FRESHWATER RESOURCE REHABILITATION AND IMPLEMENTATION PLAN FOR THE PROPOSED IDAS VALLEY RESIDENTIAL DEVELOPMENT ON ERF 9445, STELLENBOSCH, WESTERN CAPE PROVINCE

Prepared for

Asla Devco (Pty) Ltd

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Glossary of Terms & Acronyms

Alien Vegetation	Plants that do not occur naturally within the area but have been introduced either intentionally or unintentionally
CBA	Critical Biodiversity Areas
DWS	Department of Water and Sanitation
ECO	Environmental Control Officer
EI	Ecological Integrity
EIS	Ecological Importance and Sensitivity
ESA	Ecological Support Areas
HGM	Hydrogeomorphic
IAP	Invasive Alien Plants
m	Meter
mm	Millimetres
MMP	Maintenance Management Plan
NEMA	National Environmental Management Act, 1998 (Act 107 of 1998)
NEMBA	National Environmental Management Biodiversity Act
NWA	National Water Act, 1998 (Act 36 of 1998)
PES	Present Ecological Status
QDS	Quarter Degree Square
REC	Recommended Ecological Category
SANBI	South African National Biodiversity Institute
SAS	Scientific Aquatic Services
UCVBW	Unchanneled Valley Bottom Wetland
WCNCLAA	Western Cape Nature Conservation Laws Amendment Act
WMU	Water Management Unit

1. INTRODUCTION

Scientific Aquatic Services (SAS) was appointed to conduct a freshwater assessment and develop a freshwater resource rehabilitation plan as per the offset guidelines for the wetlands that will be impacted by the proposed Idas Valley residential development on Erf 9445, Stellenbosch, Western Cape Province (Figure 1). As part of the freshwater resource verification[1] undertaken in August 2018, two Seep Wetlands were identified situated along the northern and north-western boundary of the study area with a river located along the eastern boundary (Figure 2).

The need and desirability for the offset came about due to the unavoidable loss of 0,88 hectares of wetland habitat associated with the proposed residential development. Although the development layout plan includes an open space area for the Seep wetland, this is based on the delineation as provided by van Driel (2015) and only included a portion of the permanent zone of the large Seep wetland and not the temporary zone. As part of the offset investigation it was determined that 0,7 functional hectare equivalents and 0,4 habitat hectare equivalents of wetland area would need to be conserved to offset this loss.

Following this, 1,68 hectares of Seep Wetland is available in the neighbouring property which can be utilised for the wetland offset. In accordance with the offset calculator, this wetland has a functional hectare equivalent of 0,4 hectares and therefore, in order to meet the offset requirement of 0,7, the wetland would need to be improved by 35% to a Category B (Largely Natural) State. Due to the existing high urbanisation, alien invasive plant species and agricultural activities within the surrounding area, this target was deemed to be unrealistic and therefore a PES of a Category C (Moderately Modified) was proposed and supported by the Department of Water and Sanitation.

This report has been compiled in order to guide the proponent and authorising agent with the relevant rehabilitation and maintenance and monitoring requirements that must be implemented in order to successfully offset the wetland within the neighbouring site. This report further provides consideration for the river to the east of the study area, recommended guidelines for the proposed stormwater attenuation facility and provides overarching guidance in terms Alien and Invasive Plant Control.

[1] Scientific Aquatic Services. 2018. Freshwater Resource Verification and Offset calculations for the proposed development on Erf 9445, Idas Valley, Stellenbosch, Western Cape. Report Reference 218119.

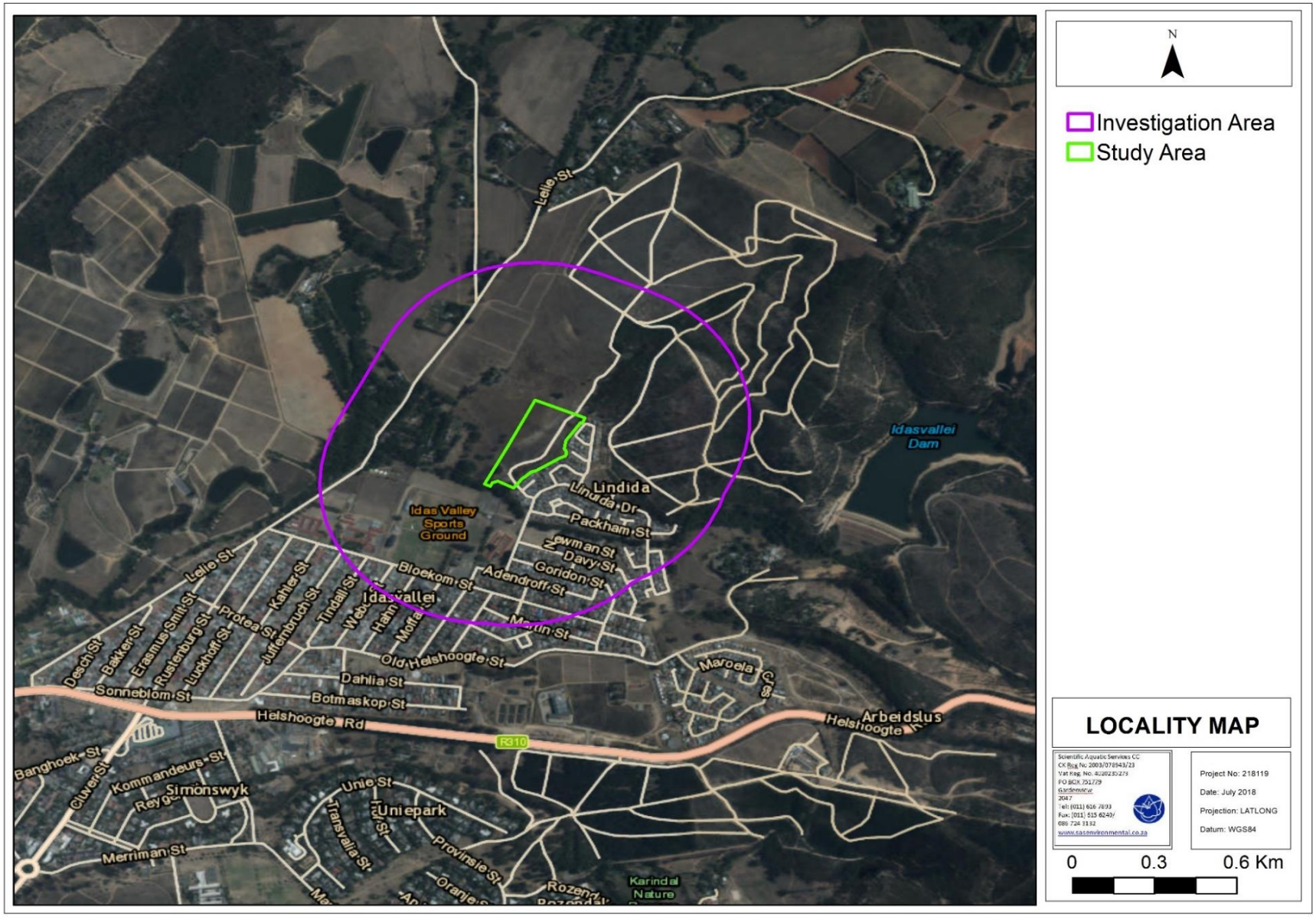


Figure 1: Digital satellite image depicting the study area in relation to the surrounding areas.

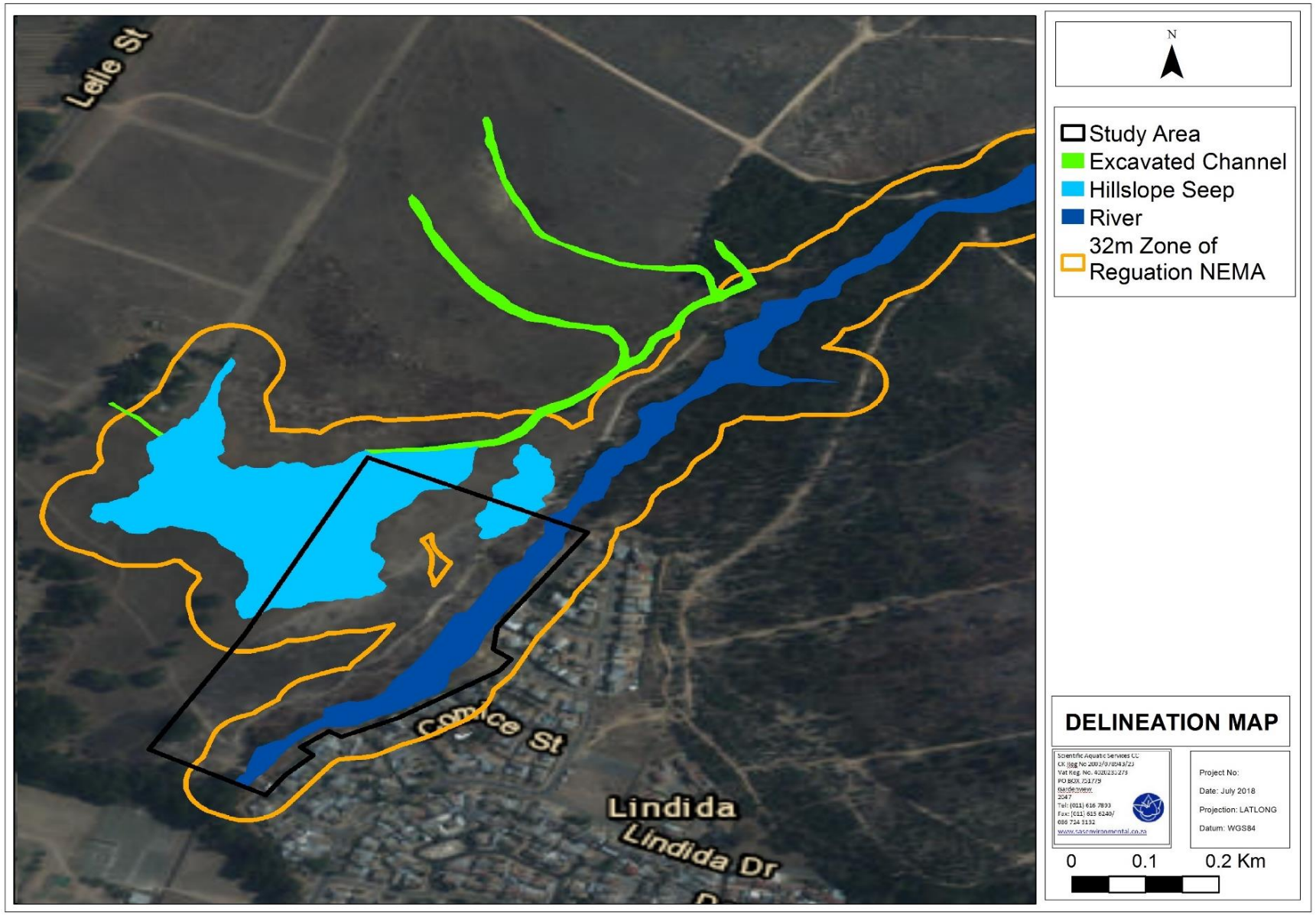


Figure 2: Delineation map and applicable Zones of Regulation for the Seep Wetlands and River within the study area.

1.1 Legislative Framework

The following legislative requirements were considered as part of the development of this Rehabilitation and Implementation Plan (Please also refer to Appendix A).

- National Water Act, 1998 (Act 36 of 1998)
- National Environmental Management Act, 1998 (Act 107 of 1998) (NEMA);
- National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004) (NEMBA): Alien and Invasive Species Regulations (Notice number 864 of 29 July 2016 in Government Gazette 40166);
- Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983) (CARA); and
- Occupational Health and Safety Act, 1993 (Act 85 of 1993) (OHSA).

It is important to note that **rehabilitation impacts** are applicable to areas where impact avoidance and minimisation are unavoidable and where an attempt to re-instate impacted areas and return them to conditions which are ecologically similar to the pre-project condition or an agreed post project land use. Rehabilitation can, however, not be considered as the primary mitigation toll as even with significant resources and effort, rehabilitation usually does not lead to adequate replication of the diversity and complexity of the natural system. Rehabilitation often only restores ecological function to some degree to avoid ongoing negative impacts and to minimise aesthetic damage to the setting of a project. Practical rehabilitation should consist of the following phases in best practice:

a. **Structural rehabilitation** which includes physical rehabilitation of areas by means of earthworks, potential stabilisation of areas as well as any other activities required to develop a long terms sustainable ecological structure;
b. **Functional rehabilitation** which focuses on ensuring that the ecological functionality of the ecological resources on the subject property supports the intended post closure land use. In this regard special mention is made of the need to ensure the continued functioning and integrity of wetland and riverine areas throughout and after the rehabilitation phase.
c. **Biodiversity reinstatement** which focuses on ensuring that a reasonable level of biodiversity is re-instated to a level that supports the local post closure land uses. In this regard special mention is made of re-instating vegetation to levels which will allow the natural climax vegetation community of community suitable for supporting the intended post closure land use.
d. **Species reinstatement** which focuses on the re-introduction of any ecologically important species which may be important for socio-cultural reasons, ecosystem functioning reasons and for conservation reasons. Species re-instatement need only occur if deemed necessary.

1.2 Assumptions and Limitations

- Global Positioning System (GPS) technology is inherently somewhat inaccurate and some inaccuracies due to the use of handheld GPS instrumentation may occur, however, the delineations as provided in this report are deemed appropriately accurate to fulfil the authorisation requirements as well as implementation of the mitigation measures provided.

2 ENVIRONMENTAL CONDITIONS

The following table provides a summary of the outcomes from the wetland assessment undertaken by SAS in August 2018 while Figure 3 provides a visual representation of the delineated wetland as well as the anticipated loss due to the development.

Table 1 provides a summary of the Wetland Seep in its current Ecological State, prior to the residential development or any rehabilitation efforts and provides a baseline from which to work off of. Please refer to the report titled “Freshwater Resource Verification and Offset calculations for the proposed development on Erf 9445, Idas Valley, Stellenbosch, Western Cape. Report Reference 218119.” For additional background information.

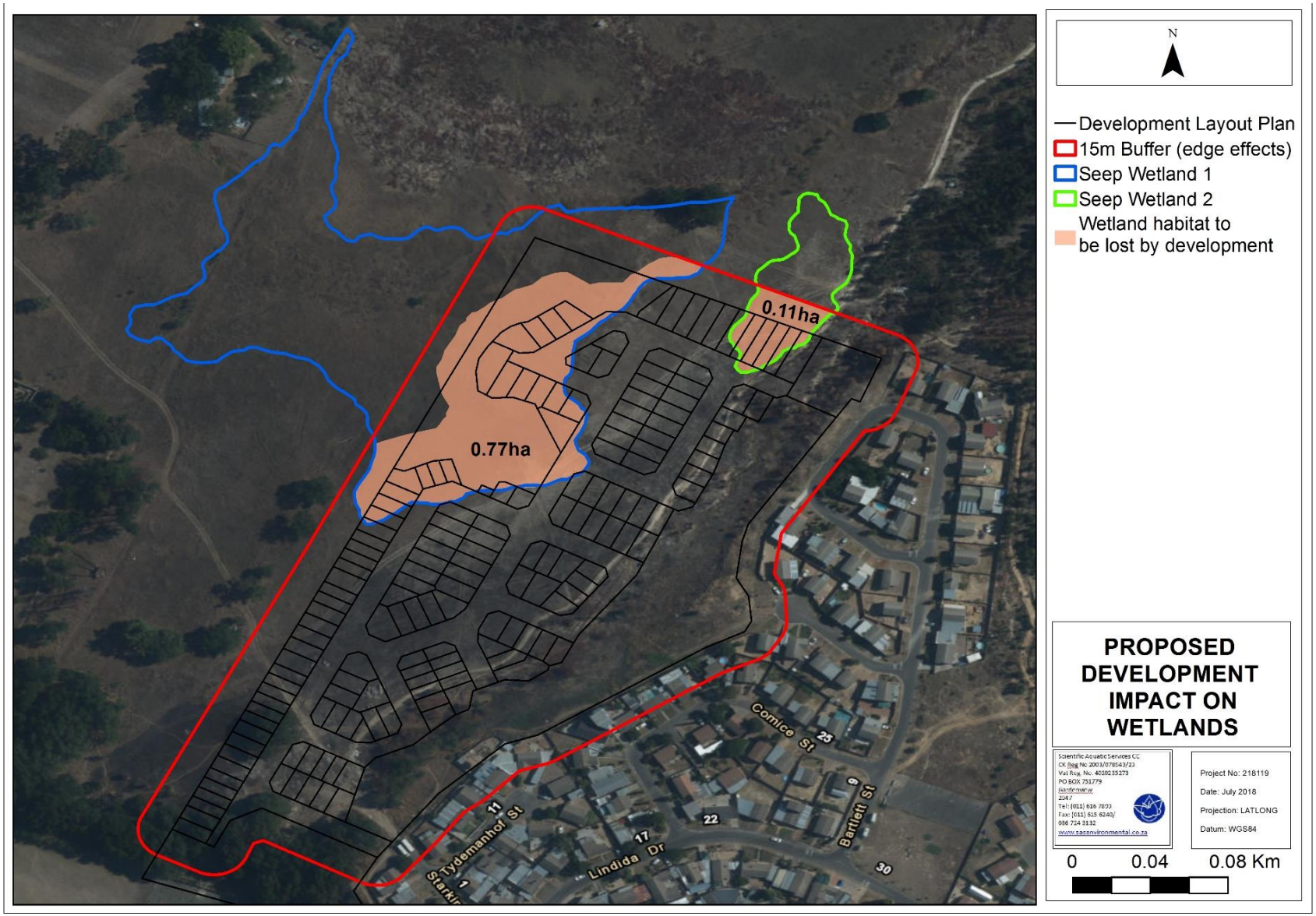
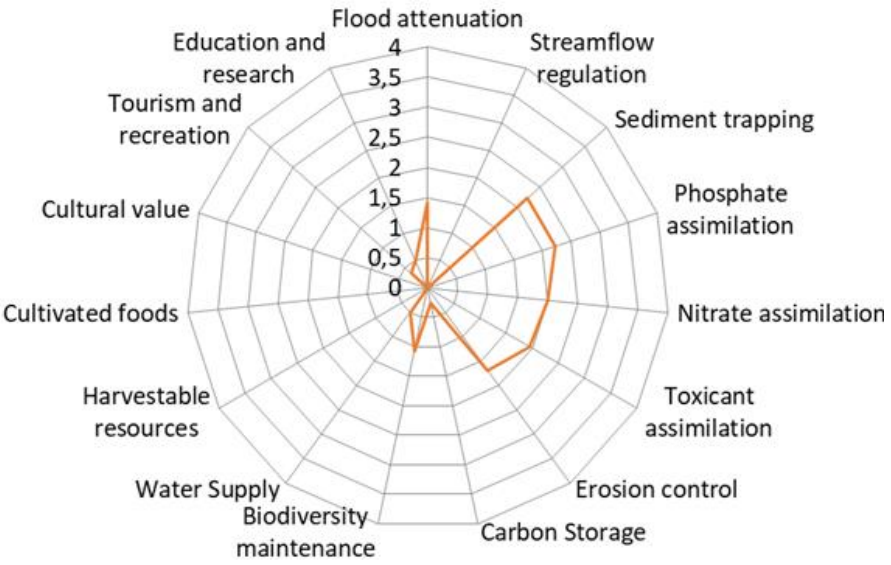


Figure 3: Map indicating development footprint, 15 m buffer included as edge effects and the anticipated loss of wetland habitat.

Table 1: Ecoservice and Ecological Health of the Seep Wetlands

<table>
<tr><th>Classification</th><th colspan="4">Function and Service Provision</th></tr>
<tr><td rowspan="3">Seep Wetland - located on gently to steeply sloping land and dominated by colluvial (i.e. gravity-driven), unidirectional movement of water and material down-slope. Seeps are often located on the side-slopes of a valley, but they do not, typically, extend onto a valley floor</td><td colspan="4" rowspan="2"> 
</td></tr>
<tr><th>Trajectory of change</th></tr>
<tr><td>Declining
↓</td><td colspan="4">Average Score: 0.9
Moderately Low benefits being supplied</td></tr>
<tr><th>Overall PES</th><th colspan="4">Wet-Health</th></tr>
<tr><td rowspan="2">Average Score: 4,77
Category D</td><td>Hydrology</td><td colspan="2">Geomorphology</td><td>Vegetation</td></tr>
<tr><td>D (Largely Modified)</td><td colspan="2">C (Moderately Modified)</td><td>E (Severely modified)</td></tr>
<tr><th colspan="5">Result Interpretation</th></tr>
<tr><td colspan="5">**Hydrological state:** The hydrological functioning of the Seep Wetlands has been largely modified due to surrounding agricultural and anthropogenic activities, including various drains, likely excavated when the land was actively cultivated. These drains as well as piles of deposited materials have created berms within and surrounding the Seeps and have changed the pattern, direction and timing of runoff within the system.

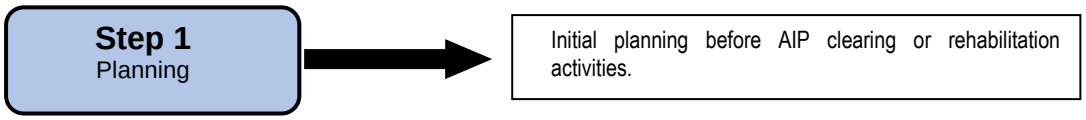
Geomorphological state: The geomorphology of the Seep wetlands is considered moderately modified due to excavation works and deposition of materials observed within the wetland. This has resulted in loss of organic matter and impacted on the dispersal of water across the HGM unit.

Vegetation health: The vegetation composition of both Seep wetlands has been critically modified through the removal of indigenous wetland species during the historical agricultural activities and through the proliferation of alien and invasive plant species such as *Acacia saligna* and *Pennisetum clandestinum* as well as a large variety of other weed and grass species indicative of disturbed areas. No endangered species were identified during the site visit, but the system may provide suitable breeding habitat for various common avifaunal and amphibian species.</td></tr>
</table>

The overall goal is to maintain the Present Ecological State of the river and improve the remaining 1,69 hectares of Seep Wetlands to a Present Ecological State of Category C (as per the Offset calculations) through the implementation of various remediation activities and rehabilitation interventions. The following sections provides a breakdown of how this will be achieved, with Chapter 4 providing the projected environmental conditions for the freshwater resources post rehabilitation.

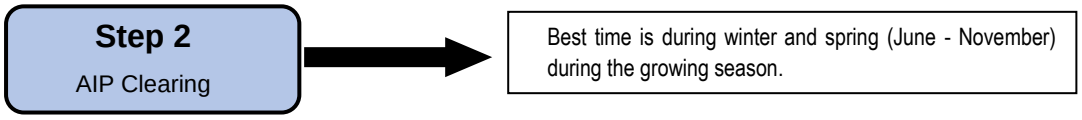
3 IMPLEMENTATION PLAN

The Implementation plan is based on a four – step approach, which includes:



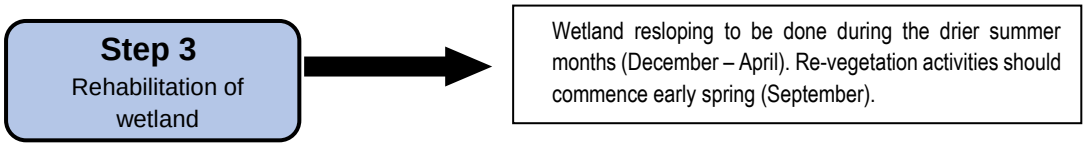
All plans and authorisations must be in place prior to commencement of the rehabilitation activities. This includes but it not limited to:

a) Obtaining all required authorisations and permits;
b) Appointment of a Contractor and ECO;
c) Planning for on-site requirements; and
d) Timeframes and budgetary allowances.



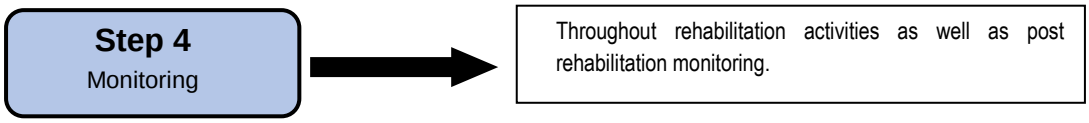
Before any rehabilitation activities can commence, the rehabilitation areas must be cleared of AIPs. This will include:

a) Mechanical removal of all large stems (focus mainly on the NEMBA listed species *Acacia saligna)*; and
b) Chemical treatment of AIPs and weed species within the surrounding terrestrial areas.



The rehabilitation of the wetlands within the identified rehabilitation areas will enhance the service provision of the wetlands through:

a) Re-sloping of embankments/ removal of soil deposits and infilling of excavated areas (as identified in Section 6 below);
b) Removal of weeds and AIPs; and
c) Repair of any identified erosion and incision.
d) The re-vegetation of the rehabilitation areas will commence on completion of any required re-sloping and removal of all AIPs. Only indigenous vegetation species may be reinstated. It is noted that *Pennisetum clandestinum* is already established in the wetlands and will have to be managed in the long-term.



Ongoing monitoring and auditing of all rehabilitation and IAP clearing will be required throughout and following completion of these activities. A list of monitoring and auditing requirements has been provided to maximize success of the rehabilitation.

These steps will be expanded upon in greater detail in the sections that follow.

Step 1: Planning

1.1. Obtaining all relevant authorisations and permits

Before rehabilitation activities can commence all necessary permits and authorisations will be required, including but not limited to:

- Water Use Authorisation for all rehabilitation activities; and
- Rezoning/ conservation servitude or similar for the rehabilitation areas this may not be in place before rehabilitation commences, however, proof of initiation of this process should be available on request.

1.2. Appointment of a Contractor and all required specialists

During the planning phase certain aspects need to be considered in order to effectively implement this plan. This includes:

- Appointment of a suitably qualified Contractor(s) to undertake the required work:
- Appointment of an ECO to audit and monitor the rehabilitation activities as well as to undertake the required post rehabilitation monitoring;
  - The ECO is to compile a monthly audit report indicating all observations, actions and any remediation measures that were implemented and the reports are to be submitted to the DWS.
- Should the Contractor not have the appropriate expertise for implementation of this plan then it is the responsibility of the Contractor to appoint a suitably qualified freshwater ecologist to oversee the implementation.

1.3. Planning for on-site requirements

The following objectives and control measures must be implemented as part of the planning phase.

Table 2: Relevant Objectives and Control Measures to be implemented as part of the planning phase

Objectives or requirements	Control Measures
Establishment and Access	➢ The neighbouring property must be correctly zoned as an open conservation servitude and no future developments may be allowed. The title deed should ideally indicate that the site has been utilised for an offset. ➢ The rehabilitation area should be pegged out and demarcated with danger tape. At no point should construction equipment extend past the designated construction site (unless for the required rehabilitation works). All vehicles must utilise the culvert crossing over the river only and may not indiscriminately drive within any freshwater features. ➢ Adequate signage (in the adequate various languages) must be placed around the planned rehabilitation areas.
Indigenous plant harvesting and propagation	➢ As part of the proposed rehabilitation plans, some indigenous wetland species will need to be re-instated within the wetland habitat. As such, plans should be made for where the species are to be sourced and budgetary allowances made for the purchasing of various species. ➢ One such nursery from which indigenous plant species can be obtained is from the Cape Flats LIFE (plant list available in Appendix B). ➢ Availability of species needs to be secured before rehabilitation activities commence to ensure that plants are ready and available for re-vegetation (Step 3), so as not to leave areas exposed and vulnerable to erosion and incision.
Unplanned Fire Management	➢ Unplanned fires can occur within the area surrounding the study area and the wetlands to be rehabilitated. This is specifically true due to the high density of urbanisation in the surrounding area, therefore there is an increased likelihood of human-started fires. The Municipality must have the necessary fire management plans in place prior to construction works. ➢ Awareness - Contractors working on site must be made aware of how their actions may result in the ignition of wild fires and must be adequately prepared to suppress any fires that may start whilst they are working, specifically in dense AIP areas. Signage should be erected to indicate that fires are not permitted and to promote vigilance and reporting of signs of veldfires (CBEN, 2015; CSIR, 2016).

Step 2: AIP Clearing

Alien and Invasive Plants (AIPs) *Acacia saligna* (Port Jackson Willow, Category 1b), *Echium plantagineum* (Patterson's Curse, Category 1b) as well as *Pennisetum Clandestinum (*Kikuyu Grass, Category 2) were identified within the site. Category 1b species require compulsory control and must be removed and destroyed as they have high invasive potential. An AIP control plan was thus developed as part of the offset project. This AIP control plan focuses on mechanisms to control the identified species within the proposed rehabilitation area. It must be noted that Port Jackson (*Acacia saligna)* have been known to have large seed banks that can germinate for upwards of five (5) decades thus it is imperative that sufficient capacity and funding be provided for follow-up control for a number of years after the initial clearing (please also refer to Appendix C).

AIP control can be divided up into two phases, namely:

1. The initial control phase whereby AIPs are removed from the rehabilitation areas; and
2. The follow-up control whereby AIPs (coppice, saplings, and seedlings) within the rehabilitation must be done once a year during spring (September – November) for a minimum period of seven (7) years to ensure that new AIP infestation does not occur within the rehabilitated areas, after which the follow-up period should be re-assessed based on the need.

The following definitions are applicable to this section:

Hand Pull	Saplings and seedlings must be pulled out by hand. All root material should be removed to avoid re-sprouting of the plant.
Frill	The technique whereby an axe or cane knife is used to chip/cut around the base of a tree (±2mm deep) in order to place herbicide into the cuts (cutting not to be as deep as to ringbark). Herbicide to be applied within 30 minutes from frilling.
Ringbark	Removal of a ring of bark at least 25cm wide and pull down to just below ground level. Ring barking interferes with the circulation of the tree and results in it slowly dying.
Tree Felling	Complete removal of the AIP down to a stump by means of a chainsaw, hand axe or cane knife.
Stumping	The treatment of the remaining stump after felling with an appropriate herbicide (see recommended below).
Soil application	The application of herbicide (see recommended below) to the soil which is taken up by the plants roots.
Foliar Spray	The application of herbicides directly to the leaves. Foliar spraying can be done by using the following: a) A hose and handgun spraying the solution from a herbicide tank; b) A backpack spray unit; or c) Splatter guns which allow for larger droplets at higher concentrations – suitable for regrowth.
Stump Coppice	New shoots that regenerate from the stumps of felled trees.
Root Suckers	New vertical regrowth that arises from the base of the trunk, a new stem arising away from the main, stumped stem.

The table below indicates the recommended control measures to be implemented as part of the rehabilitation plan. All recommended herbicides and active ingredients are listed under species specific control. It is important to note that AIP control (specifically *Acacia saligna* thickets occurring within the rehabilitated areas) must be done from the outer sections inwards in order to contain the existing AIP and prevent further spread.

Table 3: Relevant Objectives and Control Measures to be implemented as part of the AIP clearing

<table>
<tr><th>Objectives or requirements</th><th>Control Measures</th></tr>
<tr><td colspan="2">Initial Control</td></tr>
<tr><td>Chemical Control</td><td>• Dense seedling growth must be controlled with knapsack sprayers with a flat fan nozzle;
• Suitable dye must be used to limit over- or under spray of areas;
• Chemical control will entail limited usage of registered herbicides for a specific species and one must adhere to the measurements on the product label; and
• Care must be taken as to not use herbicides containing Glyphosate, Diquat and Paraquat within the identified watercourses associated with the rehabilitation area. These chemicals may only be used in the terrestrial zones as they are known to be toxic to aquatic life.</td></tr>
<tr><td>Species Specific Treatment</td><td>The following are species specific treatment for the three main AIPs noted within the rehabilitation areas. Use of these listed chemical treatments should occur after or during the mechanical removal process and may be used on other common weeds, as deemed appropriate by the ECO.

Treatment of Port Jackson (Acacia saligna):
• Seedlings must be hand pulled and no herbicide is needed;
• Young plants should be lopped/pruned and treated by means of a foliar spray of 50ml of Triclopyr Ester* mixed with 10l of water and applied at a rate of 3 l/ha; and
• Adult plants must first be cut down to a stump and frilled before being treated with 300ml of Triclopyr Amine salt* mixed in 10 l of water applied at a rate of 1.5 l/ha. Additionally, a Triclopyr Ester* solution can also be applied to approximately 0.6m length of stump.
• All branches that have been mechanically removed must be transported off site to a designated dumping facility. Cut branches should not be left in stockpiles as the seeds will likely germinate.
 
Figure A: (Left) Port Jackson coppicing just north of the identified wetland to be rehabilitated (Right): Port Jackson sapling within the study area.

Treatment of Kikuyu Grass (Pennisetum clandestinum)
• A herbicide with active ingredient Glyphosate*, dalapon or haloxyfop-P methyl ester should be used. Plants should be sprayed during their active growing season (autumn). It is to be noted that Glyphosate* or haloxyfop herbicides may not be used within the watercourses where water is free flowing as it is known to be toxic to aquatic life.
• Haloxyfop-P Methyl Ester is deemed to have a minimal environmental impact (although on an acute basis is toxic to aquatic life) and is not expected to leach into groundwater. Furthermore, it has been identified to degrade in soils under normal environmental conditions[2].</td></tr>
</table>

[2] The DOW Chemical Company. 2011. Product Safety Assessment: haloxyfop-P Methyl Ester

Objectives or requirements	Control Measures
	 *Figure B: (Left) Idas Valley River invaded by Kikuyu Grass; (Right) Kikuyu Grass surrounding wetland to be rehabilitated.* **Treatment of Patterson's Curse** (*Echium Plantagineum)* • Plants can easily be hand pulled and no herbicide is needed, however, chemical control can be used with active ingredients chlorsulfuron, mesulfuron methyl, triasulfuron or Glyphosate* to control seed sets during the flowering season.  *Figure C: Echium plantagineum located within the Idas Valley site and surroundings.*
Follow-up Control	
Follow-up AIP treatment	➢ Follow-up control is essential to control alien saplings, seedlings and coppice regrowth to achieve and sustain the progress that was made in the initial phase. If the follow up control phase is neglected, the alien infestation may become worse and denser than before the eradication process started. ➢ Follow-up should be quarterly after the initial AIP clearing, thereafter, annually, within the growing season (September – November) for at least seven (7) years. ➢ An annual assessment before mobilisation of the clearing crew should be undertaken to determine equipment and personnel requirements in order to secure the necessary funding. ➢ After initial control operations dense regrowth may arise as new regrowth will sprout in the form of stump coppice, seedlings and root suckers. The following should therefore be applied: • Plants that are less than 1 m in height must be controlled by foliar application. • For *Pennisetum clandestinum*, the use of a registered selective herbicide must be used so as to not harm the grass, and if grass is not present a registered non-selective or selective herbicide can be used. • Areas with dense seedlings should not be uprooted or hoed out, as these areas will result in soil disturbance and will in return promote flushes and germination of alien seedling growth.

Step 3: Site- Specific Wetland Rehabilitation

A detailed site-specific rehabilitation plan has been developed for the wetland area to be utilised as the offset as well as the river to the east of the proposed residential development. Successful rehabilitation depends upon conceptual planning, research and design flexibility. The proposed site-specific mitigation measures for the construction and rehabilitation phases are listed in Table 4 below and the anticipated wetland area to be rehabilitated are visually represented therein.

Table 4: Rehabilitation interventions and control measures proposed for Idas Valley.

Objective/ Requirement	Control measures
General mitigation	<u>General</u> • It is imperative that no construction equipment of personnel enter into the wetland to be rehabilitated, unless authorised as part of the rehabilitation interventions. The proposed development must be fenced off from the surrounding open space area both during construction and operation. • Any rehabilitation works should be undertaken just before the rainy season (between the months of February – May 2018 so that vegetation growth can be quickly re-established. • At no point may vehicles or construction equipment move within the remaining wetlands. All vehicles should remain on designated roads within the road reserve. • No equipment may be stored within the delineated freshwater features while not in use. Any designated storage and parking bays must be located no closer than 32 m from the river and the wetland features. • The open space area as included in the master development plan must be fenced off from the residential development with suitable fencing (such as ClearVu) that cannot be easily removed or cut. <u>Vegetation Clearing, and earthworks</u> • In order to access the river with the required construction equipment, and re-instate the area upstream of the culvert crossing, vegetation will need to be cleared. All vegetation removed must be disposed of at a suitable disposal facility. • At no point may construction equipment stand unauthorised within the wetlands or near the river. • All excess sediment removed from the watercourses must be utilised as part of the building activities or be removed from site. At no point may this material be dumped on site or within any of the other freshwater features identified within the surrounding area. Topsoil will have a high density of alien invasive seeds which will need to be controlled into the operational phase.
Rehabilitation earthworks associated with the Seep Wetlands	<u>Summary of the findings</u> The wetland is in a largely degraded state as a result of historical agricultural activities. The hydraulic regime has already been largely modified as a result of historically excavated channels and the depositions which affect the water distribution and retention patterns within the wetland. Furthermore, the vegetation is considered to be severely modified, due to the high diversity of weeds and AIPs.  *Figure A: Seep Wetland in a largely degraded state.*

Objective/ Requirement	Control measures

Rehabilitation interventions proposed

It is the opinion of the freshwater specialist that fairly extensive works need to be undertaken within this system to improve the ecoservice provision and ecological state to a Category C (as per the requirements of the Wetland Offset). Three main activities were identified:

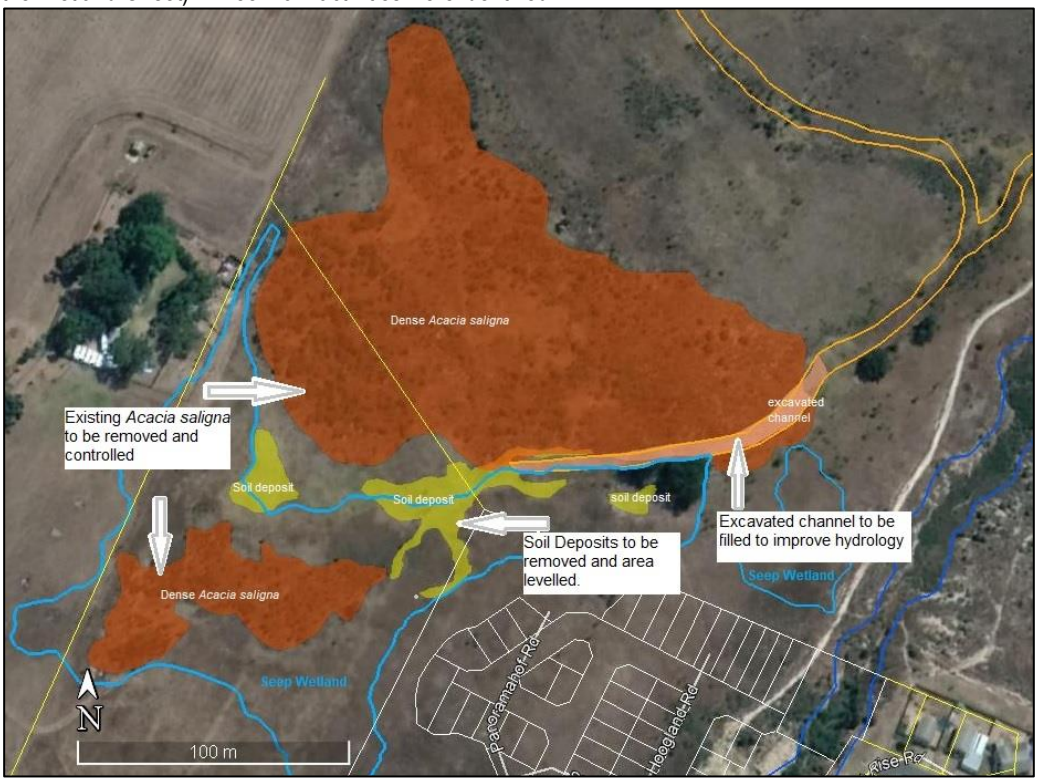


Figure B: Proposed rehabilitation interventions required to improve the Seep Wetlands to a Category C.

The following rehabilitation interventions are required:

- It is imperative that all alien and invasive *Acacia saligna* be removed and controlled into perpetuity within the Seep Wetlands. Follow-up control, as indicated within Table 3 of this report is imperative.
- The wetland area was noted to have various piles of deposited material. These deposits are dominated by *Pennisetum clandestinum* and alter the geomorphological and hydrological processes as well as the wetting patterns within the wetland. It is therefore recommended that all deposits be removed from the wetland (as indicated above) and the area sloped to maintain the average 5% fall in a southerly direction and ensure that it is free draining and that no concentration of flow occurs.
- The area should not be uniformly levelled as minor water ponding should be encouraged in areas of the Seep Wetland to increase the presence and diversity of niche habitats. Oversight from a freshwater specialist is recommended for this component of the rehabilitation to ensure the hydrological retention of the system is not adversely altered.

Figure C: Soil deposits identified within the Seep Wetland.

Objective/ Requirement	Control measures
	• An excavated channel is located to the north of the Seep Wetland. This channel is currently sedimented in places and invaded by *Pennisetum clandestinum.* Soils from this excavation have been piled alongside the channel, preventing any spill over of water being conveys from the upper reaches. It is recommended that this channel be infilled, and the gradient leveled with the surrounding area so as to encourage water dispersal across the surrounding area, rather than it being retained within the channel. Care must be taken to ensure that the outlet of the remaining channel is correctly levelled.  *Figure D: Historically excavated channel north of the Seep Wetland.* <u>Rehabilitation considerations</u> • The rehabilitation of the Seep wetlands should only be undertaken towards the end of the development construction. Dust generated from the construction works may smother new re-instated vegetation. • All rehabilitation work must be done during the drier summer months leading up to the rainy season (May – April) to reduce contamination of surface water and ensure maximum survival of new plant species (see section below of re-vegetation). Some watering of plants during the first dry season may be necessary to ensure survival. • It is important that no further works be allowed to the north east of the wetland as it is the opinion of the freshwater ecologist that this is the main inlet for surface water (based on historical imagery that indicated a drainage line used to be located within this area). Without the hydrological drivers in place the wetlands longevity will be compromised. • Should the ECO not have the relevant expertise, it is recommended that the rehabilitation be overseen by a suitably qualified wetland specialist to ensure maximum service provision is achieved over the long-term in terms of hydrology, geomorphology, water quality and biota.
Rehabilitation earthworks associated with the River.	<u>Summary of findings</u> • The river running to the east of the study area was noted to be in a largely degraded state, with both *Acacia saligna* and *Pennisetum clandestinum* dominating throughout. • The embankments of the river are of a steep slope in the upper reaches, with erosion evident and thus sedimentation of the system. Approximately two thirds of the system has become severely silted up and indigenous riparian vegetation has been lost/ smothered by *Pennisetum clandestinum.*  *Figure E: (Left) Steep embankments of river in upper reaches, with erosion evident; (Right) Large portion of the system has become heavily sedimented and invaded by Pennisetum clandestinum and Acacia saligna.*

Objective/ Requirement	Control measures
	• A gabion wall has been constructed along the west bank, bordering the study area, presumably to stabilise the western embankment and for stormwater protection. • Ponding of water was noted in the upper reaches of the system as well as surrounding the culvert crossing in the lower reaches, installed as the access road from the proposed development. This further indicates that limited through flow of water is occurring within the central portion of the system.

Figure F: (Left) Water ponding within the river as well as within an excavated trench (assumed to be associated with the installation of the gabion wall); (Right) water ponding identified associated with the culvert crossing.

Rehabilitation interventions proposed

It is the opinion of the freshwater specialist that extensive works need to be undertaken within this system to improve the ecoservice provision and ecological state. The system was divided into three portions, namely Portion A: Embankment re-sloping, Portion B: extensive re-sloping works and vegetation clearing and Portion C: limited rehabilitation requirements other than vegetation control (Figure G)

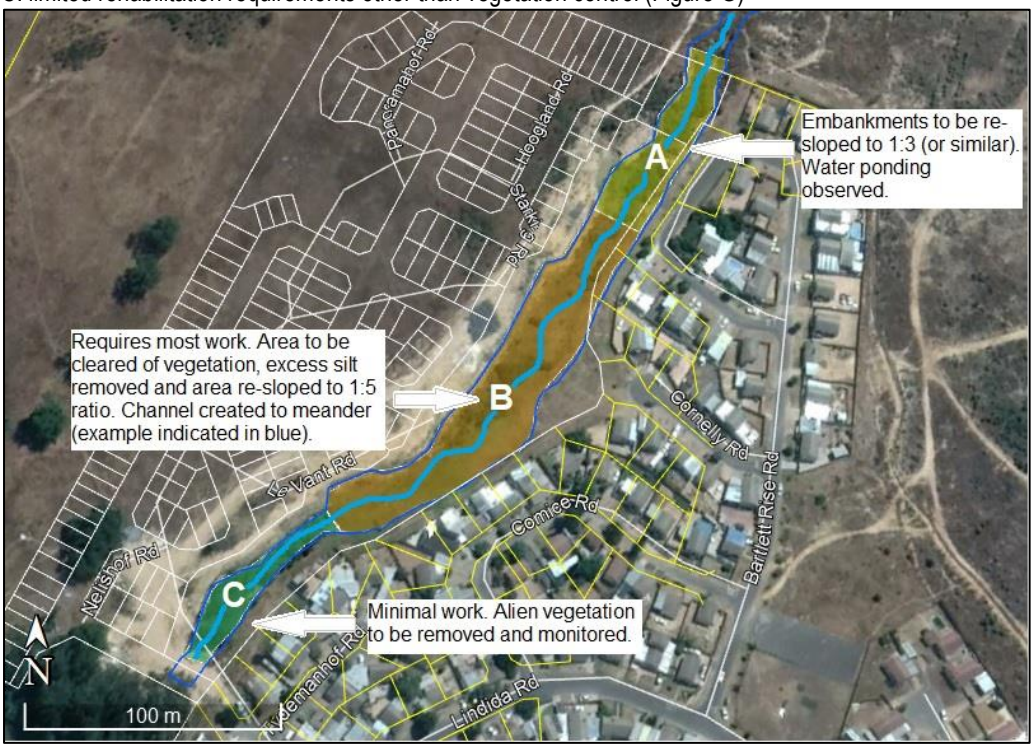


Figure G: Proposed rehabilitation interventions proposed to improve the river to the east of the residential development.

The following rehabilitation interventions are required:

- All alien vegetation within all three portions must be cleared, as per the guidelines stipulated within Table 3 of this report.

Objective/ Requirement	Control measures
	• Once cleared, all embankments within Portion A should be re- sloped to a minimum of 1:3 ratio (or similar, depending on what is feasibly possible given the space limitations due to the surrounding existing houses) and all erosion and gully formation fixed. • Portion B of the river should be re-sloped with a 1:5 ratio, and a channel area created. All excess sediment must be utilised as part of the embankment re-instatement, for the building activities or be removed from site. At no point may this material be dumped on site or within any of the other freshwater features identified within the surrounding area. • On completion of re-sloping within portion B, the channel should be developed so as to meander and not as a straight line through the site (as indicated in Figure G). This will assist in increasing the water retention capability of the system and creation of ecological pockets for smaller faunal species. • Loose pebbling should be installed within the channel and riparian vegetation re-instated within all portions to assist with increased sediment trapping and energy dispersal to prevent erosion and incision from occurring.  *Figure H: Schematic diagram of a channel with sloped sides of 1:3 ratio, reinstated with loose pebbling and boulders as well as indigenous riparian vegetation.*  *Figure I: Example of an urban river that was re-sloped and had cobble substrate re-instated (within Gauteng Province). Pennisetum clandestinum is present but controlled.* ➢ Exposed slopes along the edge of the rehabilitated embankments are highly prone to erosion, therefore the surrounding area should be covered with a geotextile product such as hessian, with commercially available products such as Geojute, which is to be staked to the surface of the slopes and indigenous riparian vegetation should be re-instated therein. ➢ Should active erosion be identified, control features such as earth berms or perimeter berm/swales (see below) must be used to intercept and convey runoff from above disturbed areas to suitable dispersal areas or drainage systems. This helps to reduce the sedimentation from exposed areas**.** Walker, D. 1999 et al. and USEPA. 2005 have identified the following methods: • **Brush layering** is when branches are placed perpendicular to the slope contour. This method is effective for earth reinforcement and mass stability. Brush layers break up the slope length, preventing surface erosion, and reinforce the soil with branch stems and roots, providing resistance to sliding or shear displacement. Brush layers also trap debris, aid infiltration on dry slopes, dry

Objective/ Requirement	Control measures
	excessively wet sites, and mitigate slope seepage by acting as horizontal drains. Brush layers facilitate vegetation establishment by providing a stable slope and a favourable microclimate for growth of vegetation. USEPA 2005 • **Live gully repair** is a technique that is similar to branch packing but is used to repair rills and gullies. Live gully repairs offer immediate reinforcement and reduce the velocity of concentrated flows. They also provide a filter barrier that reduces further rill and gully erosion and must be used where gully erosion is taking place on the project footprint. USEPA 2005. Rehabilitation considerations • All rehabilitation work must be done during the drier summer months (November – April) to reduce contamination of surface water, increased sedimentation and erosion. • Should the ECO not have the relevant expertise, it is recommended that the rehabilitation be overseen by a suitably qualified wetland specialist to ensure maximum service provision is achieved over the long-term in terms of hydrology, geomorphology, water quality and biota.
Re-vegetation	The last stage of the rehabilitation activities should be to re-instate indigenous vegetation within the rehabilitation areas. Propagation and purchasing of the required species should have been undertaken as part of the Planning (Step 1) and must be ready and available for transplantation as soon as the AIP clearing and re-sloping activities have been completed. The following points are of key importance for re-vegetation: • Planting must start as soon as possible after soil profiling so as to reduce the duration of bare ground being exposed, which could lead to erosion and sedimentation of the area, and to establish ecological habitats. Furthermore, all disturbed areas as part of the rehabilitation, as well as where AIP have been removed should also be re-instated with indigenous vegetation. • Re-instatement of indigenous vegetation should be undertaken in early May for the larger specimens (Growing season) and early spring (August/September) for the smaller saplings. This will ensure that the hot summer months are avoided, and that species will be planted prior to the onset of winter rainfall, which will maximize growth and early establishment. • Water will need to be made available for irrigation purposes for the first season after indigenous vegetation has been planted. It is recommended that all planted specimens be watered during the first summer. • Should the Contractor not have the relevant expertise on planting of specimens, they should appoint a suitably qualified botanist or landscape architect to assist with the re-vegetation. The following criteria is recommended to be used to inform the selection of wetland plant species within the site: Plants must be hardy, and ideally able to withstand: • Elevated nutrients; • Periodically high hydrocarbons (oils); • Occasional high sediment inflows; • Elevated ammonia concentrations; • Periods of low oxygen, depending on zonation; and • Periodic inundation (it is assumed that inundation is likely during the rainy season). • Plants must be readily available; • Plants must establish rapidly to facilitate prompt onset of wetland function; • Plants should ideally be locally indigenous and no plants that are alien and invasive (e.g. Port Jackson) should be planted or allowed to remain in the study area. It is important to note that the Contractor must ensure a variety of plants be used within the Seep Wetlands and consideration must be given to the wetland zonation (this system is predominantly seasonal and temporary) when selecting plant species. It is noted that *Pennisetum clandestinum* has already invaded the area, so regular maintenance will be required until the reinstated vegetation is self-sustaining. **WETLAND SPECIES** The below list was compiled through the use of the field guide titled "Easy identification of some South African Wetland plants (Grasses, restios, sedges, rushes, bulrushes, Eriocaulons and Yellow-eyed grasses)" (van Ginkel *et al*. 2011) whereby plant species were cross referenced with the broader Cape Flats area. Additionally, wetland species as listed for the Boland Granite Fynbos vegetation type in the book titled

Objective/ Requirement	Control measures
	"Vegetation of South Africa, Lesotho and Swaziland" (Mucina and Rutherford. 2006) were added. Additional plant species can be sourced from the Cape Flats LIFE locally indigenous fynbos exchange list available in Appendix B (plants marked with a "*" can be sourced from Cape Flats). · *Calopsis paniculata* · *Carex clavata** · *Cyperus congestus* · *Cyperus textillis** · *Elegia asperiflora* · *Elegia capensis* · *Elegia fistulosa* · *Eleocharis dregeana* · *Epischoenus gracilis* · *Ficinia nodosa** · *Isolepis cernua* · *Isolepis diabolica* · *Isolepis hystrix* · *Isolepis marginata* · *Isolepis setacea* · *Juncus dregeanus* · *Juncus effusus** · *Juncus lomatophyllys** · *Pycreus polystachyos* · *Zantedeschisa aethiopica (already present on site)*  • Proliferation of any of the following common Western Cape weed and alien plant species should be removed by hand and the use of chemicals be limited to when absolutely necessary, in order to prevent die back of remaining indigenous vegetation and to prevent contamination of the water resource: · *Acacia saligna (see Table 3)* · *Pennisetum clandestineum (see Table 3)* · *Echium plantagineum (see Table 3)* · *Ricinus communis* · *Avena fatua* · *Plantago lanceolate* • All chemical control must be monitored as per the requirements stipulated in Table 3 of this report.
Stormwater Management	• A Storm water attenuation facility is proposed to the south of the development, alongside the river. It is recommended that this attenuation facility be designed to be as natural as possible (earthed and unlined) and vegetated to function as a constructed wetland for water quality filtration.  *Figure J: Example of Stormwater attenuation facility with a diverse array of wetland vegetation.* • Storm inlets and outlet points must be designed at ground level so as to prevent erosion and gully formation. Suitable engineering solutions (such as concrete aprons or gabion mattresses) should be utilised at all outlets to reduce the speed at which the water flows into the attenuation facility.

Objective/ Requirement	Control measures
	• Litter traps should be installed at all outlets to catch any litter/solid wastes from entering the system. This can be in the form of a stormwater drain net or grates. These traps should be regularly cleaned during the operational phase to prevent blockages.   *Figure K: Example of litter traps from stormwater outlets.*
Culvert crossings	• Two culvert crossings are proposed over the river to gain access into the Estate (Figure 4 below). • Care must be taken when constructing the culverts to ensure that the design accomodates a 1 in 100 year flood event and that the base levels are maintained so that no erosion or ponding of water occurs surrounding the crossing. • Soil surrounding the wingwalls must be suitably backfilled and sloped (minimum of a 1:3 ratio) and concrete aprons as well as gabion mattresses should be installed both up and downstream for energy dissipation and sediment trapping (Figure L). • All soils within the river surrounding the culvert must be loosened on completion of works to allow for revegatation.   *Figure L: Example of suitable culvert crossings within a watercourse.*

Figure 4: Proposed culvert crossings over the river to gain access to the new Idas Valley Development

Step 4: Operational phase management and Monitoring

Prudent monitoring of the rehabilitated portions of the affected wetland is of utmost importance, as this will ensure a continual flow of data, enabling all parties involved to accurately assess and manage the progress of the rehabilitation interventions and any arising issues. To ensure the accurate gathering of data, the following techniques and guidelines should be followed:

- Site walk through surveys should be applied as the preferred method of monitoring (at specified frequencies) with specific focus on:
  - Erosion monitoring (for the duration of the raining season);
  - Sedimentation (for the duration of the raining season);
  - Alien and invasive vegetation proliferation (at the start and end of the growing season);
  - Spills events (regularly at the direction of the relevant engineer);
  - Surface water monitoring; and
  - Waste and litter problems.
- General habitat unit overviews should also be undertaken;
- Stability and appropriateness of stormwater controls;
- All data gathered should be measurable (qualitative and quantitative);
- Monitoring actions should be repeatable;
- Data should be auditable; and
- Reports should present and interpret the data obtained.

The monitoring plan comprises but is not limited to the following:

- Identification of areas of concern. These are areas that are affected by disturbances such as:
  - Erosion;
  - Waste dumping;
  - Alien vegetation species encroachment;
  - Soil compaction; and
- Ensuring that the management/rehabilitation measures as stipulated in Section 6 of this report are adhered to;
- A list of all alien vegetation species must be compiled as well as possible control methods such as manual, chemical or mechanical.
- Gathering all equipment required for the monitoring process; and
- Compiling a monitoring report.

Table 5: Monitoring actions for the proposed Idas Valley rehabilitation site.

Aspect	Monitoring Location	Frequency of sampling	Frequency of Reporting
AIP control	1. Screening of the entire rehabilitation area(s); 2. Logging locations of any newly coppiced species to be treated/removed.	1. Before the initial AIP clearing a baseline assessment should be taken to indicate densities and species; 2. After the initial AIP clearing densities should be re-recorded, including all methods and chemicals used; 3. Quarterly assessment during the first year post rehabilitation. Densities and locations of newly coppiced AIPs to be recorded; and 4. Annually during the growing season for the second and third year, post rehabilitation to ensure long-term maintenance measures are effective.	1. Before and after AIP clearing report should be compiled; 2. Quarterly report during the first year post AIP clearing; and 3. Annually during each growing season, for at least 3 years post rehabilitation – report should include information from before and after mobilisation of follow-up clearing teams.
Wetland Water Quality (only applicable	1. Upstream and downstream of the river to the east of the study area. 2. For consistency, the same point should be	1. Water must be tested one month before the rehabilitation process begins, and at least once a month during the rehabilitation of the wetlands and should include: a. pH (allowable limit 6.5 – 8.0);	Results should be included in the monthly monitoring report compiled by the appointed ECO.

Aspect	Monitoring Location	Frequency of sampling	Frequency of Reporting
when water is present)	used for each repeat sample.	b. Electrical Conductivity (EC) (limit: ≤50); c. Temperature (limit <15% variation); d. Total Dissolved Solids (TDS) (limit <15% variation); and e. Turbidity (limit <3). ➢ Once a month after rehabilitation for three months. Please see below for allowed monitoring variables.	
Waste and litter problems	1. All areas which are frequently traversed by personnel during the rehabilitation. 2. Stormwater outlets	Monitoring of waste or litter problems should occur daily where rehabilitation and AIP clearing is taking place. The Contractor is to ensure that no staff litter on site.	Monthly monitoring report compiled by the appointed ECO.
Erosion	1. All rehabilitated areas; and 2. All areas disturbed by construction activities.	1. Weekly during rehabilitation activities; 2. After every major rainstorm and / flood for the first wet season post rehabilitation.	Monthly monitoring report compiled by the appointed ECO.
Re-vegetation	All areas rehabilitated as part of the offset.	1. Monthly for 6 months after re-instatement of vegetation; 2. Annually during the growing season for at least three (3) years post rehabilitation to ensure plant survival and to ensure that no AIPs are outcompeting indigenous species.	1. Before commencement of rehabilitation activities a report should be compiled listing existing species as well as any endangered species that may need to be rescued. Should the Contractor not have the expertise to undertake this list, they are to appoint a suitable botanist to assist; 2. Monthly for 6 months after the re-instatement; and 3. Annually during each growing season, for at least 3 years post rehabilitation.

In accordance with the South African water quality guidelines volume 7, Aquatic ecosystems (DWAF, 1996), the below percentage change guidelines must be followed:

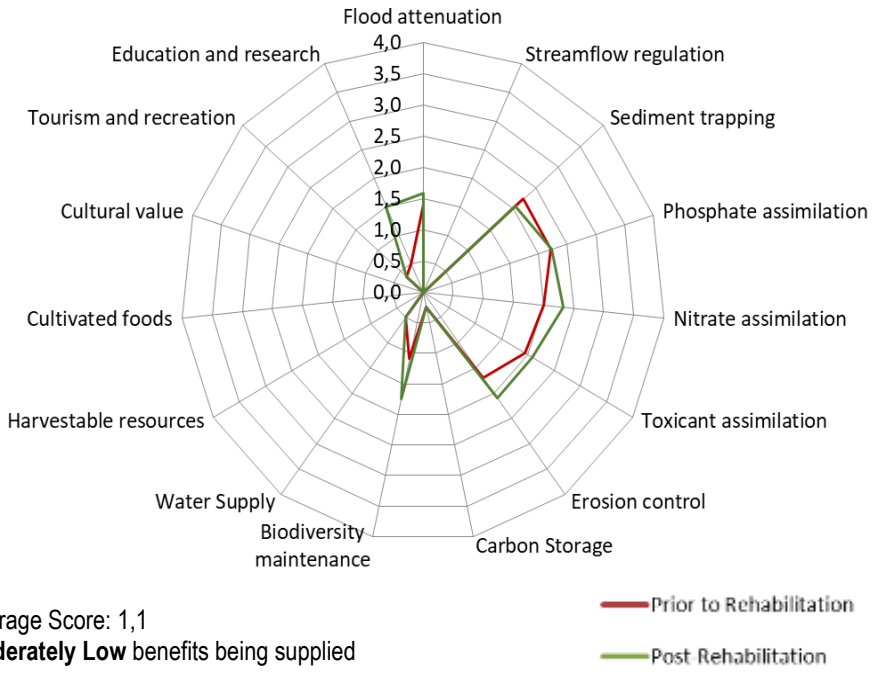
- Electrical conductivity (EC)/Total Dissolved Solids (TDS) concentrations should not be changed by > 15 % from the normal cycles of the water body under unimpacted conditions at any time of the year, and the amplitude and frequency of natural cycles in EC/TDS concentrations should not be changed;
- pH values should not be allowed to vary from the range of the baseline pH values for a specific site and time of day, by > 0.5 of a pH unit, or by > 5 % temporal variation, and should be assessed by whichever estimate is the more conservative.
- Note that EC and pH comparisons refer to temporal comparisons. However, as no guidelines are available for spatial comparisons, the percentage change recommendations will also be applied to spatial comparisons. For the purpose of this monitoring, a temporal or spatial change of 15% will be considered significant with reference to DO.

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

4 PROJECTED ENVIRONMENTAL CONDITIONS POST REHABILITATION

Based on the rehabilitation interventions indicated in Table 4 above, the predicted Ecoservice provision and wetland health calculations were revisited for the Seep wetlands in order to project the post rehabilitation improvements, as required as part of the offset initiative.

Table 6: Ecoservice and Ecological Health of the Seep Wetlands post rehabilitation.

<table>
<tr><th>Classification</th><th colspan="3">Function and Service Provision</th></tr>
<tr><td rowspan="3">Seep Wetland - located on gently to steeply sloping land and dominated by colluvial (i.e. gravity-driven), unidirectional movement of water and material down-slope. Seeps are often located on the side-slopes of a valley, but they do not, typically, extend onto a valley floor</td><td colspan="3"> 
</td></tr>
<tr><td colspan="3">Average Score: 1,1
Moderately Low benefits being supplied</td></tr>
<tr><td>Trajectory of change
Stable
→</td></tr>
<tr><td>Overall PES</td><td colspan="3">Wet-Health</td></tr>
<tr><td rowspan="2">Average Score: 2,99
Category C</td><td>Hydrology</td><td>Geomorphology</td><td>Vegetation</td></tr>
<tr><td>C (Moderately Modified)</td><td>B (Largely Natural Modified)</td><td>C (Moderately modified)</td></tr>
<tr><td colspan="4">Result Interpretation</td></tr>
<tr><td colspan="4">Hydrological state: Through the removal of the deposited materials and infilling of the upstream channel, allowing water to disperse across the wetland, the water distribution and retention patterns within the wetland and the pattern, direction and timing of runoff within the system can be improved.

Geomorphological state: Through the removal of deposited materials and re-instatement of indigenous vegetation, which will increase organic matter within the system, the geomorphology can be improved. Care must be taken during the sloping of the site, post removal of soil deposits, to ensure that depressions are not created. This must be carefully monitored.

Vegetation health: Through the removal of Alien and invasive species and follow-up control, as stipulated in Table 3 of this report, and re-instatement of wetland species, the vegetation composition of both Seep wetlands can be significantly improved. Careful control and monitoring will be required for Pennsietum clandestinum within the Seep wetlands as complete eradication is extremely difficult once established.</td></tr>
</table>

5 CONCLUSION AND RECOMMENDATIONS

Scientific Aquatic Services (SAS) was appointed to conduct a freshwater assessment and develop a freshwater resource rehabilitation plan as per the offset guidelines for the wetlands that will be impacted by the proposed Idas Valley residential development on Erf 9445, Stellenbosch, Western Cape Province. As part of the freshwater resource verification[3] undertaken in August 2018, two Seep Wetlands were identified situated along the northern and north-western boundary of the study area with a river located along the eastern boundary.

In accordance with the rehabilitation interventions and offset initiative proposed within this document, most aspects will require mechanical inputs and cannot be done by hand. Although the initial impact is significant it must be noted that these activities are only for a short period so as to restore the ecoservice provision and wetland health. These measures stipulated within this report will allow the water regime to once again flow through the river to the east of the development site and improve the remaining wetland habitat, leading to an overall betterment of the watercourses and the general environment.

The following table is a summary of the ecoservice provision and ecological health of the wetland Seeps prior to rehabilitation and the predicted values post rehabilitation.

Table 7: Summary table of wetland health and ecosystem service provision prior to and post rehabilitation

	Prior to Rehabilitation	Post Rehabilitation
Wet-health	Category D (Largely Modified)	Category C (Moderately Modified)
Ecoservice Provision	Moderately Low	Moderately Low*
Extent of functional wetland	2,55 hectares	1,69 hectares**

*Although the ecoservice provision is still considered to be moderately low, an improved from a score of 0, 9 to 1,1 was identified.

**The extent of function wetland has reduced post rehabilitation as a result of the development, however, the remaining wetland has been improved to a moderately modified wetland health (please refer to the Offset report).

Although loss of wetland habitat is not considered favourable, based on the above provided information, the offset initiative is deemed feasible provided all rehabilitation interventions and construction mitigation measures are implemented and therefore the Idas Valley Development can be considered favourably on implementation of the wetland offset.

It should be noted that this document will form part of the Water Use Authorisation, and on approval, this document becomes binding and all aspects of the proposed rehabilitation and mitigation recommendations made herein must be adhered to by the proponent and appointed Contractor.

[3] Scientific Aquatic Services. 2018. Freshwater Resource Verification and Offset calculations for the proposed development on Erf 9445, Idas Valley, Stellenbosch, Western Cape. Report Reference 218119.

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Appendix A: Legal Requirements

The sections below present each legislative document and the aspects, which are pertinent to water resource management including the rehabilitation of disturbed areas to a level that will promote water resource.

- ***The National Water Act, 1998 (Act 36 of 1998)***

The purpose of the National Water Act, 1998 (Act 36 of 1998) (NWA) is to ensure that the nation's water resources are protected, used, developed, conserved, managed and controlled.

The NWA, 1998 also provides for water use licenses which an operation will have to apply for, before commencing with any Section 21 water use activity. Various conditions may be attached to these licenses and a breach thereof will result in criminal and civil liability. The conditions attached to water use licenses will function alongside the additional protective measures, duty of care and statutory liability provisions provided by the NWA and other legislation to regulate a whole array of water issues.

Accordingly, and in terms of the *Guide to the National Water Act*, "water use" refers to doing something that has an impact on the water resource, for example:

- The amount of water in the resource;
- The quality of water in the resource; and
- The environment surrounding the resource.

Section 4 governs the entitlement to use water and states that water may only be used if it is a Schedule 1 use, a continuance of an existing lawful use (ELU), or authorised in terms of a general authorisation (GA) or license. A water use may therefore not be implemented unless it is properly authorised through one of these types of authorisations.

Furthermore, in accordance with GN509 of 2016, a regulated area of a watercourse for section 21(c) and 21(i) of the NWA, 1998 is defined as:

- *the outer edge of the 1 in 100 year flood line and/or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, lake or dam;*
- *in the absence of a determined 1 in 100 year flood line or riparian area the area within 100 m from the edge of a watercourse where the edge of the watercourse is the first identifiable annual bank fill flood bench; or*
- *a 500 m radius from the delineated boundary (extent) of any wetland or pan.*

Section 21 of the National Water Act, 1998 (Act 36 of 1998) lists the following activities as water uses:

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

The rehabilitation process will necessitate activities within the wetland, such as the removal of waste material from the wetland, as well as to reshape and revegetate areas therein, thus section 21(i) applies. These activities trigger a Section 21(c) and (i) water use.

- ***National Environmental Management Act, 1998 (NEMA, Act 107 of 1998)***

The NEMA (Act 107 of 1998) provides the framework and principles for sustainable development and sets national norms and standards for integrated environmental management (Section 24) where all spheres of Government and all organs of State must co-operate, consult and support one another.

Section 28 of the Act also imposes a duty of care and remediation of environmental damage on any person who causes, has caused or may cause significant pollution or degradation of the environment.

The guiding principles of NEMA refer specifically to biodiversity management in the following Clause:
(4) (a) *Sustainable* development requires the consideration of all relevant factors including the following:

(i) That the disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied.

NEMA (Act 107 of 1998) and the associated 2017 Regulations (Listing No R. 325, No R. 326 and R. 327) as amended, states that prior to any development taking place within a wetland or riparian area, an environmental authorisation process needs to be followed. This could follow either the Basic Assessment process or the EIA process depending on the nature of the activity and scale of the impact.

This Maintenance and Management Plan has been developed in fulfilment of the requirements as defined in the Environmental Impact Assessments EIA Regulations, 2014 (No. R. 982) and adopted in No. R. 326 where a "maintenance management plan" is defined as a management plan for maintenance purposes defined or adopted by the competent authority.

- ***National Environmental Management Biodiversity Act, 2004 (NEMBA, Act 10 of 2004)***

The objectives of this act are (within the framework of the National Environmental Management Act) to provide for:

- the management and conservation of biological diversity within the Republic of South Africa and of the components of such diversity;
- the use of indigenous biological resources in a sustainable manner;
- the fair and equitable sharing among stakeholders of benefits arising from bio prospecting involving indigenous biological resources;
- to give effect to 'ratified international agreements' relating to biodiversity which are binding to the Republic;
- to provide for co-operative governance in biodiversity management and conservation; and
- to provide for a South African National Biodiversity Institute to assist in achieving the objectives of this Act.

This act alludes to the fact that management of biodiversity must take place to ensure that the biodiversity of surrounding areas is not negatively impacted upon, by any activity being undertaken, in order to ensure the fair and equitable sharing among stakeholders of benefits arising from indigenous biological resources.
Furthermore, a person may not carry out a restricted activity involving either:

a) a specimen of a listed threatened or protected species;
b) specimen of an alien species; or
c) a specimen of a listed invasive species without a permit.

Permits for the above may only be issued after an assessment of risks and potential impacts on biodiversity is carried out. Before issuing a permit, the issuing authority may in writing require the applicant to furnish it, at the applicant's expense, with such independent risk assessment or expert evidence as the issuing authority may determine. The Minister may also prohibit the carrying out of any activity, which may negatively impact on the survival of a listed threatened or protected species or prohibit the carrying out of such activity without a permit. Provision is made for appeals against the decision to issue/refuse/cancel a permit or conditions thereof.

- ***National Environmental Management Biodiversity Act (NEMBA) (Alien and Invasive Species Regulations, 2014)***

NEMBA is administered by the Department of Environmental Affairs and aims to provide for the management and conservation of South Africa's biodiversity within the framework of the NEMA. In terms of alien and invasive species. This act in terms of alien and invasive species aim to:

- Prevent the unauthorized introduction and spread of alien and invasive species to ecosystems and habitats where they do not naturally occur,
- Manage and control alien and invasive species, to prevent or minimize harm to the environment and biodiversity; and
- Eradicate alien species and invasive species from ecosystems and habitats where they may harm such ecosystems or habitats.

Alien species are defined, in terms of the National Environmental Management: Biodiversity Act, 2004 (Act no 10 of 2004) as:

(a) a species that is not an indigenous species; or
(b) an indigenous species translocated or intended to be translocated to a place outside its natural distribution range in nature, but not an indigenous species that has extended its natural distribution range by natural means of migration or dispersal without human intervention.

Restricted activities (GN R598 National Environmental Management: Biodiversity Act 10 of 2004)

The following activities, applicable to this mining project, are defined as restricted activities:

- The spread or allowing the spread of, any specimen of a listed invasive species; and
- Releasing any specimen of a listed invasive species.

Exempted Alien Species (R.509 National Environmental Management: Biodiversity Act 10 of 2004)

Species that are exempted from the provisions of section 65 of NEMBA include:

- Dead specimens of alien species;
- Alien species legally introduced to South Africa prior to the Regulations coming into effect, and which are not on the National List of Invasive Species, including species imported for agricultural purposes; and
- Alien species that are also indigenous species, including those regulated in terms of the Threatened and Protected Species (TOPS) Regulations promulgated under NEMBA; and
- Alien species that are regulated in terms of the Conservation of Agricultural Resources Act (CARA; Act 43 of 1983) as weeds and invader plants.

Categories According to NEMBA (Alien and Invasive Species Regulations, Notice number 864 of 29 July 2016 in Government Gazette 40166)

- **Category 1a: Invasive species that require compulsory control.**
  Invasive species that may not be owned, imported into South Africa, grown, moved, sold, given as a gift or dumped in a waterway. These species need to be controlled and removed from all areas, including private property and officials from the Department of Environmental Affairs (DEA) must be allowed access to monitor or assist with control.
- **Category 1b: Invasive species that require control by means of an invasive species management programme**.
  Invasive species that may not be owned, imported into South Africa, grown, moved, sold, given as a gift or dumped in a waterway. Category 1b species are major invaders that may need government assistance to remove. All Category 1b species must be contained, and in many cases, they already fall under a government sponsored management program.
- **Category 2: Commercially used plants that may be grown in demarcated areas, provided that there is a permit and that steps are taken to prevent their spread.**

Category 2 species are invasive species that can remain in private gardens, but only with a permit, which is granted under very few circumstances. These species should be monitored and controlled to prevent spread to areas outside of permitted areas. Any Category 2 plants outside permitted areas should be dealt with as stipulated in Category 1b.

- **Category 3: Ornamentally used plants that may no longer be planted.**
- These are invasive species that may remain in private gardens. However these species may not be sold or propagated and must be controlled. In riparian zones (within 32 metres of the edge of a river, lake, dam, wetland or estuary, or within the 1:100 year floodline, whichever is the greater) or wetlands all Category 3 plants fall within Category 1b.

See Annexure F for further details pertaining to Alien and Invasive Vegetation control.

- ***Conservation of Agricultural Resources Act, 1983 (CARA, Act 43 of 1983)***

Amendments to regulations under the Conservation of Agricultural Resources Act (CARA), 1983 (Act No. 43 of 1983) ensures that landowners are legally responsible for the control of invasive alien plants on their properties. The CARA legislation divides alien plants into weeds and invader plants, with *weeds* regarded as alien plants with no known useful economic purpose, while *invader plants* may serve useful purposes as ornamentals, as sources of timber and may provide many other benefits, despite their aggressive nature.

The CARA Regulations have been superseded by the National Environmental Management: Biodiversity Act, 2004 (Act no. 10 of 2004) – Alien and Invasive Species (AIS) Regulations, which became law on 1 October 2014 (http://www.arc.agric.za, retrieved 09062016).

The Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act (1947)

The Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act (Act 36 of 1947) is administered by the Department of Environmental Affairs (DEA), and is focused on the registration, importation, sale, acquisition disposal or use of fertilisers, farm feeds and agricultural remedies, as well as the registration of sterilising pest and plant control operators. For the purpose of this report and this Act, herbicides are classified as agricultural remedies.

An agricultural remedy (herbicide) needs to comply with the following criteria in order to be accepted for registration:

- It should be suitable and sufficiently effective for the purpose it is intended;
- It has to comply with all the prescribed requirements;
- It should not transgress against the public interest; and
- The factory in which it is manufactured should comply with certain requirements.

The following specifications must be adhered to during the use of herbicides:

- The use or recommendation of a herbicide during the course of any trade, industry or business, may only be used or recommended for the purpose, in the manner that is specified on the container of the herbicide;
- Only a registered pest control operator, or a person working under the supervision of a registered pest control operator, are allowed to use or recommend any herbicides for application in any industry, trade or business;
- The minister of Agriculture is entitled to prohibit or regulate, the sale, use or acquisition of a herbicide within a specific area/s or by certain persons or groups of persons; and
- When herbicides are applied by the request of the owner or person in control of the area concerned, the operator first needs to notify the owner or person in control of the purpose of the application, the registered name and number of the herbicide, the necessary precautions as well as the number of the registration certificate of the operator. The notification can be verbally; however, it should be put in writing no later than three days after application.

Occupational Health and Safety Act (OHSA; Act 85 of 1993)

The Occupational Health and Safety Act (OHSA; Act 85 of 1993) was administered by the Department of Labour and aim to provide:

- Health and safety of persons at work and for the health and safety of persons in connection with the use of plant and machinery;
- 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; and

Establish an advisory council for occupational health and safety, which must provide for matters connected therewith.

Contravention Categories and its associated penalties according to the NVFFA

- **Category 1**: Any person who lights, uses or maintains a fire in the open air in a region where the fire danger is high or extreme. Such a person may be liable on conviction for a fine, or two year imprisonment, or both.
- **Category 2**: Any person who does the following is guilty of a second category offence. Such a person is liable for a fine, or two year imprisonment, or both:
  - Fails to prepare a firebreak when obliged to do so
  - Fails to give notice of intention to burn a firebreak
  - Burns a firebreak when a Fire Protection Officer has objected to it
  - Fails to inform adjoining land owners
  - Fails to meet the standards of readiness for firefighting
  - Refuses to assist a Fire Protection Officer
  - Hinders/obstructs a Fire Protection Officer
  - Smokes where smoking is by notice prohibited
  - Leaves a fire unattended which he/she lit before that fire has been extinguished properly
  - Lights, uses, or maintains a fire with or without permission from the landowner, or spreads a fire, causing damage/injury.
  - Throws, puts down/drops a burning match or burning material of any kind.
  - Uses material capable of self-ignition to make a fire which spreads and causes injury and damage.
- **Category 3**: Any owner, occupier or person in control of land on which a fire occurs who fails to take reasonable steps to extinguish the fire or to prevent it from spreading, or who fails to prevent it from causing damage to property or adjoining land, is guilty of a third category offence. Such a person is liable for a fine, or six months imprisonment or both. Any person who prevent a Fire Protection Officer or any other officer (police official/forest ranger) from doing his/her work, or interferes with the above when doing his/her work, is guilty of a Category 3 offence and is liable for a fine, or six months imprisonment, or both. (4)

The City of Cape Town (CoCT) Community Fire Safety By-law (2002) and Amendment By-law (2007)

The purpose of these By-laws is to:

- Promote the achievement of a fire-safe environment for the benefit of all persons within the area of jurisdiction of the municipality;
- Repeal all existing relevant by-laws of the Municipality; and
- Provide for procedures, methods and practices to regulate fire safety within the area of jurisdiction of the Municipality.

In terms of the CoCT Community Fire Safety Amendment By-law, 2007:

> *"the owner of a premises that has vegetation growing thereon shall, where necessary, prepare and maintain sufficient firebreak(s) to ensure that the risk of vegetation fire arising on or*

spreading from one premises to another is minimized; notwithstanding anything contained in the National Veld and Forest Fire Act, 1998 (Act No. 101 of 1998)".

Notably the owner of the property may not permit vegetation to grow or accumulate thereon, or other combustible material to accumulate thereon, where it may be likely to cause a fire hazard or other threatening danger. In terms of this Act, in the event of any conflict between the requirements of the By-law and the provisions in any other legislation, the provision of this By-law prevail. (4)

Appendix B: Cape Flats Fynbos Nursey stocklist

FynbosLIFE
Locally Indigenous Flora Education

Tel: 082 378 9445
Email: info@fynboslife.com

URBAN REVEGETATION PROJECTS FOR PEOPLE AND WILDLIFE

fynboslife.com fynboslife @fynboslife

Cape Town lowland waterwise and wetland plants supplied by our **Cape Flats Fynbos Nursery**

CAPE TOWN VELD TYPE PLANT LISTS & LANDSCAPING GUIDELINES AUG 2018

Available quantities shown after price, i.e. R8.90 (price) | 10 (quantity available)
Multipot plug size: 7.5cm diameter x 10cm depth (cavities slightly larger than ecotrays)
Minumum 50 plants per order. We do not charge VAT.
Species not currently available can be grown to order. Lead times are species-specific and vary between 3 months and 3 years.
Delivery: 10% for 30km radius and 15% for 60km radius. Minimum delivery fee R150.00.
NURSERY OPEN BY APPOINTMENT ONLY

This species catalogue is alphabetical, with reference to suitable veld types in Cape Town. Veld type landscaping conserves water and wildlife, and supports Cape Town's irreplaceable, highly threatened biodiversity. 19 nationally-recognised vegetation types and 10 of SA's 21 Critically Endangered vegetation types occur within Cape Town's boundaries. 6 are endemic to the City, occuring nowhere else in the world, and 9 are critically under-conserved. Locally indigenous urban biodiversity gardens (LIFE gardens) are thus ecological and educational assets, showcasing our rich natural heritage and promoting stewardship of the broader Fynbos Biome/Cape Floral Kingdom. Every LIFE garden, irrespective of size, counts towards conservation if local forms of species are planted in their original veld type. The horticulturally-viable species listed here represent a fraction of all species in Cape Town. The list is continually expanding as we trial new local plants in cultivation.

Landscapes for LIFE:

L Locally indigenous plants
I Innovation, Infiltration & Interest
F Forage/Food for people & wildlife; frog-friendly (incl. ponds & permeable fencing)
E Education & Ecosystem services

A QUICK GUIDE TO LANDSCAPING BY VELD TYPE IN CAPE TOWN:

1. Planning & Waterscaping
a. Note suburb/location of garden and refer to veld type key (pg 2) and vegetation map in Appendix A to determine the relevant veld type. This will give you an indication of the soil type and original vegetation of the site. Test soil pH and note topsoil consistency/texture (sand, clay, loam) as these may have been altered through disturbance.
b. Consider rainfall, slope/aspect, wind direction and microclimates of the site prior to plant species selection. Waterscape to capture rainfall and slow water loss.

2. Plant Selection
a. Select plants using the veld type key below or the species lists provided in Appendix B.
b. Mimic succession in nature by starting with pioneers and introducing specialist species like ericas and proteas after 3-5 years.
c. Source only forms of species grown from local Cape Town lowland genetic stock. This ensures hyperlocal adaptation and avoids genetic contamination of locally adapted forms. Locally indigenous plants should be re-established within 10km of their source and narrow endemics within 5km. Use pure, naturally-evolved species, avoiding hybrids and cultivars. For part-local part-exotic gardens, rather include non-invasive water-wise exotics than domestic exotics. Domestic exotics pose a threat of hybridisation and invasive spread e.g. Virgilia oroboides subsp. ferruginea (from George) and Virgilia divaricata (George to Port Elizabeth) introduced to Cape Town and threatening the local Virgilia oroboides subsp. oroboides.
d. Choose a variety of flower shapes, sizes, colours and scents to sustain a diversity of pollinators.
e. Look for drought-adapted leaves, e.g. succulence, hairy/grey/cobwebby, small, linear, divided, leathery/lignified, waxy.
f. Add edible and aromatic species to supplement or replace thirsty exotic veggie and herb gardens.
g. Avoid tall trees on the Cape Town lowlands, as they would not naturally occur here and require excess water to thrive.
h. For more information on species selection and terminology please consult @fynboslife on Facebook or Instagram for weekly posts on locally indigenous species and how to use them in Cape Town gardens.

3. Ground Preparation & Planting
a. Timing: Plant after the first flush of rains, i.e. early winter (May/June/July) in Cape Town.
b. Keep root disturbance to a minimum during and after planting.
c. Avoid fertilisers and dug-in mulch. Add a thick 10cm surface layer of wood chips around the base of plants. Use very well-decomposed compost if necessary, and apply sparingly on the surface only. Plant a living mulch.

4. **Irrigation & Maintenance**
a. Drip irrigate every second day for two weeks, then twice a week or as needed until plants are established, and over the first 2-3 summers as required. Restrict greywater to less sensitive species like Helichrysums, Pelargoniums & Salvias.
b. Replenish wood chip mulch in late spring and summer.
c. Prune lightly and regularly to prolong life of plants. Most shrubs listed live for 5-15 years; bulbs and trees are longer-lived.

Prepared by Caitlin von Witt 2018/08/13

VELD TYPE KEY (note this list is not exhaustive and only includes the veld types currently represented by our Cape Flats Fynbos Nursery):	
CFDS	**CAPE FLATS DUNE STRANDVELD** Endangered (coastal, neutral-alkaline sands; mostly water-wise, wind-resistant plants)
CFSF	**CAPE FLATS SAND FYNBOS** Critically Endangered (sandy, nutrient-poor, acidic soils on the Cape Flats; mostly water-wise and wind-resistant plants)
SPGF	**SOUTH PENINSULA GRANITE FYNBOS** Critically Endangered (clay soils on lower S & E slopes of Table Mountain; plants have relatively high water/nutrient needs)
CLFW	**CAPE LOWLAND FRESHWATER WETLAND** Critically Endangered (plants for irrigated applications, retention ponds, eco-pools, wetlands, river beds/banks)
PSR	**PENINSULA SHALE RENOSTERVELD** Critically Endangered (fertile clay soils; mostly water-wise, wind-resistant plants)
SSR	**SWARTLAND SHALE RENOSTERVELD** Critically Endangered (fertile clay soils; mostly water-wise, wind-resistant plants)
PSF	**PENINSULA SANDSTONE FYNBOS** Endangered (nutrient-poor acidic soil; mostly water-wise, wind-resistant plants)
HSF	**HANGKLIP SAND FYNBOS** Vulnerable (acid to neutral sand near the coast; mostly water-wise, wind-resistant plants)
LAF	**LOURENSFORD ALLUVIUM FYNBOS** Critically Endangered (seasonally wet flats near Strand)
ASF	**ATLANTIS SAND FYNBOS** Critically Endangered (sandy, nutrient-poor, acidic soils on the West Coast; mostly water-wise and wind-resistant plants)

SPECIES LISTED ALPHABETICALLY:

Species name (A-Z)	SIZE: 4L/21cm and 2L/15cm	SIZE: Multipot plugs (311ml)	SIZE: 6-pack plugs (90ml)	Description	Veld Type	Image
	PRICE | QUANTITY AVAILABLE					
Agathosma capensis	R23.40 (15cm) | 50			Steenbokbuchu. Evergreen, rounded shrub to 1m. Aromatic leaves and mauve flowers. Good bee forage. Flowering time mainly July-Nov. Suitable for lower clay slopes and sandy coastal flats as a border plant.	SPGF	
Agathosma glabrata **(Endangered)**	R23.40 (15cm) | 1			Lemon-scented buchu. Compact shrub to 50cm with bright purple flowers from July-Dec. Attracts bee and butterfly pollinators. For damp sandy flats and dune slacks.	CFDS, CFSF	
Anthospermum aethiopicum	R18.90 (4L) | 5			Dioecious shrub to 2m; attractive filler shrub for moist areas. Flowering trime: Aug-Jan. Suitable for clay or seasonally wet sandy soils.	ASF, PSR, CFSF, SSR, SPGF, LAF	
Arctotheca populifolia	R16.95 (4L) | 5			Creeping, mat-forming perennial groundcover to 20cm. Grey heart-shaped leaves and yellow daisy flowers. Good bee forage. Excellent dune stabiliser for dry, sandy conditons.	HSF, CFDS	
Arctotis incisa	R15.75 (4L) | 25	R8.90 | 0	R4.10 | 24	Sprawling grey-leaved perennial daisy to 40cm. Suitable for dry, sandy conditions.	CFDS, CFSF	
Arctotis stoechadifolia	R15.75 (4L) | 0	R8.90 | 0	R4.00 | 72	Fast-growing groundcover, for dry sandy conditions.	CFDS	
Athanasia crithmifolia	R18.65 (4L) | 40	R8.90 | 0		1.5mx1.5m seasonal wetland shrub. Fast-growing, large yellow flowerheads attract many insect pollinators.	CFSF, PSR, SPGF, SSR, CLFW	

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Athanasia dentata	R18.15 (4L) | 20	R9.00 | 0		1mx1m shrub for dry, sandy and windy conditions. Large yellow daisy flowers and fresh-green toothed leaves.	CFDS CFSF	
Athanasia trifurcata	R16.95 (4L) | 30	R8.90 | 0		1mx1m shrub for dry, sand or clay. Extremely wind- and water-wise. Bee forage.	CFDS PSR CFSF SSR SPGF LAF	
Carex clavata	R15.25 (2L) | 10	R9.00 | 20		50cm tall seasonal wetland sedge with attractive chestnut brown flower spikes	CLFW CFSF SSR	
Carpobrotus edulis		R7.40 | 60	R3.80 | 48	Sour fig, popular edible plant. Fast-growing succulent groundcover to 50cm for coastal conditions. A useful sand stabiliser. Pale yellow flowers.	CFDS HSF CFSF	
Carpobrotus acinaciformis		R7.40 | 20	R3.80 | 24	Sour fig - popular edible plant. Fast-growing succulent groundcover to 50cm for coastal conditions. A useful sand stabiliser. Bright pink flowers.	CFDS	
Chasmanthe aethiopica	R17.60 (4L) | 5			Winter-flowering bulb to 0.5m. Orange tubular flowers pollinated by sunbirds. Sun or semi-shade. Hardy. Sold as clump of approx. 3 shooting bulbs in 4L bag during growing season (May/June/July).	CFDS HSF CFSF PSR SPGF SSR	
Chasmanthe floribunda	R17.60 (4L) | 10			Winter-flowering bulb to 1m. Orange tubular flowers pollinated by sunbirds. Sun or semi-shade. Hardy. Sold as clump of approx. 3 shooting bulbs in 4L bag during growing season (May/June). More robust and floriferous than *C. aethiopica*.	CFSF SPGF	
Chironia baccifera	R19.80 (4L) | 1			Ornamental shrub with starry pink flowers, 40cm-1m. Withstands dry, sandy, windy conditions once established.	CFDS SPGF PSR	
Chrysocoma coma-aurea	R16.95 (4L) | 15	R8.90 | 20		0.6mx0.6m shrub with a mass of yellow button-shaped flowers in spring. For sand or clay in dry, windy conditions. Attracts bees.	CFDS CFSF PSR	
Cliffortia ericifolia **(Endangered)**	R18.15 (4L) | 0	R9.40 | 20		50cm tall shrub with small ericoid glossy green leaves. Suitable as a filler for seasonally wet sands over clays, or acid sands.	CFSF ASF CLFW CFDS	
Cliffortia ferruginea	R16.95 (4L) | 0	R8.90 | 0	R4.15 | 6	Groundcover to 40cm with glossy green leaves for seasonally wet sands. Full sun or semi-shade.	CFSF CLFW ASF	
Cliffortia juniperina var. *juniperina*		R9.50 | 5		Warty caperose. Fine-leaved filler species to 1m for full sun.	CFSF SPGF	

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Cliffortia obcordata	R15.75 (4L) | 20	R8.90 | 0		1.2mx1.5m shrub for dry, sandy and windy conditions.	CFSF SPGF	
Cliffortia strobilifera	R15.75 (4L) | 80	R8.90 | 20	R4.00 | 0	3mx3m fast-growing wetland shrub with lush green foliage	CFSF CLFW	
Coleonema album	R19.95 (4L) | 2			White confetti bush. 2m tall buchu with small honey-scented flowers. Withstands coastal (dry, sandy, windy) conditions.	CFDS HSF	
Commelina africana	R15.75 (12cm) | 5			Common yellow commelina. Spreading groundcover to 50cm for sandy soil in semi-shade to full sun. Yellow flowers from Oct-Mar.	PSF	
Cotyledon orbiculata	R23.40 (4L) | 10	R9.20 | 0		Pig's ear. 1m tall succulent with silvery grey leaves with a red margin. Orange tubular flowers attract bees and birds. For well-drained soils in semi-shade to full sun. Ideal for rockeries.	CFDS HSF	
Cynodon dactylon			R1.45 (200-plug tray) | 100	Couch grass/kweek. Perennial, water-wise mat forming grass. Full sun to semi-shade.	LAF HSF CFSF PSR SPGF SSR	
Cyperus textilis	R16.95 (4L) | 60	R8.90 | 20	R4.15 | 528	1-3m tall wetland sedge. Provides nesting material for birds. May be used to clean polluted water.	CLFW	
Dasispermum suffruticosum		R9.20 | 0		Dune celery. Sprawling coastal perennial with slightly fleshy stems and leaves. Small white/cream flowers.	CFDS	
Delosperma litorale	R16.95 (4L) | 10		R4.15 | 24	Trailing vygie groundcover with white flowers. Hardy; suited to coastal conditions.	CFDS	
Ehrharta calycina		R8.90 | 0		Perennial grass to 0.7m with rose pink flowerheads. For acidic sandy soils.	ASF CFDS	
Ehrharta villosa var. villosa	R17.60 (4L) | 5			Tall (1-1.5m) perennial grass for alkaline sands. Florets softly silvery hairy.	CFDS HSF ASF	
Elegia nuda	R19.40 (4L) | 0			1m tall upright wetland restio, compact growth. For seasonally wet acid sands.	HSF CFSF ASF	
Elegia tectorum (Fish Hoek)	R19.40 (4L) | 50	R9.30 | 40	R4.35 | 0	1.5m tall seasonal wetland restio. Dwarf form of Elegia tectorum. For seasonally wet neutral sands.	CFDS HSF	

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Eragrostis curvula		R9.00 | 140		Weeping love grass. Perennial tufted grass to 1 (to 1.5)m. Good forage, erosion control and an attractive ornamental grass that provides food for seed-eating birds. For full sun/semi-shade on sandy or clay slopes. Not suitable for seasonally wet flats or near nature reserves as can be invasive.	SPGF	
Erica annectens **(Vulnerable, Cape Peninsula Endemic)**	R21.80 (15cm) | 5			Approx. 60cm-1m tall, erect to spreading dwarf shrub. Orange to red 2cm-long corolla tube attracts nectar-feeding birds. Flowering time: Dec-Feb. Grows on acidic moist rock ledges from Noordhoek to Simonstown.	PSF	
Erica cerinthoides	R21.80 (15cm) | 5			Fire erica. Shrub to 1m for full sun in well-drained acidic sand. Red tubular flowers attract sunbirds.	CFSF PSF SPGF	
Erica curviflora	R21.80 (15cm) | 5			Water heath. Streamside/seepage shrub to 1.6m with showy, curved, tubular orange-red flowers which attract sunbirds. For full sun.	CLFW	
Erica ericoides	R40.00 (15cm) | 2			Compact shrub to 80cm. Small pale pink honey-scented flowers from Jan-Apr. Suitable for acid sand or clay on slopes and flats.	SPGF PSF	
Erica mammosa (white-flowered 'gilva' form)	R40.00 (15cm) | 2			Nine-pin heath. Tall, branching shrub to 2m. 2cm-long tubular white flowers attract bird pollinators. Flowering time: Dec-Apr. For full sun in well-drained acid sands, thrives in sandy seepage areas.	PSF SPGF	
Erica margaritacea **(Critically Endangered Cape Flats Endemic)**	R38.50 (15cm) | 5			Pearl heath. Compact shrub to 50cm. Pearly white-pink flowers in summer attract insect pollinators. Suitable for seasonally wet acid sands in full sun.	CFSF	
Erica subdivaricata	R38.50 (15cm) | 4			Shrub to 1m with small bell-shaped, white flowers that attract insect pollinators. Suitable for damp, partially shady spots.	CFSF	
Erica verticillata **(Extinct in the Wild)**	R40.00 (15cm) | 4			Whorled heath. Tall shrub to 1.5m with mauve-pink flowers from late summer to autumn. Suitable for seasonally wet acid sands in full sun. Attracts nectar-feeding birds.	CFSF	
Eriocephalus africanus	R16.40 (4L) | 60	R8.90 | 0		Wild rosemary, edible herb. 1.2mx1.2m shrub for dry, sandy and windy conditions.	CFDS SSR CFSF HSF PSR	

Eriocephalus racemosus	R17.40 (4L) | 25			Wild rosemary, edible herb. 1.2m hardy erect shrub for dry, sandy conditions. Less robust than *E. africanus*.	HSF ASF	
Euclea racemosa	R65.00 (10L) | 0			Sea guarrie. Small to medium-sized tree, ideal for hedges. Edible fruit, attracts birds. Dry, sandy and windy conditions.	CFDS ASF SSR HSF	
Euryops pectinatus	R17.40 (4L) | 20	R8.90 | 20		Golden daisy bush. Shrub to 1.5m with divided grey-green leaves and large yellow daisy flowers, free flowering. For sull sun on sandy or clay slopes.	PSF	
Falkia repens	R14.60 (2L) | 10	R8.90 | 40	R4.15 | 48	Fast-growing groundcover for moist areas in sun or shade. Pink trumpet-shaped flowers.	CFDS CFSF	
Felicia filifolia	R16.40 (4L) | 20	R8.90 | 0		1mx1m shrub for dry, sandy and windy conditions. Showy purple daisy flowers in spring.	CFDS PSR SSR	
Ficinia bulbosa	R18.80 (4L) | 80			Sedge with delicate, fresh green culms to 50cm. For irrigated areas.	CFDS ASF CFSF	
Ficinia capitella	R18.80 (4L) | 5			Sedge with fine, pendulous lime-green culms to 30cm. For irrigated areas.	CFDS CFSF	
Ficinia indica	R18.80 (4L) | 0			0.4m tall sedge for seepage areas. Rich chestnut-coloured spikes.	LAF PSF CFSF SPGF	
Ficinia lateralis	R18.80 (4L) | 50			0.6m tall tufted sedge for seasonally wet coastal sands. Wind tolerant.	CFDS	
Ficinia nodosa (Scirpus nodosus)	R16.95 (4L) | 20	R8.90 | 300		1m tall sedge with fresh green stems. For seasonally wet areas. Withstands summer drying. Excellent wetland filtration and soil stabilisation.	CFDS CFSF CLFW	
Freylinia lanceolata	R19.40 (4L) | 50			Small tree to 4m with cream-coloured, honey-scented tubular flowers. Attracts pollinators. For irrigated applications.	CLFW	
Fuirena coerulescens		R9.50 | 0		Delicate sedge to 50cm for damp areas.	CFDS	
Geranium incanum	R14.60 (2L) | 20	R8.90 | 20	R4.10 | 24	Groundcover for damp sandy soils. Delicate pale pink/white flowers.	CFDS CLFW CFSF SSR HSF	

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Gladiolus angustus	R18.20 (15cm) | 0		R4.25 | 72	Marsh painted lady. Bulbous plant, spring flowering. Sold as clump of approx. 3 shooting bulbs in 15cm pot during growing season.	CFDS CLFW	
Gnidia pinifolia	R16.95 (15cm) | 5			Pine-leaf saffron bush. Shrub to 1m with long tubular flowers which are fragrant at night, attracting moth pollinators. Flowers all year round. For full sun on lower slopes and sheltered sandy flats.	SPGF ASF	
Gnidia squarrosa	R16.40 (15cm) | 5			Aandbossie. Lax shrub, 1-2m. Cream flowers from June-Oct, scented at night. For full sun on sandy slopes and flats.	SPGF CFDS	
Gomphostigma virgatum	R16.95 (4L) | 2	R8.90 | 2		Shrub to 2.6m with scented white flowers. For damp soils in wetlands or along freshwater streams.	CLFW	
Gymnosporia buxifolia	R21.80 (4L) | 10			Spikethorn. Large shrub/ small tree, 3-7m, excellent spiny security hedge. Showy flowers attract insect pollinators, which in turn attract birds.	CFSF SPGF ASF	
Helichrysum crispum		R8.90 | 80		Small rounded shrub to 50cm, woolly grey leaves, creamy white flowers. For dry, sandy, windy conditions.	CFDS HSF LAF	
Helichrysum cymosum	R16.95 (4L) | 2	R8.90 | 40	R4.15 | 24	Gold carpet. Low shrub with grey foliage and yellow flowerheads. For sun or semi-shade in seasonally wet sand. Water well to establish.	CFDS CFSF SPGF	
Helichrysum dasyanthum	R17.60 (4L) | 20	R8.90 | 0		1mx1m shrub with yellow flowers. For dry, sandy and windy conditions.	CFDS CFSF SPGF SSR	
Helichrysum niveum	R16.95 (4L) | 1			Dwarf twiggy, ericoid shrublet to 20cm. Adapted to dry, sandy and windy conditions.	HSF CFDS	
Helichrysum patulum	R15.75 (4L) | 10	R8.90 | 40	R4.05 | 24	1mx1.5m sprawling shrub for dry, sandy and windy conditions.	CFDS PSR SSR	
Helichrysum petiolare	R16.95 (4L) | 15	R8.90 | 0		1mx1m shrub with soft grey foliage. For semi-shade to full sun in a sheltered position.	SPGF	
Helichrysum teretifolium	R18.20 (4L) | 10	R9.00 | 20		Compact groundcover to 30cm with dark green foliage and cream flowers. For semi-shade to full sun on sandy flats and slopes.	CFDS HSF	

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Hellmuthia membranacea	R18.20 (4L) | 5			50cm-1m tall sedge with large attractive flowerheads. Drought tolerant. Excellent soil stabiliser.	CFDS	
Hermannia pinnata	R18.20 (4L) | 0			Fast growing, mat-forming shrublet to 0.15m with creeping stems. Pale orange, nodding bell-shaped flowers. Suitable for sandy, well-drained soil.	HSF	
Imperata cylindrica		R9.20 | 40		Sword grass. Perennial rhizomatous grass to 50cm for seasonally wet areas. Host plant for the Critically Endangered Barber's ranger butterfly (*Kedestes barberae bunta*) in False Bay Nature Reserve.	CFDS HSF CFSF CLFW	
Isolepis prolifera	R14.75 (2L) | 10	R8.90 | 100		Low trailing sedge, rooting at the nodes. Grows in marshy conditions or 5-10cm deep water.	CLFW	
Jordaaniella dubia	R16.95 (4L) | 35		R4.15 | 600	Hardy creeping vygie with large yellow flowers. For dry, sandy, windy conditions.	CFDS HSF	
Juncus capensis	R18.20 (4L) | 20	R9.10 | 0		50cm tall seasonal wetland rush. Excellent wetland filtration and soil stabilisation.	CLFW SPGF	
Juncus effusus	R18.20 (4L) | 0	R9.10 | 10		Soft rush - 50cm-1m tall seasonal wetland rush.	SPGF CLFW	
Juncus kraussii	R16.95 (4L) | 50	R8.90 | 100	R4.15 | 0	1m tall wetland rush. Host plant for damselflies.	CFDS CLFW	
Juncus lomatophyllus	R18.80 (4L) | 10	R9.20 | 10		40cm tall wetland rush. Filtration for ecopools and grey water wetlands.	CLFW	
Kiggelaria africana	R105.00 (20L, 1.5m) | 0			Wild peach. Fast-growing tree to 20m for sheltered slopes or ravines in clay or loamy soil. Symbiotic relationship with *Acraea horta* butterfly, with the caterpillars attracting birds.	SPGF CLFW	
Lampranthus emarginatus		R9.40 | 0		Clusterleaf brightfig. Vygie to 30cm with narrow grey leaves and a show of purple flowers in spring/summer. For sandy flats and slopes in full sun.	SPGF PSR	
Lampranthus filicaulis **(Vulnerable)**		R9.40 | 0		Threadleaf brightfig. Prostrate perennial vygie with pink flowers in spring. For sandy irrigated areas.	CFSF SPGF	

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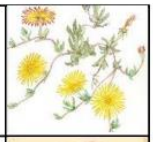
Lampranthus reptans **(Near Threatened)**		R9.00 | 20	R4.20 | 24	Creeping perennial vygie with showy yellow flowers for irrigated areas (grows naturally in seasonal wetlands).	CFSF	
Lampranthus stenus **(Critically Endangered)**		R9.40 | 20		Narrowleaf brightfig. Vygie to 30cm with narrow grey leaves and pink flowers in late spring/summer. For sandy flats and slopes in full sun.	CFSF	
Leonotis leonurus	R15.80 (4L) | 50	R8.90 | 120		2mx2m shrub for dry, sandy and windy conditions. Rewarding orange tubular flowers. Prune hard after flowering.	CFDS CFSF SPGF CLFW ASF	
Lessertia frutescens	R17.20 (4L) | 50			Cancer bush. Shrub to 1,5m tall with silvery grey compound leaves and nectar-rich orange-red flowers in spring, attracting sunbirds. For coastal sands and stony slopes. Water well to establish, water-wise thereafter. Short-lived but readily seeds itself.	CFDS ASF	
Leucadendron argenteum **(Rare and Endangered)**	R24.00 (2L) | 4			Silver tree. 7-10m tall tree with silvery-hairy leaves and separate male and female plants. Flowers attract beetle pollinators. Females produce cones. For full sun in sandy granite-derived soils only. No compost or fertiliser.	SPGF	
Leucadendron coniferum **(Vulnerable)**	R20.60 (4L) | 0	R9.60 | 20		Dune conebush. Coastal shrub or small tree, 2-4m. Attractive silvery green foilage. Withstands dry, sandy, windy conditions. No compost or fertiliser.	CFDS HSF	
Leucadendron floridum **(Critically Endangered Cape Peninsula Endemic)**	R24.00 (15cm) | 0			Flats conebush. Dioecious shrub to 2m. Attractive silvery green foliage. Wind- and beetle-pollinated. For permanently moist sands adjacent rivers/wetlands. No compost or fertiliser.	CFSF SPGF HSF CLFW PSF	
Leucadendron lanigerum var. lanigerum **(Endangered)**	R20.60 (4L) | 0	R9.60 | 0		Common shale conebush. Shrub to 1.5m. Flowering time: July-Sep. No compost or fertiliser.	ASF SSR LAF	
Leucadendron laureolum	R28.50 (4L) | 40			Laurel-leaf conebush. Large protea to 2.5m. Flowering time: June-Aug. For acid sands, wind tolerant. No compost or fertiliser.	HSF CFSF PSF	
Leucadendron levisanus **(Critically Endangered Cape Flats Endemic)**	R20.60 (4L) | 50	R9.60 | 0		Cape Flats conebush. 1-2m tall protea for seasonally wet acid sands. Tolerant of windy conditions. No compost or fertiliser.	CFSF	
Leucadendron salignum	R28.50 (4L) | 0			Common sunshine conebush. Large shrub to 2m. Flowering time: May-Dec. Full sun. For acid sands, wind tolerant. No compost or fertiliser.	HSF ASF LAF	

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Leucadendron strobilinum **(Cape Peninsula Endemic)**	R24.00 (2L) | 10			Peninsula conebush. Large shrub to 2.6m. Flowering time: Sep-Oct. For damp, rocky slopes in neutral-acid sand. Full sun. No compost or fertiliser.	PSF	
Leysera gnaphalodes	R16.40 (2L) | 4		R4.20 | 24	Shrublet to 0.4m with pale grey foliage. Suitable for windswept clay slopes. Flowering time: Sep-Nov.	ASF SSR	
Linum africanum	R16.40 (15cm) | 5			Wild flax. Compact shrub to 30cm with copious yellow flowers in summer. For semi-shade. Variable habitat from clay slopes to coastal sands.	SPGF	
Lobelia anceps (Lobelia alata)	R14.75 (2L) | 0	R8.90 | 0	R4.15 | 24	Groundcover with pretty blue flowers for irrigated areas.	CFSF SPGF CLFW	
Maurocenia frangula	R82.50 (10L) | 4			Bittersweet cherry. Small rounded tree to 3m with large leathery dark green leaves. Small white flowers from May to June followed by showy, edible cerise fruit. Occurs in coastal forest and rocky slopes. Plant in full sun in sandy soil.	CFDS	
Melianthus major	R18.80 (4L) | 2			Kruidjie-roer-my-nie. Large streamside shrub to 3m. Rusty-red, nectar-rich flower spikes attract birds. Prefers rich, moist, well-drained soils in full sun to semi-shade. Prune heavily in summer.	SPGF CLFW	
Mentha longifolia subsp. capensis	R15.75 (4L) | 40	R8.90 | 20		Edible wild mint. For seasonal wetlands.	SPGF CLFW	
Metalasia densa	R20.60 (4L) | 0			Erect shrub to 2m with green to white-woolly foliage. For sandy, windy conditions. Flowering time: June-Oct.	HSF PSR ASF PSF CFSF	
Metalasia muricata	R16.95 (4L) | 80	R8.90 | 40		2mx2m silvery-grey shrub with cream honey-scented flowerheads. For dry, sandy and windy conditions along the coast.	CFDS HSF ASF	
Mimetes fimbrifolius **(Rare Cape Peninsula Endemic)**	R24.00 (2L) | 10			Tree pagoda. 4x5m tree with flowerheads clasped by reddish-yellow leaves at branch tips. Flowering time: Jul-Dec. Attracts bird pollinators. For full sun on moist rocky slopes and sandy flats. May live for up to 100 years!	PSF	
Monopsis lutea	R16.35 (4L) | 30	R8.90 | 60	R4.10 | 24	Marsh groundcover with pretty yellow flowers and bright green trailing stems. Damp sands.	CLFW SSR	

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Morella cordifolia	R18.80 (4L) | 80	R9.30 | 0		Waxberry. 2-3m tall spreading shrub for dry, sandy and windy conditions.	CFDS CFSF HSF	
Muraltia mitior **(Endangered)**	R19.60 (4L) | 70	R9.40 | 0		Beautiful purple-flowered shrub with finger-like branches to 1m. For sandy, seasonally wet areas.	CFDS	
Muraltia (Nylandtia) spinosa	R20.00 (4L) | 0			Tortoise berry; 1.5x1m shrub with masses of purple flowers in winter and edible fruit. For dry, sandy and windy conditions.	CFDS CFSF HSF	
Olea europaea subsp. africana	R105.00 (20L) | 10			Wild olive. 9mx12m tree with glossy green foliage. Drought-, frost- and wind-resistant. Fruit attracts birds.	CFDS CFSF SPGF PSR SSR	
Orphium frutescens (pink)	R16.95 (4L) | 120	R8.90 | 0		80cm tall upright wetland shrub with showy pink flowers. Buzz-pollinated by carpenter bees.	CFDS CFSF CLFW	
Orphium frutescens (white)	R16.95 (4L) | 120	R8.90 | 0		80cm tall upright wetland shrub with showy white flowers. Buzz-pollinated by carpenter bees.	CFDS SPGF CLFW	
Osteospermum fruticosum	R16.40 (4L) | 0	R8.90 | 0	R4.10 | 24	Trailing African daisy. Semi-succulent groundcover to 40cm with white flowers, ray florets mauve on underside. Attracts butterflies. Full sun. Wind- and drought- resistant.	CFDS	
Osteospermum incanum	R16.95 (4L) | 0			Spreading, fast-growing shrub to 1.5m. Leaves softly hairy, grey. For dry, sandy and windy conditions.	CFDS CFSF	
Osteospermum moniliferum	R16.40 (4L) | 20	R8.90 | 40		Large, spreading, fast-growing shrub to 3m. Edible berries attract birds. For dry, sandy and windy conditions.	CFDS HSF CFSF SSR SPGF PSF	
Otholobium bracteolatum	R16.40 (4L) | 120	R8.90 | 0	R4.10 | 24	1mx1.5m shrub with purple and white pea flowers. Adapted to dry, sandy, windy conditions.	CFDS	
Otholobium decumbens		R8.90 | 20		Prostrate mat-forming forb with mauve flowers. For full sun in sandy soil.	CFSF SPGF	
Otholobium fruticans (**Rare Peninsula Endemic**)	R16.40 (2L) | 30			40cmx1m trailing semi-shrub with purple flowers. For sandy acidic soil on the slopes of Table Mountain.	SPGF PSF	

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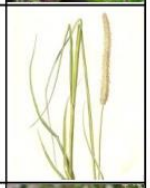
Passerina paleacea	R19.60 (4L) | 20	R9.50 | 20		Rare gonnabos. Shrub to 1m with ericoid leaves. For neutral to alkaline sands in full sun.	CFDS	
Pelargonium betulinum	R16.95 (4L) | 0	R8.90 | 10		Camphor-scented pelargonium. 1mx1m shrub for dry, sandy and windy conditions. Showy pink flowers.	CFDS CFSF HSF	
Pelargonium capitatum	R15.80 (4L) | 40	R8.90 | 20		Rose-scented pelargonium. Fast-growing groundcover with pink flowers on long stalks. Water- and wind-wise.	CFDS CFSF SPGF HSF	
Pelargonium cucullatum subsp. *tabulare*	R16.90 (12cm) | 4			Tree pelargonium. Shrub to over 2m with showy pink flowers in late spring/summer. Full sun, drought tolerant.	CFSF SPGF PSR HSF	
Pennisetum macrourum	R18,80 (4L) | 0			African feather grass. Beautifully backlit tall wetland grass to 2,5m. Suitable for full sun to semi-shade in marginal or well-irrigated applications.	CFSF CLFW	
Phylica ericoides	R18.80 (4L) | 80	R9.20 | 20		1m tall spreading shrub with white button-like flowers. For dry, sandy and windy conditions.	CFDS HSF CFSF SPGF	
Plecostachys serpyllifolia	R15.80 (4L) | 5	R8.90 | 40	R4.00 | 24	1mx1m seasonal wetland shrub with cobwebby grey foliage.	SPGF CLFW HSF	
Podalyria calyptrata	R38.50 (15cm) | 2			Sweetpea bush. Large shrub to 3m with glossy silvery-green foliage. Showy pink flowers in spring attract carpenter bees, honeybees, hoverflies, butterflies and birds. For damp acid sand or clay in full sun.	SPGF PSF	
Podalyria sericea **(Vulnerable)**	R38.50 (15cm) | 0			Small rounded shrub 1mx1m. Silvery-shiny leaves and pink flowers in spring/summer. Attracts carpenter bees, honeybees, butterflies and other insects, which in turn attract birds. For full sun on acid-neutral sand or clay slopes.	SPGF PSF	
Polygala myrtifolia	R19.40 (4L) | 0			September bush. Evergreen, water-wise shrub/small tree of 1-4m, for use as a windbreak or hedge. Striking purple flowers mainly in autumn and spring. Provides forage for bees.	CFDS CFSF SPGF	

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Prionium serratum	R20.00 (4L) | 2			Palmiet. Large wetland graminoid to 2m or more. Excellent water purifier. Flowerheads eaten as a vegetable when in bud.	CLFW	
Pseudoselago spuria **(rare Cape Flats form)**	R18.20 (4L) | 5	R9.00 | 20		Powderpuff plant. Upright perennial shrub to 60cm, white flowerheads. Prefers moist, sandy soils. Full sun.	CFSF	
Psoralea aphylla	R18.80 (4L) | 20			Seasonal wetland shrub to 2m, leaves reduced, shoots silvery hairy, stems weeping, masses of mauve/white flowers in summer. Now rare on the Cape Flats. Plant in full sun under irrigation.	CFSF CLFW	
Psoralea glaucina **(Critically Endangered Cape Flats Endemic)**	R18.20 (4L) | 0	R9.00 | 40		Groundcover for seasonally damp neutral-alkaline sands. Purple pea flowers.	CFDS	
Psoralea pinnata	R18.20 (4L) | 200	R9.00 | 20		3-4mx2m fast-growing seasonal wetland plant/small tree with masses of mauve and white flowers in late spring/summer.	CFSF SPGF CLFW HSF	
Psoralea repens	R15.80 (4L) | 2	R8.90 | 80	R4.00 | 24	Groundcover for alkaline sands. Drought- and wind- resistant. Purple pea flowers.	CFDS	
Ruschia macowanii	R15.80 (4L) | 60	R8.90 | 40		1mx1m sprawling vygie for dry, sandy and windy conditions	CFDS	
Salvia africana-caerulea		R9.60 | 5		Blue sage. 1.5mx1.5m aromatic shrub for clay slopes and flats.	SPGF SSR PSR ASF	
Salvia africana-lutea	R16.95 (4L) | 100	R8.90 | 20		1.5mx1.5m shrub for dry, sandy and windy conditions. Orange, tubular, bird-pollinated flowers.	CFDS HSF PSR SSR	
Salvia chamelaeagnea	R16.95 (4L) | 10	R8.90 | 20		Rough blue sage. Dense shrub to 2m for irrigated areas/seasonal wetlands in clay soils. Lime green foliage and large blue and white flowers in summer.	SPGF CLFW	
Salvia lanceolata	R17.60 (4L) | 0			1.5mx1.5m shrub for dry, sandy and windy conditions. Peach-orange, tubular, bird-pollinated flowers.	CFDS ASF	
Scabiosa incisa	R17.60 (4L) | 2			Fast-growing perennial groundcover with beautiful mauve, long-stemmed flowerheads from spring to summer. For coastal sands in full sun. Attracts butterflies.	CFDS	

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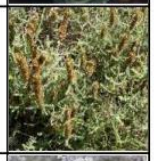
Schoenoplectus scirpoides	R18.20 (4L) | 30	R9.00 | 0	Ex open R6.00 | 0	2m tall attractive wetland reed. Requires permanent water, 50cm deep.	CLFW	
Scirpoides thunbergii	R18.20 (4L) | 2	R9.00 | 0		0.7m tall rhizomatous sedge. Suitable for sandy damp areas.	ASF CFSF	
Searsia crenata	R19.80 (4L) | 10	R9.50 | 0		Shrub/small tree to 4m. Ideal coastal or inland hedging plant. Drought and wind tolerant. Host plant for butterflies; berries attract birds. Full sun.	CFDS CFSF SPGF	
Searsia lucida	R19.80 (4L) | 0	R9.60 | 0		Shrub/small tree (3-5mx4m) with attractive glossy green leaves. Excellent hedging plant. Drought and wind tolerant. Berries attract birds. Full sun.	CFDS HSF CFSF SPGF	
Selago canescens	R16.40 (2L) | 0			Bitterbush. Evergreen shrub to 1.5m with attractive mauve flowers. Flowering time: July-Sep. Host plant for butterflies. For loamy soil in full sun.	SPGF	
Selago corymbosa	R16.40 (2L) | 0			Perennnial densely leafy shrublet to 0.6m. Creamy white flowerheads. Host plant for butterflies. Suitable for sun or semi-shade.	SPGF	
Senecio halimifolius	R15.80 (4L) | 50	R8.90 | 360		2mx1.5m seasonal wetland shrub with yellow daisy flowers which attract insect pollinators. Tolerates summer drying.	CFDS CFSF SPGF CLFW SSR	
Seriphium plumosum (Stoebe cinerea)	R18.90 (2L) | 40			Many branched grey-woolly, shrub to 1.5m for clay slopes in semi-shade to full sun.	SPGF	
Seriphium plumosum (Stoebe plumosa)	R21.40 (4L) | 0	R9.50 | 0		1mx1m shrub with woolly grey foliage for dry, sandy and windy conditions. Water-wise contrast filler.	CFDS CFSF LAF	
Serruria aemula **(Endangered Cape Flats Endemic)**	R24.00 (2L) | 0	R9.60 | 20		Shrublet to 0.5m with finely divided leaves. Silvery-pink flowers appear from July-October. For irrigated or seasonally wet sands in full sun. No compost or fertiliser.	CFSF	

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Serruria foeniculacea **(Critically Endangered Cape Flats Endemic)**	R21.40 (4L) | 10	R9.50 | 10		1mx1m protea with silvery pink flowers. For seasonally wet acid sands. No compost or fertiliser.	CFSF	
Serruria glomerata **(Vulnerable Cape Peninsula Endemic)**	R24.00 (2L) | 0			Compact shrublet to 0.5mx0.5m. Flowering time: Aug-Oct. Suitable for seasonally wet acid sands. No compost or fertiliser.	HSF CFSF	
Sideroxylon inerme **(Protected tree)**	R180.00 (20L, 3m) | 2			Milkwood. 10-15m tall tree with glossy green leaves, small white flowers and purple/black fruit which attracts birds. Suitable for coastal conditions.	CFDS	
Solanum africanum	R16.95 (4L)| 2	R8.90 | 40		Dronkbessie. Creeping succulent shrub with stems to 3m. Groups of pendulous mauve flowers with yellow stamens followed by black berries.	CFDS	
Stachys aethiopica	R16.40 (15cm) | 5		R4.10 | 24	Kattekruie. Hardy spreading groundcover with delicate white-pink flowers. For semi-shade.	CFDS SSR SPGF PSR	
Struthiola dodecandra	R19.40 (4L) | 2	R9.30 | 0		1-1.5m tall shrub with sweet-smelling white flowers. For seasonally wet flats and slopes.	CFSF SPGF CLFW	
Struthiola striata	R19.80 (4L) | 30			Shrub to 1m with small tubular flowers, scented at night, moth-pollinated. For damp sandy flats.	ASF CFSF	
Tarchonanthus littoralis	R33.00 (4L) | 10; R105.00 (20L, 1.5m) | 40			Camphor tree. 2-9m semi-deciduous, hardy, water-wise tree with grey leaves for coastal conditions. Excellent windbreak/tall hedge.	CFDS	
Tetragonia decumbens	R15.80 (4L) | 40	R8.90 | 60	R4.00 | 144	Dune spinach - popular edible plant. Fast-growing groundcover to 50cm for coastal conditions. A useful sand stabiliser.	CFDS HSF	
Tetragonia fruticosa	R15.80 (4L) | 2	R8.90 | 0		Slaaibos - popular edible plant. Fast-growing groundcover to 50cm for coastal conditions. A useful sand stabiliser.	CFDS HSF	
Thamnochortus punctatus	R21.80 (4L) | 0			Steenbok reed. Dwarf perennial restio to 1m, spreading to 0.5m at the base. For full sun in well-drained soil. Water well to establish.	ASF CFSF	
Thamnochortus spicigerus	R21.80 (4L) | 40	R9.50 | 200		Tall thatching reed. Large tussock-forming reed to 2.5m, spreading to 1.5m at the base. For well-drained, neutral-alkaline sand in full sun.	CFDS HSF	

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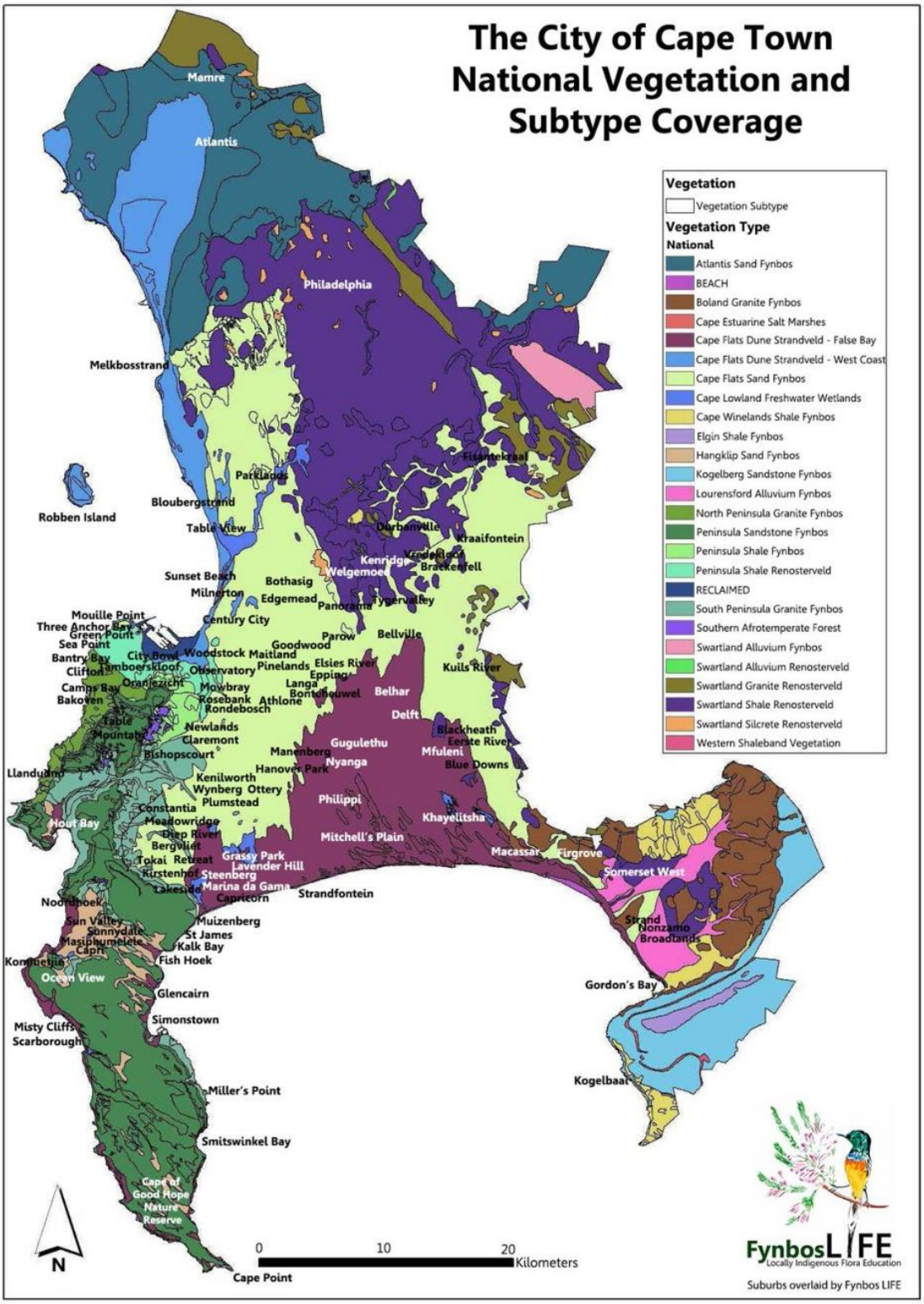
Trachyandra ciliata	R16.40 (4L) | 5			Veldkool. Perennial to 50cm for coastal sands. Edible flower buds can be steamed or boiled in the same way as asparagus, or cooked in a stew.	CFDS	
Trachyandra divaricata	R16.40 (4L) | 20	R8.90 | 20		Sandkool. Perennial to 50cm for coastal sands. The branched edible flower buds can be steamed or boiled.	CFDS HSF	
Tribolium uniolae	R18.90 (2L) | 0			Tufted perennial grass to 0.6m with compact golden flowerheads. For sandy or clay slopes and flats.	ASF PSF LAF SPGF CFSF	
Wachendorfia thyrsiflora	R19.40 (4L) | 10			Marsh butterfly lily. Tall evergreen geophyte with spikes of yellow flowers reaching 2.5m (Sep-Dec). For permanently marshy areas in full sun.	SPGF CFSF CLFW PSF HSF	
Watsonia meriana	R17.60 (4L) | 0			Cormous plant, leaves to 0.6m, flowers to 2m. Tubular red flowers attract sunbirds. For seasonally inundated areas. Sold as clump of approx. 3 shooting bulbs in 4L bag during growing season (winter/spring).	CFDS CFSF SPGF CLFW	
Watsonia tabularis **(Cape Peninsula Endemic)**	R18.20 (4L) | 0			Cormous plant, sword-shaped leaves to 1m, orange flowers from Nov-Jan, bird-pollinated. Water-wise, suited to sunny rockeries. Prefers neutral to acid soils (occurs naturally on sandstone from sea level to Table Mt summit). Sold as clump of approx. 3 shooting bulbs in 4L bag during growing season.	CFSF SPGF PSF	
Zantedeschia aethiopica				Arum lily. Geophytic species to 1m with fresh green foliage and elegant large white spathes; these support a microcosm of wildlife from beetles to bees to frogs and spiders. For full sun or semi-shade in marshy conditions. Evergreen with permanent moisture availability, deciduous with seasonal moisture. Rhizomes attract porcupines.	CLFW SPGF CFSF	

APPENDIX A. CITY OF CAPE TOWN VEGETATION MAP WITH SUBURBS OVERLAID



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Appendix C: Alien Floral Species Control

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

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

- Initial Control Phase: The existing population must be drastically reduced.
- Follow-up Control Phase: Control of coppice regrowth, root suckers and seedlings.
- Maintenance Phase: Low AIP density and numbers with a low annual control cost. During this phase, AIP are no longer considered a problem. It is important to monitor the situation of infestation during the growing season of the plants as to avoid re-infestation and to keep the control cost at a minimum.

Control Methods

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

Integrated control strategies

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

- Species of alien and invasive weeds;
- The type of growth form (i.e. seedling, sapling, shrub or tree);
- The density of infestation;
- Terrain where the infestation is present;
- Rehabilitation requirements
- What resources are available;
- Speed or urgency that the control of the infestation requires – physical removal and biological control will take longer than chemical control.
    - **Initial control phase**
        - **Hand pull:** saplings and seedlings must be pulled out by hand and regrowth must be controlled with herbicide (Campbell, 2000). All guidelines for the application of herbicide listed in this Rehabilitation Plan must be adhered to;
        - **Frill:** a cane knife is used to cut frills into the stem. Herbicide must be applied (1-2 mm per frill) and must be done in 30min after frilling;
        - **Soil application:** herbicide is applied to the soil and taken up by the plants roots

Methods for controlling Coppice, saplings and seedlings:

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

Integrated strategies to control alien shrubs

- **Alien shrubs that are less than 1 m in height**:
    - Foliar application must be used in the general control of alien shrubs that are less than 1 m in height.

- Registered herbicide must be used and where grass is present, selective broadleaf herbicide that will not impact on the grass. When grass is not present, a selective or non-selective registered herbicide must be used.
- For dense seedling growth that are of uniform height a flat fan nozzle with knapsack must be used.
- For seedling growth that are of uneven height, root suckers, short saplings, and coppice growth a cone nozzle must be used.

➢ **Alien shrubs that are taller than 1 m (Campbell, 2000):**

- Shrubs that are taller than 1 m must be reduced cutting using brush cutter or cane knifes.
- When large areas with dense growth are present a tractor mounted gyro-motor must be used.
- For low – medium density infestation a cut stump treatment must be used. Stumps that are must be treated immediately. The best time to treat is during the active growing season.
- Medium – High-density infestations must be slashed to knee height so that the plants can coppice. The best time to do this is during the winter months as the plants are dormant and the coppice will come out during the active growing period after good rain. The coppice must be sprayed when enough leaves are present to absorb the herbicide and a dye must also be used to indicate treated areas.
- Pathways must be cut to increase exposed areas so that a foliar spray treatment is more effective without compromising the indigenous vegetation.
- Mechanical uprooting of shrubs is not always a preferred method because the soil is disturbed and this increases the risk of alien vegetation infestation. Erosion is also promoted by this activity, and soil loss will occur. Mechanical uprooting can be done in areas that have a dense grass cover, as the roots of the grass will keep the soil intact. After uprooting the soil must be leveled and if grass seeds are present, some grass seeds must be placed on these areas to promote grass regrowth.

Integrated strategies to control alien herbs (Campbell, 2000)

➢ **Chemical Control:**

- Alien herbs are soft non-woody species.
- Some of the alien herbs have registered herbicides to control them and are either pre- or post-emergent herbicides.
- When alien herbs are associated with woody alien plant, herbicides that are registered to control woody alien species are often used to control alien herbs. Alternatively, glyphosate can be used as it is often registered for both alien herb and alien woody species.

Follow up control (Campbell, 2000)

Introduction

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

Follow up treatment control must use the following methods:

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

Control methods for dense regrowth

After initial control operations dense regrowth may arise as new regrowth will sprout in the form of stump coppice, seedlings and root suckers.

- **Chemical control / foliar application:**
  - Plants that are less than 1 m in height must be controlled by foliar application.
  - Dense seedling growth must be controlled with knapsack sprayers with a flat fan nozzle.
  - If grass is present, the use of a registered selective herbicide must be used so as to not harm the grass, and if grass is not present a registered non-selective or selective herbicide can be used.
  - Suitable dye must be used at all times to limit over- or under spray of areas.
- **Mechanical control:**
  - Areas with dense seedlings should not be uprooted or hoed out, as these areas will result in soil disturbance and will in return promote flushes and germination of alien seedling growth.
  - When stump density is high, plants should not be cut. This is impractical and there will be many untreated stumps. Instead cut the stumps in dense areas with brush cutters and remove the top growth. Stumps will start to coppice and foliar spay must be used to control the coppice regrowth.

Control methods for low-medium density regrowth

Neglecting to control low-medium density regrowth will result in densification and spreading as well as additional control costs.

- **Chemical control:**
  - Cut stump method must be used and stumps must be cut up to a height of 15 cm and must be sprayed within an hour of cutting the plant with a registered herbicide. Herbicide must be applied with knapsack sprayers set to a low pressure, using cone nozzles e.g. TG1 or CE1. Hand sprayers can also be used to apply herbicide. A suitable dye must be used to ensure all stumps are treated. Only the cut surface must be treated with herbicide and the side of the stumps must not be treated.
  - Foliar spray can be applied to regrowth that is up to the height of 1m. Herbicide must be applied using knapsacks with solid cone nozzle and must be mixed with a suitable dye to prevent over- or under spraying of treated areas.
- **Mechanical control:**
  - Seedlings can be removed from wet soil by hand pulling. Gloves can be used for hand protection during the operation.

Appendix D: Details, Expertise and Curriculum Vitae of Specialists

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

Kim Marais	BSc (Hons) Zoology (University of the Witwatersrand) Pri.Sci.Nat
Stephen van Staden	MSc (Environmental Management) (University of Johannesburg) Pri.Sci.Nat

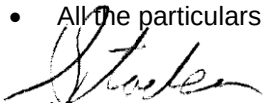
1. (a). (ii) The expertise of that specialist who compiled the specialist report including a curriculum vitae

Company of Specialist:	Scientific Aquatic Services		
Name / Contact person:	Kim Marais		
Postal address:	221 Riverside Lofts, Tygerfalls Boulevard, Bellville, 7569		
Postal code:	1401	Cell:	071 413 2245
Telephone:	011 616 7893	Fax:	086 724 3132
E-mail:	stephen@sasenvgroup.co.za		
Qualifications	BSc (Hons) Zoology (University of Witwatersrand) BSc (Zoology, Ecology and Conservation) (University of Witwatersrand)		
Registration / Associations	Registered Professional Scientist at South African Council for Natural Scientific Professions (SACNASP) Member of the South African Wetlands Society (SAWS)		

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

I, Stephen van Staden, declare that -

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the relevant legislation and any guidelines that have relevance to the proposed activity;
- I will comply with the applicable legislation;
- I have not, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct



SCIENTIFIC AQUATIC SERVICES (SAS) – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF STEPHEN VAN STADEN

PERSONAL DETAILS

Position in Company	Managing member, Ecologist with focus on Freshwater Ecology
Date of Birth	13 July 1979
Nationality	South African
Languages	English, Afrikaans
Joined SAS	2003 (year of establishment)
Other Business	Trustee of the Serenity Property Trust and emerald Management Trust

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Registered Professional Scientist at South African Council for Natural Scientific Professions (SACNASP);

Accredited River Health practitioner by the South African River Health Program (RHP);

Member of the South African Soil Surveyors Association (SASSO);

Member of the Gauteng Wetland Forum;

Member of International Association of Impact Assessors (IAIA) South Africa

Member pf the Land Rehabilitation Society of South Africa (LaRSSA)

EDUCATION

Qualifications

MSc (Environmental Management) (University of Johannesburg)	2003
BSc (Hons) Zoology (Aquatic Ecology) (University of Johannesburg)	2001
BSc (Zoology, Geography and Environmental Management) (University of Johannesburg)	2000
Tools for wetland Assessment short course Rhodes University	2016

COUNTRIES OF WORK EXPERIENCE

South Africa – All Provinces

Southern Africa – Lesotho, Botswana, Mozambique, Zimbabwe Zambia

Eastern Africa – Tanzania Mauritius

West Africa – Ghana, Liberia, Angola, Guinea Bissau, Nigeria, Sierra Leone

Central Africa – Democratic Republic of the Congo

PROJECT EXPERIENCE (Over 2500 projects executed with varying degrees of involvement)

1. Mining
    - Coal, Chrome, PGM's, Mineral Sands, Gold, Phosphate, river sand, clay, fluorspar
2. Linear developments
    - Energy Transmission, telecommunication, pipelines, roads
3. Minerals beneficiation
4. Renewable energy (wind and solar)
5. Commercial development
6. Residential development
7. Agriculture
8. Industrial/chemical

REFERENCES

- Terry Calmeyer (Former Chairperson of IAIA SA)
  Director: ILISO Consulting Environmental Management (Pty) Ltd
  Tel: +27 (0) 11 465 2163
  Email: terryc@icem.co.za

- Alex Pheiffer
  African Environmental Management Operations Manager
  SLR Consulting
  Tel: +27 11 467 0945
  Email: apheiffer@slrconsulting.com

- Marietjie Eksteen
  Managing Director: Jacana Environmental
  Tel: 015 291 4015

Yours faithfully

STEPHEN VAN STADEN

SCIENTIFIC AQUATIC SERVICES (SAS) – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF KIM MARAIS

PERSONAL DETAILS

Position in Company	Consultant
Date of Birth	28 February 1989
Nationality	The Netherlands
Languages	English, Afrikaans
Joined SAS	2015 – Present

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Registered Professional Natural Scientist with the South African Council for Natural Scientific Professions
Member of the South African Wetlands Society

EDUCATION

Qualifications

Tools for Wetland Assessment (University of Grahamstown)	2018
Certificate in Environmental Law for Environmental Managers (CEM)	2014
Certificate for Introduction to Environmental Management (CEM)	2013
BSc (Hons) Zoology (Herpetology) (University of the Witwatersrand)	2012
BSc (Zoology and Environment, Ecology and Conservation) (University of Witwatersrand)	2011

COUNTRIES OF WORK EXPERIENCE

South Africa – All Provinces
West Africa – Uganda

PREVIOUS EMPLOYMENT

Position	Junior Environmental Scientist
Company	ILISO Consulting (Pty) Ltd
Employment	2013 - 2015

SELECTED PROJECT EXAMPLES

Wetland Delineation and Wetland Function Assessment

Various **Freshwater Assessments**, including:

- Wetland Offset Plan for the Cape Town International Airport, Cape Town.
- Freshwater Assessment for the Swartklip Site as part of the Cape Town International Airport Wetland Offset requirements, Cape Town.
- Freshwater Assessment for the proposed Heuningklip Solar Farm, Vredenburg, Western Cape.
- Freshwater screening for the proposed Doornfontein Solar Farm, Velddrift, Western Cape.
- Freshwater Screening for the proposed Valentia underground shooting range, Paarl, Western Cape.
- Freshwater Assessment for the proposed Baden Powell Industrial development, Western Cape.
- Freshwater Assessment for the decommissioning of five landfill sites within the Drakenstein Municipality, Western Cape.
- Freshwater Assessment for the proposed De Hoop Residential Development, southern Paarl, Western Cape.

- Freshwater assessment for the proposed Vredenburg Wind Energy Facility, Vredenburg, Western Cape.
- Wetland Assessment for the proposed Excelsior Wind Energy Farm and associated powerline infrastructure, Swellendam, Western Cape.
- Wetland Assessment for the sewage Bulk Service System for the Drakenstein Municipality, Paarl, Western Cape.
- Freshwater screening for the proposed Vendome residential Development, Paarl, Western Cape.
- Wetland Assessment for the Riverclub Development for the Val de Vie development, Paarl, Western Cape.
- Wetland Assessment for the Riverfarm Development for the Val de Vie development, Paarl, Western Cape.
- Wetland Assessment for the development of three agricultural dams for irrigation of crops, Cape Farms, Western Cape.
- Wetland Assessment for the Willow Wood Estate Sewage pipeline upgrade, D'Urbanvale, Western Cape.
- Wetland Assessment for the rectification of infilling of a freshwater feature, D'Urbanvale, Western Cape.
- Freshwater Assessment for the stabilisation of the Franschhoek River embankment, Leeu Estates, Franschhoek, Western Cape.
- Freshwater Assessment for the proposed Helderburg Hospital, Somerset West, Western Cape.
- Freshwater Assessment for the Vergenoegd Wine Estate, Cryodon, Western Cape.
- Freshwater assessment for the proposed upgrade of the community school, Elandsdift farm, Sir Lowry's Pass, Western Cape.

Various **Freshwater Rehabilitation and Management Plans**, including:

- Implementation Plan for the proposed rehabilitation of the wetlands within the Swartklip Site as part of the CTIA offset requirement, Western Cape.
- Detailed Rehabilitation Plan for the proposed emergency upgrades for the Bainskloof Road, Western Cape.
- Rehabilitation Plan for the proposed Berg River riparian zone and open space areas within the Riverfarm development, Paarl, Western Cape.
- Detailed Method Statement for the rehabilitation and Maintenance of the wetland associated with the Gentleman's Estate Plots, Val de Vie, Paarl, Western Cape.
- Detailed method statement for the rectification and rehabilitation of a storm water system, D'Urbanvale, Western Cape.
- Rehabilitation Plan for the proposed de Hoop Residential Development, Paarl, Western Cape.
- Rehabilitation Plan for the proposed abstraction and storage of water from the Diep River within a 500,000m^3 dam, Durbanville, Western Cape.
- Rehabilitation plan for the proposed Kloof Dam and decommisionning of several smaller dams, Worcester, Western Cape.
- Rehabilitation Plan for the proposed bulk water pipeline over the Kuils River, Belhar, Western Cape.

Water Use Authorisations and ECO input

- WUA for the SANRAL N3 De Beers Pass Section within the Free State and KwaZulu-Natal.
- Assistance with the WULA for the Mzimvubu Water Project, Eastern Cape.
- WUA for the Excelsior Wind Energy Farm and associated powerline infrastructure, Swellendam, Western Cape.
- WUA for the Golden Valley Phase II Wind Energy Facility, Eastern Cape.
- WUA for the Sewage Bulk Service system for the Val de Vie Polo and Lifestyle Estate, Paarl, Western Cape.
- WUA for the Riverfarm Development for the Val de Vie Polo and Lifestyle Estate, Paarl, Western Cape.
- WUA for the Pearl Valley II Development for the Val de Vie Polo and Lifestyle Estate, Paarl, Western Cape.
- WUA for the Levendal Village for the Val de Vie Polo and Lifestyle Estate, Paarl, Western Cape.
- WUA for a residential Development, Klapmuts, Western Cape.
- WUA for the Riverclub Development for the Val de Vie Polo and Lifestyle Estate, Paarl, Western Cape.
- WUA for the proposed Copperton Wind Energy Facility, Northern Cape.
- WUA for the proposed bulk water pipeline crossing over the Kuils River, Bellville, Western Cape.
- WUA for the proposed Vergenoegd Village residential development near Crydon, Western Cape.
- Validation and Verification process of three farms in Franschhoek, Western Cape.
- Validation and Verification process for Farm 1165 in Durbanville, Western Cape.
- WUA for the De Hoop Lifestyle Estate, Paarl, Western Cape.
- WUA for the proposed Platrug Dam with storage capacity of 500,000m^3, Western Cape.
- WUA for the proposed Boland Park residential development, wWestern Cape.

Specialist **Environmental Control Work**

- ECO of WUL conditions for the proposed bridge and access road over the Berg River, Val de Vie Estate, Paarl.
- ECO of WUL conditions for the proposed bulk water pipeline over the Kuils River, City of Cape Town, Belhar, Western Cape.
- ECO of WUL conditions for the proposed Riverclub residential development, Paarl, Western Cape.
- Various specialist freshwater input into EMP's and landscape plans, Western Cape.