FINAL ENVIRONMENTAL MANAGEMENT & MAINTENANCE PROGRAMME

for

PLETT LAGOON ESTATE

on

Remainder of Erf 6503, Plettenberg Bay

In terms of the

National Environmental Management Act (Act No. 107 of 1998, as amended) & 2014 Environmental Impact Regulations (as amended)

Prepared for Applicant: **Plett Lagoon Estate (Pty) Ltd**

Date: **31 October 2024**

Appointed EAP: Ms Louise-Mari van Zyl (2019/1444)
Assisting Candidate EAP: Mr Francois Byleveld (2023/6770)
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Report Reference: BIT794/13
Department Reference: **16/3/3/1/D1/13/0024/24**
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Appointed EAP: Ms **Louise-Mari van Zyl** (MA Geography & Environmental Science [US]; EAPSA, Registration Number **2019/1444**. Ms van Zyl has over twenty years' experience as an environmental practitioner.

Assisting Candidate EAP: Mr **Francois Byleveld** (MSc Geology [University of the Free State]) (Candidate EAPASA Registration Number: **2023/6770**) under supervision of the Appointed EAP.

PURPOSE OF THIS REPORT:

Final Environmental Management & Maintenance Programme

APPLICANT:

Plett Lagoon Estate (Pty) Ltd

CAPE EAPRAC REFERENCE NO:

BIT794/13

SUBMISSION DATE

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Submitted for:

Stakeholder Review & Comment

Report Issued by:

Cape Environmental Assessment Practitioners

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ORDER OF REPORT

Environmental Management & Maintenance Programme

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ENVIRONMENTAL MANAGEMENT & MAINTENANCE PROGRAMME REQUIREMENTS

Appendix 4 of Regulation 982 of the 2014 EIA Regulations contains the required contents of an Environmental Management & Maintenance Programme (EMMPr). The checklist below serves as a summary of how these requirements were incorporated into this EMMPr.

Table 1: Checklist in terms of Appendix 4 of Regulation 982 of 2014 EIA Regulations

Requirement	Description
Details and expertise of the EAP who prepared the EMMPr; including curriculum vitae.	Appointed EAP: Ms Louise-Mari van Zyl (Primary EAP 2019/1444) Assisting Candidate EAP: Mr Francois Byleveld (Candidate EAP 2023/6770) See Appendix 10.
A detailed description of the aspects of the activity that are covered by the EMMPr as identified by the project description.	Section 1
A map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that must be avoided, including buffers	Appendix 1
A description of the impact management objectives, including Management Outcomes, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all the phases of the development including – (i) Planning and design; (ii) Pre-construction activities; (iii) Construction activities; (iv) Rehabilitation of the environment after construction and where applicable post closure; and (v) Where relevant, operation activities.	Section 4 – Environmental Impacts & Mitigations Section 5 - Responsibilities Section 6 – Pre-Construction Design Section 7 – Construction Phase Section 8 – Operation Phase
A description and identification of impact management outcomes required for the aspects contemplated above.	Section 4
A description of the proposed impact management actions, identifying the manner in which the impact management objectives and outcomes contemplated above will be achieved and must, where applicable include actions to – (i) Avoid, modify, remedy control or stop any action, activity or process which causes pollution or environmental degradation; (ii) Comply with any prescribed environmental management standards or practises; (iii) Comply with any applicable provisions of the Act regarding closure, where applicable; and	Section 4 Section 6 Section 7 Section 8

Requirement	Description
(iv) Comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable.	
The method of monitoring the implementation of the impact management actions contemplated above.	Section 9 Section 11
The frequency of monitoring the implementation of the impact management actions contemplated above.	Section 9
An indication of the persons who will be responsible for the implementation of the impact management actions.	Section 5
The time periods within which the impact management actions must be implemented.	Not Applicable
The mechanism for monitoring compliance with the impact management actions.	Section 9
A program for reporting on compliance, taking into account the requirements as prescribed in the Regulations.	Section 9
An environmental awareness plan describing the manner in which – (i) The applicant intends to inform his or her employees of any environmental risk which may result from their work; and (ii) Risks must be dealt with in order to avoid pollution or the degradation of the environment.	Section 5 Section 6 Section 7 Section 8 Section 9
Any specific information that may be required by the competent authority.	Not Applicable.

ABBREVIATIONS AND ACRONYMS

BSP Biodiversity Sector Plan - to inform land use planning, environmental assessments, land and water use authorisations, as well as natural resource management, undertaken by a range of sectors whose policies and decisions impact on biodiversity.

CARA Conservation of Agricultural Resources Act (Act 43 of 1983) - provides for control over the utilization of the natural agricultural resources of the Republic in order to promote the conservation of the soil, the water sources and the vegetation and the combating of weeds and invader plants; and for matters connected therewith.

CBA Critical Biodiversity Area - areas required to meet biodiversity targets for ecosystems, species and ecological processes, as identified in a systematic biodiversity plan.

DFFE National Department of Forestry, Fisheries & the Environment – the national authority responsible for the sustainable environmental management and integrated planning.

DEA&DP Department of Environmental Affairs and Development Planning – the provincial authority for sustainable environmental management and integrated development planning. The competent authority is this case.

DWS Department of Water & Sanitation Affairs – National authority mandated to enforce the National Water Act (NWA).

EA Environmental Authorisation – Authorisation obtained on completion of an Environmental Impact Assessment in terms of the National Environmental Management Act (NEMA).

ECA Environment Conservation Act, 1989 - To provide for the effective protection and controlled utilization of the environment and for matters incidental thereto.

ECO Ecological Control Officer – independent site agent appointed to observe and enforce the implementation of environmental policies and principles on a development site.

EIA Environmental Impact Assessment - a process of evaluating the likely environmental impacts of a proposed project or development, taking into account inter-related socio-economic, cultural and human-health impacts, both beneficial and adverse.

EMMPr Environmental Management & Maintenance Programme – an environmental management tool used to ensure that undue or reasonably avoidable adverse impacts of the construction, operation and decommissioning of a project are prevented and that positive benefits of the projects are enhanced.

GIS Geographic Information System - system designed to capture, store, manipulate, analyse, manage, and present all types of geographical data.

GPS Global Positioning System - a radio navigation system that allows land, sea, and airborne users to determine their exact location, velocity, and time 24 hours a day, in all weather conditions, anywhere in the world.

NEMA National Environmental Management Act (Act 107 of 1998, as amended) – national legislation that provides principles for decision-making on matters that affect the environment.

NEM:BA National Environmental Management: Biodiversity Act (Act No.10 of 2004) – provides for the management and conservation of South African biodiversity within the framework of NEMA.

NFA National Forestry Act (Act No.84 of 1998) - provides for the protection of forests, as well as specific tree species within South Africa.

NSBA National Spatial Biodiversity Assessment – aims to assess the state of South Africa's biodiversity based on best available science, with a view to understanding trends over time and informing policy and decision-making across a range of sectors.

NWA National Water Act (Act No.36 of 1998) - ensures that South Africa's water resources are protected, used and managed.

1. INTRODUCTION

Cape Environmental Assessment Practitioners (Cape EAPrac) was appointed by the Applicant, Plett Lagoon Estate (Pty) Ltd, to develop an Environmental Management & Maintenance Programme (EMMPr) which will be used to promote and ensure environmental monitoring and control during all relevant phases (pre-construction, construction, operational as well as maintenance) associated with the proposed activity.

The Applicant proposes to develop a residential estate, on the transformed areas of Remainder of Erf 6503, Plettenberg Bay.

This property is approximately 19.1221ha in size and is located in Plettenberg Bay (north), east of the N2 and Plett Primary School, closely bordering the Keurbooms Estuary (Figure 1).

Access to the site is gained from an existing Municipal road (Beacon Way) in the south-west corner of the site, between the Checkers Centrum and Plettenberg Bay Primary School.

The property is bordered by Keurbooms Lagoon Caravan Park (North), Plettenberg Bay Primary School (West), Checkers Centrum (South-West corner), Poortjies residential area (partial Southern boundary) separated by Erf 6504, and Erf 449 (East) that separates the property from the Keurbooms Estuary.

Figure 1: Locality map of Remainder of Erf 6503 (red outlined area) (CapeFarmMapper, 2023).

DEVELOPMENT PROPOSAL:

The development is proposed as a gated, security village. It is proposed to upgrade and maintain the current access as the primary access for the development (refer to Figures 1 & 2).

The preferred development proposal entails the following:

- Forty-one (41) x **Group housing erven** (Residential Zone II) (~4.07ha)
- Nine (9) x **Single residential erven** (Residential Zone I) (~2.27ha).
- Sixteen (16) x **Garage units** in the north-western corner of the single residential portion.
- **Entrance gate/road access** with security and fencing.
- **Internal access roads** between erven (Transport Zone III; up to 5.5m wide brick paved roads).
- Nine (9) internal x **Open Space Zone II** erven (~0.37ha).
- One (1) x **Open Space Zone IV** erf (~10.58ha) making up the bulk of the untransformed, remnant natural coastal buffer. This area will be managed as a private nature reserve.
- **Temporary** on-site **Wastewater Treatment Plant** (to be decommissioned once capacity at the Municipal Ganse Vallei WWTW is made available).

In total, the preferred proposal is for **50 residential opportunities** on 8.54ha (~6 units per hectare, amounting to approximately 45% development of the site). The private conservation area takes up approximately 55% of the total site area and acts as a buffer between the development and the Keurbooms Estuary.

- The existing primary dwelling and outbuildings on the property (occupied by the current owner of the property), will ultimately also occupy the centre plot in the layout proposal (Figure 1 and Figure 2).
- The proposed additional single residential erven, surrounding the primary dwelling erf, will form a separate gated area from the remaining General Residential Zone II erven, within the greater development.
    - A right of way servitude will be registered along the internal western access road, in favour of the single residential component of the proposed development in the Northern portion of the development.

The current zoning of the property **Agricultural Zone I** and in the event the development application is approved by the Competent Authority, it is proposed to rezone the development site into:

- **Residential Zone I and II;**
- **Open Space Zone II and IV;**
- with the internal access roads being rezoned to **Transport Zone III**.

The internal Open Space Zone II erven (approximately 0.3717ha) are functional open spaces and will consist of:

- a communal parking area at the entrance;
- maintenance and admin buildings; and
- communal pedestrian walkways that connect the development area with the private nature reserve/conservation area.

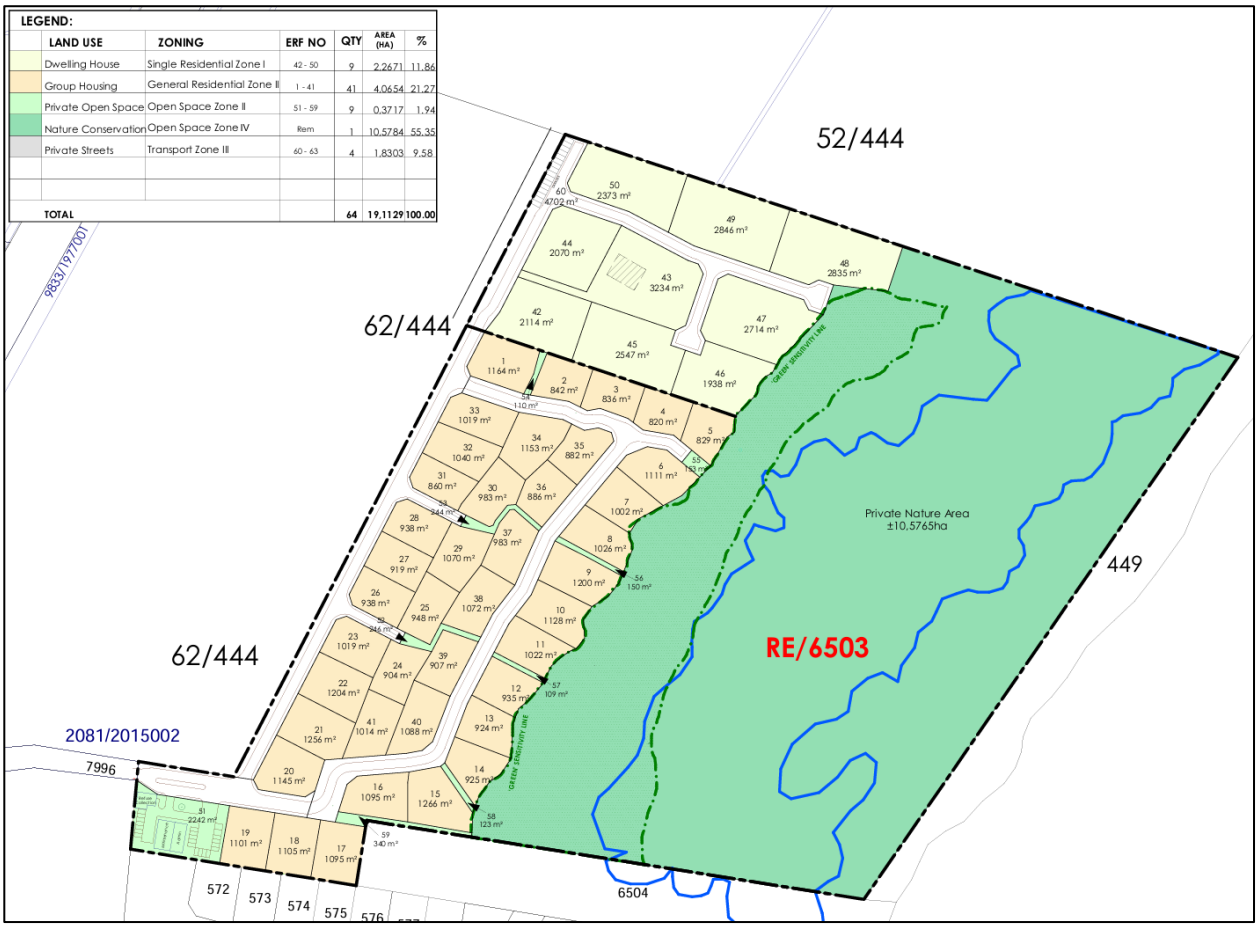


Figure 2: Site development plan indicating medium density residential dwellings (orange shade), low density residential dwellings (yellow shade) as well as proposed open space areas (green shade) (Marike Vreken Town and Regional Planners, 2024).

As a security development, fencing is proposed to be installed on the eastern side of the conservation area to ensure safe access to residents to this area. By securing this area, future residents are more likely to take 'ownership' and 'responsibility' for this area (compared to excluding the conservation area from fencing).

Strict conditions-of-use must be enforced in this area considering its conservation outcome being a priority. This area may be accessed through existing access routes and walkways only. Fencing must be in line with the CapeNature policy document on *Fencing & Enclosures of Game, Predators & Dangerous Animals in the Western Cape* (installation methods, maintenance methods etc). Fire breaks must be maintained, but clearing methods of fire breaks, must be adhered to, to ensure minimal disturbance of the on-site wetland habitat and thicket vegetation containing protected tree species.

The development of all the proposed dwellings, maintenance building, admin building and parking garages are purposefully limited to the existing, **disturbed secondary grassland area.** By clearly following the impact hierarchy approach in this design, this layout **avoids the sensitive estuarine area** containing **wetland and natural, intact thicket vegetation**, thus creating a sizeable coastal buffer along the Keurbooms Estuary that will act to conserve a large habitat intact (Figure 2).

Services:

Stormwater:

Stormwater infrastructure will be managed on site. The design has been informed by input from the aquatic specialist considering the presence of a large on-site wetland in the sensitive natural eastern portion of the site.

Internal roads will be designed with formal kerbs/edgings and roadside channels to enable a formal stormwater drainage network that will discharge into 1.5m wide swales.

The open swale stormwater network has been designed with sufficient capacity to manage and convey up to a 1:5 year rainfall event. The open swales stormwater network will follow the internal road network and will have inlet structures and pipe culverts at road crossings.

Energy dissipation structures (headwalls and reno mattresses) will be installed at high energy discharge points to prevent unwanted erosion, especially into the lower lying on-site wetland in the conservation area.

Due to the likely occurrence of a seasonal perched ground water table in the lower lying conservation area where the wetland is, provision has been made for a subsoil drainage network beneath the internal roads. The subsoil drainage network will consist of a 110mm diameter perforated pipe network installed 800mm below final road level.

Water:

Extract from Civil Engineering Report compiled by Vita Consulting Engineers regarding water supply to the proposed development: "*The bulk water system to the Goose Valley, Wittedrift and Matjiesfontein reservoirs is at capacity and must be upgraded according to the Bitou master plan before additional developments within the reservoir supply areas can be accommodated".*

GLS Consulting Engineers (on behalf of the Bitou Municipality), provided the following temporary solution as part of their master planning:

- Installation of a temporary 160Ømm bulk main off the existing 160Ømm distribution main in the N2 road reserve, will free up 860kl/day[1] water supply.
- This capacity rectification will accommodate the development demand for Farm 444/38, Farm 304/32 and RE/6503 (this application).

According to Vita Consulting Engineers, implementation of this temporary solution is to be undertaken by the developer of Erf Portion 19 and 27 of Farm 444 (construction on this development commenced June 2024).

The 160mm diameter pipeline of approximately 460m in length, is to be installed as a temporary measure till the Municipality has its bulk water supply network capacity funding for further upgrades. It will be installed above ground, following the existing water servitude that runs from the Goose Valley Reservoir to the existing distribution main in the N2 road reserve (Figure 3).

The existing servitude already contains a 200mm and 250mm diameter underground pipelines (of which one is defunct).

The temporary pipeline is to be installed in short 2.4m sections that will be welded together on site. The implementation of the temporary solutions does not entail earthworks, or the removal of vegetation, although trimming of vegetation to clear the route is anticipated.

[1] There are two existing water pipelines in the servitude. One meant to supply the reservoir of water and the other meant to distribute water from the reservoir out into the water network. One of the lines however is defunct and has not been functioning resulting in the Municipality having to rely on a single line for both supply (filling the reservoir with water) and distribution (getting water from the reservoir into the water network). The fact that one of the existing lines cannot be used requires the Municipality to use the one remaining line to fill the reservoir at night (associated with less to no demand) and then stopping supply to switch the same line to distribution during day hours (when there is continuous demand). As a result, there is always insufficient time to fill the reservoir completely resulting in water restriction. By installing the temporary surface line, the function of supply and distribution can be re-started again, hence the 860kl/day 'capacity' created in this manner, stems from the reservoir being able to be filled completely (to provide in distribution demands) coupled with no interruption between supply to the reservoir and distribution to the network.

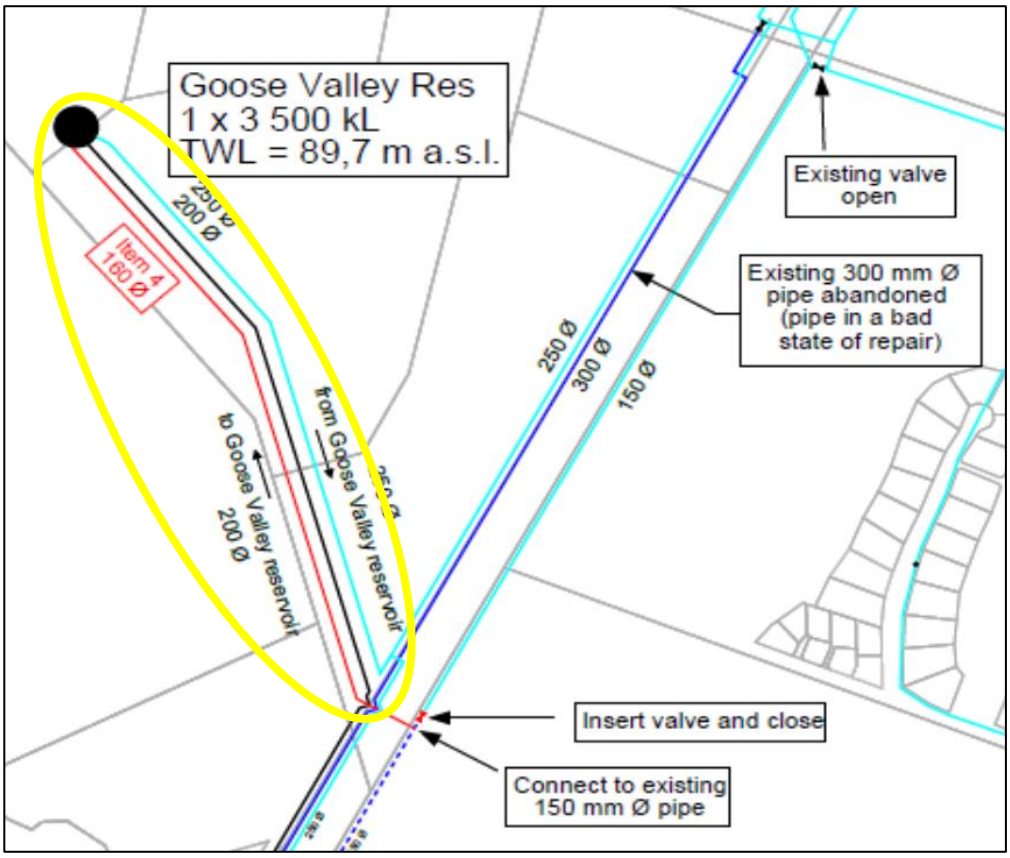


Figure 3: 160mm diameter water pipeline to be installed aboveground from the Goose Valley Reservoir to the existing distribution main in the N2 road reserve (red line) (GLS Consulting, 2023).

Link services BPW14.1 (~70m x 200mm diameter water pipeline) as seen in Figure 4 is required to connect the internal reticulation network of the proposed development to the existing municipal water network.

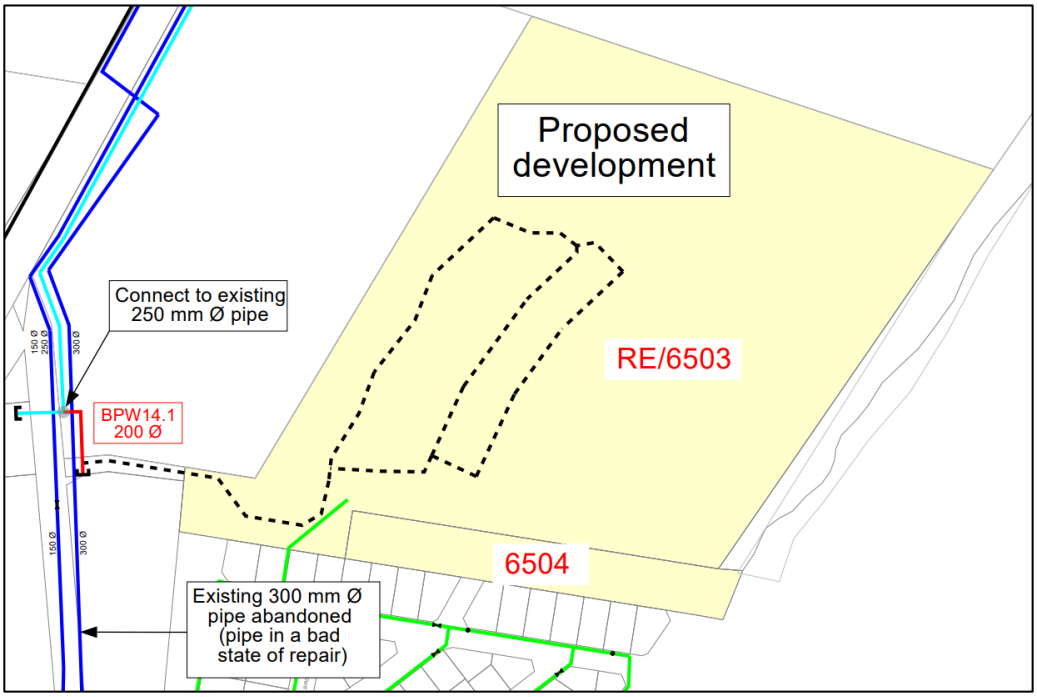


Figure 4: Water pipeline layout for internal water reticulation (extract from GLS Consulting, 2023).

The **internal water reticulation** system will be a metered network consisting of a combined domestic and fire water reticulation network (**75mm diameter uPVC** Class 12 potable water main). Provision

will be made inside erf boundaries of every property for individual water meters (located 1m inside each erf boundary).

Electricity:

The proposed development is located in the Plettenberg Bay town area which is currently supplied by Substation – 1 Ferdinand. The substation is shared with Eskom by Bitou Municipality and has an installed capacity of 20MVA with 2 x 10MVA transformers.

The Notified Maximum Demand for the substation is 15.5MVA and therefore it has sufficient capacity to accommodate the additional 800 kVA (maximum demand) of the proposed development on the Remainder of Erf 6503.

Sewage:

The Municipal Ganse Vallei Wastewater Treatment Works (WWTW) has an effluent discharge capacity of 6Ml per day and is currently at an average daily discharge volume of 5.8Ml.

According to Bitou Municipality the remaining 0.2Ml is reserved for approved developments.

Upgrades to the Ganse Vallei WWTW is therefore required to accommodate future developments.

Due to the fact that said upgrade of the WWTW may take an unknown time still (considering approvals / funding / delays etc), the proposal for this development is for the installation of a temporary on-site package plant within the confines of the development.

Confirmation of the use of such a temporary WWTP has been obtained from Bitou Municipality on 02 July 2024 on condition that the plant will be decommissioned once Bitou Municipality finished upgrades to the Ganse Vallei WWTW and the proposed Plett Lagoon Estate can be connected to the municipal system.

The temporary on-site package plant (fully enclosed) is proposed to be installed inside a 12m container directly adjacent to the proposed maintenance building at the entrance of the proposed development (Figure 6).

The temporary package plant will have a treatment capacity of 40m^3 per day and will use a combination of conventional treatment (natural bacteria) and membrane technology (microfiltration) to treat the household sewage to comply with general water limits stipulated by the Department of Water Affairs.

For the duration of the package plant being in operation, all *treated* effluent is to be used for irrigation within the estate open space areas. Dedicated irrigation storage tanks (4 x 10Kl) forms part of the design and will be located next to the container. This measure is to ensure that open space areas are not saturated unnecessarily, or that unwanted treated effluent enters the sensitive wetland system.

Figure 5: Typical design/look for an Alveo package plant as proposed (Source: https://alveowater.co.za/).

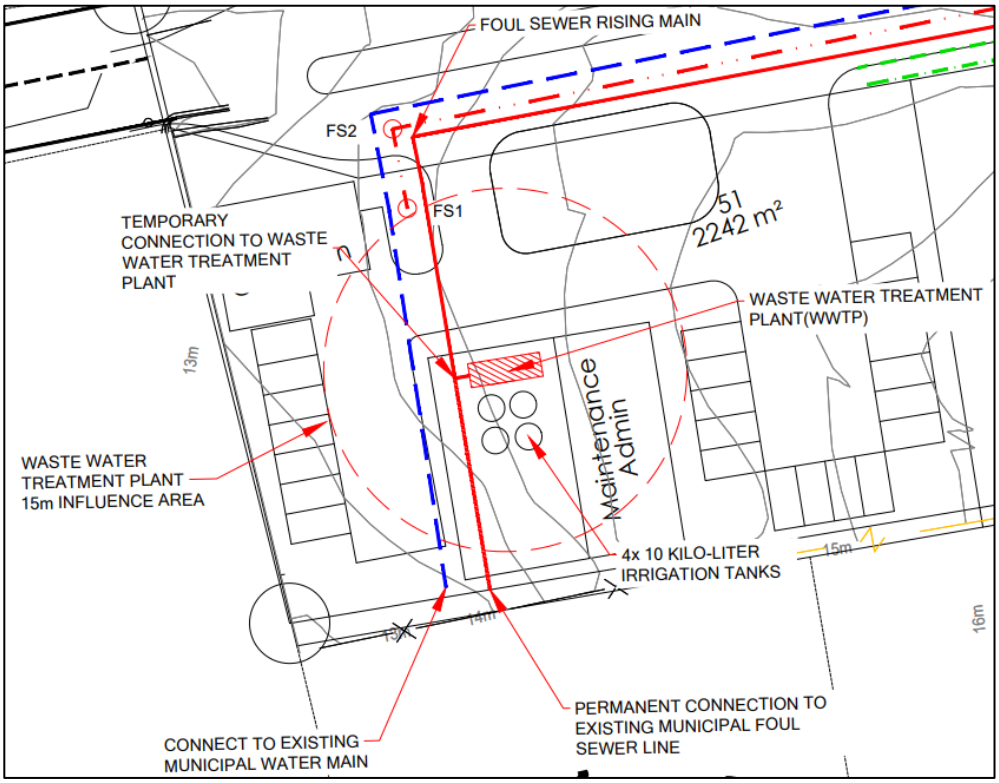


Figure 6: Proposed location of the temporary WWTP (Vita Consulting Engineers, 2024).

The **internal sewage network** will consist of a **160mm diameter uPVC** Class 34 gravity pipe network. The internal sewage pipes will drain towards a small **underground pump station** located between Erf 5 and 6 of the development, from which sewage will be **pumped** along the eastern boundary of the development footprint through a **75mm diameter rising main** towards the temporary package plant.

Once the Municipal Ganse Vallei WWTW has been upgraded to capacity to accommodate the proposed Plett Lagoon Estate development (and the package plant decommissioned), sewage will be pumped towards the existing 160mm ø underground municipal bulk sewer pipe connection in the Susan Road Reserve on the southern boundary of RE/6503. To enable this switch-over in future, this connection line to the municipal sewer system will be installed as part of the project services installation already.

The internal sewage network will be within the regulated 500m from the on-site wetland in the conservation area, in the eastern portion of RE/6503 and a Water Use License (WULA) is covering this aspect in parallel to the Basic Assessment process application in an integrated manner.

Solid Waste:

A communal **refuse collection area** is proposed at the **entrance gate** inside the proposed development perimeter, near the main security access. Bitou Municipality has confirmed that there is sufficient capacity for Waste Disposal for the proposed development on 03 June 2024.

This activity requires an Environmental Authorisation in terms of the National Environmental Management Act (NEMA, Act 107 of 1998) and Water Use Licence (WULA), before commencing, as well as for future maintenance and repairs.

This document provides part of a series of documents that is being circulated for public and stakeholder input as part of the Basic Assessment process, before being provided to the competent authority, the provincial Department of Environmental Affairs & Development Planning (DEA&DP) for decision making.

This EMMPr contains **management requirements** and **recommendations** made by *Cape EAPrac*, the appointed specialist as well as in terms of the regulations contained in the **National Environmental Management Act** (NEMA, Act 107 of 1998) and National Water Act (NWA, 1998) and environmental best practice principles.

This EMMPr must be updated to include any conditions of the **Environmental Authorisation** (EA) as issued.

1.1 PURPOSE OF THE EMMPR

The purpose of this EMMPr is to ensure that the environmental impacts and management of the various phases, of the proposed activity, on the receiving environment are managed, mitigated and kept to a minimum (i.e., the **outcome** of implementing the EMMPr). The EMMPr must provide easily understood and clearly defined **actions** that must be implemented during each phase of the proposed activity. The EMMPr is a dynamic document that is flexible and responsive to new and changing circumstances.

The document is binding on the Applicant (Plett Lagoon Estate), all contractors and sub-contractors to the site.

This EMMPr must be included as part of any documents / agreements, as well as contractual documents between the Applicant and any contractors.

Copies of this EMMPr must be kept on site and all **senior personnel** are expected to familiarise themselves with the content of this EMMPr.

Any changes or deviations to this EMMPr must be authorised by the competent authority in the event that any environmental outcomes are amended.

1.2 STATUS OF THE EMMPR

It is of utmost importance that this EMMPr be read in conjunction with any legally obtained authorisations such as an Environmental Authorisation (EA). This EMMPr is viewed as a dynamic document that must be reviewed and updated on a continual basis.

The EMMPr is valid for the duration of the project (both for construction as well as future maintenance) with each applicable phase corresponding to the identified requirements.

2 EMMPR PHASING

2.1 PRE-CONSTRUCTION PHASE

The pre-construction phase refers to the design phase of the project. This will ensure that any requirements and best practise mechanisms are built into the planning / design phase to be developed in the construction and operational phase. In terms of this application, the pre-construction can be considered as the site selection and engineering designs and mitigations.

2.2 CONSTRUCTION PHASE

The construction phase refers to the actual construction of the development on the property and includes all earthworks and installation of bulk services (water, sewerage, roads, stormwater, electricity etc.). In terms of this application, this phase relates to the construction of the civil engineering services and infrastructure.

2.3 OPERATIONAL / MAINTENANCE PHASE

The Operation Phase of this project relates to the ongoing management and maintenance required to ensure sustainable development. In terms of this application, this refers to all activities that are undertaken once construction is completed and the site is handed over to the HOA of Plett Lagoon Estate.

All future maintenance of the structure (i.e., after flooding, erosion etc) must be implemented in accordance with this EMMPr (procedures for construction activities to be followed).

The Applicant must ensure that the Operational Phase maintains the underpinning principles 'Duty-of-Care-to-the-Environment' and ideals of sustainable development.

Maintenance of the structures, once installed, must be undertaken in accordance with this management & maintenance plan.

2.4 CLOSURE AND DECOMMISSIONING PHASE

Decommissioning refers to the process of removing the operating assets of any development after completion of the operating life cycle.

The decommissioning phase is not foreseen in the near future at the moment.

Should the need arise in future to remove the structure wholly, the Applicant must consult with the Competent Authority to ensure compliance with legislation applicable at the time.

3 LEGISLATIVE REQUIREMENTS

The project Applicant is required to comply with all necessary legislation and policies applicable to development and management of the development. These include but are not limited to:

3.1 NATIONAL ENVIRONMENTAL MANAGEMENT ACT (NEMA, ACT 107 OF 1998)

The National Environmental Management Act (**NEMA**, Act 107 of 1998, as amended), makes provision for the identification and assessment of **activities** that are potentially detrimental to the environment and which require authorisation from the competent authority (in this case, the provincial Department of Environmental Affairs & Development Planning (DEA&DP)) based on the findings of an Environmental Impact Assessment (EIA).

NEMA embraces the notion of sustainable development as contained in the Constitution of South Africa (Act 106 of 1996) in that everyone has the right:

- to an environment that is not harmful to their health or wellbeing; and
- to have the environment protected for the benefit of present and future generations through reasonable legislative and other measures.

NEMA aims to provide for cooperative environmental governance by establishing principles for decision-making on all matters relating to the environment and by means of Environmental Implementation Plans (EIP) and Environmental Management Plans/Programmes (EMMPr), of which this EMMPr is one.

Principles contained in Section 2 of the NEMA, amongst other things, prescribe that environmental management must:

- In order of priority aim to: avoid, minimise or remedy disturbance of ecosystems and loss of biodiversity;
- Avoid degradation of the environment and avoid jeopardising ecosystem integrity;
- Pursue the best practicable environmental option by means of integrated environmental management;
- Protect the environment as the people's common heritage;
- Control and minimise environmental damage; and
- Pay specific attention to management and planning procedures pertaining to sensitive, vulnerable, highly dynamic or stressed ecosystems.

It is incumbent upon the landowner, to ensure that the abovementioned principles, entrenched in this EMMPr are upheld and complied with.

3.2 ENVIRONMENT CONSERVATION ACT, 1989 (ECA)

The EIA regulations contained in the Environmental Conservation Act (ECA) have been replaced by NEMA. However, property owners must comply with the draft regulations pertaining to noise as published in the province of Western Cape Provincial Extraordinary Gazette as provision made in section 25 of the ECA), as well as Section 24 of the ECA regarding waste management and Section 20 of the ECA dealing with waste management under Part IV, Control of Environmental Pollution.

3.3 NATIONAL ENVIRONMENTAL MANAGEMENT: BIODIVERSITY ACT (NEM:BA) (ACT 10 OF 2004)

This Act controls the management and conservation of South African biodiversity within the framework of NEMA. Amongst others, it deals with the protection of species and ecosystems that warrant national protection, as well as the sustainable use of indigenous biological resources. Sections 52 & 53 of this Act specifically make provision for the protection of critically endangered, endangered, vulnerable and protected ecosystems that have undergone, or have a risk of undergoing, significant degradation of ecological structure, function or composition as a result of human intervention through threatening processes.

The National List of Threatened Ecosystems (Notice 1477 of 2009, Government Gazette No. 32689, 6 November 2009) was gazetted in 2014. The list of threatened terrestrial ecosystems supersedes the information regarding terrestrial ecosystem status in the National Spatial Biodiversity Assessment (NSBA) 2004 & 2011.

In addition to the management of ecosystems, this Act makes provision for the management and control of alien invasive vegetation. This includes the listing of invasive species that are a threat to

natural ecosystems. These species must be strictly controlled and / or eradicated. The property has been significantly transformed due to grazing practises but does not contain many alien vegetation species. Only indigenous vegetation should be permitted for landscaping by the proposed HOA and future landowners.

3.4 NATIONAL WASTE MANAGEMENT STRATEGY

The National Waste Management Strategy presents the South African government's strategy for integrated waste management for South Africa.

It deals among others with: Integrated Waste Management Planning, Waste Information Systems, Waste Minimisation, Recycling, Waste Collection and Transportation, Waste Treatment, Waste Disposal and Implementing Instruments.

It is advisable that an integrated waste management system be adopted, which includes waste minimisation, waste recycling and the proper storage and disposal of waste, which does not impact of the health of the environment and human health.

All waste must be collected and disposed of at a waste facility. No waste material may be left on site once construction/maintenance is completed.

3.5 NATIONAL WATER ACT (NWA, ACT 36 OF 1998)

The National Water Act (NWA) gives effect to the constitutional right of access to water. The Act's overall purpose is to ensure that South Africa's water resources are protected, used and managed in ways which take into account a number of factors, including inter-generational equity, equitable access, redressing the results of past racial and gender discrimination, promoting sustainable and beneficial use, facilitating social and economic development, and providing for water quality and environmental protection.

The NWA makes persons who own, control, occupy or use land responsible for taking measures to prevent pollution of water resources, and empowers Government authorities to take measures to enforce this obligation.

3.6 NATIONAL FOREST ACT (ACT 84 OF 1998)

The NFA provides for the **protection of forests**, as well as **specific tree species**, quoting directly from the Act: "no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree or any forest product derived from a protected tree, except under a licence or exemption granted by the Minister to an applicant and subject to such period and conditions as may be stipulated". The Department of Agriculture, Forestry & Fisheries (DAFF) is responsible for the implementation and enforcement of the NFA, which includes **prohibition of damage to indigenous trees in any natural forest without a licence** (Section 7 of the NFA), as well as the prohibition of the cutting, disturbing, damaging destroying or removing **protected trees** without a licence (Section 15 of the NFA).

The purpose of the National Veld and Forest Fire Act is to **prevent and combat veld, forest and mountain fires** throughout the RSA and to provide institutions, methods and practices for achieving this purpose. Institutions include the formations of such bodies as **Fire Protection Associations** (FPA's) and **Working on Fire**. The Act provides the guidelines and constitution for the implementation of these institutions as well as their functions and requirements.

3.7 NATIONAL HERITAGE RESOURCES ACT (ACT 25 OF 1999)

The purpose of the National Heritage Resources Act is to:

- Introduce an integrated and interactive system for the management of the national heritage resources;
- Promote good government at all levels,
- Empower civil society to nurture and conserve their heritage resources so that they may be bequeathed to future generations;
- To lay down general principles for governing heritage resources management throughout South Africa;
- To introduce an integrated system for the identification, assessment and management of the heritage resources of South Africa;
- To establish the South African Heritage Resources Agency together with its Council to co-ordinate and promote the management of heritage resources at national level;
- To set norms and maintain essential national standards for the management of heritage resources in South Africa and to protect heritage resources of national significance;
- To control the export of nationally significant heritage objects and the import into South Africa of cultural property illegally exported from foreign countries;
- To enable the provinces to establish heritage authorities which must adopt powers to protect and manage certain categories of heritage resources;
- To provide for the protection and management of conservation-worthy places and areas by local authorities; and
- To provide for matters connected therewith.

Due to the nature of the proposed activity, the location of the site and the transformed nature of the surroundings, it is not likely that any heritage or archaeological features will be impacted upon.

3.8 OCCUPATIONAL HEALTH AND SAFETY ACT (ACT 85 OF 1993)

The Act provides for the health and safety of persons at work and for the health and safety of persons in connection with the use of plant and machinery; the protection of persons other than persons at work against hazards to health and safety arising out of or in connection with the activities of persons at work.

In terms of this Act, a Health and Safety Officer and Protocol must be implemented on any sites. The appointment of a Health and Safety Officer is the responsibility of the proponent and contractor and is included in this report to ensure due diligence on construction sites. It is the responsibility of the appointed to HSO to conduct any required audits and as such only the appointment of an HSO will be auditable in terms of this document.

4 ENVIRONMENTAL IMPACTS & MITIGATIONS

The following specialist impact assessments / studies were undertaken for the proposal:

- Aquatic Biodiversity Impact Assessment (Confluent Consulting).
- Terrestrial Biodiversity Compliance Statement (Biodiversity Africa)
- Terrestrial Plant Species Specialist Report (Biodiversity Africa)
- Terrestrial Animal Species Specialist Report (Biodiversity Africa)
- Agricultural Compliance Statement (Johann Lanz)

The following environmental impacts of the proposed activity were identified and considered during the environmental process, based on which the associated mitigation measures were recommended for implementation (to reduce negative impacts & enhance positive ones):

Specialist Assessments/Compliance Statement

Potential Impacts

- Habitat degradation by alien vegetation and through mowing.
- Disturbance to wetland and buffer areas (due to vehicles, workers and materials active in wetland and buffer areas).
- Stormwater runoff from the site (sedimentation in the wetland and creation of preferential flow paths).
- Loss of vegetation, habitat disturbance, water pollution and harm to animas (greater than necessary footprint for fence line installation).
- Slope erosion and sedimentation of the wetland (damage caused by stormwater runoff).
- Alien vegetation establishment (establishment of aliens in disturbed areas post-construction in habitat degradation).
- Inappropriate mowing, planting or trimming of vegetation leading to habitat degradation (landscaping, fire-breaks and recreational pathways maintenance).
- Pollution and eutrophication of the wetland leading to habitat degradation and impacts to biota (leaking, blocked or overflowing sewerage infrastructure).
- Seepage of treated wastewater into the wetland could result in eutrophication (irrigation with treated wastewater daily resulting in eutrophication of the wetland).
- Loss of faunal habitat (associated with the construction of the proposed residential development).
- Loss of faunal species of conservation concern (SCC) (associated with the construction of the proposed residential development).
- Disturbance of faunal species (associated with the construction, operation and decommissioning of the proposed residential development).
- Mortality of faunal species (associated with the construction of the proposed residential development).
- Fragmentation of faunal habitat and disruption of faunal movement.
- Faunal mortality due to collision or electrocution.
- Loss of secondary grassy fynbos.
- Loss of Goukamma Dune Thicket.
- Loss of plant species of conservation concern (SCC).
- Habitat loss and fragmentation.

- Infestation of alien plant species.
- Loss of indigenous vegetation due to increased access by residents.
- Loss of re-established indigenous vegetation.

4.1 MITIGATIONS

Table 2: List of Mitigation Measures & Associated Management Requirements

Mitigation	Condition of Approval	Included in EMMPr	Construction Phase	Operational /Maintenance Phase
Mitigations / Recommendations				
Control alien vegetation in isolated stands where it occurs. No herbicide to be used in the wetland. Large trees must be fully ring-barked, while smaller plants can be hand-pulled or removed using a tree popper. Shrubs of bramble and Lantana must be cut back with clippers until the stump is visible, which must then be removed.		✓	✓	
All vegetation biomass must be removed from the wetland and disposed of at a green waste dump. No vegetation must be dumped in the wetland.		✓	✓	
Follow up alien investigation must be conducted every 6 months following initial clearing to ensure emergent seedlings are consistently removed.		✓	✓	
Pre-construction, temporary fencing must be erected along No-Go areas with the top of the slope leading to the wetland indicated as the sensitive feature.		✓	✓	
Signage indicating No-Go areas must be placed on fencing.		✓	✓	
All contractors must attend a site induction and be briefed that vehicles, workers, equipment and materials may not encroach into No-Go areas around wetlands.		✓	✓	
Consider the termination of contracts or fines for encroachment into the no-go area.		✓	✓	
Daily and weekly site meetings must consider forecasted rainfall to avoid working during such periods, and to plan accordingly for predicted high rainfall events. Work on the site must cease altogether during rainfall.		✓	✓	
The site office must have a store of materials suitable for rapid response to erosion control such as shade-cloth (silt-fencing), haybales (check-dams), wooden droppers, hessian fabric, and fencing wire.		✓	✓	
All material stores should be kept on flat areas and bunded to prevent material loss during rainfall.		✓	✓	
When construction commences in the residential area, create a compacted, low soil berm along the perimeter of the site approximately		✓	✓	

Mitigation	Condition of Approval	Included in EMMPr	Construction Phase	Operational /Maintenance Phase
400 mm high to retain stormwater on site and reduce runoff to surrounding areas.				
Monitor the site during / following periods of rainfall and install haybale check dams at points where runoff collects and could overtop / breach the soil berm.		✓	✓	
Following rainfall, any water that must be pumped out of pools in excavated areas must not be directed to the wetland. The soil berm system or a temporary haybale check dam can be constructed to contain water until it seeps into the ground or slowly disperses through the haybales which act as a filter.		✓	✓	
Access points for delivery of material are only from the northern side along drier parts of the wetland where the area has been mowed and disturbed already. No access is permitted by vehicle along the southern edge because this has high sensitivity wetland vegetation and is very wet.		✓	✓	
The fenceline may not be installed during the breeding season from September to February. This is to avoid disturbance or harm to dispersing wildlife which are more active and vulnerable at this time.		✓	✓	
Fencelines can be installed with the help of a small machine such as a bobcat, but should otherwise be installed by hand. No excavations or larger machines are permitted to drive along the fenceline.		✓	✓	
Vegetation obstructing work on the fenceline should be cut or trimmed, and not uprooted, unless in the direct path of the fenceline.		✓	✓	
Disturbed soil along the fenceline should be revegetated with low growing indigenous grass already found at the site. Strenotaphrum secondatum (buffalo grass) is recommended in wetland areas. This can create a relatively open area along the fenceline which can be monitored or patrolled on foot.		✓	✓	
Any concrete mixing for posts must be contained in a wheelbarrow or small vehicle (e.g. Kubota), and is not permitted on the ground, especially in the wetland or buffer areas.		✓	✓	
Excess concrete must be removed from the site and disposed of. No waste materials, dirty water, or concrete may be left in the wetland area. This must be monitored closely by the Eco with incidents immediately reported to DEA&DP and/or BOCMA.		✓	✓	
Absolutely no washing of tools in water in the wetland.		✓	✓	
No water from the wetland may be used to mix concrete.		✓	✓	
Any vegetation cleared for installation of the fenceline must be removed from the site, or lightly scattered. It cannot be piled up along he fence, which creates further barriers and smothers vegetation.		✓	✓	

Mitigation	Condition of Approval	Included in EMMPr	Construction Phase	Operational /Maintenance Phase
The site must be assessed by an aquatic specialist 6 months following conclusion of construction to confirm that stormwater management infrastructure is functional and not causing any impacts to the wetland.		✓	✓	✓
Stormwater management infrastructure such as swales, drains and culverts must be routinely monitored and maintained to ensure they are free of blockages and functional. This includes a regular inspection of all stormwater outflows to identify any emerging erosion issues, and keep the structures clear of excessive siltation and litter.		✓	✓	✓
Where erosion is occurring, immediately identify and control the origin of the flow path and protect the site of erosion by replacing soil with soil from the site, and stabilising with indigenous vegetation found on the site. Where more serious interventions are required spot installations of gabions may be suitable for stabilisation provided they are not in the wetland buffer or in the wetland itself. As far as possible, flows must be attenuated, and the source of erosion controlled upslope within the residential area.		✓	✓	✓
Eroded areas of the steep banks must be refilled with topsoil (from the site), reseeded with indigenous vegetation, covered with a light mulch and protected with soil saver mats. The use of silt fencing can be extended to problem areas to provide further protection.		✓	✓	✓
Follow up inspection and control of alien vegetation in the residential development and the wetland on a 6- monthly basis.		✓	✓	✓
No herbicides to be used in the wetland or wetland buffer. Sprays and / or cut-stump treatments may be used in the residential areas.		✓	✓	✓
Ensure bare areas of vegetation are replanted with indigenous vegetation that occurs naturally on the site.		✓	✓	✓
Under no circumstances may removed alien plants be discarded in the wetland. The HOA must inform the landscaping / gardening team that no dumping of vegetation or discarding of waste material may happen in the wetland or buffer area.		✓	✓	✓
The north-eastern boundary fire-break should be maintained at 20m wide as a defensible zone for adjacent housing. Either mowing with weedeaters or limited vehicle mowers (during dry season when the water recedes, out of breeding season) can continue along the 20m strip. IF it is thought that reed growth (Phragmites) beyond the 20 m fire-break poses a serious fire risk (agreed to in writing by SCFPA), then reeds may be cut by hand/hand held machinery to 1m high for an additional 20 m with no soil disturbance by vehicles or machinery permitted. Reeds (no other vegetation) must be cut during winter to avoid disturbance to breeding birds, and removed from the wetland area to avoid smothering vegetation.		✓	✓	✓
6m Fire Break must be maintained along the Southern boundary at lowest vegetation level without soil disturbance (exception is the wetland		✓	✓	✓

Mitigation	Condition of Approval	Included in EMMPr	Construction Phase	Operational /Maintenance Phase
area where vegetation can be maintained at 1m height and no vehicle access);				
Currently at least two road-width access routes are maintained by mowing through the wetland/open space which provide access for fire-fighting and invasive alien clearing teams. Emergency (fire-fighting) vehicles that will typically access the reserve, are Land Rovers fitted with fire-fighting equipment) for which a minimum of 2 metres is possible. therefore the restored area must be maintained by the Estate to keep Returning vegetation low within the minimum 2m wide trails at all times, enabling an emergency vehicle to access the trails without delay.		✓	✓	✓
Use simple markers along the designated edge of paths and fire-breaks to ensure landscaping teams do not encroach further than the designated edge.		✓	✓	✓
No herbicides can be used to maintain access routes or fire-breaks in the wetland area or buffer.		✓	✓	✓
The existing footprint of any mowed or cleared access routes may not be enlarged.		✓	✓	✓
No new access routes may be created in addition to those already existing in the open space area.		✓	✓	✓
Do not plant any exotic plants that do not occur naturally at the site in any area of the wetland or buffer. ie. under no circumstances may kikuyu grass be planted in any part of the wetland or buffer.		✓	✓	✓
No vehicles (tractors pulling mowers) may be used to cut vegetation in any part of the wetland, for firebreaks or access routes extending across the wetland area unless it falls outside of the wet season when the water level recedes and outside of the breeding season for aquatic species.		✓	✓	✓
No fire-break may be cut along the new fenceline proposed adjacent to the estuary although it is acknowledged that an open area along this fenceline is necessary to monitor for security reasons, as well as any animals that may be trapped in the fence.		✓	✓	✓
Ensure gardening / landscaping team / homeowners do not dump green waste into the open space area as this will smother indigenous plants and encourage the spread of alien and exotic plant species.		✓	✓	✓
All sewerage infrastructure must be well maintained and kept free of obscuring vegetation. Manholes, sewer lines, and the pump stations must be accessible, easily observed, and routinely inspected for leaks or blockages.		✓	✓	✓
Emergency response measures to sewage spillages should be maintained on site, including lime to treat sewage and sand bags to contain spill and limit their dispersal. An emergency response protocol must be established by management of the HOA.		✓	✓	✓

Mitigation	Condition of Approval	Included in EMMPr	Construction Phase	Operational /Maintenance Phase
Ensure sufficient backup power systems are available for the operation of pump stations during load shedding and at peak times (e.g., December).		✓	✓	✓
Under NO circumstances can treated wastewater be discharged to the stormwater system, as this leads directly to the wetland which has a unique water chemistry that supports a diverse assemblage of fauna and flora.		✓	✓	✓
Install 2 groundwater spikes / wells at 10m depth to monitor ground water on the upland area (within the estate) near the wetland buffer. These should be located at least 200 m apart and provide easy access during the construction and operational phase. They should not be located in any area of significant natural vegetation, and should rather be sited in grassy areas.		✓	✓	✓
Water measurements must be taken prior to the package plant being operational to establish a baseline for future monitoring.		✓	✓	
Collect a water sample from each monitoring point on a monthly basis during operational phase and submit to a registered laboratory for the analysis of parameters indicated by DWS general limits.		✓	✓	✓
Collect a water sample from each monitoring point on a monthly basis during operational phase and submit to a registered laboratory for the analysis of parameters indicated by DWS general limits.		✓	✓	✓
If water chemistry deviates significantly from background levels and begins to indicate eutrophication (nutrient enrichment; e.g. elevated levels for > 3 months), then an alternative solution to the irrigation of water must be provided. This could involve discharging to clay-lined ponds, or irrigating on the neighbouring school's sports fields. Proactive steps to mitigate eutrophication must be taken from the first month that elevated levels are noted, so that if elevated levels persist, a solution is fully actionable by the 3rd month.		✓	✓	✓
Water samples must be submitted to the Bitou Municipality, BOCMA and be reviewed by an aquatic ecologist on a quarterly basis for the first two years of operation of the estate.		✓	✓	✓
The Goukamma Dune Thicket, Cape Seashore and Wetland Habitat must be declared a No-Go.		✓	✓	
Construction vehicles and machinery must not encroach into adjacent habitat and must remain within the footprint of the project.		✓	✓	
A stormwater management plan must be compiled and implemented and ensure that the wetland downslope is not impacted on. This plan must include measures to prevent erosion.		✓	✓	
A clause must be included in contracts for ALL personnel working on site stating that: “no wild animals will be hunted, killed, poisoned or captured. No wild animals will be imported into, exported from or		✓	✓	

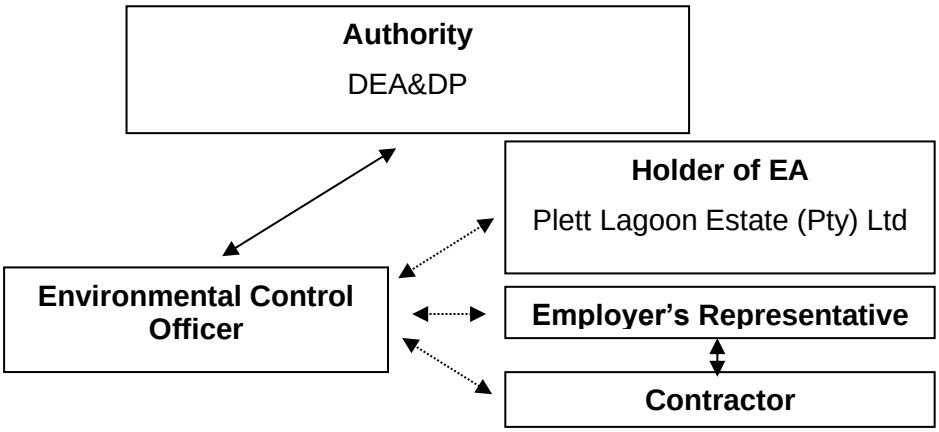
Mitigation	Condition of Approval	Included in EMMPr	Construction Phase	Operational /Maintenance Phase
transported in or through the province. No wild animals will be sold, bought, donated and no person associated with the development will be in possession of any live wild animal, carcass or anything manufactured from the carcass." A clause relating to fines, possible dismissal and legal prosecution must be included should any of the above transgressions occur for SCC.				
Slow moving species, such as tortoises that may be in harms way during construction, must be moved and placed out of harm's way in habitat immediately adjacent to the project area within the reserve.		✓	✓	
All night lighting must be minimised and if required, only down lighting must be used and placed as low as practical and low light emitting bulbs (LED's).		✓	✓	
Vehicles and machinery must meet best practice standards as this will minimise noise and vibrations.		✓	✓	✓
Staff and contractors' vehicles must comply with speed limits of maximum of 40km/hr.		✓	✓	✓
Project must start and be completed within the minimum timeframe. i.e., may not be started and left incomplete.		✓	✓	
ECO (or relevant person) to walk ahead of clearing construction machinery and move slow moving species, e.g., tortoises, out of harms way and into suitable neighbouring habitat.		✓	✓	
A snake handler should be on call to provide removal and relocation service should any snakes be found on site or entering neighbouring homes.		✓	✓	
No lights must be placed on the exterior wall facing the thicket habitat. Should general lighting inside the estate be used, only down lighting must be used and placed as low as practical and low light emitting bulbs (LED's).		✓	✓	✓
The fence line along the Eastern boundary must be inspected regularly to ensure that any animals that may be trapped are rescued and if in need of veterinary attention for any injuries, must be captured and taken for medical attention whereafter it must be released. Such steps must be done in consultation with CapeNature.		✓	✓	✓
Vehicles and machinery must meet best practice standards as this will minimise noise and vibrations.		✓	✓	✓
Vegetation clearance must be strictly limited to that which is necessary for the construction of the proposed residential estate and associated infrastructure.		✓	✓	
Topsoil (20 cm, where possible) must be collected and stored in areas of low (preferrable) and medium sensitivity and used to rehabilitate		✓	✓	

Mitigation	Condition of Approval	Included in EMMPr	Construction Phase	Operational /Maintenance Phase
impacted areas that are no longer required during the operational phase (e.g., laydown areas).				
Protected species must be translocated into surrounding undeveloped areas (on the same property) or rehabilitated areas.		✓	✓	
No Alien Invasive Plant Species should be used for rehabilitation purposes.		✓	✓	
Where excavation is required, topsoil should be removed and managed for use during rehabilitation. Topsoil often contains a large seedbank which can aid in the restoration of impact areas.		✓	✓	
Employees must be prohibited from collecting plants. It is recommended that spot checks of pockets and bags are done on a regular basis to ensure that no unlawful harvesting of plant species is occurring.		✓	✓	
Basal plant cover must be maintained where possible to reduce the possibility of soil erosion.		✓	✓	
Implement an Alien Invasive Management Plan/Method Statement and remove alien invasive plant species within the Goukamma Dune Thicket to increase the habitat available for indigenous plant species.		✓	✓	
No AIP species may be used for landscaping in residents' gardens or common areas.		✓	✓	
Design and implement a Stormwater Management Plan.		✓	✓	
Design and implement an Erosion Method Statement.		✓	✓	
Erect signs and/or notice boards informing construction staff of No-Go areas or areas of high sensitivity.		✓	✓	
Regular toolbox talks must be presented to inform construction staff of No-Go areas or areas of high sensitivity.		✓	✓	
Permits must be obtained prior to the translocation/removal of protected SCC.		✓	✓	
Should any threatened SCC be identified prior to or during vegetation clearance, infrastructure must be repositioned to avoid these individuals. If this is not possible, permits for the translocation of these species must be obtained and species should be translocated to the same habitat type on the same property.		✓	✓	
No pruning or clearing of the Goukamma Dune Thicket is permitted unless the relevant permits have been obtained.		✓	✓	✓
Residents must be made aware of the sensitivity of the Goukamma Dune Thicket and the foredune which supports Cape Seashore Vegetation through the erection of notice boards at strategic access points to and from the beach.		✓	✓	✓

Mitigation	Condition of Approval	Included in EMMPr	Construction Phase	Operational /Maintenance Phase
Access must be restricted to existing access routes and the most direct paths used. Access routes must be demarcated using environmentally friendly markers and paths off the main path, that should not be used by residents, must be cordoned off to prevent people accidentally using these.		✓	✓	✓
Best Practise				
Applicant must appoint an ECO to oversee construction.		✓	✓	
Construction work must be limited to Mondays-Fridays (07:00-18:00) and Saturdays (08:00-13:00)		✓	✓	
Construction work may not take place on Sundays.		✓	✓	
Vegetation clearing must be done in phases to avoid large pieces of land being exposed to the wind (which could result in unnecessary dust pollution).		✓	✓	
Make use of wetting agents should dust be a problem.		✓	✓	
Rehabilitation of work areas to take place as soon as possible to minimise dust pollution.		✓	✓	
An ECO must be appointed to oversee construction and must keep record of any complaints regarding noise/dust pollution.		✓	✓	
Construction material must be stored on-site and construction vehicles must not obstruct traffic flows.		✓	✓	
Clear the proposed development site of all NEMBA listed invasive alien vegetation species prior to any site clearing/development to ensure that indigenous vegetation can recover and rehabilitate more easily.		✓	✓	
Only indigenous vegetation permitted in the place of the loss of remainder on-site natural vegetation/habitat.		✓	✓	
Employees must be prohibited from making open fires during construction phase.		✓	✓	
Should any heritage resources, including evidence of graves and human burials, archaeological material and palaeontological material be discovered during the execution of the activities above, all works must be stopped immediately, and Heritage Western Cape must be notified without delay.		✓	✓	
Contractors should provide at least one (1) toilet for every ten (10) people present on the development site.		✓	✓	
Employees must be prohibited from collecting plants.		✓	✓	✓

5 RESPONSIBILITIES

This section deals with the responsibilities of various parties during the Construction Phase of any development (see chart below).



5.1 HOLDER OF THE EA

The holder of the EA / property owner is the overseeing entity responsible for ensuring that all activities undertaken on the property comply with the Environmental Authorisation (EA) and associated Environmental Management & Maintenance Programme (EMMPr) (as well as any other approval / licence / permit).

The responsibilities of the holder of the EA / property owner include, but are not limited to the following:

- Ensure that **all tender documentation** include reference to, and the need for compliance with, the EA and EMMPr as well as any other legally binding documentation, which include and are not limited to Approval/s.
- Be conversant with, and ensure that all Contractors, Sub-contractors, Engineers (and future senior site managers / personnel) are made aware of, and understand the conditions and recommendations, contained in the abovementioned documentation;
- Ensure that all Contractors, Sub-contractors and Engineers (during construction activities) are made aware of their 'Duty of Care to the Environment' and that any damage or degradation of the natural environmental within the bounds of the property will not be tolerated and must be dealt with / remedied at the cost of the perpetrator;
- Take remedial and/or disciplinary action in circumstances where persons are found to be in contravention of the abovementioned legally binding documentation.

5.2 ENGINEERS AND CONTRACTORS

The Engineers and Contractors are often the parties responsible for physically carrying out the activities for which majority of the recommendations in this EMMPr are intended. Service providers and Contractors include: services, building contractors, 'handy-men' and engineers overseeing the installation and maintenance of services etc. The responsibilities indicated here are also relevant to Sub-Contractors.

Contractors are responsible to ensure that all sub-contractors are compliant with the EA, the EMMPr, and any relevant licence, permit or any legally binding documentation relevant to their operations.

It is recommended that contractors and sub-contractors use colour codes for easy identification by the Environmental Control Officer (i.e., colour coded hard hats or vests).

The responsibilities of these parties include but are not limited to the following:

- Be conversant and compliant with the EA, the EMMPr, and any relevant License, Permit or any legally binding documentation relevant to their operations;

- Have a responsibility to adhering to any conditions and recommendations laid out in above mentioned documentation;
- Prevent actions that may cause harm to the environment;
- Be responsible for any remedial activities in response to an environmental incident within their scope of influence;
- Liaise with the holder of the EA/WULA in complying with the EMMPr, and in the event that any industry regulated standards are in contradiction with the EMMPr or any other authorisations.
- Review and amend to any construction activities to align with the EMMPr and Best Practice Principles;
- Ensure compliance of all site personnel and/or visitors to the EMMPr and any other authorisations.

5.3 ECOLOGICAL CONTROL OFFICER (ECO)

It is recommended that a suitably qualified Environmental Control Officer (ECO) be appointed to oversee all activities for the duration of the construction phase (i.e. construction activities, rehabilitation) as well as any maintenance work that must be undertaken that will involve earthworks or machine works. The ECO must have at least 3 years' experience and proven competency as an ECO.

The responsibilities of the ECO include but are not limited to the following:

- Provide environmental induction training to Contractors on site prior to construction activities commencing.
- Provide maintenance, update and review of the EMMPr if necessary.
- Liaison between the Project Holder of the EA, Contractors, Authorities and other lead stakeholders on all environmental concerns, including the implementation of the EMMPr.
- Compilation of Environmental Control Reports (ECR) to ensure compliance with the EA, EMMPr and duty of care requirements, where necessary.
- Compilation of the Environmental Audit Report or Environmental Completion Statement, after completion of construction (or as otherwise defined in the Environmental Authorisation), where necessary.
- Ensuring/guiding and monitoring compliance with the EA and EMMPr and any legally binding documentation.
- Facilitating consultation with relevant environmental authorities (e.g. DEA&DP, DFFE, CapeNature or Municipality).
- Facilitating the application for any required amendment of the EA/EMMPr.
- Provide guidance and interpretation of the EA and EMMPr where necessary.
- Issuing site instructions to the contractor for corrective actions required.
- The ECO is required to conduct regular site visits for the duration of the construction period, in order to ensure the Contractor receives the necessary induction and that all procedures are in place. Additional site visits may be undertaken in the event of any unforeseen environmental accidents.
- The duration and frequency of these visits may be increased or decreased at the discretion of the ECO.
- Attendance of site meetings if required.
- Maintain a record of environmental incidents (e.g. spills, impacts, legal transgressions etc.) as well as corrective and preventative measures taken. This information must also be included in the ECR.
- Maintain a public complaints register in which all complaints and action taken must be recorded. This information must also be included in the ECR.

5.4 ECO SITE VISIT FREQUENCY

The following site frequency for ECO site visits has been determined:

- Bi-weekly during all construction activities.
- Maintenance activities must be monitored on an ad hoc basis depending on the type of maintenance.

Ad hoc site visits may be undertaken in the event of any incidents or specific requests from the project holder of the EA or project team.

5.5 ENVIRONMENTAL INDUCTION & TRAINING

The holder of the EA in consultation with the Contractor shall ensure that adequate environmental awareness training of senior site personnel takes place and that all construction workers receive an induction presentation on the importance and implications of the EA and EMMPr. The presentation shall be conducted, as far as is possible, in the employees' language of choice. The Contractor must provide a translator from their staff for the purpose of translating, if this is deemed necessary.

As a minimum, training must include:

- Explanation of the importance of complying with the EA and EMMPr and the employees accountability.
- Discussion of the potential environmental impacts of construction activities.
- The benefits of improved personal performance.
- Employees' roles and responsibilities, including emergency preparedness.
- Explanation of the mitigation measures that must be implemented when carrying out their activities.
- Explanation of the specifics of this EMMPr and its specification ("no-go" areas, etc.).
- Explanation of the management structure of individuals responsible for matters pertaining to the EMMPr.

Where staff turnover is high and with additional appointment of sub-contractors, it may be necessary to undertake additional induction training sessions. The Contractor must keep records of all environmental training sessions, including names, dates and the information presented.

6 PRE-CONSTRUCTION DESIGN CONSIDERATIONS

It is recommended that sustainable design considerations are implemented during the planning phase to ensure that the impacts associated with the development are avoided, minimised or managed before construction commences.

6.1 STORMWATER MANAGEMENT PREPARATION

Management Outcome	Impacts & Risks Avoided
To prepare the site to minimise the negative impacts of stormwater.	Damage to the environment caused by stormwater runoff.
Management Actions	

a. Final design of the stormwater system must take place prior to construction to ensure timeous implementation.					
Method of monitoring implementation	Frequency of Monitoring	Responsible Party for implementing management action	Time period	Mechanism for monitoring Compliance	Programme for reporting on Compliance
Site Plans	Once off	Architect / Engineer	Prior to construction	Audit	Once off

6.2 DEMARCATION OF WORK AND NO-GO AREAS

Management Outcome	Impacts & Risks Avoided
To clearly define the work area and avoid impacting on non-work areas.	Negative construction impacts on natural and rehabilitated areas.

Management Actions					
a. Clearly identify and demarcate the development area, area of works and spoiling areas prior to the commencement of any activities on site.					
Method of monitoring implementation	Frequency of Monitoring	Responsible Party for implementing management action	Time period	Mechanism for monitoring Compliance	Programme for reporting on Compliance
Method Statement	Once off	Developer / contractor	Pre implementation	Audit	Once off
b. Fuel and chemicals may only be stored in a designated work area.					
Method of monitoring implementation	Frequency of Monitoring	Responsible Party for implementing management action	Time period	Mechanism for monitoring Compliance	Programme for reporting on Compliance
Method Statement	Once off	Developer / contractor	Pre implementation	Audit	Once off
c. Provide on-site sanitation and rest areas for personnel.					
Method of monitoring implementation	Frequency of Monitoring	Responsible Party for implementing	Time period	Mechanism for monitoring Compliance	Programme for reporting on Compliance

		management action			
Method Statement	Once off	Developer / contractor	Pre implementation	Audit	Once off

6.3 WATER RESOURCE PROTECTION

Management Outcome	Impacts & Risks Avoided
To minimise the use of scarce water resources by improving consumption methods.	Unsustainable or wasteful use of water for construction and operation purposes.

Management Actions

a. Rainwater harvesting must be incorporated into the designs. All rainwater tanks must be shown on building plans.

Method of monitoring implementation	Frequency of Monitoring	Responsible Party for implementing management action	Time period	Mechanism for monitoring Compliance	Programme for reporting on Compliance
Site Plans	Once off	Architect / Engineer	Prior to construction	Audit	Once off

b. Water efficiency must be incorporated into the design of the units.

Method of monitoring implementation	Frequency of Monitoring	Responsible Party for implementing management action	Time period	Mechanism for monitoring Compliance	Programme for reporting on Compliance
Site Plans	Once off	Architect	Prior to construction	Audit	Once off

Dual Flush Toilets

Conservative estimates have shown that a saving of more than 22 000 liters per household can be achieved annually with the installation of dual flush toilets (Aquanotion, 2008). All households and ablution facilities should be fitted with dual flush systems.

Low flow shower heads

The installation of low flow shower heads can not only reduce water consumption by up to 50%, but also the energy required for water heating by up to 50% (Eartheasy, 2008).

It has been estimated that a saving of up to 57 000 liters of water per annum per household can be achieved through the installation of low flow shower heads. Low flow shower heads make use of either aerators or

pulse systems to reduce the flow without compromising the quality of the shower. The choice of shower head is up to the individual owner but must have a flow of less than seven liters per minute.

Low flow Taps

Low flow tap use aerators to reduce the flow of the water. These are either built into the faucet or added as an aftermarket product. The faucets in bathrooms should have a peak flow of less than 10 liters per minute.

It is not necessary to install aerators in kitchen sinks as they are seldom run without a plug. All bathroom basins must be fitted with low flow faucets.

Washing machines

It is recommended that all washing machines that are to be installed in shared facilities should be front loading washing machines as opposed to top loading washing machines. Apart from much lower energy and water requirements, front loader washing machines have a number of advantages that make them a better environmental choice:

- **Less wear and tear on washed materials** – Washed materials therefore last longer and result in a net resource saving;
- **Faster drying times** - Because of the horizontal axis and faster spin speeds, more water is removed, and the materials dry faster which results in energy saving if a clothes dryer is used.;
- **Quieter operation** – Therefore less noise pollution; and
- **Less detergent** - Far less is required compared to top loaders. Fewer chemicals therefore reach treatment plants and ultimately waterways.

Geyser and pipe insulation

Apart from the savings in terms of energy as detailed below, insulating geysers and pipes save water, as shorter periods of running the tap to get hot water are required.

All structures should have insulation on geysers and all hot water pipes.

Waterwise Landscaping

Waterwise landscaping principles must be incorporated into the detailed landscaping plans. The following principles apply to waterwise gardening:

- Grow water-wise plants – generally the best suited plants are those indigenous to the area, as they seldom need additional watering;
- Group plants according to their water needs – this avoids wasting water on plants that don't need it;
- Consider the quality and type of the lawn. Lawns use unacceptable amounts of water, so consider reducing lawn areas to a minimum. Use tougher, low-water lawn types such as Buffalo (coastal areas) or Kweek (inland) rather than Kikuyu.
- Maintain the garden – remove unwanted plants, plant more perennials than summer annuals, as they have deeper root systems and so need less watering.
- Improve the soil and mulch. Soil water-holding capacity is improved by higher organic matter content. Mulching (covering the soil with a thick layer of bark, compost, straw etc.) keeps the soil much more moist.
- Plant in the right season – For winter rainfall areas this is in autumn and early winter, so the plants have a chance to develop their root systems before the dry season. In summer rainfall areas it is spring and early summer for the same reason.
- Water correctly – avoid watering during the heat of the day or in windy conditions.
- The best irrigation system is drip irrigation – it uses 25% of water used by normal irrigation systems with the same effect and can even be placed under lawns.

Grey Water

Grey water is the water that comes from the bath, shower, basins, laundry and the kitchen sink. It is not to be confused with Black water, which is sewage that comes from the toilet. Black water is toxic and requires very specific methods of treatment in order to be safe for re-use. Grey water, however, can easily be recycled and re-used for a variety of uses. These include:

- Irrigation of gardens;

- Water for flushing toilets;
- Any outdoor use;
- Dampening dusty areas or roads.

Grey water systems require precise methods to clean the water. There are various companies and organizations that can assist with implementing a grey water system.

6.4 ENERGY RESOURCE PROTECTION

Management Outcome	Impacts & Risks Avoided
To minimise the use of energy resources by improving consumption methods.	Excessive and unnecessary energy consumption.

Management Actions

a. Incorporate energy efficiency into the design of the facility.

Method of monitoring implementation	Frequency of Monitoring	Responsible Party for implementing management action	Time period	Mechanism for monitoring Compliance	Programme for reporting on Compliance
Energy saving checklist	Once off	Owner	Ad hoc	Audit	Once off

Solar heating water systems

Solar heated water systems are an innovative way of producing hot water without putting additional pressure on gas or municipal power supply. There are many different types available on the market, and homeowners should consider all their requirements (number of people using facility, location of house, angles of roof) before making a choice.

Energy Efficient Lighting

In terms of Best Practice, it is required that energy saving lighting fixtures be used throughout the entire development. It is therefore specified that Light Emitting Diode (LED) or Compact Fluorescent (CF) lighting be used as opposed to incandescent lighting. This is required for all internal and external lighting, including street lighting. Proximity switches should be used in areas where lighting for pedestrians is required.

NO external High Pressure Sodium (HPS) or Metal Halide (MH) spot or floodlights should be installed.

CF lighting uses quantities of mercury in the bulbs and tubes which pose serious environmental hazards. The mercury from one CF bulb can pollute many thousand litres of water if not treated correctly (Eden District Municipality, 2011). CF lighting (energy saving bulbs and tubes) must be correctly disposed of at registered Hazardous waste sites. Companies like Pick n Pay and Woolworths offer facilities to collect CF bulbs for recycling and disposal. The following should be considered when handling CF bulbs (eHow Home, 2011):

Energy Efficient Appliances

Energy efficient appliances are becoming widely available. Follow the Energy Guide labels on appliances to help selection of correct models. Any appliance that has to heat up water or air will use more energy, as will an appliance that boasts additional extras such as ice making, dispensing and auto defrosting on fridges or heat drying on dishwashers.

Solar Cooling Systems

Where required by homeowners, the homeowner should consider the use of solar cooling systems such as absorption or adsorption chillers as opposed to conventional air conditioning units.

Evaporative Cooling Systems

Consideration should be given to evaporative cooling systems as these cut down considerably on energy usage for appliances such as air conditioners. Furthermore, the system ensures that fresh air circulates within housing units, which improves on environmental health risks.

Fresh air is drawn from outside the house (the hotter the better) and passes through moistened pads which cools it down and filters it before flowing through outlets in the house.

There are certain parameters required for evaporative cooling systems, which should be thoroughly investigated prior to installation.

Geyser and pipe insulation

Apart from the savings in terms of energy as detailed below, insulating geysers and pipes save water, as shorter periods of running the tap to get hot water are required.

All structures should have insulation on geysers and all hot water pipes.

7 CONSTRUCTION CONSIDERATIONS

These Construction Phase requirements are aimed at using Best Practise Principles and/or specialist recommendations to manage the impacts on the environment during the construction of the development.

Table 3: Site Clearance Methodology.

No	Action	Scheduling
1	**Survey** approved layout on site.	Prior to construction
2	**Establish site camp** and **material stockpile sites** (incl. waste disposal area, portable toilets etc. The construction camp and necessary ablution facilities meant for construction workers must not be in any of the delineated no-go / sensitive areas.	Prior to construction.
3	**Demarcate work areas** using correct demarcation methods. (milkwood tree must have a 2m high screen outside the drip line of the trees/vegetation – ECO to advise).	Prior to construction.
4	**Demarcate sensitive areas as no-go areas** in consultation with the ECO. Demarcation must be up prior to any site clearing/construction works commencing and must remain in place (and well maintained) for the duration of the construction phase.	Prior to construction.
5	**Erosion control measures** must be put in place prior to any construction activities that would result in soil being exposed.	Prior to construction.
6	Weather forecasts from the South African Weather Bureau of up to three days in advance must be monitored on a daily basis to avoid exposing soil, works or materials during a storm event. This must be considered in conjunction with tide tables for beach construction work.	Construction
7	Commence with mechanical vegetation clearing within the demarcated work areas only.	Construction

8	Vegetation clearing should occur **in parallel with the construction progress** to minimise erosion and/or run-off. Large tracts of bare soil will either cause dust pollution or quickly erode and then cause sedimentation in the lower portions of the catchment.	Construction
9	Any biomass from the clearing activities must be stockpiled within the development footprint at an area / areas approved by the ECO. It is recommended that the biomass must be **chipped in situ** and stockpiled within designated areas within the footprint. Alternatively, it must be removed and taken to an approved disposal site for biomass. NO DUMPING IS ALLOWED.	Construction
10	Any cleared areas that will not be immediately constructed or planted, must be covered with the wood chips or other mulch to prevent wind erosion.	Construction

7.1 STORMWATER MANAGEMENT

Management Outcome	Impacts & Risks Avoided
To minimise the generation of contaminated stormwater.	Minimise sedimentation, erosion and/or undercutting.

Management Actions

a. Develop level spreaders along the fence line to prevent the high-velocity of stormwater runoff.

Method of monitoring implementation	Frequency of Monitoring	Responsible Party for implementing management action	Time period	Mechanism for monitoring Compliance	Programme for reporting on Compliance
Method Statement	Once off	Developer / contractor	Pre implementation	Audit	Once off

Any areas that are identified by the ECO as being prone to erosion must be suitably protected. During construction, the contractor shall protect all areas susceptible to erosion by installing temporary works (e.g., sandbags, haybales, silt fences) and by taking any other measures necessary to prevent stormwater from concentrating in streams and scouring slopes, banks, etc.

In areas where construction activities have been completed and where no further disturbance would take place, rehabilitation and re-vegetation should commence as soon as possible. A suitable rehabilitation method statement must be submitted to the ECO for approval.

7.2 DUST CONTROL

Management Outcome	Impacts & Risks Avoided
To ensure there is no health risk or loss of amenity due to emission of dust to the environment.	Ensure land coverage with biomass chips / vegetation / damping to minimise dust.

Management Actions

a. Implement a dust prevention strategy, developed at the project planning stage

Method of monitoring implementation	Frequency of Monitoring	Responsible Party for implementing management action	Time period	Mechanism for monitoring Compliance	Programme for reporting on Compliance
Method Statement	Once off	Developer / contractor	Pre implementation	Audit	Once off

The strategy should include the following amongst others:

- Speed control to minimise dust on site.
- Exposed stockpile materials must be adequately **protected** against wind (covered) and should be sited taking into consideration the prevailing wind conditions.
- Trucks bringing in materials must be covered to prevent dust and small particles escaping and potentially causing damage to people and property.

7.3 NOISE AND VIBRATION

Management Outcome	Impacts & Risks Avoided
To ensure nuisance from noise and vibration does not occur.	Nuisance impacts to neighbours and visitors.

Management Actions

a. Fit and maintain appropriate mufflers on earth-moving and other vehicles on the site.

Method of monitoring implementation	Frequency of Monitoring	Responsible Party for implementing management action	Time period	Mechanism for monitoring Compliance	Programme for reporting on Compliance
As required	Initially when vehicle or machinery is introduced to the site and thereafter monthly.	Contractor	During construction and operation	Audit	As required

	As required if complaints registered.				
b. Enclose noisy equipment such as generators and pumps.					
Method of monitoring implementation	Frequency of Monitoring	Responsible Party for implementing management action	Time period	Mechanism for monitoring Compliance	Programme for reporting on Compliance
As required	Initially when vehicle or machinery is introduced to the site and thereafter monthly. As required if complaints registered.	Contractor	During construction	Audit	As required
c. Provide noise attenuation screens, where appropriate.					
Method of monitoring implementation	Frequency of Monitoring	Responsible Party for implementing management action	Time period	Mechanism for monitoring Compliance	Programme for reporting on Compliance
As required	Initially when vehicle or machinery is introduced to the site and thereafter monthly. As required if complaints registered.	Contractor	During construction	Audit	As required
d. Where an activity is likely to cause a noise nuisance to nearby residents, restrict operating hours to between 7 am and 6 pm weekdays and 8 am to 1 pm Saturday, except where, for practical reasons, the activity is unavoidable. No work to take place on Sundays.					
Method of monitoring implementation	Frequency of Monitoring	Responsible Party for implementing management action	Time period	Mechanism for monitoring Compliance	Programme for reporting on Compliance

As required	As required if complaints registered.	Contractor	During construction	Audit	As required

7.4 TRAFFIC CONTROL

Management Outcome	Impacts & Risks Avoided
To manage and minimise the nuisance effect created by construction traffic.	The development entrance access will be via Beacon Way between the Checkers Centrum and Plett Primary School. Increase in traffic during construction phase along the access route.

Management Actions

a. Implement a traffic management strategy during construction.

Method of monitoring implementation	Frequency of Monitoring	Responsible Party for implementing management action	Time period	Mechanism for monitoring Compliance	Programme for reporting on Compliance
Method Statement	Daily	Contractor	During construction	Audit	As required

- Construction related activities should be timed where possible to avoid peak periods.
- No construction workers, apart from security personnel, should be allowed to stay on site overnight.
- Contractors appointed by the developer must ensure that workers are transported to and from the site daily.
- Construction related activities should comply with all relevant building regulations. In this regard activities on site should be restricted to between 07:00 and 18:00 during weekdays and 08:00 and 13:00 on Saturdays. No work should be permitted on Sundays and public holidays.

7.5 WASTE MANAGEMENT

Management Outcome	Impacts & Risks Avoided
To minimise the waste load discharged to the environment.	Improve waste disposal methods during construction. Reduce waste volumes to landfill sites.

Management Actions

a. Reduce wastes by selecting, in order of preference, avoidance, reduction, reuse and recycling.

Method of monitoring implementation	Frequency of Monitoring	Responsible Party for implementing management action	Time period	Mechanism for monitoring Compliance	Programme for reporting on Compliance

Record of volumes of material removed	As required	Contractor	As required	Audit	Records
b. Maintain a high quality of housekeeping and ensure that materials are not left where they can be washed or blown away to become litter.					
Method of monitoring implementation	Frequency of Monitoring	Responsible Party for implementing management action	Time period	Mechanism for monitoring Compliance	Programme for reporting on Compliance
Photographic	Weekly	Contractor	As required	Audit	Records
c. Provide bins for construction workers and staff at locations where they consume food.					
Method of monitoring implementation	Frequency of Monitoring	Responsible Party for implementing management action	Time period	Mechanism for monitoring Compliance	Programme for reporting on Compliance
Photographic	Weekly	Contractor	As required	Audit	Records
d. Conduct ongoing awareness with staff of the need to avoid littering.					
Method of monitoring implementation	Frequency of Monitoring	Responsible Party for implementing management action	Time period	Mechanism for monitoring Compliance	Programme for reporting on Compliance
Induction	Once off	Contractor	As required	Audit	Attendance register

7.6 STOCKPILE MANAGEMENT

Management Outcome	Impacts & Risks Avoided
To manage soil stockpiles so that dust and sediment in run-off are minimised.	Pollution due to dust and sediment runoff.

Management Actions					
a. Minimise the number of stockpiles, and the area and the time stockpiles are exposed.					
Method of monitoring implementation	Frequency of Monitoring	Responsible Party for implementing management action	Time period	Mechanism for monitoring Compliance	Programme for reporting on Compliance

Photographic	As required	Contractor	As required	Audit	Records
b. Keep topsoil and underburden stockpiles separate.					
Method of monitoring implementation	Frequency of Monitoring	Responsible Party for implementing management action	Time period	Mechanism for monitoring Compliance	Programme for reporting on Compliance
Visual inspection of stockpiles	Daily when stripping topsoil	Contractor	Continuously during construction	Audit	Records
c. Ensure that stockpiles and batters are designed with slopes no greater than 2:1 (horizontal/vertical).					
Method of monitoring implementation	Frequency of Monitoring	Responsible Party for implementing management action	Time period	Mechanism for monitoring Compliance	Programme for reporting on Compliance
Visual inspection of stockpiles	As required	Contractor	Continuously during construction	Audit	Monthly
d. Stabilise stockpiles and batters that will remain bare for more than 28 days by covering with mulch or anchored fabrics or seeding with sterile grass.					
Method of monitoring implementation	Frequency of Monitoring	Responsible Party for implementing management action	Time period	Mechanism for monitoring Compliance	Programme for reporting on Compliance
Visual inspection of stockpiles	As required	Contractor	Continuously during construction	Audit	Monthly
e. Establish sediment controls around unstabilised stockpiles and batters.					
Method of monitoring implementation	Frequency of Monitoring	Responsible Party for implementing management action	Time period	Mechanism for monitoring Compliance	Programme for reporting on Compliance
Visual inspection of stockpiles	As required	Contractor	Continuously during construction	Audit	Monthly

f. Suppress dust on stockpiles and batters, as circumstances demand.					
Method of monitoring implementation	Frequency of Monitoring	Responsible Party for implementing management action	Time period	Mechanism for monitoring Compliance	Programme for reporting on Compliance
Visual inspection of stockpiles	As required	Contractor	Continuously during construction	Audit	Monthly

7.7 STORING FUELS & CHEMICALS

Management Outcome	Impacts & Risks Avoided
To ensure that fuel and chemical storage is safe, and that any materials that escape do not cause environmental damage.	Avoid hydrocarbon pollution to soil and watercourses/coastal environments.

Management Actions					
a. Minimise fuels and chemicals stored onsite.					
Method of monitoring implementation	Frequency of Monitoring	Responsible Party for implementing management action	Time period	Mechanism for monitoring Compliance	Programme for reporting on Compliance
Method statement	As required	Contractor	As required	Audit	Method statement records
b. Install bunds and take other precautions to reduce the risk of spills.					
Method of monitoring implementation	Frequency of Monitoring	Responsible Party for implementing management action	Time period	Mechanism for monitoring Compliance	Programme for reporting on Compliance
Method statement	As required	Contractor	As required	Audit	Method statement records

c. Implement a contingency plan to handle spills, so that environmental damage is avoided.					
Method of monitoring implementation	Frequency of Monitoring	Responsible Party for implementing management action	Time period	Mechanism for monitoring Compliance	Programme for reporting on Compliance
Method statement	As required	Contractor	As required	Audit	Method statement records

7.8 MINIMISING EROSION

Management Outcome	Impacts & Risks Avoided
To minimise the quantity of soil lost during construction due to land-clearing.	Avoid siltation by installing silt traps.

Management Actions					
a. Schedule measures to avoid and reduce erosion by phasing the work program to minimise land disturbance in the planning and design stage.					
Method of monitoring implementation	Frequency of Monitoring	Responsible Party for implementing management action	Time period	Mechanism for monitoring Compliance	Programme for reporting on Compliance
Method statement	As required	Contractor	As required	Audit	Method statement records
b. Keep the areas of land cleared to a minimum, and the period areas remain cleared to a minimum.					
Method of monitoring implementation	Frequency of Monitoring	Responsible Party for implementing management action	Time period	Mechanism for monitoring Compliance	Programme for reporting on Compliance
Method statement	As required	Contractor	As required	Audit	Method statement records

c. Base control measures to manage erosion on the vulnerability of cleared land to soil loss, paying particular attention to protecting slopes.					
Method of monitoring implementation	Frequency of Monitoring	Responsible Party for implementing management action	Time period	Mechanism for monitoring Compliance	Programme for reporting on Compliance
Method statement	As required	Contractor	As required	Audit	Method statement records
d. Mulch, roughen and seed cleared slopes and stockpiles where no works are planned for more than 28 days, with sterile grasses.					
Method of monitoring implementation	Frequency of Monitoring	Responsible Party for implementing management action	Time period	Mechanism for monitoring Compliance	Programme for reporting on Compliance
Method statement	As required	Contractor	As required	Audit	Method statement records
e. Keep vehicles to well-defined haul roads (From Beacon Way).					
Method of monitoring implementation	Frequency of Monitoring	Responsible Party for implementing management action	Time period	Mechanism for monitoring Compliance	Programme for reporting on Compliance
Site plan	As required	Contractor	As required	Audit	Final site plan
f. Rehabilitate cleared areas promptly.					
Method of monitoring implementation	Frequency of Monitoring	Responsible Party for implementing management action	Time period	Mechanism for monitoring Compliance	Programme for reporting on Compliance
Visual / photographic	As required	Contractor	Continuously during construction	Audit	Final Rehabilitation statement

7.9 REHABILITATION & BOTANICAL MANAGEMENT

Management Outcome	Impacts & Risks Avoided
To ensure that degradation to existing botanical/aquatic components are minimised and that any rehabilitation is undertaken with conservation orientated approach.	To minimise the disturbance to existing flora. To minimise the introduction and/or spread of weed species.

Management Actions

a. Demarcate sensitive areas to avoid damage during construction.

Method of monitoring implementation	Frequency of Monitoring	Responsible Party for implementing management action	Time period	Mechanism for monitoring Compliance	Programme for reporting on Compliance
Method statement	As required	Contractor / George Municipality	Continuously	Audit	Visual / photographic

b. Rehabilitation and landscaping may only make use of indigenous vegetation.

Method of monitoring implementation	Frequency of Monitoring	Responsible Party for implementing management action	Time period	Mechanism for monitoring Compliance	Programme for reporting on Compliance
Visual / photographic	As required	Contractor / George Municipality	Continuously	Audit	Visual / photographic

All necessary plant permits must be obtained prior to the commencement of any construction activities for the following species:

- *Carpobrotus edulis*
- *Delosperma inconspicuum*
- *Tetragonia decumbens*
- *Tetragonia fruticose*
- *Carpobrotus deliciosus*
- *Brunsvigia orientalis*
- *Aloe arborescens*
- *Aloiampelos ciliaris*
- *Chasmanthe aethiopica*
- *Gladiolus gueinzii*
- *Sideroxylon inerme*
- *Agathosma apiculate*

7.10 FAUNA MANAGEMENT

Management Outcome	Impacts & Risks Avoided

To ensure that impacts to native faunal species is minimised and/or avoided.	To minimise the impact to fauna.

Management Actions

a. Prevent unnecessary mortalities of indigenous fauna.

Method of monitoring implementation	Frequency of Monitoring	Responsible Party for implementing management action	Time period	Mechanism for monitoring Compliance	Programme for reporting on Compliance
Ad hoc	As required	Contractor	Continuously	Audit	Visual / photographic

7.11 SOCIAL REQUIREMENTS

Management Outcome	Impacts & Risks Avoided
To ensure equitable, fair and safe social interaction on construction sites.	Loss of employment opportunities to the region.

Management Actions

a. It is strongly recommended that the Contractor make use of local labour as far as possible for the construction phase of the project.

Method of monitoring implementation	Frequency of Monitoring	Responsible Party for implementing management action	Time period	Mechanism for monitoring Compliance	Programme for reporting on Compliance
Employment records	Ad hoc	Contractor	Ad hoc	Audit	Once off

b. Theft and other crime associated with construction sites is not only a concern for surrounding residents, but also the Developer and the Contractor.

Method of monitoring implementation	Frequency of Monitoring	Responsible Party for implementing management action	Time period	Mechanism for monitoring Compliance	Programme for reporting on Compliance
Site records	Ad hoc	Contractor	Ad hoc	Audit	Once off

Targets

- The contractor should endeavour to source local suppliers.

- The contractor must ensure that suitable procurement policies are in place that supports local economic growth.
- Locally manufactured products must be used as far as possible.

Site Security

Theft and other crime associated with construction sites is not only a concern for surrounding residents, but also the developer and the contractor.

Considering this, contractors need to be proactive in order to curtail theft and crime on and resulting from the construction site. It is recommended that the contractor develop a jobsite security plan prior to commencement of construction. This jobsite security plan should take into account protection of the construction site from both internal and external crime elements as well as the protection of surrounding communities from internal crime elements. All incidents of theft or other crime should be reported to the South African Police Service, no matter how seemingly insignificant.

7.12 METHOD STATEMENTS

Management Outcome	Impacts & Risks Avoided
To ensure efficient communication mechanisms in the implementation of environmental performance requirements.	Prevention of potential impacts are avoided during construction by means of correct communication.

Management Actions

a. Method statements are written submissions by the Contractor to the ECO in response to the requirements of this EMMPr or to a request by the ECO. The Contractor shall be required to prepare method statements for several specific construction activities and/or environmental management aspects.

Method of monitoring implementation	Frequency of Monitoring	Responsible Party for implementing management action	Time period	Mechanism for monitoring Compliance	Programme for reporting on Compliance
Method statement	Ad hoc	Contractor	As required	Audit	Once off

Based on the specifications in this EMMPr, the following method statements are required as a minimum (more method statements may be requested as required at any time under the direction of the ECO):

- Demarcation of “No-Go” areas.
- Site clearing.
- Alien vegetation management.
- Plant rescue (protected species; permit required).
- Hazardous substances and their storage.
- Materials requirements and sourcing.
- Solid waste control system.
- Fire control and emergency procedures.
- Stormwater management and water quality control.
- Erosion control.
- Traffic control.

- Noise control.

7.13 CEMENT BATCHING

Management Outcome	Impacts & Risks Avoided
Cement powder has a high alkaline pH that may contaminate and adversely affect both soil pH and water pH negatively. A rapid change in pH can have consequences on the functioning of soil and water organisms as well as on the botanical component.	Minimises negative impacts to vegetation and soils on areas that will not be hard surfaced.

Management Actions

b. All concrete batching must take place on an area that is to be hard surfaced as part of the development.

Method of monitoring implementation	Frequency of Monitoring	Responsible Party for implementing management action	Time period	Mechanism for monitoring Compliance	Programme for reporting on Compliance
Method statement	As required	Contractor	As required	Audit	Method statement records

c. Concrete mixing areas must have bund walls or a settling pond in order to prevent cement run off. Once the settling ponds dry out, the concrete must be removed and dispatched to a suitable disposal site.

Method of monitoring implementation	Frequency of Monitoring	Responsible Party for implementing management action	Time period	Mechanism for monitoring Compliance	Programme for reporting on Compliance
Method statement	As required	Contractor	As required	Audit	Method statement records

d. When using Readymix concrete, care must be taken to prevent spills from the trucks while offloading. This form of batching is preferable for large constructions as no on site batching is required and there is a lesser likelihood of accidental spills and run off. Trucks may not be washed out on site.

Method of monitoring implementation	Frequency of Monitoring	Responsible Party for implementing management action	Time period	Mechanism for monitoring Compliance	Programme for reporting on Compliance

Method statement	As required	Contractor	As required	Audit	Method statement records

7.14 HERITAGE REQUIREMENTS

Management Outcome	Impacts & Risks Avoided
To minimise the impacts of development, operation and maintenance of the Project on the heritage values in the Project area.	Ensure heritage impacts are minimised and impacts outside of the approved disturbance area are avoided.

Management Actions

a. No disturbance of heritage values outside of the approved disturbance area.

Method of monitoring implementation	Frequency of Monitoring	Responsible Party for implementing management action	Time period	Mechanism for monitoring Compliance	Programme for reporting on Compliance
Site records	Ad hoc	Contractor	Ad hoc	Audit	Once off

- Should any heritage remains of potential cultural value be exposed during excavations, these must be immediately reported to the ECO and the Provincial Heritage Resource Authority of the Western Cape, namely Heritage Western Cape in terms of the national Heritage Resources Act (Act No. 25 of 1999). Heritage remains uncovered or disturbed during earthworks may not be disturbed further until the necessary approval has been obtained from Heritage Western Cape.
- Should any archaeological remains including (but not limited to) fossil bones, fossil shells, coins, indigenous ceramics, colonial ceramics, marine shell heaps, stone artefacts, bone remains, rock art, rock engravings and any antiquity be discovered during construction, they must be immediately reported to the ECO and Heritage Western Cape and not disturbed further until the necessary approval has been obtained.
- Should any human remains be uncovered, they must immediately be reported to the ECO and the HWC archaeologist, who can be contacted on **(021) 483 9685**. Construction in the area must cease immediately and the site may not be disturbed further until the necessary approval has been obtained.

8 FENCING DESIGN SPECIFICATIONS AND MITIGATION MEASURES

The following fencing design specification and mitigation measures are to be adhered to:

- The proposed fence must be designed and constructed in line with the Policy on Fencing and Enclosure of Game, Predators and Dangerous Animals in the Western Cape Province (CapeNature, 2014), particularly in terms of the following minimum requirements:
- The fence must be permeable to allow for movement of small, naturally occurring wild animals. Considering the faunal species likely to utilise the project area (particularly Sensitive Species 8), the proposed fence must be constructed using a type fencing with a 120 mm gap between pales to allow movement of fauna to and from the project area and the estuary. Larger breaks in the fence approximately 40 cm high (measured from the ground surface) and 21 cm wide, must be created at regular intervals along the length of the fence to allow for faunal movement to and from the site.
- A faunal specialist must be appointed to confirm the faunal corridors linking the project area and the estuary once the fence plan has been finalised. The location of faunal corridors must inform the placement of the breaks in the fencing (i.e. breaks must intercept faunal corridors to allow the continued movement of faunal species). However, a maximum spacing of 75 m between gaps in the fencing is permitted.
- The straining, concern and gateposts must be sturdy and be set vertically into the ground.
- All fence posts must stand erect and maintain the same height above ground level. In this way the undulations of the ground are followed.
- The fence must be correctly maintained and gaps in the fencing must be inspected regularly. These gaps must be kept free of obstructions, including plant growth and debris.
- Straining posts must not be too far apart. The closer they are together, the studier the fence.
- The fence must be visible to animals to prevent unnecessary collisions with the fence.
- The fence cannot be erected with inferior material.
- The landowner/body corporate must make provision for damage to the fence or enclosure as a result of fires, floods, or other emergencies or disasters.
- The proposed fence must follow the existing access route on either alternative routing and additional clearing of thicket vegetation is not permitted unless for trimming/maintenance purposes.
- Electric fencing, barbed and razor wire must be avoided as this could pose a collision threat to birds and result in the electrocution and death of faunal species moving through the fence. If electric fencing is used, this must be placed on top of the fence but should not exceed the height of the surrounding thicket vegetation.
- No electric strands may be within 1m of the ground as this can result in the electrocution and death of faunal species. Markers must be placed on electric fencing so that it is visible to birds. Although the fence will be erected along an existing access route, vegetation must not be allowed to touch the electric fencing. Where necessary, shrubs must be pruned and a gap between vegetation and electric fencing must be maintained [NB: vegetation clearance/strip clearing is not permitted, only pruning/trimming. If the pruning of any protected trees is required, the necessary permit must be obtained from the Department of Agriculture, Forestry and Fisheries (DAFF)).

- Fencing should be of dark colour and not blend into the surrounding vegetation so that it is visible to faunal species, particularly birds.
- Access points for delivery of material are only from the northern side along drier parts of the wetland where the area has been mowed and disturbed already. No access is permitted by vehicle along the southern edge because this has high sensitivity wetland vegetation and is very wet.
- The fenceline may not be installed during the breeding season from September to February. This is to avoid disturbance or harm to dispersing wildlife which are more active and vulnerable at this time.
- The fenceline may not be installed during the breeding season from September to February. This is to avoid disturbance or harm to dispersing wildlife which are more active and vulnerable at this time.
- Fencelines can be installed with the help of a small machine such as a bobcat, but should otherwise be installed by hand. No excavations or larger machines are permitted to drive along the fenceline.
- Vegetation obstructing work on the fenceline should be cut or trimmed, and not uprooted, unless in the direct path of the fenceline.
- Disturbed soil along the fenceline should be revegetated with low growing indigenous grass already found at the site. *Strenotaphrum secondatum* (buffalo grass) is recommended in wetland areas. This can create a relatively open area along the fenceline which can be monitored or patrolled on foot.
- Any concrete mixing for posts must be contained in a wheelbarrow or small vehicle (e.g. Kubota), and is not permitted on the ground, especially in the wetland or buffer areas.
- Excess concrete must be removed from the site and disposed of. No waste materials, dirty water, or concrete may be left in the wetland area. This must be monitored closely by the Eco with incidents immediately reported to DEA&DP and/or BOCMA.
- Absolutely no washing of tools in water in the wetland.
- No water from the wetland may be used to mix concrete.
- Any vegetation cleared for installation of the fenceline must be removed from the site, or lightly scattered. It cannot be piled up along he fence, which creates further barriers and smothers vegetation.

9 OPERATIONAL PHASE ENVIRONMENTAL MANAGEMENT REQUIREMENTS

The Operational/Maintenance Phase of this EMMPr refers to the day to day management activities that are required to ensure sustainability and the achievement of the principles and objectives of the development. The requirements are applicable to the proponent, all employees and all visitors to the property.

9.1 ALIEN VEGETATION MANAGEMENT

Management Outcome	Impacts & Risks Avoided

To ensure that indigenous vegetation is encouraged within urban areas.	Ongoing spread of alien invasive species. Ensure protected species are taken into consideration.

Management Actions					
a. Staff must practice ongoing alien invasive management.					
Method of monitoring implementation	Frequency of Monitoring	Responsible Party for implementing management action	Time period	Mechanism for monitoring Compliance	Programme for reporting on Compliance
Visual / photographic	Ongoing	George Municipality	As required	Audit	Audit
b. Retain and manage protected and indigenous vegetation.					
Method of monitoring implementation	Frequency of Monitoring	Responsible Party for implementing management action	Time period	Mechanism for monitoring Compliance	Programme for reporting on Compliance
Visual / photographic	Ongoing	George Municipality	As required	Audit	Audit

Rehabilitate with appropriate indigenous vegetation to promote soft landscaping.

Replace vegetation if it dies off with indigenous vegetation.

9.2 STORMWATER MANAGEMENT

Management Outcome	**Impacts & Risks Avoided**
To ensure management of stormwater during operation phase	To prevent erosion due to stormwater impact

Management Actions					
a. No stormwater runoff should be allowed to concentrate onto open spaces and downstream of the property. Stormwater must infiltrate through the provided stormwater retention pond.					
Method of monitoring implementation	Frequency of Monitoring	Responsible Party for implementing management action	Time period	Mechanism for monitoring Compliance	Programme for reporting on Compliance
Ensure soft landscaping	Ongoing	Developer / HOA	As required	Audit	Audit

- Concentration of stormwater runoff will be minimised through the application of landscaping techniques, i.e., by creating grass lined swales, undulations and depressions.
- Ensure rainwater harvesting takes place.

10 CONSERVATION MANAGEMENT PLAN (OPEN SPACE MAINTENANCE AND MANAGEMENT)

The purpose of this Conservation Management Plan (CMP) component of the EMMPr is to address and guide activities within this designated area to ensure that it is managed in an integrated manner, to promote biodiversity management objectives and a conservation use. This is to ensure a positive conservation outcome into the future during the operational phase of the estate.

This Conservation Management Plan (CMP) is applicable to all Open Space areas associated with the development. The most prominent of all the open space areas is located in the eastern portion (~10.58ha) of RE/6503 which abuts the Keurbooms Estuary.

Figure 7: Proposed Open Space Area on RE/6503.

This portion of land forms the most important aspect of the CMP. Small portions (~0.37ha) of communal open space areas are proposed throughout the development, however these will entail a communal parking area, maintenance and admin buildings as well as pedestrian walkways that connect the development with the private nature reserve area.

The CMP is applicable to both Construction and Operation phases of the development. The action items associated with this EMMPr are also applicable at all times. This CMP thus focusses specifically on biodiversity management.

10.1 DEMARCATION OF ERVEN & OPEN SPACE INTERFACE AREAS

- Prior to any site clearing/earthworks/vegetation removal all erf boundaries bordering onto the No-Go Conservation Area, must be clearly demarcated to (A) define the open space area as excluded from private property boundaries, (B) to prevent any pet dogs from accessing the open space areas unaccompanied and (C) establish a visual barrier that can be monitored.
- Temporary demarcation during construction must be such that it is highly visible and must be marked clearly as NO-GO areas.
- Owners/Tenants bordering onto the No-Go conservation area may NOT extend any formal landscaping (gardening), or structures (i.e. children's play areas) beyond their property boundaries into these open space areas.
    - It is the responsibility of the Holder/HoA/Managing Agent to conduct regular inspections along these interfaces / contact areas with the No-Go conservation areas to ensure that no form of 'creeping' is permitted or entertained;
- Owners/Tenants, may NOT clear any vegetation beyond their property boundaries into the No-Go conservation areas to utilise privately.
    - It is the responsibility of the Holder/HoA/Managing Agent to conduct regular inspections along these interfaces / contact areas with the No-Go conservation areas to ensure that no form of 'creeping' is permitted or entertained;
- When erecting temporary or permanent boundary fences along the No-Go conservation areas, workers must make every effort to work from the development footprint side so as to avoid/minimise any temporary disturbance on the open space areas.
- In all instances the ECO must specifically monitor and report on these interface areas with the No-Go conservation areas during construction and operational phases to ensure no 'creeping' takes place over time. Any non-compliance must be reported to the Holder/HOA/Managing Agent immediately for them to issue instructions to remove/rehabilitate such affected areas without delay.

10.2 ACCESS TO OPEN SPACE AREAS

- During construction, workers may NOT enter the demarcated open space areas unless it is the teams responsible for invasive alien vegetation clearing in the designated open space areas OR a team responsible for fire-fighting and then only allow existing access/vehicular routes.
    - Method Statements must be submitted to the ECO for approval for any minimal trimming of vegetation that may hinder/prevent effective fire management/invasive alien vegetation clearing.
- During operational phase residents/visitors may only access the open space areas (excluding the communal open space area) in terms of the conditions permitting access (refer to open space trail map below).
- Specific reference in the HOA Constitution, as well as via the provision of information pamphlets and sign boards/notices place strategically along the open space areas of the property at all existing access points to the open space areas, prohibiting the following:
    - No pets permitted in the No-Go conservation area unless they are on a leash under full control of the owner;
    - Picking of flowers/plant clippings/damage to vegetation/collecting fauna not permitted;
    - User must remain on existing access routes only and no new footpaths / accesses may be created unless it is of a temporary nature for clearing of invasive alien vegetation/firefighting in the open spaces, in which case the temporary access

must be blocked-off once the clearing/firefighting team has achieved its target and only with permission from the ECO in accordance with a Method Statement.

10.3 INVASIVE ALIEN VEGETATION MANAGEMENT

For on-site invasive alien vegetation management, the Holder must ensure continuous invasive alien clearing during construction and operation.

- The ECO must do a monthly visual inspection of phases not yet developed, as well as the remnant natural No-Go areas, to identify any listed invasive alien plant species that require removal;
- The ECO must provide an instruction to the Contractor on how such species must be removed / disposed off in accordance with Alien Clearing Guideline document attached as Appendix 6;
- The ECO must report on ongoing invasive alien vegetation removal in monthly Environmental Control Reports to the Competent Authority.

10.4 ESTATE LANDSCAPING & MANAGEMENT OF PRIVATE GARDENS

Within urban environments, one of the greatest impacts on adjoining/surrounding open space areas is the spread of exotic / alien invader vegetation indiscriminately planted in gardens and landscaping of recreational open space areas. Plants do not adhere to boundaries such as fences or cadastral units, and may be blown, carried (by fauna) or creep outside of designated areas (gardens) and establish themselves in natural areas. This results in the so called “garden escapees”, which can negatively affect the biodiversity and ecological functioning of natural areas. The most effective method of preventing this is simply to landscape with only locally occurring, indigenous plant species. The other benefits to using this approach is that local indigenous plants are adapted to local conditions and use less water and/or fertilisers i.e. require less maintenance.

The vegetation type mapped to occur in the area is Goukamma Dune Thicket. However, aside from taking note of and/or identifying what plant species are currently growing naturally in the open space corridors, it is often difficult to determine what indigenous plant species are considered to be ‘local’ and are known to grow in Goukamma Dune Thicket, and in the Southern Cape for that matter. It is not always an easy task to recreate or replant indigenous vegetation types in a garden setting.

The following points must be adhered to or implemented by residents and service providers (garden services) in this regard:

- No invasive alien plant species may be used for any gardening landscaping purposes. All listed alien plant species must be removed from the property and may not be reintroduced through rehabilitation or landscaping.
- Under no circumstances may garden waste / ornamental plant species material be disposed of in the open space areas / corridors;
    - It is the responsibility of the Holder/HOA/Managing Agent to monitor the interface erven, as well as the access routes within the open space areas, to ensure that residents/tenants do not dispose of their garden waste into the adjacent open space areas;
    - The ECO must monitor the interface erven with the open space areas, as well as the access routes within the open space areas;
- All garden waste material must be collected and disposed of at a suitably registered facility (unless re-used in the garden/landscaped areas of the Estate);

- The use of water-wise landscaping is recommended, not only in the interests of water conservation, but because excessive watering can create changes in the nutrient levels and hydrological capabilities of the soil.

10.5 WILDLIFE MANAGEMENT IN THE OPEN SPACE AREAS

Developments of any kind create several problems for the indigenous fauna of an area. This includes destruction and fragmentation of their habitat, destruction of corridors, introduction of problem animals, poaching, road mortality and disturbance of breeding sites to name a few. There have been many recorded sitings of various animals, including leopard, as well as a comprehensive bird list along the Keurbooms River. This section identifies various mechanisms that can be adopted by home owners to improve their interaction with the local wildlife (Harrison, 2008 and CapeNature).

Avoid Destruction of Natural Habitats and Populations

Habitat destruction is the prime driver in the decimation of populations.

- Restrict development and construction activities outside the No-Go conservation areas and maintain groundcover until such time as it will be transformed;
- Clear each building site or development phase individually to allow animals/reptiles to relocate to undisturbed areas;
- Restrict the footprint of development to the smallest area possible;
- Preserve undeveloped portions of erven in their natural state (trimming of vegetation permitted to keep the site neat whilst vacant);
- Create laydowns in previously disturbed areas or within areas that are to be developed to avoid unwanted and costly rehabilitation post-construction;
- Clear the site in a logical sequence (towards natural areas in order to allow fauna to escape towards open space areas);
- Rehabilitate affected areas, where applicable;
- Manage functional areas appropriately i.e. recreational areas are not conservation areas;
- Compensate for loss of habitats through creating indigenous gardens;
- Facilitate search-and-rescue operations before and during site clearance;
- Leave undeveloped portions of erven unfenced to optimize animal movement over the longest possible period of time;
- Wherever possible, place pipelines and cables underground, and rehabilitate – all outside of the open space conservation areas;

Road Mortality

Road deaths of animals as a direct result of human actions must be avoided by adhering to the following:

- Restrict speed on all internal roads;
- Use appropriate curb designs (recommend edge restraint and/or mountable instead of barrier curbs).

Light Pollution

The unnecessary introduction of lighting can change animal behaviour and must be avoided/minimized in proximity to the No-Go conservation open space areas:

- Reduce exterior lighting and avoid constant lighting bordering onto these areas;
- Use only long-wavelength or low wattage lights for exterior lighting;
- Use directional fittings for exterior lights to reduce lighting on adjacent open space areas;

- Encourage the screening of interior lighting for all erven directly bordering the No-Go conservation open space areas.

Poaching of Local Wildlife

In light of the objectives of conservation and improving biodiversity in the open space areas poaching is strictly prohibited within the boundaries of the property. The following points should be considered to prevent poaching:

- Educate workers to avoid poaching;
- Patrol the area to ensure that no snares are set;
- Report incidents of snaring to the Holder/HOA/Managing Agent;
- Keep a record of incidents;
- In the event of any poachers detected a criminal case must be opened by the Estate against the person/persons responsible for poaching either animal/plant species from the Estate.

Problem-animal Scenarios

Problem animals are created as a direct result of human interference in their habitats. Baboons and monkeys are the most common of problem animals as they most easily adapt to using humans as a food source, and are able to access houses, vehicles and most other units with ease when not sufficiently secured.

In order to minimise the impact of problem animals on people and to protect the animals themselves, the following must be undertaken:

- Do not allow feeding of wild animals;
- Keep attractive resources out of reach, this includes planting of fruit trees too close to dwellings;
- Keep food out of reach of baboons and monkeys i.e. don't leave a picnic unattended;
- Exercise rigorous control of edible refuse;
- Do not leave dustbins outside in easy reach;
- Keep windows and doors securely closed when no at home;
- Avoid bird feeders as the seed / fruit put out for birds do attract other animals as well.
- Feral cats and dogs must be removed from the Estate. Contact the local Society for the Prevention of Cruelty to Animals (SPCA) for assistance in capturing and removing feral animals.

Domestic Animals

Domestic animals such as dogs, cats, monkeys and some birds can cause problems to the natural fauna if not kept adequately enclosed. This is in line with the municipal bylaws regarding domestic animals. The following measures must be implemented and communicated very clearly to all homeowners.

- No domesticated animal may roam outside of the owners property unsupervised;
- Animals roaming the nature areas unsupervised are liable to be removed from the site at the conservation authority's discretion;
- The municipal regulations regarding the number of animals that may be kept must be adhered to.
- No pets may access the open space area of land without being on a leash and under control of the owner/tenant at all times

The following requirements are applicable to the proponent, all employees and all visitors of the property (please also refer to **Figure 8** below for ease of reference):

Open Space Restrictions/Requirements:

- Yellow Routes (**Figure 8**):
  - Pedestrian access allowed.
  - Temporary vehicle access allowed for routine alien vegetation maintenance by HOA as well as for Fire Break Maintenance / Emergencies.
  - Brushcutting allowed for access routes up to a maximum width of 2m.
- Blue Routes (Figure 8):
  - Access not permitted during wet season.
  - No vehicle access allowed (temporary vehicle access allowed for routine alien vegetation maintenance by HOA as well as for Fire Break Maintenance / Emergies).
  - No bicycle access allowed.
  - Brushcutting allowed for access routes up to a maximum width of 2m.
- Additional General Restrictions/Requirements:
  - No herbicides or pesticides may be used during alien vegetation clearance.
  - Only existing access routes through the wetland and buffer may be maintained. Maintenance involves removal of alien vegetation, trimming and weed eating of access routes. No disturbance to plant roots or soil is permitted.
  - The existing footprint of the access routes may not be enlarged.
  - No vehicles are allowed on the beach.
  - No infilling or maintenance as a response to coastal accretion.
  - Signs informing of Open Space Route Restrictions as well as sensitivity of the Goukamma Dune Thicket and the foredune which supports Cape Seashore Vegetation to be erected at entrances to the natural vegetation area.
  - No vegetation to be dumped in the natural vegetation area.
  - Follow up alien investigation must be conducted every 6 months following initial clearing to ensure emergent seedlings are consistently removed.

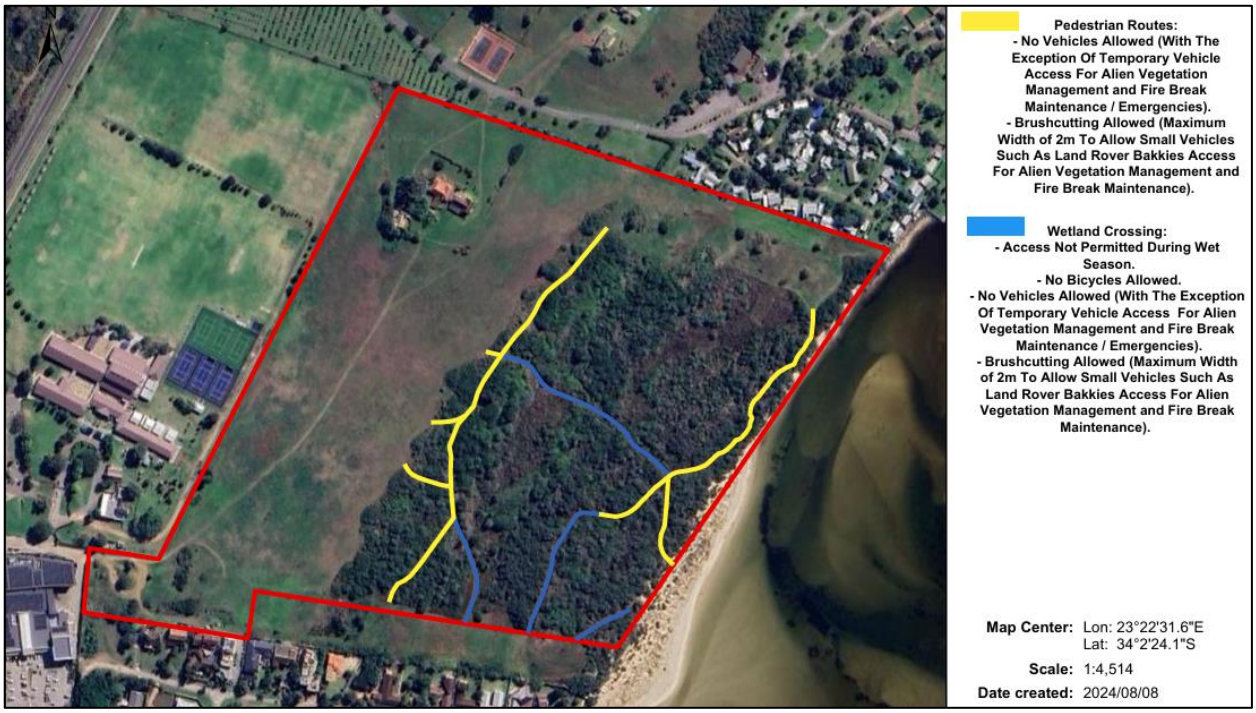


Figure 8: Plett Lagoon Estate Open Space Trail Map.

11 MONITORING, MAINTENANCE & VALIDTY OF EMMPR

11.1 MONITORING

Monitoring is an important tool in determining the effectiveness of management actions by measuring changes in the environment. These could be in the form of fixed-point photography where an area is photographed on a regular/seasonal basis to ascertain changes, monitoring of a particular aspect such as landscape integrity parameters, recordings of animal movement from fixed point etc. The most important aspect of any monitoring programme is **consistency and continuity**. This will ensure a level of scientific accuracy to determine baselines/thresholds and measure changes/deviations, which then Street management reactions.

Any required monitoring reports must be made available to the competent authority as required.

The type and frequency of monitoring must include:

- During construction photographs must be taken from pre-identified fixed points and a comprehensive record maintained by the ECO;
- Incident Reports;
- Site meeting minutes.

11.2 POST-CONSTRUCTION MAINTENANCE & VALIDITY OF EMMPR

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

A "Maintenance Management Plan" means a *management plan for maintenance purposes defined or adopted by the competent authority.*

The following is recommended:

- Conduct an as-built survey of the completed structure and HOA of Plett Lagoon Estate to keep this on record for future maintenance work.
- Any reports of damage to the structure to be followed-up by HOA of Plett Lagoon Estate.
- HOA of Plett Lagoon Estate to conduct visual inspection post heavy rains/flooding for any damage to the structure. Detect damages/abnormalities (bulging, broken components, corrosion of mesh baskets, vegetation growth or vandalism).
- DEA&DP to be notified, seven (7) days in advance, of any maintenance work.
- Appoint an ECO to monitor maintenance work.
- Holder of the EA must supply ECO with a Method Statement for maintenance work in order to determine inspection frequency.
- ECO completion report once maintenance is complete.
- Maintenance work to be undertaken in line with EMMPr and as-built survey (engineer to confirm compliance with "as-built").

11.3 MONITORING TIMEFRAMES SUMMARY

Table 4: Monitoring Timeframe Summary

MONITORING TIMEFRAMES		
Type	Frequency	Criteria
ECO visits	As per section 5.4	Site photographs/site diary

Record keeping	Bi-weekly during construction	Site photographs, method statements, site meeting minutes (if applicable)
	3-month post construction	Completion Statement
Auditing	One year post construction	Compliance with the EA, EMMPr, municipal permits. Note that GA compliance is the responsibility of the BOCMA.

11.4 ENVIRONMENTAL AUDITS

A final construction phase Completion Statement must be submitted within 3 months of completion of construction / site handover.

This Completion Statement must include the monitoring results as above, where applicable to construction.

An independent Environmental Audit must be undertaken one (1) year post construction.

11.5 AUDIT REPORTS FREQUENCIES AND FORMAT

The table below provides a summary of the timeframes for the various Audit Reports specified in the EA.

Table 5: Audit Reports Timeframe Summary

ENVIRONMENTAL AUDIT TIMEFRAMES		
Type	Frequency	Criteria
Construction Audit	One year post construction	Audit on operational aspects of the EA and EMMPr
Future audits	Competent Authority to confirm	Compliance with the Environmental Regulations for Audits

In terms of the 2014 EIA Regulations, Audit Reports must be submitted to the registered Interested & Affected Parties within 7 days of submission to the competent authority.

In order to comply with the 2014 EIA Regulations, any audits must be undertaken using the following format:

Table 6: Environmental Audit Requirements

Appendix 7 of Regulation 326 of the 2014 EIA Regulations, as amended contains the required contents of an Environmental Audit Report. The checklist below serves as a summary of how these objectives & requirements were incorporated into this Audit Report.	
Objective	**Description**
The objective of the environmental audit report is to -	
(a) Report on –	

Appendix 7 of Regulation 326 of the 2014 EIA Regulations, as amended contains the required contents of an Environmental Audit Report. The checklist below serves as a summary of how these objectives & requirements were incorporated into this Audit Report.	
Objective	**Description**
(i) the level of compliance with the conditions of the environmental authorisation and the EMMPr, and where applicable, the closure plan; and (ii) the extent to which the avoidance, management and mitigation measures provided for in the EMMPr, and where applicable, the closure plan achieve the objectives and outcomes of the EMMPr, and closure plan.	
(b) Identify and assess any new impacts and risks as a result of undertaking the activity.	
(c) Evaluate the effectiveness of the EMMPr, and where applicable, the closure plan.	
(d) Identify shortcomings in the EMMPr, and where applicable, the closure plan.	
(e) Identify the need for any changes to the avoidance, management and mitigation measures provided for in the EMMPr, and where applicable, the closure plan.	
Requirement	**Description**
(1) An Environmental audit report prepared in terms of these Regulations must contain -	
(a) Details of – (i) The independent person who prepared the environmental audit report; and (ii) The expertise of independent person that compiled the environmental audit report.	
(b) A declaration that the independent auditor is independent in a form as may be specified by the competent authority.	
(c) An indication of the scope of, and the purpose for which, the environmental audit report was prepared.	
(d) A description of the methodology adopted in preparing the environmental audit report.	
(e) An indication of the ability of the EMMPr, and where applicable the closure plan to – (i) Sufficiently provide for the avoidance, management and mitigation of environmental impacts associated with the undertaking of the activity on an on-going basis; (ii) Sufficiently provide for the avoidance, management and mitigation of environmental impacts associated with the closure of the facility; and	

Appendix 7 of Regulation 326 of the 2014 EIA Regulations, as amended contains the required contents of an Environmental Audit Report. The checklist below serves as a summary of how these objectives & requirements were incorporated into this Audit Report.	
Objective	**Description**
(iii) Ensure compliance with the provisions of environmental authorisation, EMMPr, and where applicable, the closure plan.	
(f) A description of any assumptions made, and any uncertainties or gaps in knowledge.	
(g) A description of an consultation process that was undertaken during the course of carrying out the environmental audit report.	
(h) A summary and copies of any comments that were received during any consultation process.	
(i) Any other information requested by the competent authority.	

Any other requirements of the EA or any other authorisations must be incorporated into an Audit where necessary.

12 DECOMMISSIONING PHASE ENVIRONMENTAL MANAGEMENT REQUIREMENTS

Not Applicable.

13 NON-COMPLIANCE

Any person is liable on conviction of an offence in terms of regulation 49(a) of the National Environmental Laws Second Amendment Act (Act 30 of 2013) to imprisonment for a period not exceeding ten (10) years or to a fine not exceeding R10 million or an amount prescribed in terms of the Adjustment of Fines Act, 1991 (Act No. 101 of 1991).

It is the responsibility of the ECO to report matters of non-compliance to the Employer's Representative or the Holder of the EA if no representative is in place. It is the responsibility of the Holder of the EA, and not the ECO, to report such matters of non-compliance to the competent Authority.

13.1 PROCEDURES

The Holder of the EA shall comply with the environmental specifications and requirements of this EMMPr, any Approval / License issued and Section 28 of NEMA, on an on-going basis and any failure on his part to do so will entitle the authorities to **impose a penalty**[2].

In the event of non-compliance, the following recommended process shall be followed:

- The competent authority shall issue a **Notice of Non-compliance** to the Holder of the EA, stating the nature and magnitude of the contravention.

[2] A penalty may not necessarily be a monetary fine but could also be a stoppage in work time, additional mechanisms to prevent pollution or degradation at the cost of the proponent or even a directive to cease activities from the competent authority.

- The Holder of the EA shall **act to correct the transgression** within the period specified in by the authority.
- The Holder of the EA shall provide the competent authority with a **written statement** describing the actions to be taken to discontinue the non-conformance, the actions taken to mitigate its effects and the expected results of the actions.
- In the case of the Holder of the EA failing to remedy the situation within the predetermined time frame, the competent authority may recommend halting the activity.
- In the case of non-compliance giving rise to physical environmental damage or destruction, the competent authority shall be entitled to undertake or to cause to be undertaken such **remedial works** as may be required to make good such damage at the cost of the Project applicant.
- In the event of a dispute, difference of opinion, etc. between any parties in regard to or arising out of interpretation of the conditions of the EMMPr, disagreement regarding the implementation or method of implementation of conditions of the EMMPr, etc. any party shall be entitled to require that the issue be referred to **specialists and / or the competent authority** for determination.
- The competent authority shall at all times have the right to **stop work** and/or certain activities on site in the case of non-compliance or failure to implement remediation measures.

14 REFERENCES

Aquanotion, 2008. www.twoflush.com/conservbody.htm. Aquanotion Ltd, Alberta, Canada.

Cape EAPrac, 2024. *Final Basic Assessment Report for Plett Lagoon Estate.* Cape Environmental Assessment Practitioners, George, South Africa.

Dabrowski, J. 2024. *Aquatic Biodiversity Impact Assessment for Proposed construction of Plett Lagoon residential estate on Erf 6503, Plettenberg Bay, Western Cape.* Confluent Environmental (Pty) Ltd, George, South Africa.

Dealtry, N. 2023. *Terrestrial Biodiversity Compliance Statement for the Proposed Plettenberg Bay Lagoon Residential Estate.* Biodiversity Africa, Cape Town, South Africa.

Dealtry, N. 2023. *Terrestrial Plant Species Specialist Assessment Report for the Proposed Plettenberg Bay Lagoon Residential Estate, Western Cape.* Biodiversity Africa, Cape Town, South Africa.

Eartheasy, 2008. www.eartheasy.com - Solutions for Sustainable Living.

Jackson, A., Martin, T. 2024. *Terrestrial Animal Species Assessment for the Proposed Plettenberg Bay Lagoon Residential Estate.* Biodiversity Africa, Cape Town, South Africa.

Lochner, P. 2005. *Guideline for Environmental Management Plans.* CSIR Report No ENV-S-C 2005-053H, Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs and Development Planning, Cape Town.

Appendix 1: Locality Maps

Date created: May 31, 2023

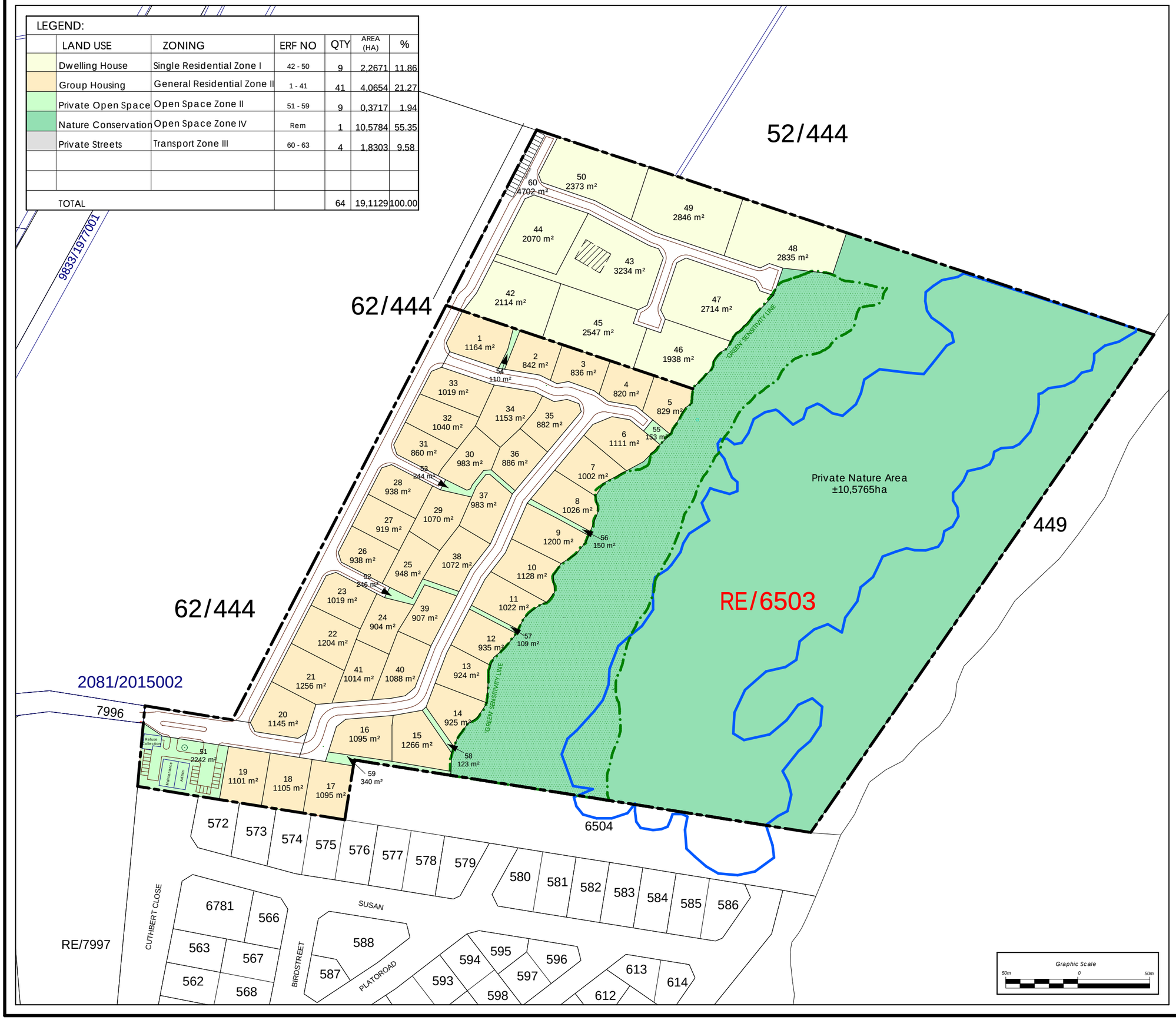
0 0.5 1 2 km

Western Cape Government
FOR YOU

Appendix 2: Site Development Plan

LEGEND:

	LAND USE	ZONING	ERF NO	QTY	AREA (HA)	%
	Dwelling House	Single Residential Zone I	42 - 50	9	2,2671	11.86
	Group Housing	General Residential Zone II	1 - 41	41	4,0654	21.27
	Private Open Space	Open Space Zone II	51 - 59	9	0,3717	1.94
	Nature Conservation	Open Space Zone IV	Rem	1	10,5784	55.35
	Private Streets	Transport Zone III	60 - 63	4	1,8303	9.58
	TOTAL			64	19,1129	100.00



PLAN 4

PLETTENBERG BAY
ERF 6503

ALTERNATIVE 1
PREFERRED PROPOSAL

N

SCALE 1: 2500

NOTES

1. Sizes and dimensions are approximate and subject to final survey
2. For Property details, refer to SG 8205/1996
3. 0,5m Contour intervals, surveyed by VPM Surveys

DRAWN:	MV	CHECKED:	MV
PLAN NO:	Pr2309PB6503L07		
PLAN DATE:	8 Feb 2024		
STORED:	*z:\drawings\App\Pr2309PB6503L07.drg*		

MUNICIPAL MANAGER

DATE: _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

Marike Vreken
STADS & OMGEWINGSBEPLANNERS
URBAN & ENVIRONMENTAL PLANNERS

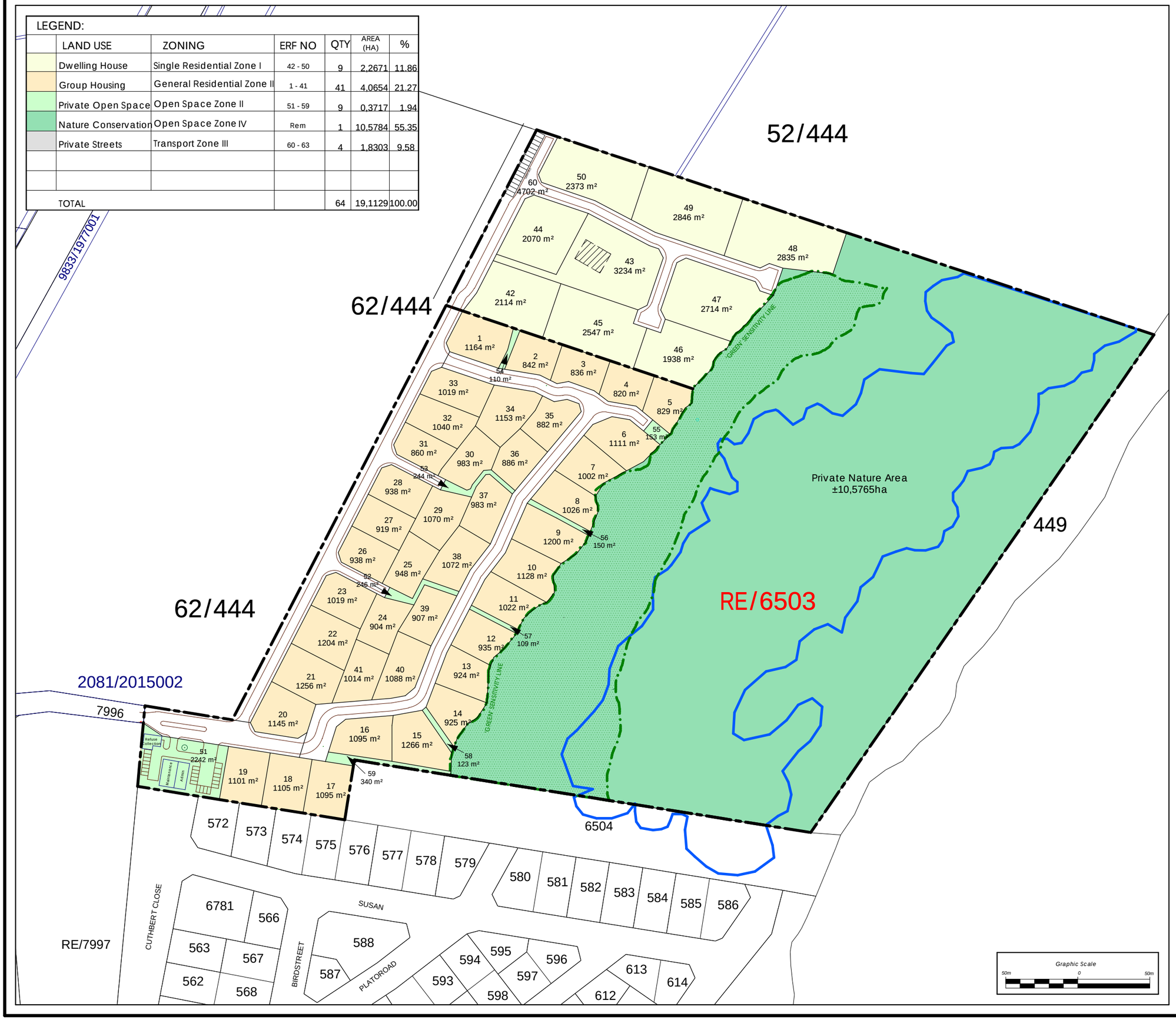
21 Trotter Street, PO Box 2180
KNYSNA 6570

(044) 382 0420
086 459 2987
e-mail: marike@vreken.co.za
www.vreken.co.za

Appendix 3: Environmental Sensitivities Map

LEGEND:

	LAND USE	ZONING	ERF NO	QTY	AREA (HA)	%
	Dwelling House	Single Residential Zone I	42 - 50	9	2,2671	11.86
	Group Housing	General Residential Zone II	1 - 41	41	4,0654	21.27
	Private Open Space	Open Space Zone II	51 - 59	9	0,3717	1.94
	Nature Conservation	Open Space Zone IV	Rem	1	10,5784	55.35
	Private Streets	Transport Zone III	60 - 63	4	1,8303	9.58
	TOTAL			64	19,1129	100.00



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Appendix 4: Environmental Guidelines For Construction

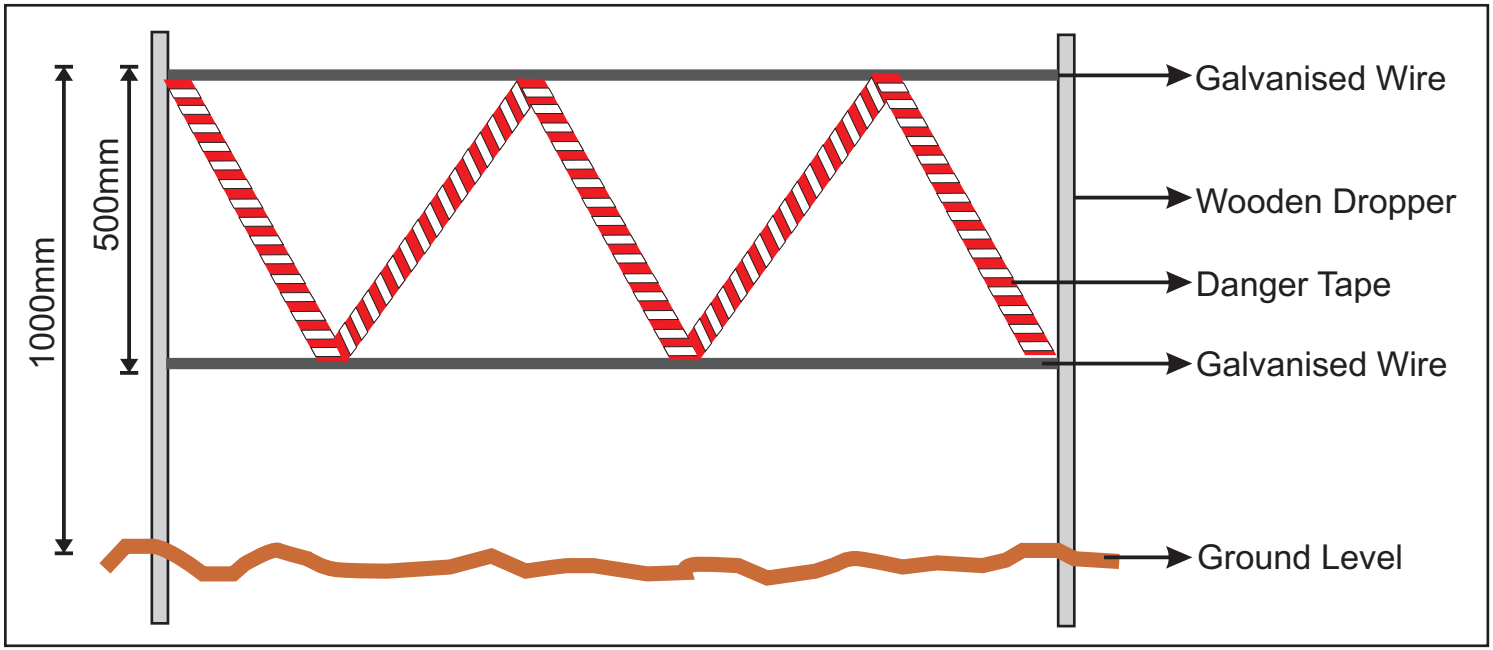

Plate A: Showing a cross section of a typical method of demarcation of no-go areas.

Where demarcation is required on a down slope, it can be more cost effective to include the required silt protection mechanisms on the same support structure as the demarcation. This is detailed in **Plate B** below and must be read in conjunction with the details on erosion control included in the previous diagram.

GENERAL CONSIDERATIONS FOR DEMARCATION OF NO GO AREAS

- The demarcation must include all areas that are going to be disturbed in the total construction (including all service lines)
- The no -go areas may not be accessed by any person (including lunch, tea breaks etc.). Without the explicit written permission from te ECO.
- Maximum fines will be issued for any non compliance with regards to the no go policy.

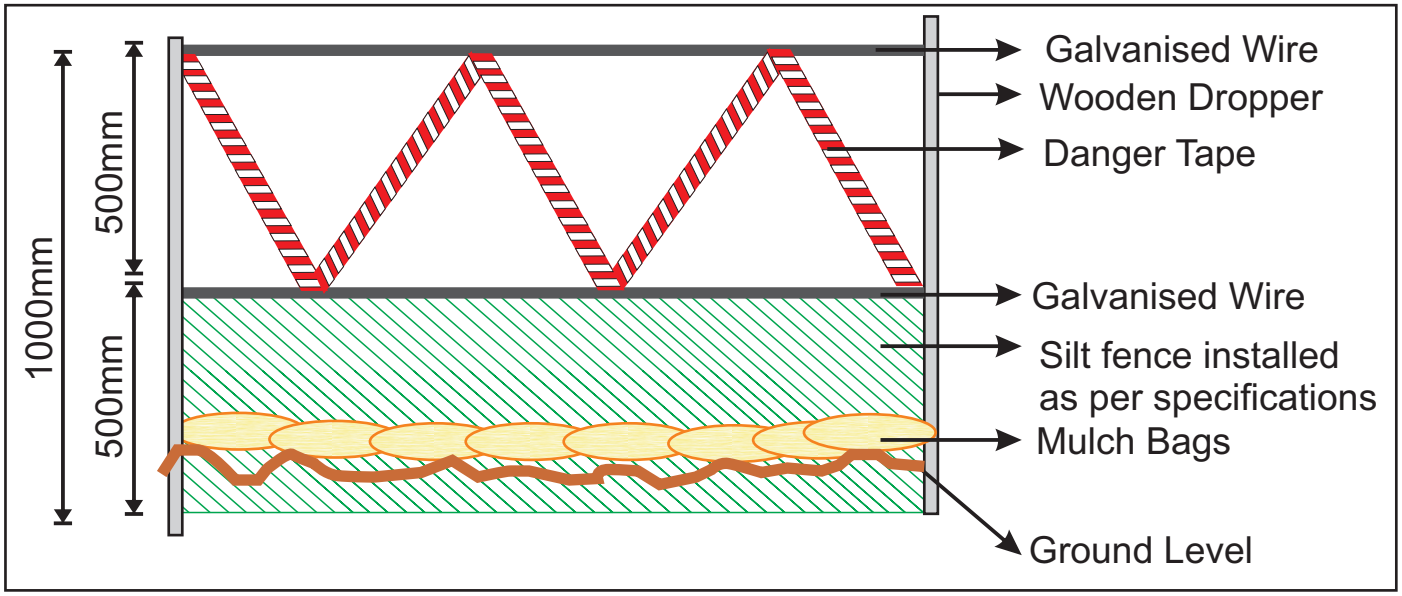

Figure 1: Demarcation of No - Go Areas During Construction

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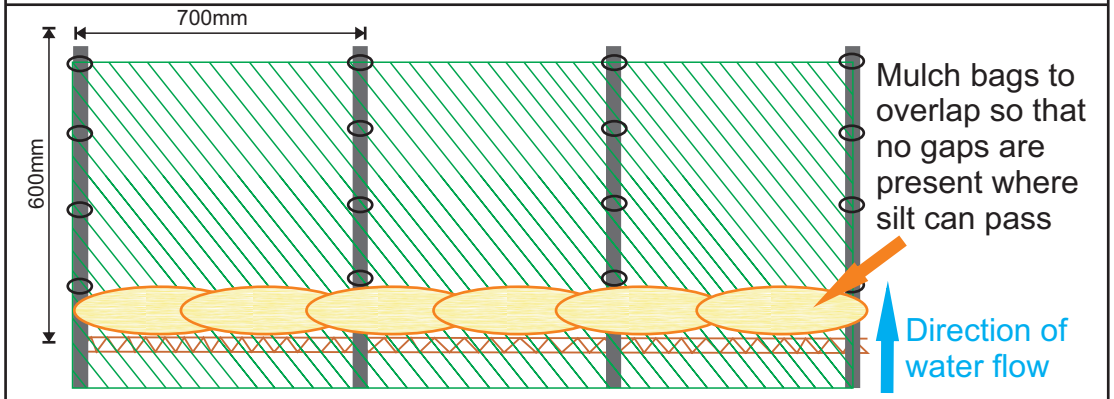
Frontal View



The purpose of a silt fence is to create a temporary barrier to maintain sediment on a construction site in order to prevent soil erosion and pollution through sediment and nutrient loading. Silt fences are designed to detain sediment from the disturbed construction area and also prevent sheet erosion by decreasing the velocity of the run off.

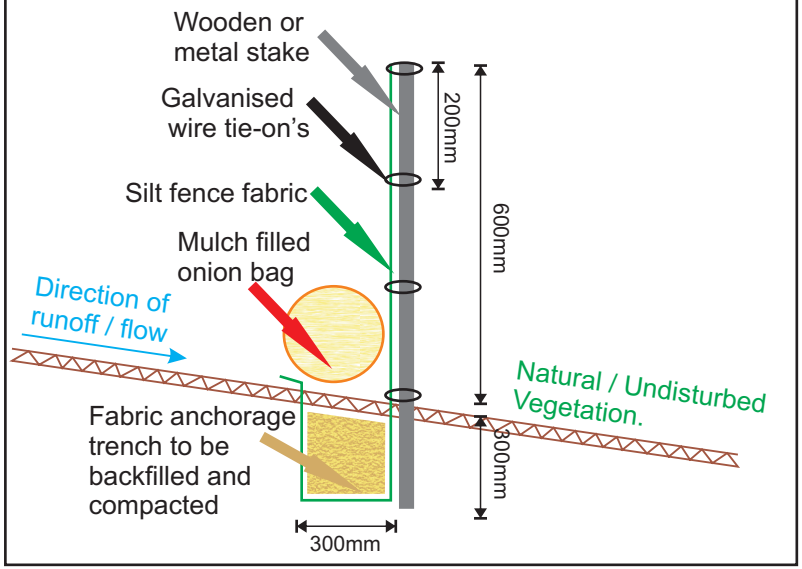
Technical Specifications

- Silt fence fabric to consist out of 50% shade cloth or a geotextile such as biddim (if biddum is used, it is not necessary to place mulch bags).
- Wooden droppers are suitable for the stakes. If the construction program takes place over an extended time frame it may be necessary to use treated droppers or metal stakes.
- The support stakes should not be placed further than 700mm apart on the down slope side of the fabric.
- The fabric should be secured to the stakes using galvanised wire ties not further than 200mm apart.
- The fabric anchorage trench should be at least 300mm deep.

Planning, Placing and Maintenance

- The silt fence is to be installed on all disturbed slopes where sheet erosion may take place.
- This type of silt fence is not suitable for areas where water is concentrated. i.e. gulleys and storm-water outlets.
- The silt fences should be along the contour lines
- The rows of silt fences should be bowed to prevent erosion and loss of silt on the ends of the fence line.
- Silt fences should be inspected weekly and before every forecast rainfall event. Any damage must be repaired immediately.
- Silt deposits should be cleared after each rainfall event. CLEARED SILT MUST NOT BE PLACED DOWN SLOPE OF THE FENCE.

Cross-section View



Top View

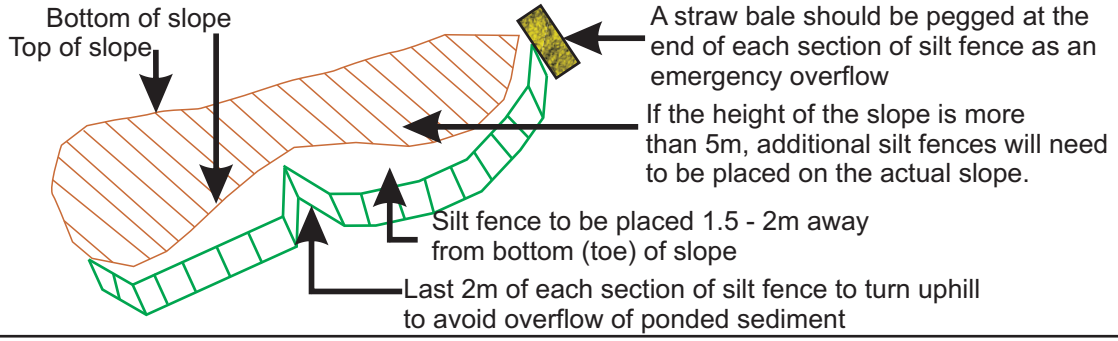


Figure 2: Specifications for Silt Fences

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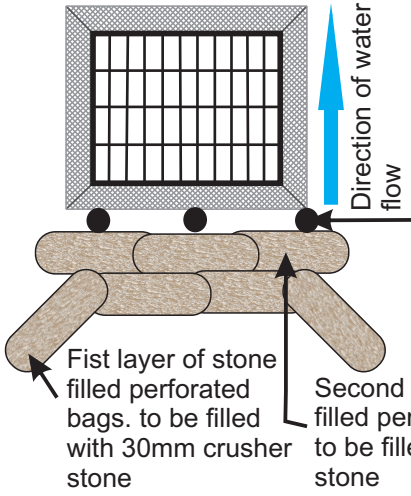
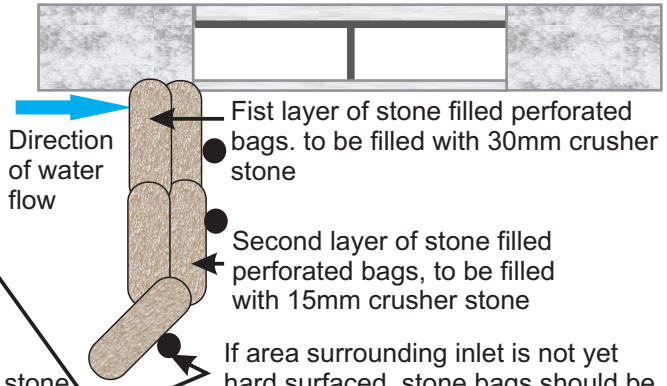
Inlet Protection

Drop Inlets



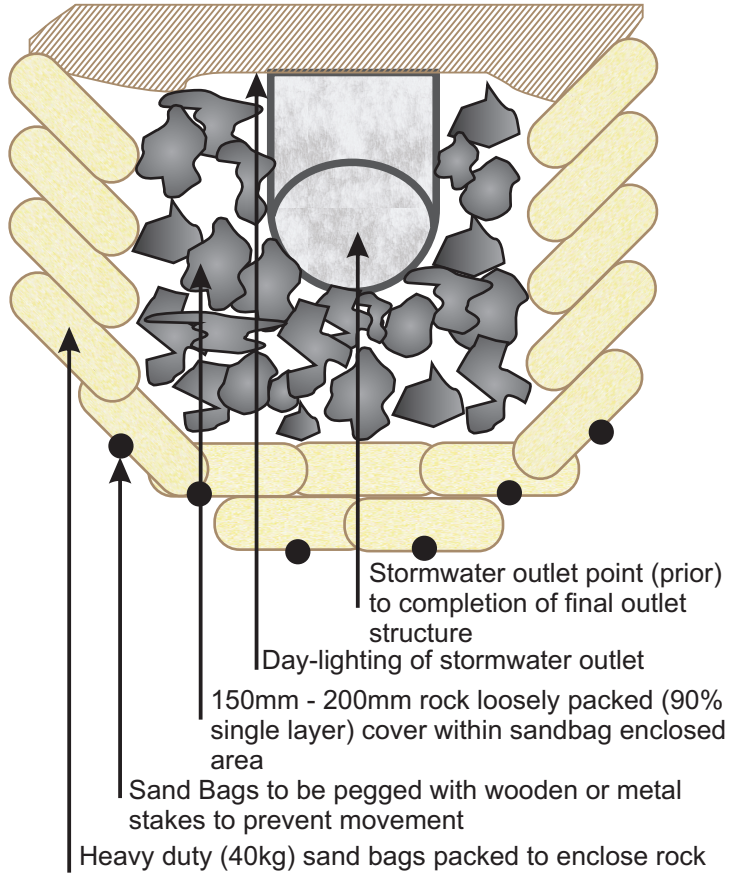
Kerb Inlets



- Should the inlet be positioned at a low point with water entering from a number of sides, a double row of stone bags (as detailed above) should be placed at each side where water enters.

- In low flow, high sediment areas, consideration should be given to cover the inlet structures with biddum (this will only work in low flow areas.)

Outlet Protection



- The methodology referred to above is effective as a temporary measure to be used during construction and is in no way intended to replace the permanent measures that must be installed. These permanent measures must be constructed as per the engineers specifications.
- Stormwater systems should ideally be constructed during low rainfall periods in order to allow for permanent protection measures to be put in place before the rainy season.
- Consideration should be given to encase the outlet structure with a geo-fabric such as biddum. This should first be clarified with the site engineer to ensure compatibility with the stormwater system.

Figure 3: Specifications for Temporary Stormwater Management During Construction

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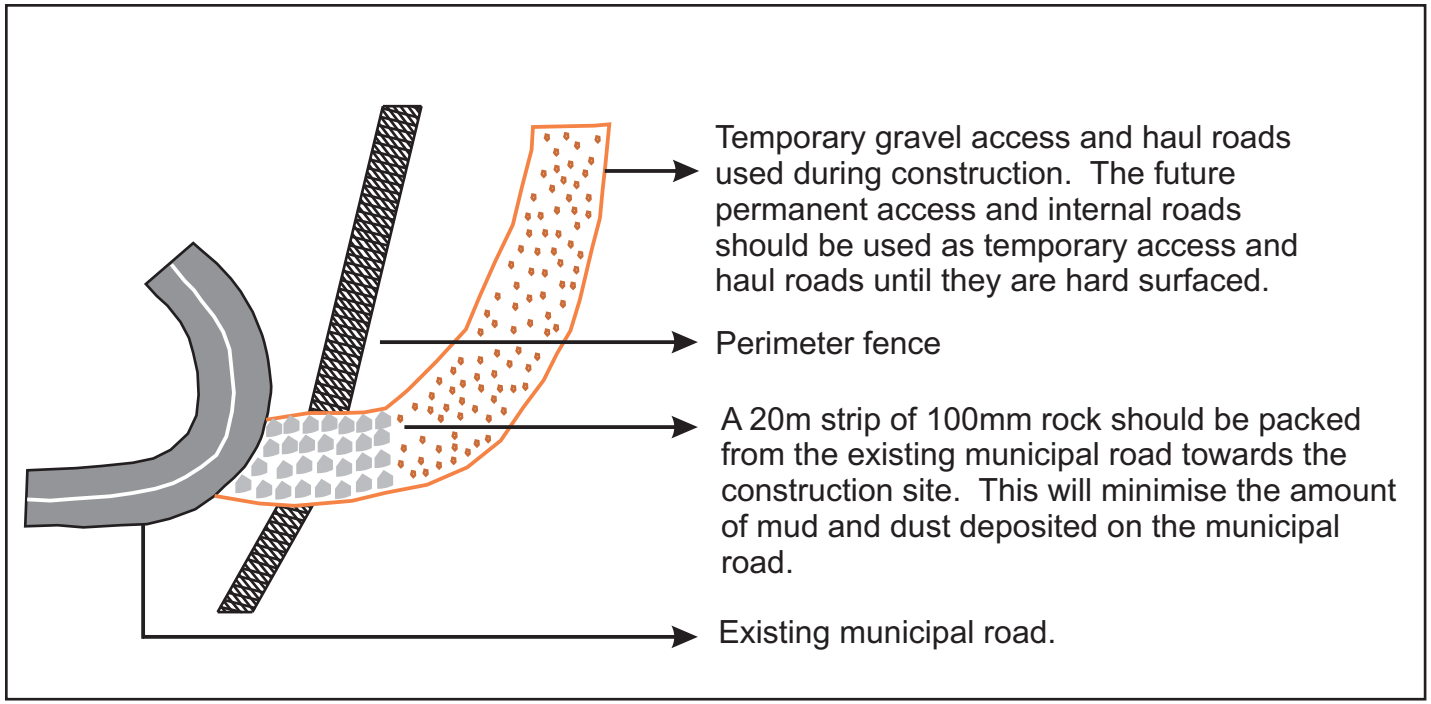
Key Environmental Considerations for Haul Roads

The most important environmental factor to be considered regarding access and haul roads, is the location thereof. Haul roads should be designed to make use of future permanent internal roads and access points.

The haul roads should never be construction in areas that will not be permanently transformed with the development. Nor should they be constructed in any sensitive area.

Another safety and environmental hazard caused by haul road surface is dust problems. Roads should be designed with enough fines to act as binders for the larger particles. However, an excess of fines will result in these particles being released to the atmosphere when repeated stress is applied by the equipment tires. All haul roads that do not have a "sealed" surface, will create dust. The dust problem is mainly dealt with by application of water.



Minimisation of Dust on Haul Roads

- Every effort to minimize dust pollution on the site must be undertaken.

- Construction vehicles must adhere to speed limits and minimization of haul roads must be implemented. During dry, dusty periods haul roads should be kept dampened to prevent excess dust.

- No potable water may be used for damping haul roads.

- As an alternative, products such as road environment dust suppressants (Reds) would be recommended in order to minimize the use of water for controlling dust pollution. This is to be determined by the ECO during construction as required.

Figure 4: Management of Haul and Access Control During Construction

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Appendix 5: Snake Information Poster

COMMON SNAKES OF THE SOUTHERN CAPE

Garden Route & Klein Karoo

VERY DANGEROUS — Has caused human fatalities

DANGEROUS — Painful bite, but does not require antivenom

MILDLY VENOMOUS — Not thought to be harmful

HARMLESS — Not dangerous to humans

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Cape Cobra
(*Naja nivea*)

Cape Cobra - juvenile
(*Naja nivea*)

Cape Boomslang - male
(*Dispholidus typus typus*)

Cape Boomslang - female
(*Dispholidus typus typus*)

Puff Adder
(*Bitis arietans arietans*)

Berg Adder
(*Bitis atropos*)

Rinkhals - banded phase
(*Hemachatus haemachatus*)

Coral Shield Cobra
(*Aspidelaps lubricus lubricus*) Photo David Maguire

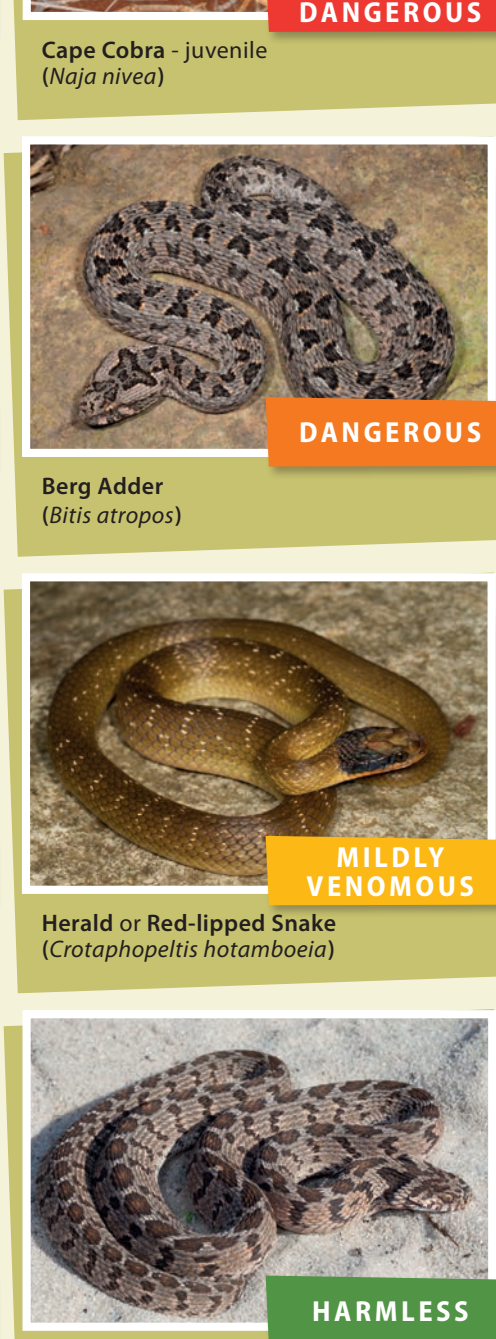
Karoo Sand Snake
(*Psammophis notostictus*)

Herald or **Red-lipped Snake**
(*Crotaphopeltis hotamboeia*)

Spotted Harlequin Snake
(*Homoroselaps lacteus*)

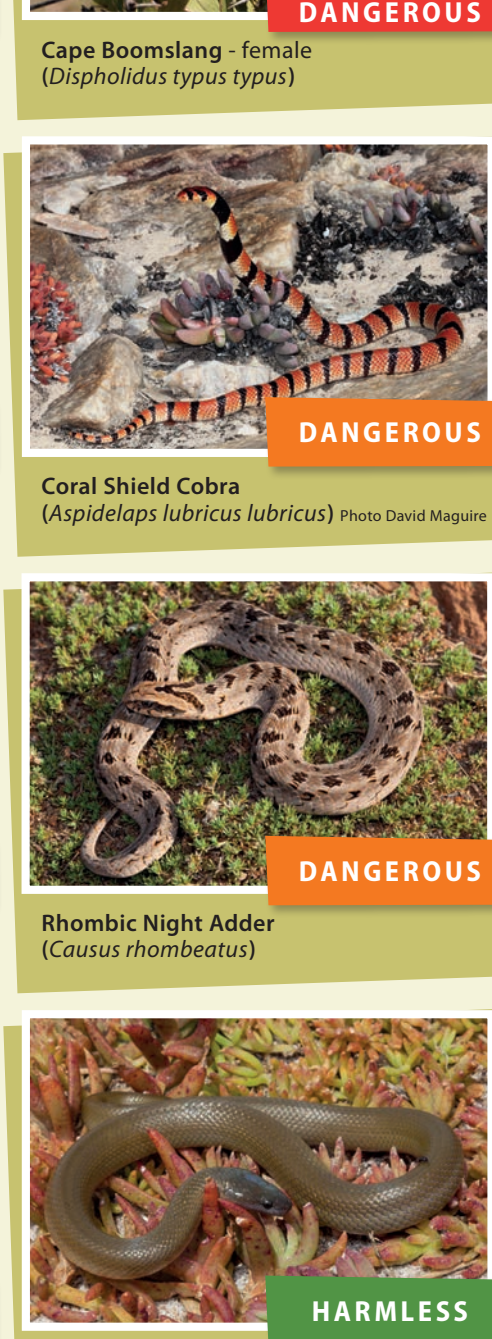
Rhombic Night Adder
(*Causus rhombeatus*)

Mole Snake
(*Pseudaspis cana*)



Rhombic Egg-eater
(*Dasypeltis scabra*)

Western Natal Green Snake Photo Tyrone Ping
(*Philothamnus natalensis occidentalis*)



Olive Snake
(*Lycodonomorphus inornatus*)

Brown House Snake
(*Boaedon capensis*)

Common Brown Water Snake
(*Lycodonomorphus rufulus*) Photo Tyrone Ping

Delalande's Beaked Blind Snake
(*Rhinotyphlops lalandei*)

Common Slug-eater
(*Duberria lutrix lutrix*) Photo Tyrone Ping

Johan Marais | African Snakebite Institute
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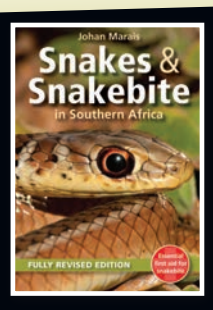
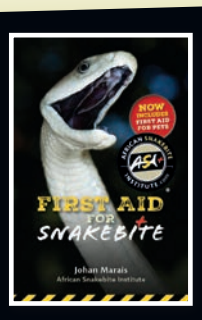




JOHAN MARAIS is the author of various books on reptiles including the best-seller *A Complete Guide to Snakes of Southern Africa*. He is a popular public speaker and offers a variety of courses including **Snake Awareness**, **Scorpion Awareness** and **Venomous Snake Handling**. Johan is accredited by the International Society of Zoological Sciences (ISZS) and is a Field Guides Association of Southern Africa (FGASA) and Travel Doctor-approved service provider. His courses are also accredited by the Health Professions Council of South Africa (HPCSA).

Appendix 6: Best Practice Guidelines Alien Vegetation Management

Best Practice Guideline:
alien vegetation management

Preamble

Invasive alien vegetation must be removed from environmentally sensitive areas with the least amount of damage to indigenous vegetation, to ensure compliance with the Conservation of Agricultural Resources Act (**CARA**) regulations.

Before any clearing of alien vegetation is initiated, it must be understood that when the programme starts, it must be implemented until completion. There is no value in *ad hoc* clearing, with no follow-up programme.

Management actions:

- Map the extent of invasion as well as density and height of alien species
- Determine costs and priorities and produce a plan of operations detailing Initial control (drastic reduction of the existing population), Follow-up control (control of seedlings and coppice re-growth) and Maintenance (on-going, low-level control) and include targets and timeframes.
- Prioritise the clearing of the most lightly infested areas first
- Prioritise the clearing of highly invasive species which may not have become well established to date
- Prioritise clearing before the burning of a block
- Prioritise clearing within the first season after a burn
- Prioritise follow up clearing
- To restore/rehabilitate areas cleared of alien vegetation
- Keep record of clearing operations and stands

Where should you start?

By removing invasive alien plants from your property, you will help reduce their spread. If your property is very large, and there are many invasive plants present, consider the following as high-priority areas, which should be controlled first:

- The area immediately around buildings, if there is a risk of fire.
- Low-density infestations, to curb the spread of invasive plants into surrounding areas.

- The tops of slopes, watercourses, and steep, long bare slopes, to inhibit the spread of seeds downhill or downstream, where they will infest new areas.
- Sites where initial control work has been completed and regrowth is present, to prevent densification and further infestation.
- Disturbed sites, to prevent new infestations from mass germination of alien seeds in the soil.

Seedlings should be controlled when shorter than 0,5 m to avoid costly control work at a later stage.

Control methods

The following section contains generic guidelines/principles for the removal of alien plants. Specific removal methods for each plant are provided further below.

Invasive alien plant control relies on four main methods - manual, mechanical, chemical and biological control. Long-term success of any programme is best achieved through a combination of these. This is called an integrated control approach.

When using herbicide

Read the labels for specific instructions.

Do

- spray when plants are actively growing,
- ensure that herbicide is mixed according to label application rates,
- ensure correct wearing of safety gear at all times,
- plan the application of herbicides before the operation commences,
- spray when the sun is shining,
- use a drip sheet and keep herbicide in a demarcated area in the veld out of direct sunlight,
- apply spray to the canopy and stems,
- include dye to assist in the identification of areas that have been cleared,
- include a wetting agent should be added to the herbicide mix to allow for better absorption.

Do not

- spray during strong wind, or where there is the slightest evidence of drift,
- spray when it is very hot,
- spray when plants are stressed or dormant,

- spray plants that are over 1m,
- apply herbicide in the rain or on wet, damp leaves,
- allow pregnant women to be directly involved in herbicide operations, or spray near children, animals or water bodies.

Storage

All storage facilities shall comply with the requirements of AVCASA.

Using labour intensive methods

- Always start at the highest point and work downwards i.e. downhill or downstream
- Start from the edge of the infestation and work towards the centre

❖ **Hand pulling**

- Hand pulling is most effective with small (30cm), immature or shallow rooted plants.
- Shake the excess sandy material from the plant, this makes the plant easier to stockpile and lighter to transport

❖ **Chopping/ cutting/ slashing**

- This method is most effective for plants in the immature stage, or for plants that have relatively woody stems/ trunks.
- This is an effective method for non-resprouters or in the case of resprouters (coppicing), if done in conjunction with chemical treatment of the cut stumps.
- **Note**
  - Cut/slash the stem of the plant as near as possible to ground level.
  - Paint resprouting plants (i.e. black wattle, lantana and port jackson) with an appropriate herbicide immediately after they have been cut.
  - Stockpile removed material into piles as prescribed.

❖ **Basal bark**

- Application of suitable herbicide in water can be carried out to the bottom 250mm of the stem. Applications should be by means of a low pressure, coarse droplet spray from a narrow angle solid cone nozzle or by using a paintbrush.
- **Note**
- If plant is multi stemmed, then each stem needs to be treated.

❖ **Ring barking**

- Remove the bark and cambium around the trunk of the tree in a continuous band around the tree at least 25cm wide, starting as low as possible.
- Where clean de-barking is not possible due to crevices in the stem or where roots are exposed, a combination of bark removal and basal stem treatments should be carried out.
- For aggressively coppicing species pull off the bark below the cut to ground level (bark stripping), to avoid the use of herbicide.
- **Note**
- This method is not used for stands but rather individual large trees

❖ **Bark stripping**

- All the bark shall be stripped from the trunk between the ground level and 1m above ground level.
- Application of suitable herbicide can also be used with this method.
- Applications should be by means of a low pressure, coarse droplet spray from a narrow angle solid cone nozzle or by using a paintbrush.

❖ **Frilling**

- Using an axe or bush knife, make a series of overlapping cuts around the trunk of the tree, through the bark into the softwood (approximately 500mm from ground level). The thickness of the blade should force the bark open slightly, ensuring access to the cambium layer.
- Ensure to affect the cuts around the entire stem.
- Apply the herbicide immediately to the cuts by spraying into the frill. The frill needs to be deep enough to retain the herbicide.

Using mechanical methods

❖ **Felling**

- De-branch cut trees and where possible remove all material.
- Where possible large trees are to be felled so that they fall uphill.
- Cut the plant down as low as possible to the ground.
- Apply herbicide immediately (no later than 30mins) to the cambium layer.
- Ensure all the cuts in the cambium layer are treated.

❖ **Bark stripping**

Where bark stripping is used, then all the bark shall be stripped from the trunk between the ground level and 1m above ground level.

- Application of suitable herbicide can also be used with this method.
- Applications should be by means of a low pressure, coarse droplet spray from a narrow angle solid cone nozzle or by using a paintbrush.

Using chemical control

- Chemical control of alien plants is not recommended in aquatic systems due to the risk of pollution, but may be used on the floodplain in conjunction with cutting or slashing of plants.
- Chemicals should only be applied by qualified personnel.
- Only herbicide registered for use on target species may be used.
- Follow the manufacturer's instructions carefully.
- Appropriate protective clothing must be worn.
- Only designated spray bottles to be used for applying chemicals.

❖ **Injection**

- Drill or punch downward slanting holes into the tree around the entire circumference of the stem.
- Inject the chemical directly into the plant.

❖ **Foliar spray**

- Use a solid cone nozzle that ensures an even coverage on all leaves and stems to the point of runoff.
- Do not spray just before rain (a rainfall-free period of 6 hours is recommended) or before dew falls.
- Avoid spraying in windy weather as the spray may come into contact with non target plants.
- Spraying dormant or drought stressed plants is not effective as they do not absorb enough of the herbicide.

❖ **Cut stump application**

- This is a highly effective and appropriate control method for larger woody vegetation that has already been cut off close to the ground.
- The appropriate herbicide should be applied to the stump using a paintbrush within 30 min of being cut.
- Stems should be cut as low as possible. Herbicides are applied in water as recommended for the herbicide.

Stacking

- Stacking the cut material in heaps, or in windrows along mountain contours to reduce erosion, facilitates easy access for follow up.
- It also assists in containing the resulting fuel load and therefore the risk of uncontrolled fire.
- Keep stacks well apart to prevent fires from crossing easily, not less that fire meters apart, this is naturally dependant on the size of the stack & the resulting fire intensity when they burn.
- Stockpile removed material into piles of 2m high, 3m wide windrows/stacks.
- Stack light branches separately from heavy timber (75mm and more). Preferably remove heavy branches to reduce long burning fuel loads that can result in soil damage from intensely hot fire.
- Do not make stacks under trees, power and telephone lines, within 30 meters of a fire belt or near watercourses, houses and other infrastructure.

Disposal of plant material

- Plant material should be used beneficially wherever possible, as opposed to disposing it at a landfill site where it takes up valuable airspace.
- Woody and dry material, provided no seeds are present, can be chipped and used as mulch or made available to the local community for firewood.
- Wet material and aquatic weeds should be combined with other organic matter and composted. Alternatively, it may be possible to use it for basket making, animal feed or other uses.
- Material which cannot be used beneficially must be disposed of at a registered and approved disposal site.
- When removing material, take care to remove all debris, including shoots and seeds.

Monitoring

- Follow-up inspections are required in order to establish whether follow-up operations are required.
- It is preferable to follow up on an area and remove all seedlings or treat resprouting plants, rather than treat a new area.

Conclusion

Any land management programme in South Africa will inevitably include an alien plant control program. Alien control programs are essential to protect valuable resources such as economically viable agricultural land, surface and ground water, biodiversity and the beautiful landscapes of our country. An alien control program however requires a high level of commitment, coordination between landowners and authorities, professional planning and implementation and a good dose of common sense. Competent land managers are essential for cost effective and professional implementation programmes. The guidelines provided are compiled from a wide source and will hopefully provide insight to land managers in order for financial and human resources to be effectively used in an integrated control programme.

SPECIES & CARA Category	CONTROL METHODS
Salix babylonica weeping willow CARA 2	Fell the trees and treat the cut stumps with a Triclon 2% solution or a mycoherbicide. Trees can be felled, then burnt, and seedlings sprayed with herbicide. **Biological Control** can be released on regrowth or seedlings.
Melia azedarach Seringa CARA 3	**Foliar Spray** Confront 0.75% Solution. **Cut Stump** Confront 3% Solution. **Frill** Confront 3% Solution. **Basal Stem** Garlon 2% Solution. **Cut Stump** Access 2% Solution.
Solanum mauritianum bug weed CARA 1	Hand pulling can be done. Mature plants can be sawed and herbicide applied to cut stump. Frilling is also another method that can be used with herbicide. **Foliar spray can be done using:** 12.5ml of Starone 200 (Fluroxypyr) mixed with 10l water. Spray onto plants up to 1m tall 0.5l/ha 50ml Mamba (Glyphosate) mixed with 10l water 2l/ha Touch Down (Glyphosate Trimesium) 2l/ha to be used on plants that are 500mm tall. 50ml Garlon 4/Viroaxe (Triclopyr Ester) mixed with 10l water 1,5l/ha **Frill the trunk of large trees** and use the following: 300ml Timbrel 3A (Triclopyr Amine Salt) mixed with 10l water 1,5l/ha 200ml Chopper (Imazapyr) mixed with 10l water 1l/ha **After felling, a cut stump can be treated with:** 300ml Timbrel 3A (Triclopyr Amine Salt) mixed with 10l water 2,25l/ha 200ml Chopper (Imazapyr) mixed with 10l water 1l/ha **Disposal**: Stack and burn. Chip cut material.

SPECIES & CARA Category	CONTROL METHODS
Opuntia ficus-indica prickly pear CARA 1	Seedlings can be hoed, mature plants can be dug out. **Chemical control applications:** Inject into 4 – 12 pre-made holes per plant any of the following: MSMA ll mixed with 1l water and injected at 2ml/dose. Mamba (Glyphosate) 1l mixed with 2l water and injected at 2ml/dose. Touchdown (Glyphosate) 330ml mixed with 10l water and injected at 2ml/dose. **Biological Control** is a very cost effective way of removing this species. **Disposal:** Leave standing until it rots away. It can be burnt in stacks after it has dried out.
Agave americana agave Proposed Invader species	Seedlings can be hoed, or dug out if mature. For **chemical control**, inject 2ml of MSMA into the bowl of the plant - 2l per 1000 plants. **Biological control** is the most cost effective way of dealing with this species. **Disposal:** Leave standing until it rots away.
Pinus pinaster Pine CARA 2	Can be pulled out by hand or hoed. Intermediate sized plants should be cut at ground level, with the root being left behind. Mature pine trees can be cut/sawed. Ring barking or filling can also be used. **Disposal:** Cut material can either be stockpiled for removal or used as erosion barriers. Smaller stemmed material can be stacked for burning or chipping. Seed bearing slash that has been chipped must be left to compost (or to allow seeds to germinate) before being used. Stockpiling should be avoided within a flood plain as this could pose a flood risk. It should always be known that stacked material poses a fire hazard and burns easily.
Pennisetum clandestinum Kikuyu CARA 2	A herbicide with the active ingredient glyphosate should be used. Plants should be sprayed during their active growing season (summer or autumn dependant on rainfall region). The suitability of using herbicide near water should be considered i.e. some herbicides may pollute the downstream environment. Application of herbicides is more successful in conjunction with mechanical means.

SPECIES & CARA Category	CONTROL METHODS
Eucalyptus spp. Blue gums CARA 1 & 2	Can be pulled out by hand or hoed. Intermediate sized plants should be cut at ground level, with the root treated with herbicides immediately. Mature *Eucalyptus* can be cut/sawed. Herbicides should be applied to the stump as soon as possible thereafter (within 30 mins). The suitability of using herbicide near water should be considered i.e. some herbicides may pollute the downstream environment. Seedlings can be sprayed using 200g/ha Brush Off (Mersulphfuron Methyl) plus 3l/ha Mamba (glyphosphate). Frill the trunk of mature plants, apply a mix of 1250ml Chopper (Imazapyr) & 10l of water at a rate of 6 l/ha. With a cut stump, apply a mix of 1250ml Chopper (Imazapyr) & 10l of water at a rate of 6 l/ha. If the species is known, check the rate on the label. For spot spraying coppice, apply 16l water, 16gms Brush off, 1% Mamba and 0,5% Actipron. Application of herbicides is more successful in conjunction with mechanical means. **Disposal:** Cut material can either be stockpiled for removal or used as erosion barriers. Smaller stemmed material can be stacked for burning or chipping. Seed bearing slash that has been chipped must be left to compost (or to allow seeds to germinate) before being used. Stockpiling should be avoided within a flood plain as this could pose a flood risk. It should always be known that stacked material poses a fire hazard and burns easily.
Poplar canescens grey poplar CARA 2	Pull out and remove entire root system. Immature and mature plants can be sawed and the stump can be treated with herbicides. The suitability of using herbicide near water should be considered i.e. some herbicides may pollute the downstream environment. For seedlings/immature trees apply a foliar spray of 150ml of Garlon 4/ Viroaxe (Triclopyr Ester) can be mixed with 10l of water and applied at a rate of 2 l per hectare. For stumps that have been cut try 500 ml Chopper (Imazapyr) mixed with 10 l water and applied at a rate of 1.5 l per hectare (Do not apply in riparian zone where water can be contaminated!!!) Large/mature trees that have been cut can be treated with 500 ml Chopper (Imazapyr) mixed with 10 l water and applied at a rate of 1.5l/ha. Cut stumps or frilled trees can be treated with 300ml of Timbrel 3A (Triclophyr Amine salt) mixed in 10 l of water applied at a rate of 1.5 l per hectare. Ecoplugs can be used for trees that are within 10m of a river course. Application of herbicides is more successful in conjunction with mechanical means. **Disposal:** Cut material can either be stockpiled for removal or used as erosion barriers. Smaller stemmed material can be stacked for burning or chipping. Seed bearing slash that has been chipped must be left to compost (or to allow seeds to germinate) before being used. Stockpiling should be avoided within a flood plain as this could pose a flood risk. It should always be known that stacked material poses a fire hazard and burns easily.

SPECIES & CARA Category	CONTROL METHODS
Arundo donax spanish reed CARA 1	Hand removal, removal of rhizomes is essential to avoid resprouting. **Foliar Spray** can be done using Mamba 10% solution.
Acacia cyclops rooikrans CARA 2	Can be removed by hand. Large/mature trees should be removed by cutting the stem below ground level - follow up in the form of weeding of seedlings when they are 15-40 cm high. **Disposal:** Cut material can either be stockpiled for removal or used as erosion barriers. Smaller stemmed material can be stacked for burning or chipping. Seed bearing slash that has been chipped must be left to compost (or to allow seeds to germinate) before being used. Stockpiling should be avoided within a flood plain as this could pose a flood risk. It should always be known that stacked material poses a fire hazard and burns easily. Can be used for firewood, charcoal and as a building material.
Acacia longifolia long-leafed wattle CARA 1	Seedlings/saplings can be pulled out by hand if in the seedling stage. With large/mature trees, the stem should be cut cleanly as near to the ground as possible, ensuring buds don't sprout. The suitability of the use of herbicide near water should be considered i.e. some herbicides may pollute the downstream environment. For seedlings, a foliar spray of 60ml of Garlon 4/ Viroaxe (Triclopyr Esterl) can be mixed with 10l of water and applied at a rate of 2l/ha. Cut large/mature trees, the stump can be treated with 60ml of Garlon 4/Viroaxe (Triclopyr Ester) mixed with 10l of water and applied at a rate of 2 l/ha. After cutting the stump or frilling tree, it can also be treated with 300ml of Timbrel 3A (Triclopyr Amine salt) mixed in 10 l water and applied at a rate of 1.5l/ha. Application of herbicides is more successful in conjunction with mechanical means. **Biological control** is available. **Disposal:** Cut material can either be stockpiled for removal or used as erosion barriers. Smaller stemmed material can be stacked for burning or chipping. Seed bearing slash that has been chipped must be left to compost (or to allow seeds to germinate) before being used. Stockpiling should be avoided within a flood plain as this could pose a flood risk. It should always be known that stacked material poses a fire hazard and burns easily. Can be used for firewood, charcoal and as a building material.

SPECIES & CARA Category	CONTROL METHODS
Acacia saligna port Jackson CARA 2	Can be removed by hand. Large/mature trees should be removed by cutting the stem below ground level; thereafter the stumps should be treated to prevent the formation of shoots and left to dry. Follow up in the form of weeding of seedlings when they are 15-40 cm high is necessary. The suitability of the use of herbicide near water should be considered i.e. some herbicides may pollute the downstream environment. For seedlings a foliar spray of 2-4 l of Mamba (Glyphosate) can be applied as a spot spray (1.5%) at a rate of 2-4 l/ha. A foliar spray of 50ml of Garlon 4/ Viroaxe (Triclopyr Ester) can be mixed with 10l of water and applied at a rate of 1.5 l/ha. Note: Do not use Garlon 4 or Viroaxe if other pioneer grass seedlings are present. A foliar spray of Touchdown (Glyphosate Trimesium) can be applied at a rate of 2-4 l/ha. Immature plants should be treated with a foliar spray of 50ml of Garlon 4/Viroaxe (Triclopyr Ester) mixed with 10l of water and applied at a rate of 3 l/ha. Can be treated with Touchdown (Glyphosate) applied at a rate of 4l/ha. Cut stumps of large/mature trees can be treated with 300ml of Timbrel 3A (Triclophyr Amine salt) mixed in 10 l of water applied at a rate of 1.5 l/ha. A Garlon solution can also be applied to approximately 0.6m length of stump. Application of herbicides is more successful in conjunction with mechanical means. **Biological control** is available, once the fungus has become established in an area; it is preferable not to use any other control measures. **Disposal:** Cut material can either be stockpiled for removal or used as erosion barriers. Smaller stemmed material can be stacked for burning or chipping. Seed bearing slash that has been chipped must be left to compost (or to allow seeds to germinate) before being used. Stockpiling should be avoided within a flood plain as this could pose a flood risk. It should always be known that stacked material poses a fire hazard and burns easily. Can be used for firewood, charcoal and as a building material.
Acacia mearnsii black wattle CARA 2	Seedlings/saplings can be pulled out by hand. Immature plants can be removed with hand tools. Intermediate sized plants should be cut at ground level, with the root being treated with herbicides. Mature plants can be cut/sawed. Herbicides should be applied to the stump as soon as possible thereafter (within 30 min). The suitability of the use of herbicide near water should be considered i.e. some herbicides may pollute the downstream environment. For seedlings a foliar spray of 150ml Mamba (Glyphosate) per 10l of water can be applied at a rate of 3 l/ha. A foliar spray of 25-75ml of Garlon 4/Viroaxe (Triclopyr Ester) can be mixed with 10l of water and applied at a rate of 0.5-1.5 l/ha. For young trees a foliar spray of 75ml of Garlon 4/Viroaxe (Triclopyr Ester) can be mixed with 10l of water and applied at a rate of 3 l/ha. Cut large/mature trees**,** the stump can be treated with 3 l of Timbrel 3A (Triclophyr Amine salt) mixed in 100 l of water applied at a rate of 1.5 l/ha. Application of herbicides is more successful in conjunction with mechanical means. **Biological control** is available, when cutting down the trees, the stump fungus should be applied to the cut stumps.

SPECIES & CARA Category	CONTROL METHODS
Acacia pycnantha golden wattle CARA 1	Seedlings and immature plants can be removed by hand. The stems of large/mature trees should be cut below ground level; thereafter treated to prevent the formation of shoots and left to dry. Follow up in the form of weeding of seedlings when they are 15-40 cm high. The suitability of the use of herbicide near water should be considered i.e. some herbicides may pollute the downstream environment. For seedlings a foliar spray of 2-4 l of Mamba (Glyphosate) can be applied as a spot spray (1.5%) at a rate of 2-4 l/ha. A foliar spray of 50ml of Garlon 4/ Viroaxe (Triclopyr Ester) can be mixed with 10l of water and applied at a rate of 1.5 l/ha. Note: Do not use Garlon 4 or Viroaxe if other pioneer grass seedlings are present. A foliar spray of Touchdown (Glyphosate Trimesium) can be applied at a rate of 2-4 l/ha. Immature plants should be treated with a foliar spray of 50ml of Garlon 4/Viroaxe (Triclopyr Ester) mixed with 10l of water and applied at a rate of 3 l/ha. Can be treated with Touchdown (Glyphosate) applied at a rate of 4 l per ha. Cut stumps of large/mature trees can be treated with 300ml of Timbrel 3A (Triclophyr Amine salt) mixed in 10 l of water applied at a rate of 1.5 l/ha. A Garlon solution can also be applied to approximately 0.6m length of stump. Application of herbicides is more successful in conjunction with mechanical means. **Disposal:** Cut material can either be stockpiled for removal or used as erosion barriers. Smaller stemmed material can be stacked for burning or chipping. Seed bearing slash that has been chipped must be left to compost (or to allow seeds to germinate) before being used. Stockpiling should be avoided within a flood plain as this could pose a flood risk. It should always be known that stacked material poses a fire hazard and burns easily. Can be used for firewood, charcoal and as a building material.

***Contact PPRU for information, advice and availability of bio-control agents, see contact details below.**

HELPFUL CONTACT NUMBERS

Note: Although these telephone numbers are correct at the time of going to print, they may change from time to time.

Working on Fire

Tel: +27 (0) 21 799 8800

Fax: +27 (0) 21 797 8390

Web Site: www.workingonfire.org

Plant Protection Research Unit (PPRU)

Stellenbosch: Vredenburg Research Centre

Tel: +27 (0) 21 887-4690

Fax: +27 (0) 21 883-3285

Website: http://www.arc.agric.za/

Working for Water

Toll-free number 0800-005-376

Web site: http://www.dwaf.gov.za/wfw/

Department of Agriculture

Durbanville

Tel: +27 (0) 21 976 8136/1759

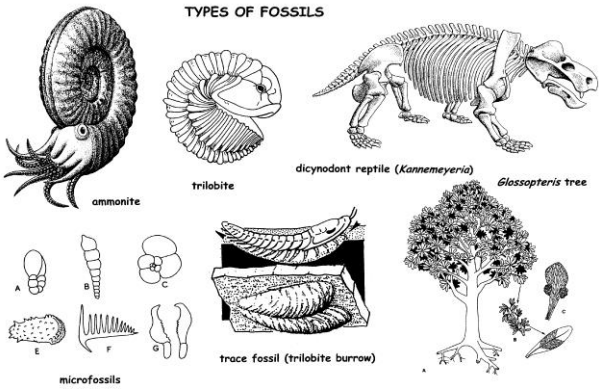
Fax: +27 (0) 21 976 1889

Appendix 7: Fossil Finds Poster

Palaeontology: what is a fossil?

Fossils are the traces of ancient life (animal, plant or microbial) preserved within rocks and come in two forms:

- Body fossils preserve parts, casts or impressions of the original tissues of an organism (e.g. bones, teeth, wood, pollen grains); and
- Trace fossils such as trackways and burrows record ancient animal behaviour.



How to report chance fossil finds: What should I do if I find a fossil during construction/mining?

If you think you have identified a fossil:

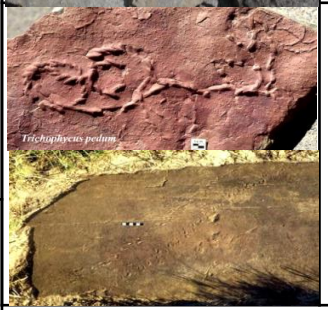
Immediately inform the ECO or Site Agent. He/she will then contact HWC and write a report and if necessary operations will stop in that specific area until the fossil is recovered

Heritage Western Cape
ceoheritage@westerncape.gov.za
021 483 5959
www.hwc.org.za

Types of palaeontological finding - What does a fossil look like?

Fossils vary in size, from fossilised tree trunks and dinosaur bones down to very small animals or plants. Finds can be **individual fossils** (one isolated wood log or bone) or **clusters and beds** (several bones, teeth, animal or plant remains, trace fossils in close proximity or bones resembling part of a skeleton). A bed of fossils is a layer with many fossil remains.

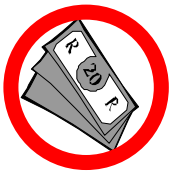
Below there is a list of few examples of fossils which may be identified during excavations in the Western Cape.

Image	Description	Image	Description
	Leaves		Snail shells and other shells
	Fossil wood		Bones of larger animals
	The remains of fish and marine life (e.g. teeth, scales, starfish)		Large burrows made by moles and other animals
	Stromatolites		Traces made by burrowing insects (ants, wasps, dung-beetles etc.).
	Animal footprints		

Images provided by Dr John Almond

Text by HWC's Archaeology, Palaeontology & Meteorites Committee June 2016

Appendix 8: Environmental Do's and Don'ts Poster

	ENVIRONMENTAL DO'S	ENVIRONMENTAL DON'TS
Work Site	 Workers and equipment to stay within site boundaries	 Do not enter no go areas
Materials & Equipment	 Use drip trays Report spills	 Do not create dust Do not drive too fast
	 Store in camp at night Check for leaks Ensure loads don't spill	 Do not wash machinery or tools on site
Waste Management	 Use toilets provided	 Don't burn or bury waste No fires on site Report any other fires
	 Use bins provided for cigarette butts & waste	 Eat in designated area Don't eat at dam or river
Natural Environment	 Save water Use only drinking water provided	 Do not damage trees, flowers or rocks
	 Protect animals and archaeological remains	 Do not swim or wash in the dam or river
Danger & Emergencies	 Know emergency procedures & no's Report accidents	 No smoking near gas or diesel
	 Be careful when working with hazardous substances	 Fines will be issued for non-compliance with environmental specifications

Appendix 9: Health and Safety

Health and Safety

The Contractor must ensure compliance with the Occupational Health and Safety (No. 85 of 1993). Of key importance is the following (Section 8 of the aforesaid act):

8. General duties of employers to their employees:

- Every employer shall provide and maintain, as far as is reasonably practicable, a working environment that is safe and without risk to the health of his employees.
- Without derogating from the generality of an employer's duties under subsection (1), the matters to which those duties refer include in particular-
    - the provision and maintenance of systems of work, plant and machinery that, as far as is reasonably practicable, are safe and without risks to health;
    - taking such steps as may be reasonably practicable to eliminate or mitigate any hazard or potential hazard to the safety or health of employees, before resorting to personal protective equipment;
    - making arrangements for ensuring, as far as is reasonably practicable, the safety and absence of risks to health in connection with the production, processing, use, handling, storage or transport of articles or substances;
    - establishing, as far as is reasonably practicable, what hazards to the health or safety of persons are attached to any work which is performed, any article or substance which is produced, processed, used, handled, stored or transported and any plant or machinery which is used in his business, and he shall, as far as is reasonably practicable, further establish what precautionary measures must be taken with respect to such work, article, substance, plant or machinery in order to protect the health and safety of persons, and he shall provide the necessary means to apply such precautionary measures;
    - providing such information, instructions, training and supervision as may be necessary to ensure, as far as is reasonably practicable, the health and safety at work of his employees;
    - as far as is reasonably practicable, not permitting any employee to do any work or to produce, process, use, handle, store or transport any article or substance or to operate any plant or machinery, unless the precautionary measures contemplated in paragraphs (b) and (d), or any other precautionary measures which may be prescribed, have been taken;
    - taking all necessary measures to ensure that requirements of this Act are complied with by every person in his employment or on premises under his control where plant or machinery is used;
    - enforcing such measures as may be necessary in the interest of health and safety;
    - ensuring that work is performed and that plant or machinery is used under the general supervision of a person trained to understand the hazards associated with it and who have the authority to ensure that precautionary measures taken by the employer are implemented; and

- causing all employees to be informed regarding the scope of their authority as contemplated in section 37 (1) (b).

The Occupational Health and Safety Act aims to provide for the health and safety of persons at work and for the health and safety of persons in connection with the activities of persons at work and to establish an advisory council for occupational health and safety.

Health & Safety on site is the responsibility of the contractor and the proponent.

Although this is not the function of the ECO, it is a standard requirement for building construction and must be monitored and evaluated by a suitably qualified Health & Safety person. It will not form part of any environmental audit in the future.

Appendix 10: EAP Company Profile

Cape Environmental Assessment Practitioners (Pty) Ltd

Cape EAPrac
Company Profile

Cape Environmental Assessment Practitioners (Pty) Ltd was established in March 2008 by Directors **Doug Jeffery** (EAPASA Reg. No 2019/1746) and **Louise-Mari van Zyl** (EAPASA Reg. No. 2019/1444). The full time professional team includes: **Dale Holder** - Senior Environmental Practitioner (EAPASA Reg.No 2019/301), **Siân Holder** (Practitioner/ECO/Environmental Education), **Mariska Byleveld** - Cadidate Environmental Practitioner (EAPASA Reg. No 2023/6593), **Francois Byleveld** - Candidate Environmental Practitioner (EAPASA Reg.No 2023/6700), **Onke Nandipha** (EAPASA Reg.No 2023/6688) & **Charmaine Mudau** - Full Time On-Site ECOs and **Carin Naudé** - Business Administrator.

The firm implements legislation under the National Environmental Management Act (NEMA), National Environmental Management: Waste Act (NEM:WA) and the National Environmental Management: Air Quality Act (NEM:AQA).

Our main services include:

- Environmental Impact Assessments (EIA's & Basic Assessments)
- Environmental Management Policies & Plans (EMMP's)
- Environmental Control & Monitoring(ECO)
- Environmental Audits
- Environmental Education & Interpretation
- Environmental Constraints Analysis
- Public Participation & Stakeholder Engagement
- Outeniqua Sensitive Coastal Area Permits (OSCA)
- Forestry Applications (for removal/pruning of protected species)
- GIS & Mapping
- Retrospective Damage Assessment (Section 24G)
- Rehabilitation Plans
- Coastal Water Discharge Permits
- Air Quality Licence Applications (AEL's)
- Waste Management Licence Applications (Waste Licence)

PROJECT EXPERIENCE INCLUDES

Reverse Osmosis Desalination; Sensitive Environmental Management including National Parks/Conservation Areas & World Heritage Sites; Renewable Energy Projects (Solar & Wind); Waste Management License Applications for Waste Disposal Sites, Sewerage Plants & Abattoirs; Waste-to -Energy Projects including Biogas Facilities; Marine Aquaculture; Filling Stations; Air Emission Processes for Sawmills, Brick Works & Processing Plants; ECO responsibilities on Private & State Housing Developments, Provincial & Municipal Roads and Infrastructure, Private, Provincial & Municipal applications for development of infrastructure, housing & commercial components

LIST OF ONGOING ***CAPE EAPRAC*** PROJECTS IS AVAILABLE ON REQUEST. PLEASE VISIT OUR WEBSITE FOR MORE DETAILS

PO Box 2070
6530 George

17 Progress Street
6529 George

www.cape-eaprac.co.za

Tel: +27 44 874 0365
Cell: +27 71 603 4132

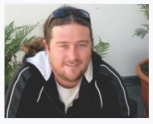
The Team

Doug Jeffery - Director

Doug Jeffery obtained a Bsc with majors in Botany and Zoology at the University of Cape Town (UCT) and went on to obtain his MSc in Botany also at UCT. He has worked extensively in the Western-, Southern- and Eastern Cape both as a professional Botanist and co-ordinating EIA processes for over 20 years. He is registered with the South African Council for Natural Scientific Professions since 1990. He is also registered with the Environmental Assessment Practitioners Association of South Africa.

email: doug@dougjeff.co.za

Dale Holder
Senior Environmental Practitioner

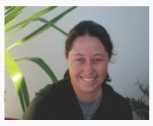


Dale graduated from the Technicon Pretoria in 1999 with a National Diploma in Nature Conservation. He worked as a Socio-Ecologist for SANParks and as Project Manager for the Department of Marine and Coastal Management. He started working as an environmental practitioner in 2002. His focus is currently on Renewable Energy Infrastructure Assessment, but is also involved with assessments in various other industries.

Registered as a Professional Environmental Assessment Practitioner with the Environmental Assessment Practitioners Association of South Africa (EAPASA). (Reg. No. 2019/301)

email: dale@cape-eaprac.co.za

Siân Holder - Consultant / ECO



Siân completed a National Diploma Nature Conservation (Pta Tech), B-tech Nature Con. (NMMU) and a Masters Degree in Environmental Education (Rhodes University). She joined our team in 2008. She worked as Environmental Assessment Practitioner for many years, but her current focus is on Environmental Control and Monitoring, Rehabilitation and Alien Invasive Management.

email: sian@cape-eaprac.co.za

Carin Naudé
Business Administrator

Carin obtained a BBA degree through UNISA. She gained extensive experience in business management and administration since 1988. She joined *Cape EAP*rac in June 2008 and is responsible for the day to day administrative functions of the business. Her acquired knowledge and leadership skills enables the rest of the team to function efficiently in their respective fields.

email: carin@cape-eaprac.co.za

Louise-Mari van Zyl
Director / Principal Environmental Practitioner

Louise-Mari van Zyl holds a Masters degree in Geography & Environmental Sciences from the University of Stellenbosch. She worked as an Environmental Assessment Practitioner (EAP) since 2002 on projects in the Eastern, Southern, Western & Northern Cape provinces. She is registered as and EAP with the Environmental Assessment Practitioners Association of South Africa.

email: louise@cape-eaprac.co.za

Mariska Byleveld
Candidate Environmental Practitioner

Mariska joined Cape EAPrac in April 2022 . She completed her BSc in Geology in 2016, BSc Honours in 2017 and holds a MSc in Geology from the University of the Free State (2020). She worked as a Geologist for two years before joining our team. She is registered as a Candidate Environmental Practitioner.

email: mariska@cape-eaprac.co.za

Francois Byleveld
Candidate Environmental Practitioner

Francois graduated from the University of the Free State in 2020 with a MSc in Geology. After working in the petroleum industry, he joined our team in May 2023 to train as an Environmental Assessment Practitioner. He is registered as a Candidate EAP.

email: francois@cape-eaprac.co.za

On-Site ECOs

We have three full-time, on-site ECOs, working on PV Solar construction sites in the Northern Cape:

- Onke Nandipha - BSc in Environmental Sciences (2017) and a BSc Honours in Geography (2018) from Walter SisuluUniversity. He is registered as a Candidate EAP with EAPASA.
- Charmaine Mudau - BA in Geography and Environmental Management from the University of the Free State (2014) and a BSc Honours in Geography from UNISA (2020).

Their knowledge and understanding of environmental management make them a valuable asset on site.

email: onke@cape-eaprac.co.za &
email: charmaine@cape-eaprac.co.za

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