secured to prevent them from blowing over. Sanitation provision and servicing shall be to the satisfaction of the environmental control officer. It is recommended that the ablution facility is located within an approved area within Baydunes Complex.

The contractor must ensure that the toilet(s) are emptied regularly and also before weekends and public holiday periods.

Failure to use the chemical toilet provided and making use of the vegetation either on or off-site will result in maximum penalty fine being awarded in addition to requiring the contractor to clean up.

CONSTRUCTION SITE CAMP, STORAGE OF MATERIALS, ACCESS TO THE SITE AND MANAGEMENT OF MACHINERY/EQUIPMENT

The contractor must continue to use the current site camp for the storage of materials and deliver materials to the site as required. Once the project is complete – the site camp must be rehabilitated or handed over in the state that it was received.

Access to the site must be gained via the existing access road. No new road may be created, and the road will need to be fully rehabilitated as outlined in this report.

No equipment or materials may be stored or stockpiles within the delineated area of the river (30m buffer area).

No fuel storage, refuelling, vehicle maintenance or vehicle depots to be allowed within 30 m of the delineated riparian zone of the river.

Refuelling and fuel storage areas, and areas used for the servicing or parking of vehicles and machinery, must be located on impervious bases and should have bunds around them (sized to contain 110 % of the tank capacity) to contain any possible spills. These areas must not be located within any natural drainage areas or preferential flow paths and must be located on flat terrain (i.e. not on the steep slope).

WASTE MANAGEMENT

The contractor must ensure that the site is maintained in a neat and tidy condition and kept free of litter. Litter bins, containers and refuse collection must be provided and all rubbish must be cleaned / emptied regularly and disposed of at a licenced facility.

No burning, on-site burying or dumping of waste shall occur. It is important to ensure that no waste from the construction site enters the river. **Cigarettes may not be discarded onsite and must be disposed of properly in receptacles for this purpose.**

SITE DEMARCATION

The site must be clearly demarcated to prevent unnecessary disturbance of instream and riparian habitat outside of these areas.

Uncontrolled access of vehicles must be prevented through the river and riparian zone that can cause a significant adverse impact on the hydrology and alluvial soil structure of these areas.

Waste from chemical toilets must be disposed of regularly (at least once a week) in a responsible manner by a registered waste contractor.

Cement/concrete used in the construction must not be mixed on bare ground or within the watercourse. An impermeable/bunded area must be established in such a way that cement

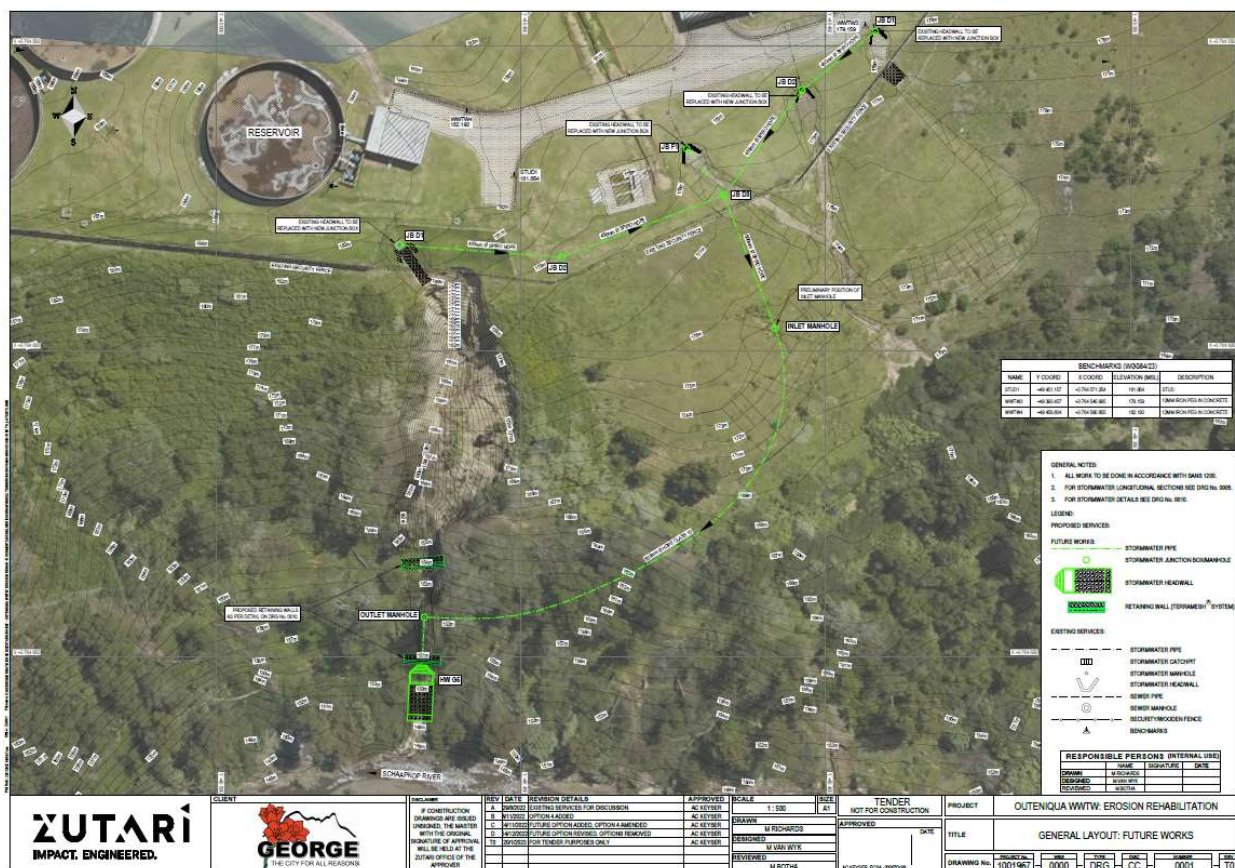
slurry, runoff and cement water will be contained and will not flow into the surrounding environment, the stream or riparian zone or contaminate the soil.

COMPLETION OF THE INSTALLATION OF THE STORMWATER OUTLET STRUCTURE

Complete the construction of the stormwater infrastructure and associated pipeline in accordance with the engineering plan.

The installation of silt fencing south of the working footprint before the river will be required to ensure that no construction silt enters the watercourse.

The silt fencing must be maintained and can only be removed once the installation of the stormwater outlet structure is completed and there is no risk of silt entering the river.



Engineering site plan (Zutari, 2023)

REHABILITATION

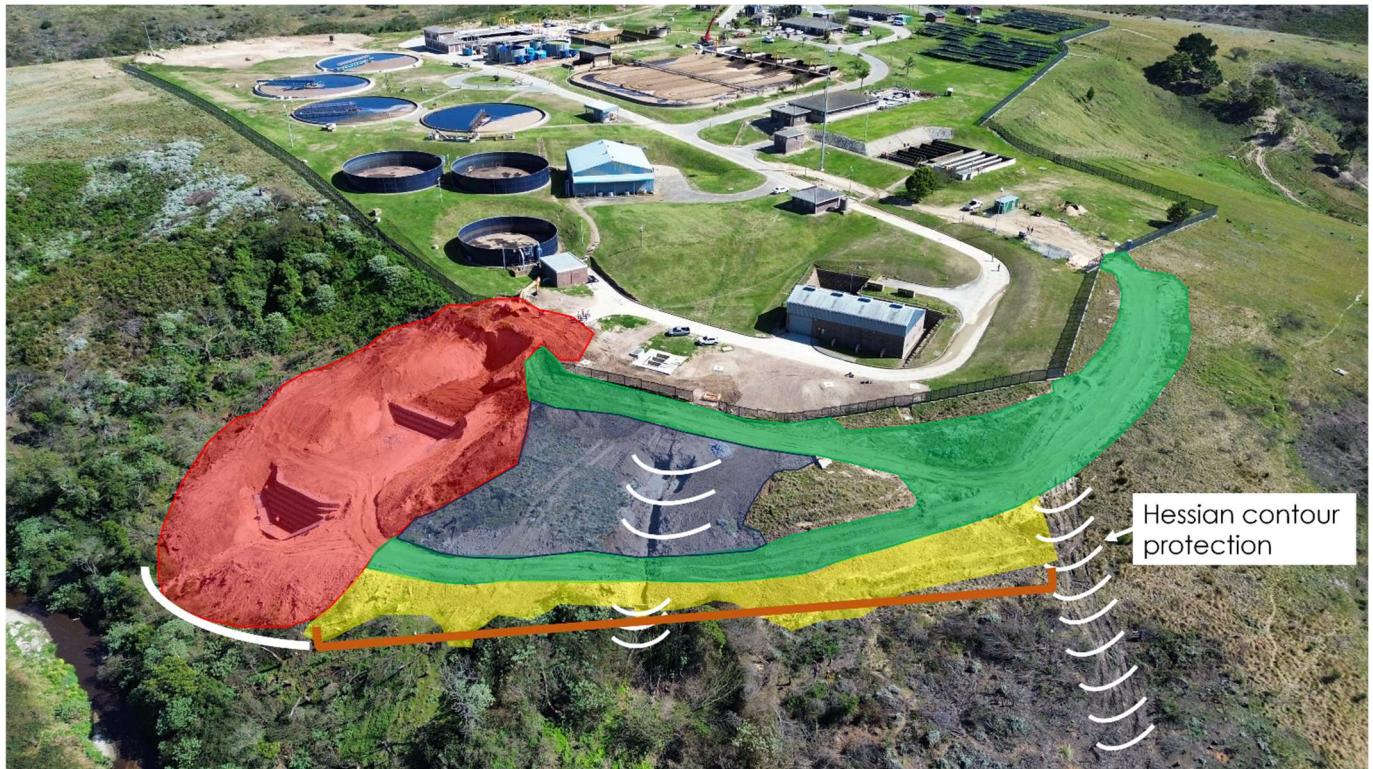


Figure highlighting the rehabilitation to be done at various sections of the site

RED: installation of the final stormwater headwall and dissipator to be completed, area to be backfilled, reshaped, covered with topsoil, seeded and geojute/sausage bags to be installed. Silt fence to be installed between the works and the river before commencement of the construction of stormwater outlet

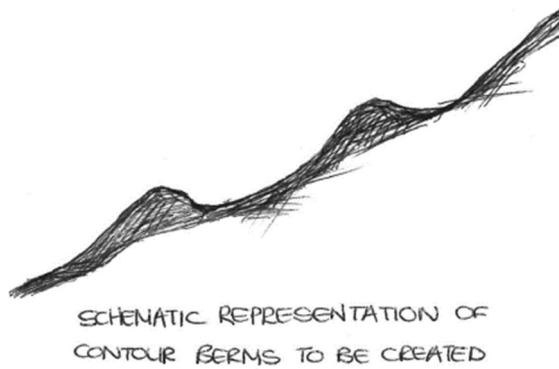
BLUE: area to be backfilled, reshaped, covered with topsoil seeded and silt fences to be installed as indicated by the white

YELLOW: excess material to be pulled back (as part of the rehabilitation of the green zone), removed, area to be reshaped, covered with topsoil and seeded. Silt fencing to be installed as indicated. Hessian sausages to be installed and to remain for the long term – as indicated in brown

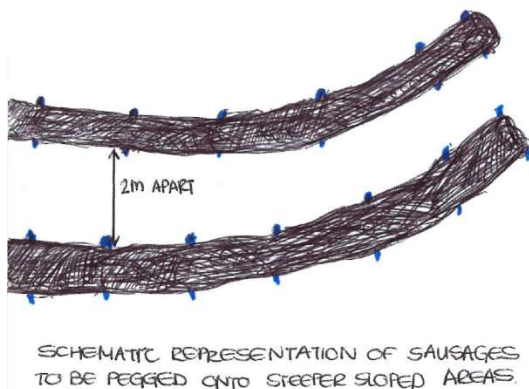
GREEN: access road to be ripped, reshaped, covered with topsoil and seeded

Additional hessian contour protection to be installed at eroded area south of the road. Area first to be reshaped, covered with topsoil, seeded and contour protection to be installed

- The entire affected site must be **reshaped** to form natural slopes. It is important to ensure that the excavator teeth marks do not lead down the slope (as this will result in erosion between the subsoil and the topsoil in future). Preferably have any ridges running in contours across the slope.
- **Topsoil** must be spread over the entire site.
- Include shallow topsoil **contour berms across the whole slope** to slow water down and encourage infiltration and reduce runoff.



- Seed the site with a mix of *Eragrostis tef* (teff grass), *Eragrostis capensis* (cape love grass), *Cynodon dactylon* (scutch grass), *Paspalum* sp. (paspalum grass), and winter rye. Add to the grass mix a clover or lucerne which will ensure added nitrogen for the longer-term growth. Premix and apply at a rate of 0.4g per m².
- Lightly rake the seed into the slopes or hydroseed.
- Cover with a layer of woodchip or mulch to keep the moisture in the soil while the seeds germinate.
- Peg mulch filled bags or sausages onto the steeper sections of the slope (two (2) meters apart) to prevent runoff while waiting for the seeds to germinate and cover the slopes.



- It may be necessary to install a geo-jute fabric over the slope.



Photograph showing sausages with geojute fabric (source: Aussie Environmental 2023)

- Cover the whole area with cut brushwood to reduce the impact of wind and to keep all livestock off the slope while the grass seeds are germinating.
- **Collect seed from surrounding fynbos areas on a monthly basis and spread randomly onto the slope. *Helichrysum* sp, *Euryops*, *Chrysanthemoides moniliferum*, *Felicia* sp – are all seeding now and will assist in bringing back some natural diversity to the slopes. The ECO can guide the seed collection and spreading as this is key to the success of the**

rehabilitation to the same state as the site was prior to any clearing taking place (restore the vegetation to the same state as the surrounding vegetation with the exception of alien species which will need to be continually monitored and removed).

- The rehabilitation will only be signed off when deemed sufficient by the ECO. This will be based on level of ground cover and diversity of cover achieved.
- Ongoing alien seedling removal from the entire rehabilitation area will be necessary.

MONITORING AND REPORTING

- An **induction** meeting with the ECO and the contractor to ensure that they are aware of the requirements of this plan before the commencement of any activities on site. Induction registers to be kept for all contractors on site.
- The ECO is to do a site inspection **once a week** during the construction and rehabilitation phase.
- Upon **completion** of the construction of the stormwater outlet structure and associated rehabilitation of the site, a **final completion monitoring report** must be submitted by the ECO to sign-off compliance with environmental requirements. The report must be submitted to DEADP, client and the contractor within 1 month of the completion of all construction activities (irrespective of the status of the rehabilitation).

OPERATIONAL/MAINTENANCE PHASE

Mitigation measures recommended by the aquatic specialist (as extracted from aquatic specialist assessment, Confluent Environmental, 2023):

- The stormwater outlet structure must be inspected on a routine basis to ensure that is free of any blockages and debris and is operating according to design specifications;
- The bed and banks of the river must be routinely inspected (especially following heavy rainfall events) to ensure that the outlet structure is not causing unnecessary erosion of the bed and banks of the river. Any erosion observed must immediately be attended to through appointment of a suitably qualified aquatic specialist.
- Subsoil must be used for infilling and reshaping the slope and access road, and topsoil applied as a final layer for revegetation;
- Following the completion of infilling and reshaping, the area must be promptly revegetated by planting suitable vegetation (vigorous indigenous grasses) to protect the exposed soil;
- The slope must be seeded with a fast-growing indigenous fynbos reclamation mix. For example, the seed company Sakata produces a mix of perennial grasses consisting of *Eragrostis curvula*, *Digitaria erianthus*, *Cynodon dactylon*, *Cenchrus ciliaris* and *Eragrostis tef* and is considered ideal for the purposes of this project;
- Seeding of the slope must ensure an even distribution of seed. In this respect hydroseeding is preferable;

- The slope must be protected by rolled erosion control mats. Biodegradable rolled erosion control mats must be used. For example, SoilSaver® is made from a biodegradable 100% jute yarn woven to form a 65 % open mesh structure which is ideal for erosion control. These mats conserve moisture and hold seeds and soil firmly in place. The open structure provides space for plant propagation and growth and most importantly biodegrade over time;
- Wooden stakes must be used to anchor erosion control mats as there is a high probability that metal stakes will be stolen;
- All soil stockpiles must be removed from the slope (or used to fill in the erosion gully);
- The revegetated area must be routinely inspected to ensure that revegetation of the slope is successful and to identify (and rehabilitate) any areas that start to erode; and
- An alien invasive plant management plan must be implemented to prevent the establishment of alien invasive tree species across the slope.

CONCLUSION

This rehabilitation plan is for the remedial works and ongoing construction phase of the stormwater infrastructure at the WWTW.

The current works within the erosion gully and associated access road have resulted in listed activities in terms of NEMA being triggered. The proposal is to continue with the installation of the proposed stormwater outlet structure and full rehabilitation as per the recommendations provided in this report.

It is anticipated that the contractor will return to site in early January 2024 and that the works will be completed within the allocated timeframes as set by the consulting engineers. The rehabilitation works in all area where construction is complete must commence immediately and the rehabilitation works at the final outlet structure, pipeline route and temporary access road must be systematically rehabilitated as the works are completed so that it is not necessary for machinery to re-enter an area once the works and rehabilitation is completed.

REFERENCES

Rehabilitation of an Erosion Gully Below the Outeniqua Wastewater Treatment Works (WWTW), George, Western Cape. Specialist Freshwater Impact Assessment, Confluent Environmental, August 2023