

Strategic Biodiversity Offset Framework Plan Aalwyndal, Mossel Bay, Western Cape

REPORT 1: Revision of the Aalwyndal Precinct Layout



**Western Cape
Government**
Economic Development
and Tourism



confluent

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The plan was compiled by Confluent and Eco-Pulse in consultation with the Mossel Bay Municipality, Cape Nature, and the Department of Environmental Affairs and Development Planning.

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Report Series Information

This report (in bold) is one of a series of reports produced for this framework plan which are listed below:

- 1. Revision of the Aalwyndal Precinct Layout.**
2. *Calculated Size and Characteristics of the Offset.*
3. *Costed Conservation Management Plan for the Onsite Biodiversity Offset.*
4. *Identification, Ground-truthing and Feasibility of Potential Offsite Offsets.*
5. *Management and Financial Arrangements for Biodiversity Offsets.*

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GLOSSARY

Biodiversity	The variability among living organisms from all sources including, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part and also includes diversity within species, between species, and of ecosystems.
Biodiversity Offset	The measurable outcome of compliance with a formal requirement contained in an environmental authorisation to implement an intervention that has the purpose of counterbalancing the residual negative impacts of an activity, or activities, on biodiversity, through increased protection and appropriate management, after every effort has been made to avoid and minimise impacts and rehabilitate affected areas.
Biodiversity Offset Implementation Agreement	Means a legally binding agreement that is entered into between the holder of an environmental authorisation and a third party, or third parties, for the implementation of a biodiversity offset.
Biodiversity Offset Management Plan	Means a plan setting out the management actions to be taken at a biodiversity offset site to achieve and maintain specific conservation outcomes in the long term.
Biodiversity Offset Receiving Area	Means an area identified in an official policy, plan or programme as an optimal area for locating biodiversity offsets.
Biodiversity Offset Report	Means a report prepared by a relevant specialist, or specialists, and submitted to a competent authority together with a basic assessment report, or environmental impact assessment report, setting out the findings of a biodiversity offset study.
Biodiversity Offset Site	Means a suitable area in the landscape which meets the offset requirements in an environmental authorisation and is secured for biodiversity conservation in the long term.
Biodiversity Priority Area	Means an area identified as a priority for biodiversity conservation in a spatial biodiversity plan, and includes Critical Biodiversity Areas, Ecological Support Areas, Freshwater Ecosystem Priority Areas and focus areas for protected area expansion.
Buffer	A strip of land surrounding a wetland or riparian area in which activities are controlled or restricted to reduce the impact of adjacent land uses on the wetland or riparian area. Buffers are land use specific and are calculated for the specific environmental context and proposed land use.
Candidate Biodiversity Offset Site	Means one of the potential biodiversity offset sites identified in a Biodiversity Offset Report.
Characteristics of a watercourse	Means the resource quality of watercourse within the extent of a watercourse.
Delineation of a wetland or riparian habitat	Means delineation of wetlands and riparian habitat according to the methodology as contained in the Department of Water Affairs and Forestry, 2008 publication: A Practical Field Procedure for Delineation of Wetlands and Riparian Areas or amended version.
CBA Map	Means a map of Critical Biodiversity Areas and Ecological Support Areas, based on a systematic biodiversity plan.
Conservation Area	Means an area with a conservation designation that is effective at achieving in-situ conservation of biodiversity outside of protected areas in the long term.
Conservation Authority	Means South African National Parks or the organ of state responsible for the conservation of biodiversity in a province.

Conservation Importance (CI)	The importance of a site for supporting biodiversity features of conservation concern present, e.g., populations of IUCN threatened and Near Threatened species (CR, EN, VU and NT), Rare species, range-restricted species, globally significant populations of congregatory species, and areas of threatened ecosystem types, through predominantly natural processes. CI is evaluated in accordance with recognised established internationally acceptable principles and criteria for the determination of biodiversity-related value, including the IUCN Red List of Species, Red List of Ecosystems and Key Biodiversity Areas.
Conservation Servitude	Means a servitude registered against the title deed of a property placing restrictions on the landowner and successors-in-title for the purposes of conservation of biodiversity on the relevant property.
Critical Biodiversity Area (CBA)	Means an area that must be maintained in a good ecological condition (natural or near-natural state) in order to meet Biodiversity Targets for ecosystem types as well as for species and ecological processes that depend on natural or near natural habitat, that have not already been met in the protected area network.
Ecosystem	Means an assemblage of living organisms, the interactions between them and their physical environment.
Ecological Condition	Means the extent to which the composition, structure and function of an area or biodiversity feature has been modified from a reference condition of “natural”.
Ecosystem Extent	Means the proportion of an ecosystem type that remains intact (i.e. in a natural, near-natural or semi-natural condition) relative to its historical distribution.
Ecological Infrastructure	Means naturally functioning ecosystems that deliver valuable services to people, such as water and climate regulation, soil formation and disaster risk reduction.
Ecosystem Services	Means services and benefits to people and the economy provided by ecosystems, often classified into three broad categories: provisioning services, regulating services and cultural services.
Ecosystem Threat Status	Means the indicator of how threatened an ecosystem type is (in other words the degree to which it is still intact or alternatively losing vital aspects of its function, structure or composition) in which Ecosystem types are categorised as Critically Endangered, Endangered, Vulnerable or Not Threatened, based on the proportion of ecosystem type that remains in good ecological condition relative to a series of biodiversity thresholds.
Fatal Flaw	Means a major defect or deficiency in a project proposal that should result in environmental authorisation being refused, and from a biodiversity perspective, a residual negative impact that would have a Very High significance rating.
Functional Integrity	A measure of the ecological condition of the impact receptor (e.g. the vegetation/fauna community or habitat type) as determined by its remaining intact and functional area, its connectivity to other natural areas and the degree of current persistent ecological impacts
Irreplaceable Biodiversity	Means biodiversity identified through a systematic conservation assessment as being essential to meet a biodiversity target.
Regulated area of a watercourse	a) The outer edge of the 1 in 100-year flood line or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, dams and lakes.

	b) In the absence of a determined 1 in 100-year flood line or riparian area as contemplated in (a) above the area within 100m of distance from the edge of a watercourse where the edge of the watercourse (excluding floodplains) is the first identifiable annual bank fill flood bench. c) In respect of a wetland: a 500m radius around the delineated boundary (extent) of any wetland (including pans).
Rehabilitation	Means the process of reinstating natural ecological driving forces within part or whole of a degraded habitat to recover former or desired ecosystem structure, function, biotic composition, and associated ecosystem services.
Residual negative impacts	Means negative impacts that remain after the proponent has made all reasonable and practicable changes to the location, siting, scale, layout, technology and design of the proposed development, in consultation with the environmental assessment practitioner and specialists (including a biodiversity specialist), in order to avoid and minimise negative impacts, and/or rehabilitate any impacted areas within the prescribed timeframes specified for the completion of the rehabilitation in the EA.
Restoration	Means returning a disturbed, degraded or destroyed ecosystem to its natural condition, with the species present being representative of the ecosystem that occurred on the site prior to disturbance, and ecological processes supporting the long-term persistence of the ecosystem and species, and the associated ecosystem services, through active (with interventions) or passive (without interventions) means.
Spatial Biodiversity Plan	Means a spatial plan that identifies one or more categories of biodiversity priority area, using the principles and methods of systematic biodiversity planning.
Receptor Resilience	The intrinsic capacity of the receptor (i.e., habitat type in question) to resist major damage from disturbance and/or to recover to its original state with limited or no human intervention
Resource Quality	Of a watercourse means the quality of all the aspects of a water resource including: (a) The quantity, pattern, timing, water level and assurance of instream flow; (b) The water quality, including the physical, chemical and biological characteristics of the water; (c) The character and condition of the instream and riparian habitat, and; (d) The characteristics, condition and distribution of the aquatic biota.

ABBREVIATIONS

BA	Basic Assessment	FEPA	Freshwater Ecosystem Priority Area
BOCMA	Breede-Olifants Catchment Management Authority	I&AP	Interested and Affected Part
CA	Competent Authority	MEC	Member of the Executive Council for the environment (provincial)
CBA	Critical Biodiversity Area	MBM	Mossel Bay Municipality
CN	CapeNature	NBA 2018	National Biodiversity Assessment
DFFE	Department of Forestry, Fisheries and Environment	NBF	National Biodiversity Framework
DEADP	Department of Environmental Affairs and Development Planning	NBOG	National Biodiversity Offset Guideline
EA	Environmental Authorisation	NDP	National Development Plan
EAP	Environmental Assessment Practitioner	NEMA	National Environmental Management Act (Act No. 107 of 1998)
EIA	Environmental Impact Assessment	NEMBA	National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)
EMPr	Environmental Management Programme	NWA	National Water Act (Act No. 36 of 1998)
ESA	Ecological Support Area	NGO	Non-government organisation
EOO	Extent of Occurrence	NPO	Non-profit organisation

1. INTRODUCTION

The Aalwyndal Precinct is in the coastal town of Mossel Bay in the Western Cape Province of South Africa (Figure 1). The precinct was formed when Portion 190 of Farm Brakkefontein 220 was sub-divided into lifestyle plots of 5-10 ha on average during the 1990s, most of which have had at least one house built on them with varying degrees of transformation of natural habitat on the remaining property. The precinct was zoned as single residential as it was not considered bona fide farming land by the Department of Agriculture at the time.

The precinct is well positioned in relation to the existing road network and services making it an ideal location for the expansion of urban development. It represents a large area with 73 erven collectively measuring approximately 600 ha and could therefore provide for extensive expansion of urban development. Aalwyndal is located at a vegetation ecotone with elements of fynbos, renosterveld and thicket in threatened ecosystem types, and a multitude of protected plant species and important protected bird species that occupy the precinct and surrounds.

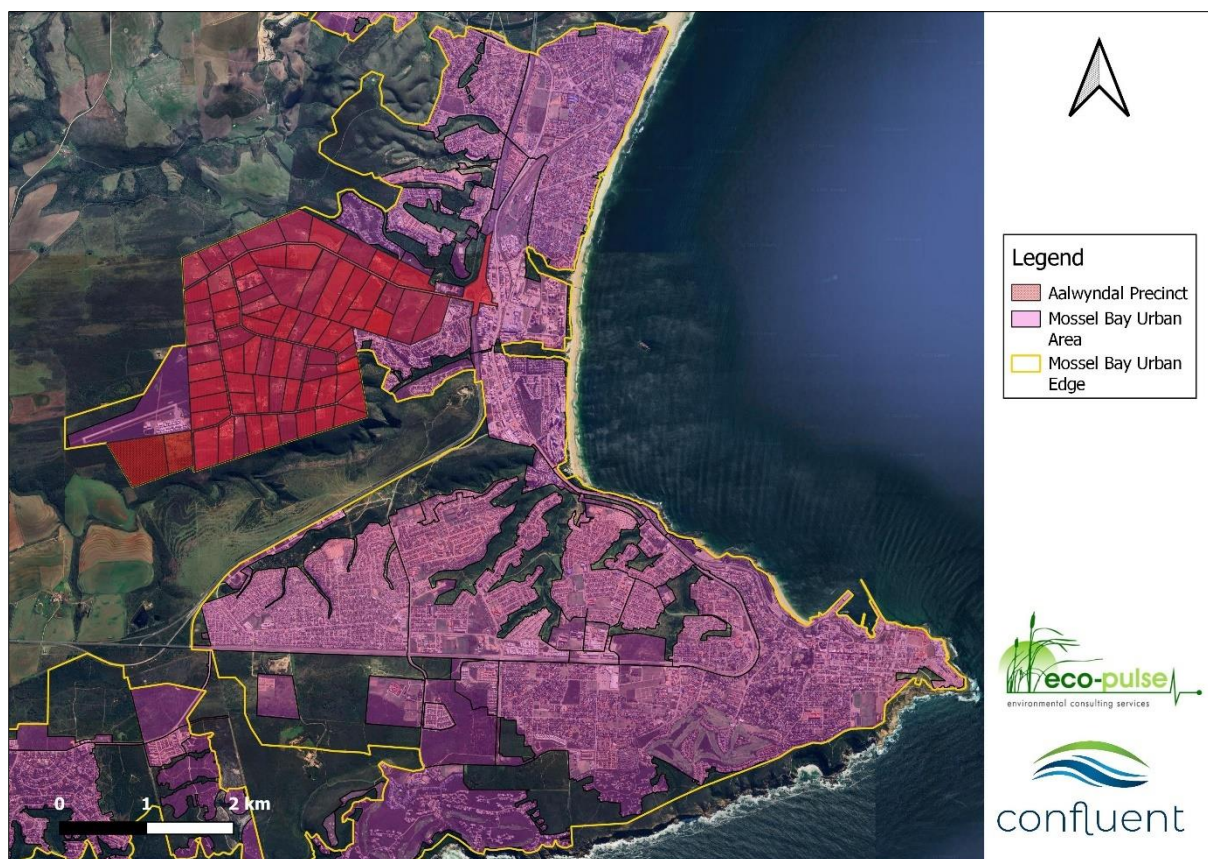


Figure 1. Location of the Aalwyndal Precinct in the Mossel Bay Municipality, Western Cape.

Rapid growth in Mossel Bay has resulted in the Aalwyndal Precinct being identified by the Mossel Bay Municipality for development as a high-density intensification area. As individual development applications were made to regulating authorities the supporting biodiversity specialist assessments made it clear that the precinct is in an area of high biodiversity value. Individual offsets on a per development basis would have been impractical and a source of frustration and confusion for authorities, landowners and developers alike. Hence the need for development of a strategic biodiversity offset framework plan at the precinct level.

This project aims to resolve the conflict between highly sensitive ecosystems and the need for high density residential development facilitating trade-offs between competing land uses while optimising and expediting development in the future development area.

The benefit of adopting a strategic approach to offsets in the Aalwyndal Precinct is that it provides clarity about the offsets required for addressing the biodiversity impacts associated with development in the precinct and streamline the offset assessment, design, and approval process. The strategic approach aims to meet offset requirements at the level of the overall precinct area as opposed to the individual project level and identifies potential offset receiving areas forming the basis of an offset bank. This approach will benefit project proponents and decision makers alike and adequately accommodates cumulative impacts that would otherwise be ignored on a project-by-project basis.

1.1 Terms of Reference

This report aims to provide a revised Aalwyndal precinct layout to accommodate maximised development potential and densification while avoiding impacts to sensitive biodiversity as far as possible and non-offsetable areas in particular. The approach must apply the mitigation hierarchy for development of the precinct as a whole and consider available offset receiving areas that have been assessed to be viable to serve as offsets.

The aim of the updated precinct layout is to refine the existing layouts to ensure an optimum plan which is supported by Mossel Bay Municipality (MBM), Department of Environmental Affairs and Development Planning (DEA&DP), the Breede-Olifants Catchment Management Agency (BOCMA) and CapeNature (CN).

The revised layout must indicate areas of the precinct where no development will be allowed (no-go areas), any potential offset receiving areas within the precinct, areas which will likely trigger offsets, and areas where offsets will likely not be required. The process of updating the precinct layout must consider relevant work that has been done to date and must be based on continued engagement throughout the project with the Department of Economic Development and Tourism (DEDAT), MBM, DEA&DP, CN, and any other required partner.

The process of revising the layout includes demonstrating that the principles and desired outcomes for biodiversity offsetting as indicated in the National Biodiversity Offset Guideline (NBOG; DFFE, 2023) have been addressed as follows:

- Offsets must be the final option in the mitigation hierarchy. All reasonable and feasible measures and alternatives to avoid / prevent and minimise potentially significant negative impacts on biodiversity must be considered;
- Offsets must consider significant residual impacts on biodiversity including direct, indirect and cumulative impacts.
- That the cumulative impact of the development (densification in Aalwyndal) does not:
 - Result in the loss of irreplaceable biodiversity or jeopardise the ability to meet biodiversity targets;
 - Lead to any further decline in ecosystem threat status;

- Cause an irreversible decline in the conservation status of species and the presence of special habitats; or
- Cause significant loss of ecosystem services.
- Residual impacts on irreplaceable biodiversity cannot be offset. This occurs when there are no options left in the landscape to counterbalance residual impacts in accordance with the like-for-like principle. In these cases, development would be considered a fatal flaw.
- The significance of residual impacts on biodiversity must be considered in decision making involving biodiversity offsetting. At the very least this must consider biodiversity priority areas; threat status and protection level; ecological condition; and the size of the impacted area.
- Biodiversity offsets should take the landscape scale into account by embodying the ecosystems approach and promoting connectivity. Conservation benefits from integrated landscape-scale interventions as opposed to a 'patchwork' of small-scale isolated interventions.
- Biodiversity offsets must result in long-term protection and management of priority biodiversity in perpetuity.
- Biodiversity offset design must be evidence-based and transparent in terms of the size and significance of the residual impacts on biodiversity caused by the proposed activity. This should be based on the best available biodiversity information and sound science. All associated reports should be made publicly available.
- A risk averse and cautious approach should be followed considering uncertainties relating to the residual impacts of development as well as the successful outcome and timing of the biodiversity offset intervention.
- Offsets must be fair and equitable, and the process should be undertaken in an open and transparent manner providing for stakeholder engagement, respecting recognised rights (e.g. existing development rights in Aalwyndal), and seeking positive outcomes for affected parties.
- Offset intervention timing is important and implementation of a biodiversity offset should preferably take place before the impacts of the activity occur, or as soon thereafter as reasonably feasible. In the case of Aalwyndal, a few developments have been approved which already influence the layout of possible conservation areas.

The above must be considered in the context that the Aalwyndal precinct will be further developed to some extent even if increasing density of residential and urban areas were not formally planned for the precinct. This is because current landowners continue to expand their individual footprints through vegetation clearance, generally poor control of alien plant species, fire exclusion, and construction of additional dwellings and infrastructure. If all impacts relating to future densification were to be mitigated through avoidance or minimisation, there would be no further development in Aalwyndal, or requirement for any strategic offset plan because all remaining high sensitivity areas would be preserved. It is therefore implicit that further development and densification in Aalwyndal will trigger the requirement for an offset due to the extensive areas of high sensitivity habitat where development is targeted.

The purpose of this project is therefore to strike a balance between allowing a degree of development while ensuring that biodiversity considered irreplaceable or of major potential concern is protected. This project also acknowledges that the *status quo* is not sustainable and will ultimately lead to high biodiversity losses over time, with no clear conservation plan or strategic conservation outcome. In that respect, the strategic offset is considered critical to ensuring a more sustainable conservation outcome that will realistically include some loss of sensitive biodiversity in the Aalwyndal precinct with the aim of conserving well connected representative areas of biodiversity in the long-term both within and beyond the precinct.

The updated precinct plan aims to accommodate the maximised development potential and densification while avoiding biodiversity impacts as far as possible and non-offsetable areas in particular.

1.2 Scope of Work

The mitigation hierarchy must be applied to the whole precinct and the plan must incorporate available offset receiving areas that have been assessed as viable options. This task will include the following activities:

- i. Engagement with MBM, DEADP and CapeNature through discussions and correspondence to establish important concerns and objectives are identified up front and addressed in the revised precinct plan. These are considered key stakeholders in development of the biodiversity offset framework plan.
- ii. Revision of the mapped vegetation type to more accurately reflect the species assemblage and conservation status identified by several botanical specialists.
- iii. Biodiversity specialists undertake a desktop study to review mapped areas of High Sensitivity along with existing biodiversity survey information (specialist reports) and species observation records. Identify areas with low confidence or coverage and undertake ground truthing to survey these sites to verify ecological characteristics and condition of terrestrial and aquatic habitats in the precinct. Refine the mapped High Sensitivity areas if necessary and determine No-Go areas.
- iv. Delineate a minimum functional Core Area which aims to provide real support to highly sensitive areas and maintain connectivity with areas beyond the precinct (if feasible). This area is classified as the No-Go area with criteria such as minimum width / pinch points and must incorporate factors such as the condition, structural heterogeneity and species richness of areas included.

The updated precinct plan proposal will essentially identify three spatial categories:

- **Core Area:** areas considered not developable because the biodiversity features therein are irreplaceable and does not qualify for an offset. Also includes areas of Medium and High Sensitivity which can feasibly be included in corridors with minimal impacts due to existing and future infrastructure. This is a No-go area for development;
- **Offset Required:** areas that trigger a biodiversity offset (e.g. areas where Listed Threatened Ecosystems and/or Critical Biodiversity Areas (CBAs) exist

and would be impacted and where such impacts cannot be avoided, mitigated or rehabilitated); and

- **No Offset Required:** areas that are developable with no biodiversity offset required.
- v. Review of the three existing precinct layouts developed by MBM in 2015 (WM de Kock Associates, 2018), Sharples (Biodiversity Assessment for the Aalwyndal Precinct Plan, 2019), and Brownlie et al. (2021). Highlight similarities, differences and identify gaps and issues.
- vi. Presentation of the proposed precinct plan at a stakeholder workshop to review the revised plan in draft form which can be amended based on feedback.

2. ENGAGEMENT WITH STAKEHOLDERS

Extensive engagement was undertaken with stakeholders including online meetings, in-person meetings, site visits, emails, *ad hoc* discussions and telephone conversations. A summary of engagements, their purpose, and participants is provided in Table 1. This list also includes the dates of some of the earlier site visits undertaken to improve knowledge of the biodiversity in Aalwyndal and surrounding areas.

Table 1. General record of engagements with stakeholders regarding the revision of the Aalwyndal precinct plan.

Date	Location	Purpose of the Meeting	Participants
29/02/2025	Online & In Person	Discussion of timelines, planned approach and recommended reading.	Confluent & EcoPulse
11/03/2024	Phone	<i>Ad hoc</i> call to discuss DEA&DP's main concerns about revision of the precinct plan. Also to determine process for access to all reports on plots with applications.	Confluent & DEA&DP
20/03/2024	Site Visit	Site visit to Aalwyndal to investigate thicket areas and adjacent vegetation plus work experience day for matric student. Plant SCCs identified during site visit.	Confluent
02/04/2024	In Person & Site Visit	Visit to Aalwyndal and introduction to the area along with detailed site inspection for 21266 (untransformed site). Camera traps set and collected after 2 days.	Confluent & EcoPulse
04/04/2024	Online	Meeting with stakeholders and project managers explaining the need to revise the mapped vegetation type and provide justification of associated delay by 1 month in delivery of the revised precinct layout.	Confluent, EcoPulse, DEDAT, DEA&DP, MBM
08/04/2024	In Person	Discuss the role and potential benefits of offsite offset areas in extension of conservation corridors managed by the Gouritz Cluster Biosphere Reserve (GCBR)	Confluent & GCBR
18/04/2024	Online	Meeting with SANBI and CapeNature to explain the need to update the vegetation type and establish the process required from SANBI to formalise this.	Confluent, SANBI, CapeNature, Nick Helme.
19/04/2024	Site Visit	1 st surveys to determine botanical sensitivity and veg. reclassification at multiple points	Confluent
09/05/2024	Site Visit	Site visit to Aalwyndal to ground-truth vegetation and wildlife movement potential on mapped 1:4 slopes, along with watercourses.	Confluent
17/05/2024	Online	Meeting with botanical specialists to explain the need to update the vegetation type and discuss alternative	Confluent, Nick Helme, Mark Berry, Jan Vlok

Date	Location	Purpose of the Meeting	Participants
		vegetation types that could better fit both the vegetation type and ecosystem threat status.	
20/05/2024	Online & in person	Project team meeting to discuss revision of the precinct plan, allocate responsibilities, and identify tasks outstanding	Confluent & EcoPulse
20/05/2024	Online & in person	Project team and stakeholders to discuss planning aspects of the precinct revision and specifically understand primary rights of landowners.	Confluent, EcoPulse, DEA&DP, DelPlan
22/05/2024	Site Visit	Ground-truthing of watercourses & 1:4 slope areas; investigation of area west of Aalwyndal including depression wetlands	Confluent
24/05/2024	Site Visit	Site visit & discussion on Aalwyndal and surrounds. The purpose was to a) consider the vegetation type re-classification, b) demonstrate our vegetation & disturbance classification system, and c) investigate the area west of Aalwyndal as a prospective offsite offset. High level discussion about offset ratios.	Confluent & Cape Nature
28/05/2024	In Person	Meeting with SMEC Engineering to discuss the Mossel Bay master roads project findings, timeframes and implications.	Confluent & SMEC
30/05/2024	Online & In Person	Meeting with stakeholders to present draft precinct plan	Confluent, Cape Nature, DEA&DP, MBM, DEDAT
31/05/2024	PRESENTATION OF DRAFT REVISION OF THE PRECINCT LAYOUT		
07/06/2024	FEEDBACK RECEIVED FROM STAKEHOLDERS		
11/06/2024	Online & In Person	Internal team meeting to discuss feedback, approach & revision	Confluent & EcoPulse
18/06/2024	Online	Discussion with Cape Nature regarding the revised precinct layout and feasibility of onsite offset areas given fire management limitations.	Confluent, EcoPulse Cape Nature
23/08/2024	Online	Workshop to discuss the need for ecological burns and their feasibility in the future Core Area.	Confluent, MBM, CN, City of Cape Town, SCFPA
Early-mid August	Online & Email	Discussion with stakeholders about the necessity of communicating with landowners about this project and implications for planning.	Confluent, MBM, DEA&DP, DEDAT, Cape Nature
16/08/2024	Online	Workshop to discuss roads planning & conflict areas in future layouts.	Confluent, MBM, SMEC, DEA&DP, DEDAT.
9/09/2024	Online	Discussion regarding conservation efforts and habitat requirements for Black Harrier around Aalwyndal	Confluent & Fitzpatrick Institute (UCT)
13/09/2024	PRESENTATION OF DRAFT OFFSET AREAS & DISCUSSION ABOUT FINANCIAL & INSTITUTIONAL ARRANGEMENTS		
12/11/2024	Online	Presentation of Aalwyndal Core Area and Offset Sites to the Cape Nature Stewardship Review Committee	Confluent, Cape Nature

Further to the engagements mentioned in Table 1, numerous *ad hoc* telephone conversations and Teams meetings took place between Confluent and key stakeholders regarding a wide variety of topics related to precinct plan revision. Additional presentations and discussions have focussed on other reports required for the framework plan and are not included here.

During engagements it was necessary to ensure that key issues considered important to each stakeholder were identified and addressed as part of the process. The primary concerns were clear through feedback received on earlier version of the revised precinct plan. A summary of the most important concerns is provided in Table 2.

Table 2. Summary of precinct plan-related concerns raised by Department of Environmental Affairs and Development Planning, Cape Nature and Mossel Bay Municipality.

Stakeholder	Highlighted Concerns	Response
DEA&DP	Master roads layout should be included in the precinct plan	Obtained copy of Master Roads Plan for Mossel Bay Municipality (May 2024). Aalwyndal more detailed plan in progress (SMEC) but not available at time of writing. For reference used the new roads proposed in Mossel Bay revised precinct plan layout, although this can change. Confluent meeting with SMEC to discuss the master roads plan and future roads planning. Once Version 5 of the precinct plan was finalised (Feb 2025) it was shared with SMEC along with sensitivity layers to better inform the revised roads layout for Aalwyndal in the coming weeks.
	Sewage reticulation for increased density including pump stations should be included in the precinct plan	Requested from MBM but only received existing water and sewage reticulation including existing pump stations and reservoirs, which is included in the 'conflict layer'. This information was still not finalised at the time of completing this report. It is understood that master planning is in progress. Currently landowners in Aalwyndal utilise septic tanks for wastewater disposal.
	Bulk water supply infrastructure including pipelines and reservoirs should be included.	
	Stormwater management with increased impermeable surface and steep gradients will be a challenge given the limited outflow capacity of the Tweekuilen River which is a single box culvert under the N2 from where it is piped to the sea.	At the time of writing, the stormwater management master plan for Aalwyndal had just been compiled. Through this project some existing dams have been identified at a desktop level with limited ground-truthing as being suitable as stormwater detention ponds. From a SuDS perspective these would provide important <u>regional controls</u> for stormwater management. It is recommended that a floodline study be undertaken for all major watercourses to ensure that roads and infrastructure are kept well above these levels. Floodlines must be determined using modelled post-development runoff rates.
	Incorrect classification of vegetation (and associated mapping of Critical Biodiversity Areas) in Aalwyndal is making regulation and enforcement a challenge in Aalwyndal.	Confluent undertook extensive engagement with SANBI, Cape Nature, and other botanical specialists to reclassify the vegetation. This aspect had not been finalised at the time of concluding this report.
	Try and link corridors to areas beyond Aalwyndal so they are not just fenced off fragments.	At all times we considered offsite offset areas adjacent to the precinct in preference to disconnected distant areas. Much done to address this issue in subsequent reports where offsite offset were identified.
	Support for an approved fire management plan for the Core Area must be unequivocal from the Mossel Bay Municipality. Implementation is critical for the maintenance of biodiversity therein.	Extensive engagements (workshop, phone calls, written correspondence) undertaken with the SCFPA, MBM and DEA&DP to facilitate assurance that support is obtained from the MBM for this aspect.
Cape Nature	Concerned about precinct vegetation type mapping and classification, and revision thereof.	Undertook site visit to ground-truth vegetation with A. Vlok and M. Simons (24/04/2024)

Stakeholder	Highlighted Concerns	Response
	Emphasise the need to comply with the like for like criteria when considering offsite offset areas.	Compiled draft correspondence to SANBI proposing vegetation type change and copied to A. Vlok (signatory) and M. Simons.
	Fire regime consideration for Core Areas within Aalwyndal in the revised precinct plan. Many areas of fynbos and renosterveld are senescent.	Included 1:4 slopes and added a 30m buffer to the Core Area to avoid additional fire risk of building on hilltops. Engaged the Southern Cape Fire Protection Association who will review this plan with a view to fire management in the Core Area (more on this in the Costed Conservation Plan). Consider fire management carefully when working on the revised layout for the precinct.
	Existing fragmentation in the precinct means that corridors will be difficult to implement.	Overlay conflict layer with sensitivity layers to identify the extent and nature of fragmenting factors. This aspect to be considered in the costed conservation plan. Some fragmentation can be reversed to an extent. E.g. fencing removed or degraded areas rehabilitated.
	Don't want open space to preserve watercourses and steep slopes alone. Efforts must be made to incorporate high sensitivity areas into the open space network.	This is consistent with the aims of the NBOG. The open space network, in all versions of the revised precinct plan conserves all Very High sensitivity (considered irreplaceable) and a significant area of High sensitivity biodiversity area beyond watercourses and steep slopes.
Mossel Bay Municipality	As far as possible, existing dwellings and access roads / driveways should not be included in open space areas.	The draft precinct layout attempted to avoid these areas, and this was further refined and improved in subsequent versions. Reasons are provided where this is not possible in very few cases.
	Existing development rights must be upheld on undeveloped properties or properties with minimal development.	A minimum area of 1 ha was included for future development on all properties with low/no development at present.
	Fragmentation of the development area with dead-end or isolated conservation areas with high edge effects should be avoided.	Multiple versions of the revised precinct plan have been reviewed and refined to strike a balance between conservation of sensitive areas along with reasonably continuous areas for development.

In addition to the above, Confluent have had chance meetings with residents during site visits who have expressed some of the following contrasting opinions:

"We don't want to develop our plot. We moved here for the peace and quiet and for safety, and to have space for our horses."

"When will I know if my plot can be developed because I need to know whether to sell it or not?"

"The biodiversity of Aalwyndal is irreplaceable and no offset will do it justice."

"The birdlife in this area is very sensitive to free-roaming dogs and horses. Birds like Blue Cranes have been scared into fence lines, where they've been entangled and died."

"People are upset because they are investing big money and don't know what the plan is."

These are just a few of the residents' opinions in casual conversation and by no means represents an exhaustive assessment of stakeholder views and inputs. What is noteworthy however, is the theme of conflicting views between development and conservation. It is also clear that different perceptions exist about what conservation is and how it manifests. Some of the residents who have expressed appreciation for the peace, quiet and nature of Aalwyndal, have also cleared large quantities of natural vegetation from their own properties. This emphasises that for any meaningful conservation to take place within the precinct a formal conservation plan will have to be implemented and enforced.

3. VEGETATION TYPE REVISION

The mapped vegetation types according to the SANBI VegMap (2018) are presented in Figure 2. The two dominant vegetation types are Mossel Bay Shale Renosterveld (MBSR) to the north, and North Langeberg Sandstone Fynbos (NLSF) in the central and southern areas of Aalwyndal. Hartenbos Dune Thicket (HDT) extends slightly into the precinct to the east and the southwest.

It has been widely acknowledged by various botanical specialists that the classification of the fynbos vegetation type is incorrect and does not fit the vegetation observed within the precinct. North Langeberg Sandstone Fynbos (FFs 15) is a montane vegetation type that is primarily mapped along the northern slopes of the Langeberg mountains. Aalwyndal is south of the Langeberg Mountain range, and is situated in a low-lying, non-mountainous area with a species composition and structure differing strongly from the typical description of North Langeberg Sandstone Fynbos (Dayaram et al., 2019; Mucina & Rutherford, 2006). Furthermore, the mapped fynbos vegetation type has an ecosystem threat status of Least Concern and does not carry the requirement for any biodiversity offset. This is also acknowledged by specialists as an inaccurate reflection of the sensitivity and threatened nature of the fynbos vegetation type present within the precinct. The renosterveld and thicket vegetation types are not under major dispute, although the extent of the thicket area within the precinct is slightly greater than that mapped.

For the proposal of offset ratios and selection of offsite offset areas to be meaningful, it is necessary to propose a better suited vegetation type to replace the mapped fynbos area along with an ecosystem threat status that more closely matches that acknowledged by specialists with a working knowledge of the Aalwyndal area. Revision of the vegetation type to one with an established and more appropriate threat status was also necessary for remapping and revising the ecological sensitivity of different habitat units within the precinct. Vegetation with a low ecosystem threat status such as Least Concern obviously does not carry the same Conservation Importance as that with a higher status such as Endangered or Critically Endangered.



Figure 2. Mapped vegetation types in the Aalwyndal Precinct according to SANBI's VegMap (2018).

3.1 Proposed Alternative Vegetation Type

A consultative process was followed to engage relevant stakeholders, institutions, and botanical specialists for the proposal of an alternative vegetation type to replace the North Langeberg Sandstone Fynbos in the precinct. A summary of engagements to explain the need, establish the process, and come to a consensus on the vegetation type revision is provided in Table 1.

During engagement with botanical specialists and based on our own observations during site visits within the precinct (which included Cape Nature), it was confirmed that the vegetation of Aalwyndal is unique to the extent that it does not precisely fit the description of any existing vegetation type. It is therefore challenging to classify within existing types and represents a complex mosaic of fynbos, renosterveld, and thicket. Despite the lack of a national vegetation description, the more detailed vegetation communities described in the regional Jan Vlok vegetation map of 2011 (Vlok & de Villiers, 2007) classifies the vegetation as Brandwag Fynbos-Renoster-Thicket which clearly encapsulates the heterogeneous mosaic-type vegetation that occurs in the area. Unfortunately, this vegetation type was never formally adopted as a vegetation type by the South African National Biodiversity Institute (SANBI) and therefore has no associated ecosystem threat status which can be used to determine offset ratios.

Our own surveys, which covered 31 points within the Aalwyndal precinct (indicated in Figure 3), reflected a similar boundary between fynbos- and renosterveld-dominated areas as that depicted by the 2018 National Vegetation map of South Africa (Dayaram et al., 2019; Mucina & Rutherford, 2006), as illustrated in Figure 2. The recommendation of specialists was that

the most similar fynbos vegetation type is Swellendam Silcrete Fynbos which is mapped west of the precinct and has a threat status of Endangered (Figure 3). The Vlok vegetation map also indicates Aalwyndal and the adjacent area west of the precinct as occurring in the Biome described as Proteoid Silcrete Mosaic Renosterveld Thicket with silcrete a recurrent theme between the proposed vegetation type and the Vlok biome classification.

Discussions with SANBI both during formal meetings and subsequent email correspondence have confirmed that the proposed change to the VegMap constitutes a Minor Change (MN1). At the time of writing, correspondence to this effect had been prepared by Confluent detailing the proposed change and providing motivation. This was also distributed to all botanical specialists for comment before being submitted to SANBI.

One of the issues identified in MN1 proposals is that resultant gains or losses can lead to a change in ecosystem threat status of affected vegetation types, which must be recalculated. The proposed change would result in approximately 1 921 ha being added to Swellendam Silcrete Fynbos and an equal amount being subtracted from North Langeberg Sandstone Fynbos. The project team engaged with both Cape Nature and SANBI on this issue and it was determined that Cape Nature would need to provide revised figures for the formal amendment of the ecosystem threat status based on the proposed change.

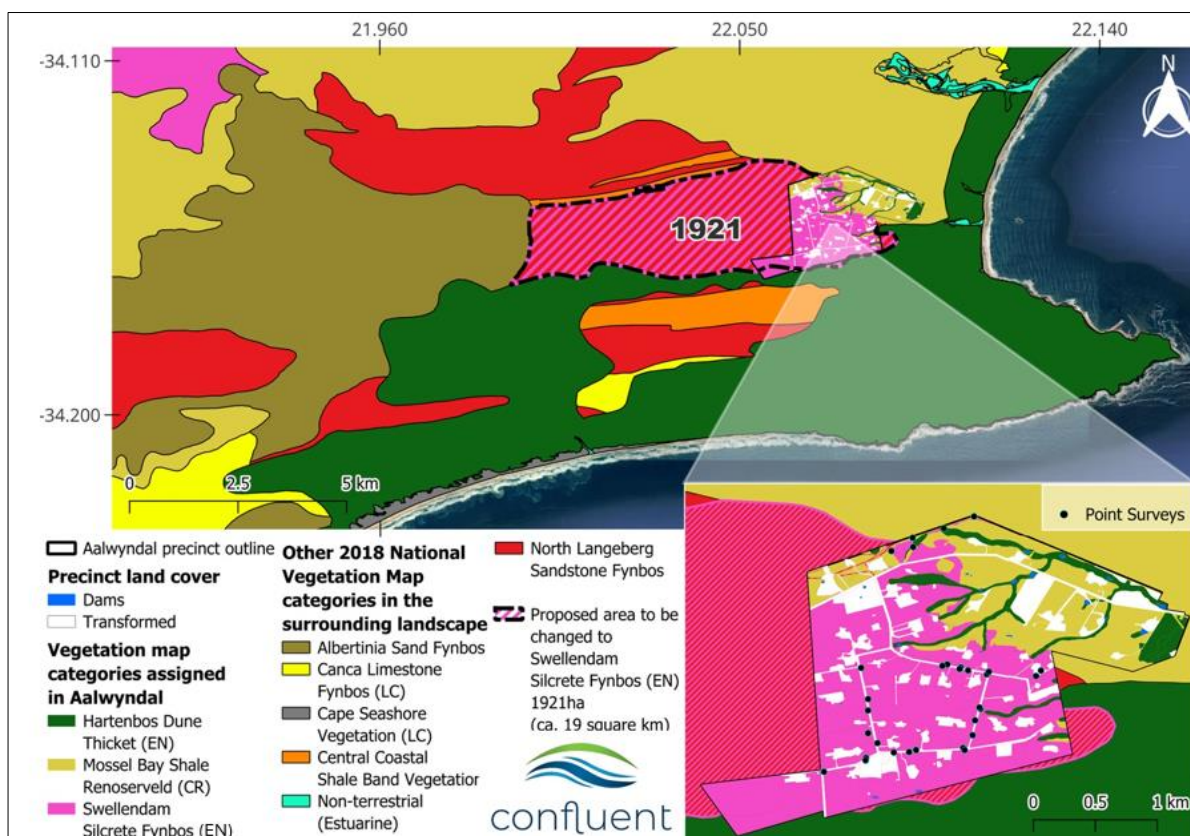


Figure 3. Map of points indicating vegetation survey points. The highlighted polygon indicates the area proposed for reclassification as Swellendam Silcrete Fynbos (area = 1921 ha).

4. ECOLOGICAL SENSITIVITY REVIEW

Specialist biodiversity inputs are required to inform the revised precinct layout given that conservation areas (The Core Area) must aim to sustainably protect areas of irreplaceable and high biodiversity sensitivity. Historical biodiversity assessments of Aalwyndal have been undertaken at the precinct level, as well as on individual erven for development proposals. The precinct-wide biodiversity assessment undertaken by Sharples Environmental Services (SES; 2019) was primarily compiled from a vegetation perspective by Nick Helme and included delineations of watercourses, but only a high-level faunal assessment and limited ground-truthing. Areas of high sensitivity and all watercourses were combined with other features such as 1:4 slopes, and Critical Biodiversity Areas (CBAs) to inform the layout of the open space network.

Specialist inputs to the SES report were not underpinned by the need to determine appropriate offset ratios and requirements. Furthermore, the assessments and layout were compiled prior to publication of the Species Environmental Assessment Guidelines (SANBI, 2020) which includes a matrix to determine the Site Ecological Importance (SEI). These guidelines along with the SEI are now widely applied by biodiversity specialists as a standardised method of assessment; the use of which is stipulated in the Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Animal and Plant Species (GN1150; 2020) of the National Environmental Management Act (NEMA).

The revised precinct layout aims to build on existing specialist knowledge and provide metrics aligned with current assessment guidelines that can be used to inform offset decision-making and delineation of a conservation network.

The review of ecological sensitivity in the precinct incorporated the following elements:

- Desktop review of SES (2020) precinct plan to establish baseline sensitivity;
- Collection and review of existing specialist reports for individual erven divided into botanical, animal and aquatic themed disciplines (permissions were obtained for this);
- Desktop watercourse assessment;
- Based on the above desktop assessments, erven were identified as having high or low confidence and ground-truthing would be necessary in the case of the latter;
- Site-based vegetation surveys in areas of low confidence aimed to confirm the vegetation type (Terrestrial Biodiversity Theme), identify existing impacts and disturbance, consider veld condition such as succession and/or grazing, and rate alien plant density. Specialists were constantly on the lookout for any plant or animal Species of Conservation Concern (SCC);
- Site-based verification and delineation of watercourses.
- Site-based surveys and general observations of wildlife.
- Capture all the above in a single SEI layer which incorporates terrestrial and aquatic biodiversity sensitivities of the precinct.

A more detailed explanation of our approach to each of the above elements is provided in the following sections.

4.1 Collation of Existing Specialist Reports

The complete report provided by N. Helme for the SES (2020) precinct layout was reviewed, and any specific sites, properties, or SCCs highlighted in this report were added to the body of knowledge on a per erf basis. A request for information was sent to all known Environmental Assessment Practitioners (EAPs) working in the Aalwyndal area as well as to DEA&DP for all available biodiversity specialist reports covering the disciplines of fauna, flora or aquatic. A total of 19 erven had specialist reports for a mix of disciplines. These reports were reviewed to determine the level of confidence that could be placed in the findings of the report for each erf. Confidence scores were defined as indicated in Table 3. Several of the specialist reports reviewed were compiled before the Species Environmental Assessment Guidelines (SANBI, 2020) were available, meaning that no SEI would have been determined for the site, although biodiversity information could be used to inform the erf's SEI when it came to that step.

Table 3: The definitions and ratings for the confidence intervals assigned to the data provided in past biodiversity specialist reports for Aalwyndal.

No.	Confidence score	Definition
1	Very Low	- No dominant plants identified, no animal survey, no SCC (plant or animal), or invasive species listed and there was no description of the vegetation on the site based on a desktop assessment or ground-truthed data. - Watercourse assessment undertaken by a non-specialist at a desktop level only.
2	Low	- Partial description of dominant plants, animal species present, SCC (plant or animal), and / or invasive species, and minimal description of the vegetation on the site based largely on a desktop assessment, but lacking ground-truthed data. - Watercourse assessment undertaken by a specialist at desktop level only.
3	Moderate	- Good description of dominant plants, animal species present, SCC (plant or animal), and / or invasive species, and minimal description of the vegetation on the site based largely on a desktop assessment, with little emphasis on ground-truthed data. - A high-level discussion of the presence / absence of watercourse which may be limited to mapped watercourses but includes ground-truthing.
4	High	- A detailed description of dominant plants, animal species present, SCC (plant or animal), and / or invasive species, and an adequate description of the vegetation on the site based on both a desktop assessment as well as ground-truthed data. - If present, watercourses classified and delineated.
5	Very High	- A comprehensive description of dominant plants, surveys for animal species present, SCC (plant or animal), and / or invasive species, and a comprehensive description of the vegetation on the site based on both a desktop assessment as well as ground-truthed data. - If present, watercourses classified, delineated and Present Ecological State determined.

The terrestrial and aquatic ecosystem descriptions and plant and animal species observations (including SCCs) from the past reports were incorporated into the spatial analysis for Aalwyndal, and the results of the confidence scoring is presented per property in Table 4. All properties where recorded biodiversity specialist reports have been undertaken were included. This was essential in determining site assessment points required for increased certainty of biodiversity sensitivity across the precinct. Areas with high confidence ratings were not excluded from subsequent ground-truthing, and several of these sites were revisited. Fortunately, many of the reports have been compiled by the Confluent specialist team, further increasing our confidence in whether sensitive features are present on a property.

Table 4: The confidence level of biodiversity reports that have been undertaken by various specialists in Aalwyndal in the past and present.

Property	Confidence Level in Biodiversity Assessments		
	Terrestrial / Botanical Biodiversity	Aquatic Biodiversity	Fauna Biodiversity
178/220	-	High Dam & Wetland	-
193/220	Very High	-	-
209/220	Very High	Very High No watercourse	Very High
216/220	Very High	Very High No watercourse	Very High
21238	Very High	-	Avifauna* – Very High
21239	Very Low	-	-
21244	High	-	Very High
21242	-	Very High Tweekuilen River	-
21245	Very High	-	-
21246	Very High	-	-
21248	Very High	High Wetlands	Low
21249	Low	Low Wetlands	Low
21250	Very High	Very High Watercourse Present	Moderate
21252	Low	-	-
21266	Very High	Very High No watercourse	-
21274	Very High	-	-
21275	Very High	-	-
21277	Very High	-	-
21278	Very High	Low Wetlands	High
21281	-	Very High No watercourse	High
6/221	Very Low	-	-

* Black Harrier nearby and potential for Denhams Bustard

The erven directly assessed in detail are indicated in Table 4 number 21 out of a total of 73 erven in the precinct.

4.2 Site Assessments

Numerous site visits have been undertaken in the precinct and adjacent areas. Some have taken place as long ago as 2020 and involve the application for various environmental authorisations. More recently (in 2024), at least fourteen field trips were undertaken for this project aimed at increasing confidence and knowledge of the area. GPS tracks walked by biodiversity specialists, along with locations of point surveys and properties where specialist reports were available are presented in Figure 4. Some pertinent points to our coverage of the precinct are highlighted below:

- Site visits have been conducted in a range of seasons and during wet and dry periods. This increased the chance of observing a range of fauna and flora.
- Some properties are well secured with no way of contacting owners (e.g. bell) making access impossible. To improve our understanding of these properties we conducted point surveys throughout the precinct where we observed vegetation from the roadside as far as possible (visual limits in the region of 20-30m). In a few places a drone was flown to take pictures of vegetation from afar without invading landowners' right to privacy.
- Along many property boundaries where permission to access was granted, it was possible to visually observe the condition of the neighbouring property.
- Where GPS tracks indicate walking along boundary routes, this increases our confidence in vegetation on neighbouring properties as these are mostly within line of sight.
- While not every property has been surveyed, detailed surveys on representative sites provide increased confidence for properties with similar vegetation nearby.



Figure 4. Map of Aalwyndal precinct showing GPS tracks walked by biodiversity specialists, point surveys, and erven assessed previously by biodiversity specialists (updated Sep. 2024).

4.3 Aquatic Ecosystem Assessment

4.3.1 General Catchment Features

The Aalwyndal precinct is located within quaternary catchment **K10A**. The Mean Annual Precipitation (MAP) is 458 mm which occurs year-round with seasonal peaks in spring and autumn. Soil erodibility is High (0.65) and rainfall intensity is mapped as High. The precinct is in sub-quaternary reach 9292 which is a Freshwater Ecosystem Priority Area (FEPA) according to the National Freshwater Ecosystem Priority Atlas (NFEPA; Nel et al., 2011).

River FEPAs achieve biodiversity targets for river ecosystems and threatened/near-threatened fish species and were identified in rivers that are currently in a good condition (A or B ecological category). Their FEPA status indicated that they should remain in a good condition to contribute to national biodiversity goals and support sustainable use of water resources (Nel et al., 2011).

For river FEPAs, the whole sub-quaternary reach (SQR) is identified as a FEPA. Thus, the whole sub-quaternary catchment needs to be managed in a way that maintains each river within the reach in a good ecological condition. This in turn supports a healthy and function aquatic ecosystem in the mainstem rivers, which in this case, are the main valley-bottom watercourses that drain east to the sea. It is therefore important that development is planned in a way that minimises direct degradation of watercourses or their catchment area.

The precinct can be divided into two separate sub-catchments which either drain in a north-easterly direction to the Tweekuilen River, or south and east towards an unnamed valley-bottom wetland. From the N2 onwards, the Tweekuilen River is canalised for a long distance until it daylight at the small Tweekuilen Estuary in Mossel Bay, approximately 2 km East of Aalwyndal.

4.3.2 Resource Quality Objectives

Resource Quality Objectives (RQOs) are defined as clear goals (numerical or descriptive statements) relating to the quality of a water resource and are set in accordance to the management class for the resource to ensure the water resource is protected. The purpose of RQOs is to set clear objectives for the resource against which WULs and the related impacts can be evaluated and managed to achieve a balance between the need to protect and utilise the resource.

The Breede-Olifants Catchment Management Agency concluded an assessment of major rivers in the Water Management Area in 2018.

The Tweekuilen Estuary was included in the assessment and the RQOs that have been set for the estuary are in many cases directly applicable to how water resources are managed upstream in the catchment, which includes the precinct. Some of the more applicable objectives are listed as follows:

- Maintain flows as the system is small and needs most of its freshwater flows;
- Waterborne pathogens (e.g. *E. coli*) must be maintained at levels suitable for full contact recreation;
- Flood regime must be maintained to support the natural bathymetry and sediment characteristics of the estuary;
- Clear alien vegetation from the catchment.

The Present Ecological State (PES) of the Tweekuilen Estuary is rated as D (Largely Modified) and the Recommended Ecological Category is listed as C (Moderately Modified). The two main threats to the system are freshwater deprivation and impaired water quality due to stormwater and sewage spills. Based on the PES and REC, the high-density residential developments planned in the catchment must be carefully managed as they could quite possibly result in further degradation of the estuary. If the REC is to be achieved, then watercourses on all affected properties will need to be adequately buffered along with the careful maintenance of flows and water quality.

4.3.3 Delineation of Watercourses

At a desktop level, watercourses were mapped using the Department of Water Sanitation's 1: 50 000 flow paths, the National Wetland Map 5 wetlands, and 1 m contours provided by the Mossel Bay Municipality. The latter helps indicate where unmapped flow paths could occur and assists in more accurately defining the channel location. In addition, a few smaller wetlands, ponds or seeps were identified through assessment of specialist reports on various properties (Table 4). Instream and off-channel dams were digitised using satellite imagery. Several watercourses were the subject of previous assessments for environmental authorisations (Table 4 and Figure 4).

All watercourses were delineated following the methods of DWAF (2005). A combination of desktop and ground-truthed observations were used to delineate the extent of riparian vegetation for streams and plants and soils associated with wetlands. Wetland habitat was delineated along with riparian vegetation in a seamless continuum excluding fine-scale differentiation between conventional hydrogeomorphic units. This creates a more practical unit of management.

Watercourses in Aalwyndal typically follow valley bottoms and there are very few wetland features outside of this topography. The central area of transition from higher upland areas down steep slopes to the lower lying areas of Aalwyndal is identified as an important water source protection zone because it represents the area of origin of several watercourses (Figure 5). This area is also associated with steep slopes which carry their own set of environmental sensitivities and are discussed in the next section. Small streams tend to be extremely incised which is a natural feature of drainage lines in the Mossel Bay district. It is not uncommon to encounter very steep, almost cliff-like drop offs to the channel below which is usually vegetated with dense thicket and has small streams of water which flow on an intermittent basis.

Delineated watercourses are presented in Figure 5 and include all rivers, riparian zones, wetlands, and drainage lines. Seasonal areas of wetlands are frequently dominated by the ground-cover *Falkia repens* and *Senecio burchellii*, while more permanent areas of valley bottom wetlands are dominated by *Phragmites australis*, *Nidorella ivifolia*, *Cyperus textilis* and

Typha capensis (Figure 6). Typical riparian zones included in the delineated extent of the watercourse are dominated by thicket species including *Sideroxylon inerme*, *Grewia occidentalis*, *Carissa bispinosa*, and *Gymnosporia buxifolia* (Figure 7).



Figure 5. Map of delineated watercourses showing 1 m contours. Highlighted area in red indicates important water source zone associated with steep slopes and transition from upland to lower lying areas.



Figure 6. Examples of wetland habitats on two different erven.



Figure 7. Examples of riparian vegetation included in the delineation of rivers, streams and drainage lines.

4.3.4 Watercourse Buffers

Aquatic buffer zones are areas where the land meets a watercourse, and refers to the interface between these two habitats. Buffer areas are linear zones adjacent to watercourses managed with the intention of protecting water resources from diffuse pollution associated with adjacent land uses. In addition, they provide habitat for wildlife and aid movement through increasingly fragmented landscapes. Some well established benefits of buffer zones include:

- | | |
|--|-------------------------------------|
| ✓ Maintain channel stability | ✓ Improve habitat connectivity |
| ✓ Control microclimate and temperature | ✓ Screening adjacent disturbance |
| ✓ Flood attenuation | ✓ Enhance visual quality |
| ✓ Maintain wildlife habitat | ✓ Control noise levels |
| ✓ Sediment removal from diffuse runoff | ✓ Improve air quality |
| ✓ Nutrient removal from diffuse runoff | ✓ Create recreational opportunities |

The buffer area was determined using the detailed site-based model for wetlands developed by Macfarlane & Bredin (2017) which is the more detailed of the two available models. Buffers are then mapped from the edge of the delineated watercourse area. The site-based model takes numerous variables into consideration when calculating the buffer width. These include the local climate and environment (rainfall, rainfall intensity, soil permeability, erosion potential, slope, hydrogeomorphic unit), typical threats associated with the development sector proposed (high density residential), and vegetation characteristics including disturbance and interception potential.

A range of factors that influence buffer width are present in the Aalwyndal precinct. These are primarily related to the slope of the catchment and buffer zone, and to the type of vegetation cover. The watercourse definition also ranges throughout the precinct with a range of wetland types present (channelled and unchannelled valley-bottom, and hillslope seeps). Buffer widths were determined for a range of segments with differing characteristics, and the resulting widths ranged between 25m and 43m depending on the combination of variables applied and associated risk. To simplify the application of buffers to watercourses in the precinct, it was concluded that an intermediate buffer applied to all watercourse would protect watercourses from the majority of impacts anticipated from high density residential development. A buffer

zone of 30 m is recommended, which is considered fairly standard as it is similar to the NEMA setback line of 32 m from a watercourse, beyond which environmental authorisations are triggered for listed activities. The Mossel Bay Spatial Development Framework (SDF; 2022) also recommends that urban development be prohibited within a 32 m boundary from the watercourse. This recommendation is therefore considered reasonable given existing guidelines, legislation, and the range of site sensitivities present. A few pertinent considerations and limitations related to buffer zones are discussed below.

- Future stormwater management plans for the Aalwyndal precinct should consider 1:100 year floodlines for all major watercourses. Modelling to determine floodlines should consider the precinct in both the low density (present) and high density (future) development scenarios. The conservative approach is to ensure that no development takes place within the 30 m buffer or the 1:100 year floodline, whichever is the higher level.
- While the 30m buffer should preferentially be applied to all new developments, there are several existing developments that have already taken place well within this buffer zone. These existing developments cannot be undone, but should definitely not be replaced if they are ever decommissioned.
- High density residential developments do not carry major diffuse sources of pollution which riparian buffer zones are primarily used to mitigate. This is because point sources of pollution such as stormwater outlets are not effectively mitigated by buffer zones. In this instance, the most important benefits of buffer zones is as corridors for the movement of wildlife and preservation of habitat providing a network within and beyond the precinct.

4.3.5 *Watercourse Ecological Importance*

Watercourses in Aalwyndal provide an existing network of habitat for watering, feeding and breeding utilised by a wide range of animals and extending across the upland and lowland areas of the precinct. They provide a useful base ecosystem through which a conservation corridor can be routed. Furthermore, there already are, and always will be, culverts beneath road crossings which can be enlarged to improve the safety of crossing points for wildlife if necessary. For this reason, all natural watercourses (excluding 30 m buffers) including instream dams, but excluding off-channel dams were considered High Sensitivity when the Site Ecological Importance was determined for precinct revision. While new road crossings are inevitable as development in the precinct increases, it will be necessary to limit the impacts to watercourses at these points and ensure that buffer zones are not impacted in a serious way during the construction and operational phases.

4.4 **1 in 4 Slopes**

Many of the smaller streams that flow downslope from the water source zone to lower lying areas in Aalwyndal, navigate steep slopes, where watercourses have incised deep channels. It is not uncommon in Aalwyndal to stand on the edge of a watercourse looking 10m over the edge of a precipice to the watercourse below. Steep slopes and watercourses are frequently related with watercourses being more vulnerable to impacts where adjacent buffer areas are very steep.

Slopes $\geq$ than 1 in 4 were identified as an additional layer of sensitivity for the revised precinct plan. These are identified in Figure 5. The 1 in 4 slopes were mapped to identify their location

in the precinct using the 1m contour converted to a Digital Elevation Model (DEM) in QGIS. In addition, a 30m buffer was added to the slopes to promote sustainable development in these challenging areas. Motivation for including the slopes and buffer is as follows:

- Vegetation on slopes of different aspects is distinct, and by conserving the slopes a high degree of variability in vegetation structure is preserved. The drone image of a 1 in 4 slope in Figure 8 clearly shows the more renosterveld-dominated vegetation on the left (north-facing slope) and the more fynbos-dominated vegetation on the right (south-facing slope). Species assemblages differ substantially in these different slope aspects.
- Clearing of alien vegetation on steep slopes is challenging. In some areas of the precinct Rooikrans trees are well controlled on flatter areas but dense invasions remain on the slopes. Building close to the edge these invaded areas means that access for control and management will be even more difficult.
- Building on hilltops increases dwellings to the maximum threat of fire and erosion. Fires spread more quickly uphill than downhill because the flames preheat the fuel upslope. Creating a buffer at the top of slopes provides space for firebreaks and ensure the risk of fires is more easily managed.
- The risk of erosion with ongoing erosion control interventions to protect buildings is at maximum when building on the edge of slopes. Given that watercourses are usually at the bottom of most slopes, erosion issues upslope can cause significant issues to the watercourse in terms of sedimentation and resulting habitat degradation.
- The Mossel Bay Municipality (and most municipalities) do not support development on 1 in 4 slopes.
- As the layer indicates slopes with a minimum 1 in 4 gradient, there are much steeper slopes within this. These may be difficult to navigate, and site experience has indicated that cliff-like drop-offs occur in places representing significant barriers to the movement of wildlife. The additional 30m buffer around the sloped areas provides space for the movement of wildlife through less challenging terrain. Vegetation on flatter areas is often different to that on slopes, representing greater habitat variability and potential food resources for wildlife.
- Rocky cliff-like drop offs occur in sloping areas which could support cliff-nesting birds. The image in Figure 8 for instance, has a 10 m cliff along the drainage line which is not clearly visible in this image and is mostly obscured by dense vegetation providing good habitat and cover for birdlife.



Figure 8. An area of 1:4 slopes with a small unchanneled valley bottom wetland showing the obvious difference in vegetation on north-facing (left) versus south-facing (right) slopes.

4.5 Animal Species Assessment

This assessment considers both Species of Conservation Concern (SCC) predicted to occur within the precinct, along with animal species known to occur, regardless of their Red List status. As in the assessment of Aquatic and Terrestrial ecosystems, this assessment included both desktop and fieldwork components.

4.5.1 Online Screening Tool

The scope of work for this report is guided by the legislative requirements of the National Environmental Management Act (NEMA; Act 107 of 1998), and the Animal Species Protocols specified in the Published Government Notice No. 1150, Government Gazette 43855 (30 October 2020). As such, the Department of Forestry, Fisheries and the Environment (DFFE) Screening Tool is used to assess the site sensitivity for the property.

The DFFE Screening Tool revealed a HIGH sensitivity for the terrestrial animal species theme for the Aalwyndal precinct.

A **HIGH** sensitivity rating indicates:

- Confirmed habitat for SCC;
- SCC are listed on the IUCN Red List of Threatened Species or South Africa's National Red List website as Critically Endangered, Endangered, or Vulnerable according to the IUCN Red List 3.1 categories and criteria and under the national category of Rare.

4.5.2 Species of Conservation Concern

A list of possible Species of Conservation Concern was compiled using the SCCs highlighted in the DFFE Screening Tool along with the following public resources:

- iNaturalist (all taxa) within 3 km x 4 km area of the precinct;

- Virtual Museum for herpetofauna, mammals and invertebrate taxa within the Quarter Degree Squares (QDS) 3422AA: DungBeetleMAP, FrogMAP, LacewingMAP, LepiMAP, MammalMAP, OdonataMAP, ReptileMAP, ScorpionMAP, SpiderMAP.
- South Arican Bird Atlas Project (SABAP2) for pentad 3405_2200.

Some SCC reported on the platforms were highly unlikely to occur on the site given either clearly unsuitable habitat or being deemed a vagrant/transient animal. For example, Bontebok have been extinct from the area for some time and definitely do not occur in the precinct or immediate surrounding areas. For the purposes of this report these animals were excluded from further assessment.

The combined list of SCC (from the DFFE screening tool and public resources) potentially occurring in the Aalwyndal precinct is presented in Table 6. The information for each SCC presented in Table 6 stems largely from the online SANBI Red List of South African Species (<http://speciesstatus.sanbi.org>) in addition to a few key resources for each taxa:

- **Avifauna:** Roberts Birds of Southern Africa VII (Roberts, et al., 2005)
- **Mammals:** The Mammals of the Southern African Subregion (Skinner and Chimimba, 2005)
- **Invertebrates:** Field Guide to the Insects of South Africa (Picker, Griffiths and Weaving, 2019)
Field Guide to the Butterflies of South Africa (Woodhall, 2005)
Field Guide to the Spiders of South Africa (Dippenaar-Schoeman, 2023)
- **Amphibians:** A Complete Guide to the Frogs of Southern Africa (Du Preez and Carruthers, 2015)
- **Reptiles:** A Guide to the Reptiles of Southern Africa (Alexander, 2013)

Any Information presented from different sources is cited in the text.

4.5.3 Field Assessment Methods

Following the Species Environmental Assessment Guidelines (SANBI, 2022), taxa-specific sampling techniques were conducted in habitats where SCC were likely to occur when various sites were visited in the precinct (Figure 4). Taxa-specific sampling was interspersed with meanders through the project area to collect additional opportunistic data for all fauna and inspect all habitat types (Figure 6). Most of the fieldwork has been undertaken in autumn and winter however, which reduced the likelihood of detecting several SCCs, particularly invertebrates.

Table 5. Sampling techniques conducted for potential SCCs occurring in Aalwyndal.

Taxa	Field Methods	Public platform where observations were reported
Avifauna	- Meander across the site for direct observations 5-minute bird counts	Birdlasser (species lists) iNaturalist (photos)
Mammals	- Meander across the site for direct observations, tracks, scats, and signs. - Camera traps set at multiple points around in and around Aalwyndal.	iNaturalist (photos)
Invertebrates	- Meander across the site for direct observations - Active searching - Sweep netting	iNaturalist (photos)

4.5.4 Likelihood of Occurrence of SCCs

When planning the revised precinct layout, it is necessary to consider the habitat requirements of any animal SCCs that have been directly observed or are considered highly likely to occur within the precinct given the available habitat.

Three Species of Conservation Concern listed in Table 6 have been directly observed during site assessments for this project to date. A Black Harrier was observed foraging over fynbos on Portion 215/220 (mid-August) towards the western edge of the precinct. Golden mole tunnels were observed on the same property as well as in the road reserve on Klipheuwel Way and Suikerkan Street. Blue Cranes were observed on Erf 21281 where they are habituated to humans and small livestock. The likelihood of occurrence determined for each of the SCCs is therefore based on other specialist reports for the precinct, available public resources (already indicated) and direct observations of habitat.

Animal SCCs with a High likelihood of occurring in the precinct are avifaunal species with a strong association with renosterveld and/or fynbos vegetation types found in the precinct. Observation of these birds either directly in or very close to the precinct indicates that they utilise the habitat for foraging at the very least, and the available habitat is also deemed suitable for breeding.

Table 6. Summary of SCC potentially occurring in the Aalwyndal precinct and immediate surrounds. SCCs identified in the Screening Tool highlighted in bold.

Species	Common Name	Regional Status, Global Status*	Observed In Precinct	Suitable Habitat	Likelihood of Occurrence
AVIFAUNA					
<i>Circus maurus</i>	Black Harrier	EN, EN	Yes	Yes	HIGH: Suitable foraging habitat. Breeds and forages on ground in fynbos, renosterveld, and dry grassland. Breeding confirmed west of the precinct.
<i>Circus ranivorus</i>	African Marsh Harrier	EN, LC	No	No	LOW: No suitable coastal wetland habitat (of significant size) for breeding and unlikely foraging habitat
<i>Polemaetus bellicosus</i>	Martial Eagle	EN, EN	No	No	LOW: No suitable breeding habitat, no suitable tall trees, unlikely foraging habitat, preferring open savanna and woodland on plains.
<i>Afrotis afra</i>	Southern Black Korhaan	VU	No	Possible	MEDIUM: favours open spaces and renosterveld which is present in areas of the precinct. Fragmented nature of remnants is a limiting factor.
<i>Bradypterus sylvaticus</i>	Knysna Warbler	VU, VU	No	Possible	HIGH: Dense streamside thickets provide potentially suitable habitat.
<i>Falco biarmicus</i>	Lanner Falcon	VU, LC	Yes	Possible	MEDIUM: Lower lying topography of the site is not typical of SCC habitat, but a few small cliffs are present which would support breeding
<i>Neotis denhami</i>	Denham's Bustard	VU, NT	No	Yes	MEDIUM: Suitable breeding and foraging habitat in shrubland, renosterveld, grassland and fynbos.
<i>Sagittarius serpentarius</i>	Secretarybird	VU, EN	No	Possible	LOW: Limited extent of preferred habitat of open grassland with shrubs but occasional foraging possible.
<i>Certhilauda brevirostris</i>	Agulhas Long-billed Lark	NT, NT	Yes	Yes	HIGH: Suitable foraging and breeding habitat
<i>Grus paradisea</i>	Blue Crane	NT, VU	Yes	Yes	MEDIUM: Possible transient foraging, but lacking preferred habitat of natural / cultivated grasslands and wetlands IN the precinct. But confirmed habitat immediately west of the precinct.
<i>Buteo trizonatus</i>	Forest Buzzard	LC, NT	No	No	LOW: No suitable forest habitat nearby
MAMMALS					
<i>Panthera pardus</i>	Leopard	VU	No	Possible	LOW: Suitable habitat exists, but anthropogenic disturbance and compromised movement (fragmentation) would reduce the attraction. Suitable prey species are present.

<i>Aonyx capensis</i>	Cape Clawless Otter	NT	No	Possible	MEDIUM: Suitable habitat exists along the Tweekuilen River especially in the upper reaches as opposed to the lower reaches which are more fragmented and disturbed. Large home range, so potential for 1 breeding pair within the precinct.
-	Sensitive species 8	VU	No	No	LOW: No forest habitat in vicinity of the area
<i>Amblysomus corriae</i>	Fynbos Golden Mole	NT	Yes	Yes	HIGH: Tunnels observed at properties along Klipheuwel Way which are likely <i>A. corriae</i>.
INVERTEBRATES					
<i>Aloeides thyra orientis</i>	Red Copper Butterfly	EN	No	Possible	MEDIUM: Larval host plants are present in fynbos areas, however fire exclusion (listed threat) decreases habitat suitability for SCC. Recommend specialist surveys in Oct / Feb to confirm presence / absence.
<i>Aloeides trimeni southeyae</i>	Trimen's Copper Butterfly	EN	No	Possible	LOW-MEDIUM: Larval host plants are present in fynbos areas, however fire exclusion (listed threat) decreases habitat suitability for SCC. Recommend specialist surveys in Oct / Feb to confirm presence / absence.
<i>Lepidochrysops littoralis</i>	Coastal Nimble Blue Butterfly	EN	No	Possible	MEDIUM: Not near sea-shore as per listed habitat preference, but does occur in Mossel Bay with one population 3 kms away. Recommend specialist survey in Aug-Dec.
<i>Aneuryphymus montanus</i>	Yellow-winged Agile Grasshopper	VU	No	Possible	LOW: Unlikely habitat given the distance from Outeniqua Mountains and lack of sclerophyllous fynbos which has not burnt for some time.
<i>Aloeides pallida littoralis</i>	Knysna Pale Copper Butterfly	NT	No	Possible	MEDIUM: Larval host plants are present in fynbos areas, however fire exclusion (listed threat) decreases habitat suitability for SCC. Recommend specialist surveys in Oct / Feb to confirm presence / absence.

* EN: Endangered; VU: Vulnerable; NT: Near Threatened; LC: Least Concern

4.5.5 General Species List

Around 205 recorded animal species (including birds) were obtained for the Aalwyndal precinct and immediate surrounds. These species were filtered based on observations made during fieldwork, specialist report reviews, and frequency of observations on iNaturalist. We created a list of commonly encountered animal species in the Aalwyndal precinct that would benefit from establishment of an onsite conservation corridor (excluding SCCs; Table 7). Birds were excluded from this list as avian species frequently observed in the precinct are fairly widespread and could essentially move to suitable habitat elsewhere if displaced.

Table 7. Commonly encountered animals in the Aalwyndal precinct that would benefit from the establishment of onsite conservation corridors.

Taxon	Species	Common Name
Amphibian	<i>Hyperolius marmoratus</i>	Painted Reed Frog
Amphibian	<i>Sclerophrys capensis</i>	Raucous Toad
Amphibian	<i>Strongylopus fasciatus</i>	Striped Stream Frog
Amphibian	<i>Strongylopus grayii</i>	Clicking Stream Frog
Reptile	<i>Acontias meleagris</i>	Cape Legless Skink
Reptile	<i>Bitis arietans</i>	Puff Adder
Reptile	<i>Boaedon capensis</i>	Cape House Snake
Reptile	<i>Chersina angulata</i>	Angulate Tortoise
Reptile	<i>Stigmochelys pardalis</i>	Leopard Tortoise
Reptile	<i>Crotaphopeltis hotamboeia</i>	Red-lipped Herald
Reptile	<i>Duberria lutrix</i>	Common Slug-eater
Reptile	<i>Naja nivea</i>	Cape Cobra
Reptile	<i>Homopus areolatus</i>	Parrot-beaked Tortoise
Reptile	<i>Psammophylax rhombeatus</i>	Rhombic Skaapstekker
Mammal	<i>Caracal caracal</i>	Caracal
Mammal	<i>Sylvicapra grimmia</i>	Common Duiker
Mammal	<i>Cryptomys hottentotus</i>	Common Molerat
Mammal	<i>Herpestes pulverulentus</i>	Cape Grey Mongoose
Mammal	<i>Hystrix africaeaustralis</i>	Cape Porcupine
Mammal	<i>Otomys irroratus</i>	Southern Vlei Rat
Mammal	<i>Procavia capensis capensis</i>	Cape Rock Hyrax
Mammal	<i>Raphicerus melanotis</i>	Cape Grysbok
Mammal	<i>Rhabdomys pumilio</i>	Cape Four-striped Grass Mouse
Mammal	<i>Tragelaphus sylvaticus</i>	Cape Bushbuck





Figure 9. Some of the terrestrial animal species signs and observations made during fieldwork in Aalwyndal.

4.5.6 Onsite Conservation Implications

The needs of both SCCs with a Medium to High likelihood of occurrence and more commonly encountered wildlife in the area were considered from the perspective of the conservation corridor.

Given the strong association between areas of intact renosterveld and fynbos and larger-bodied bird SCCs (Black Harrier, Southern Black Korhaan & Denham's Bustard), the conservation corridor should aim to maintain strong linkages between fragments of largely natural vegetation and natural / minimally impacted areas along the edge of the precinct. More extensive development will likely result in the area becoming too disturbed and fragmented for these birds to persist within the precinct but given that Black Harrier are likely feeding but not breeding in Aalwyndal in minimally impacted areas (potential offsite offset areas), this could already be the case. Cliffs with potentially suitable nesting sites for Lanner Falcons are not numerous but occur in association with steep slopes which are included in the 1:4 slope areas which are not ideal development sites and should be included in the conservation area.

Dense streamside vegetation that potentially supports Cape Clawless Otters and Knysna Warbler also supports the movement, feeding and breeding of a wide range of other more common animals. Otters can have large home ranges extending over 90 ha and can travel 54 km when foraging between river systems (Nel & Somers, 2007). The precinct is therefore unlikely to support more than a breeding pair of otters in the present state, which could potentially be maintained provided connections beyond the precinct persist and allow for movement of these animals. These habitats also provide drinking water for a range of animals and are included in the mapped riparian zones of watercourses. The 30m watercourse buffer recommended beyond this provides further reduction of edge effects related to disturbance such as noise, lighting, and pets.

Invertebrate SCCs are dominated by butterflies dependent on certain plant species (*Aspalathus* spp. and *Hermannia depressa*) as a larval food source with a complex relationship with *Lepisiota capensis* ants. These plant species occur in both fynbos and renosterveld vegetation in Aalwyndal. Ants would benefit from minimal disturbance to habitat in terms of earth-moving and vegetation removal. Therefore, the preservation of significant areas of fynbos and renosterveld in the corridor would support the butterfly SCCs.

4.6 Terrestrial Plant Species and Ecosystems

Terrestrial ecosystems were assessed from a desktop level, and site-based ground truthing points (31 in this assessment; Figure 3) have been selected to improve the accuracy and precision of the land cover and vegetation mapped for Aalwyndal. This exercise is critical due to the complex nature of the site, as it is the meeting point of three distinct vegetation types, namely Thicket (not fire driven), Fynbos (fire driven), and Renosterveld (fire driven).

4.6.1 Vegetation Type Delineation and Classification

The ecosystem threat status for each of the 3 terrestrial ecosystems assessed in Aalwyndal is defined according to the Revised National List of Threatened Terrestrial Ecosystems (GN 47526 of 202) as:

- Hartenbos Dune Thicket (HDT): **Endangered**
- Mossel Bay Shale Renosterveld (MBSR): **Critically Endangered**
- Swellendam Silcrete Fynbos (SSF): **Endangered**

Note that the latter fynbos vegetation type replaces the North Langeberg Sandstone Fynbos which has a threat status of Least Concern. Refer back to Figure 3 for the delineation of distinct vegetation types and proposed classification system.

4.6.2 Ecosystem Disturbance

One of the key determinants of the SEI is Functional Integrity (FI). To gain an objective assessment of FI it was necessary to determine the level of disturbance affecting each erf from a range of disturbance types typical across the precinct.

The calculation of the disturbance score was completed in addition to identifying the vegetation types / units present on Aalwyndal. It is essential to understand the level of disturbance on various erven in Aalwyndal as it provides a better baseline understanding of the extent of degradation and current impacts faced by the ecosystems within the precinct. Quantifying disturbance caused by anthropogenic interference allows for the subsequent calculation and better understanding of residual environmental impacts that would result should sections of the landscape be developed in the future.

The baseline understanding is that the disturbance score together with the vegetation type classification can be used to design effective offset measures, including calculating, and agreeing to the best suited offset ratios that need to be applied for the different ecosystem types in Aalwyndal. In other words, a disturbance score leads to improved understanding about the critical habitats that need to be protected and where rehabilitation efforts could be directed (Figure 10). It must be noted that these ratings were determined at a point in time and are subject to change depending on fluctuations in environmental conditions and management actions.

The main four disturbance types identified in the precinct were categorized as:

- Invasion
- Grazing
- Senescence
- Anthropogenic Disturbance (abbreviated to Anthrop.)

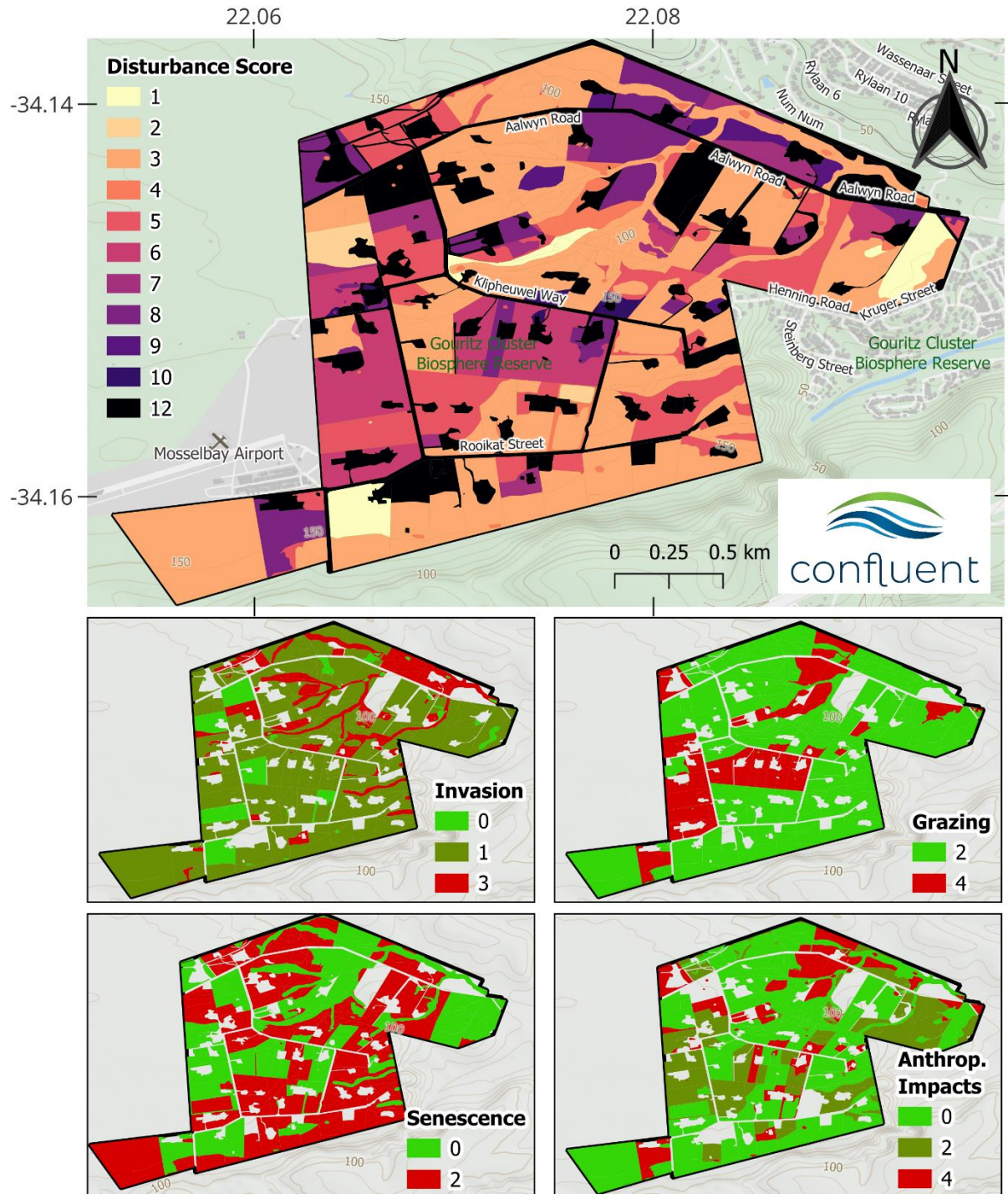


Figure 10: The disturbance map produced for Aalwyndal (top), together with the four disturbance categories that were combined to arrive at the final score (bottom). Higher scores indicate higher levels of disturbance. Scores are weighted slightly and were based on desktop and field point-survey assessments of various erven.

The disturbance score also helps identify areas where corridors may be more (or less) suitable across the landscape and provides insight into areas that would require more management / rehabilitation, if more modified parts of the landscape are required to create a functional and connected corridor through the Aalwyndal precinct.

The disturbance score was calculated using four different criteria which were also used as a quick checklist during the vegetation point surveys (Table 8).

1. Level of alien plant invasion.
2. Presence / absence of grazing.
3. Presence / absence of senescent vegetation (in fynbos and renosterveld only).
4. General landscape modifications excluding the above.

Weighted scores were assigned to each disturbance category, as described in Table 8. All the scores were then added together to obtain the final disturbance score. Fynbos and renosterveld vegetation that scored as being senescent (old / becoming moribund) could not also be scored as being grazed. Therefore, the maximum sum of scores for disturbance in any given vegetation type was 10. All completely transformed and degraded areas in Aalwyndal (i.e., roads, built environment, established fields) were automatically assigned a disturbance score of 12.

Table 8: Four disturbance classes that affect the vegetation and ecosystem quality. Numbers next to the classes represent a weighting system for the impacts, which relates to the final level of disturbance that informs the Functional Integrity (FI).

No.	Level of invasion	Grazing	Senescence	Anthropogenic Impacts
0	None	None	Not senescent	None
1	Invasive (usually Rooikrans) presence (+1) Small to moderately sized shrubs covering <60% of the landscape.	Grazed (+3) There is evidence of grazing (livestock seen, animal paths prominent, short shrubs with a dominance of renosterbos)	Senescent (+2) Veld with old overgrown vegetation (last fire >15 years ago) dominated by few species. Low plant diversity observed.	Disturbed (+2) Some disturbance and modification are visible in the natural vegetation (e.g. tracks, clearing, dumping, old fields); however the veld can still recover using passive restoration methods.
2	Highly invaded (+3) Mature rooikrans covering >60% of the landscape, or a site dominated by a host of invasive plant species.			Cleared (+4) Severe disturbance of previously natural veld where the vegetation is either cut to near ground-level, or has been removed; However the veld can recover in time and with active restoration.

As an all-encompassing measure of both disturbance on an erf, as well as the degree to which the habitat could potentially recover from its present state, the vegetation and ecosystems of Aalwyndal were divided into different VAST (Vegetation Assets, States, and Transitions) categories, which is a vegetation classification system developed in Australia (Thackway & Lesslie, 2006). The VAST framework is summarised in Table 9 below. The benchmark for “fully natural” vegetation according to VAST is the state of the ecosystem during pre-European conditions (i.e., period prior to the 1700s or 1600s). The VAST framework works as an aid for the SEI calculation as it informs both the Functional Integrity (as a composite measure of disturbance) and the Receptor Resilience (as a measure of the extent of transformation from a natural state). The VAST framework provides the following information:

- Describe and account for changes in the condition and status of vegetation.
- Make explicit links between land management (current) and vegetation modification.
- Provide a mechanism for describing the consequences of certain land management practices for vegetation.
- Contribute to the analysis of terrestrial ecosystem services that are provided by vegetation, including comparison between various land-uses.

Together the disturbance score and VAST categories assigned to the vegetation and ecosystems of Aalwyndal informed which portions of the precinct can:

1. Recover relatively fast (between one to five years) with passive restoration methods where minimal intervention is required. These areas are represented by disturbance scores zero to three, and VAST classes 0 and I.
2. Recover slowly (taking over five years, or within three fire cycles) with passive restoration methods where minimal intervention is required (only periodic alien clearing & burning). These areas are represented by disturbance scores four to seven, and VAST class II.
3. Recover with active intervention (i.e., long-term rehabilitation programmes including ongoing augmentation / reintroduction of species sourced elsewhere). These areas are represented by disturbance scores eight to ten, and VAST class III.
4. Transformed landscapes that are unlikely to recover to a state resembling the historical natural ecosystem unless infrastructure and major land-uses are removed. These areas are represented by a disturbance score of 12, and VAST categories IV, V, and VI.

Table 9: Vegetation Assets, States, and Transitions (VAST) framework with columns representing states and shifts between them defined as transitions, as laid out in (Thackway & Lesslie, 2006).

Increasing modification 								
Native vegetation cover Dominant plant species indigenous to the locality and spontaneous in occurrence, i.e. a vegetation community described using definitive vegetation types relative to estimated pre 1750 types					Non-native vegetation cover Dominant structuring plant species indigenous to the locality but cultivated; alien to the locality and cultivated; or alien to the locality and spontaneous			
Vegetation cover classes	Class 0: RESIDUAL BARE		Class I: RESIDUAL	Class II: MODIFIED	Class III: TRANSFORMED	Class IV: REPLACED -ADVENTIVE	Class V: REPLACED -MANAGED	Class VI: REMOVED
	Areas where native vegetation does not naturally persist		Native vegetation community structure, composition, and regenerative capacity intact—no significant perturbation from land use or land management practice. Class I forms the benchmark for classes II to VI	Native vegetation community structure, composition and regenerative capacity intact—perturbed by land use or land management practice	Native vegetation community structure, composition and regenerative capacity significantly altered by land use or land management practice	Native vegetation replacement—species alien to the locality and spontaneous in occurrence	Native vegetation replacement with cultivated vegetation	Vegetation removed
	Natural regenerative capacity unmodified—ephemerals and lower plants		Natural regenerative capacity unmodified	Natural regeneration tolerates or endures under past and or current land management practices	Natural regenerative capacity limited or at risk under past and or current land use or land management practices. Rehabilitation and restoration possible through modified land management practice	Regeneration of native vegetation community has been suppressed by ongoing disturbances of the natural regenerative capacity; limited potential for restoration	Regeneration of native vegetation community lost or suppressed by intensive land management; limited potential for restoration	Nil or minimal
	Nil or minimal		Structural integrity of native vegetation community is very high	Structure is predominantly altered but intact, e.g. a layer or strata and or growth forms and or age classes removed	Dominant structuring species of native vegetation community significantly altered, e.g. a layer or strata frequently removed	Dominant structuring species of native vegetation community removed or predominantly cleared or extremely degraded	Dominant structuring species of native vegetation community removed	Vegetation absent or ornamental
Diagnostic criteria	Vegetation composition		Compositional integrity of native vegetation community is very high	Composition of native vegetation community is altered but intact	Dominant structuring species present—species dominance significantly altered	Dominant structuring species of native vegetation community removed	Dominant structuring species of native vegetation community removed	Vegetation absent or ornamental
	Vegetation structure		Nil or minimal	Nil or minimal	Nil or minimal	Nil or minimal	Nil or minimal	Nil or minimal

5. SITE ECOLOGICAL IMPORTANCE (SEI)

Site Ecological Importance (SEI) is a standardised metric of environmental sensitivity (ranging from Very High to Very Low) used to highlight areas of importance for species of conservation concern (SCC), vegetation/fauna communities or habitat type within a development site. While this metric was introduced in the Species Environmental Assessment Guideline (SANBI, 2022) it does make provision for including threatened vegetation types as a criterion for determining the SEI. Estimation of the SEI relies on a qualitative assessment of a combination of criteria that include the conservation importance (CI), functional integrity (FI) and receptor resilience (RR) of the vegetation type per property. Although the final SEI map is similar to the older sensitivity maps that have been produced for Aalwyndal, the SEI provides a more defensible layer that speaks to several landscape level processes that inform the ecological functioning of the landscape. This is because the SEI method is a standardised, repeatable, multi-part calculation that is used to determine priority areas in terms of ecological functions and processes (SANBI, 2020).

Most importantly, the outputs of the SEI are aligned to the mitigation hierarchy and provide guidance on the applicability of offsetting (Table 10). However, it must be noted that while there would be a positive correlation between sites with a High SEI and the requirement for offset, this is not always the case as the impacts must still be rated to determine whether the residual negative impacts trigger an offset. Avoidance is the only appropriate mitigation in Very High SEI areas, which by definition, are areas of irreplaceable biodiversity. Offsets in these areas are therefore not acceptable and, within the context of Aalwyndal, must be prioritised for inclusion in the Open Space Network. High SEI categories represent endangered or critically endangered vegetation types of high biodiversity importance where offsetting will be required if excluded from the core Open Space Network. Offsetting is not a requirement in Low and Very Low SEI areas. This is because areas with a Low and Very Low SEI are either entirely transformed or are degraded to the point where active restoration over long periods of time will be required to restore biodiversity and promote the return of ecological functionality and resilience (Liu et al., 2022).

Table 10: The mitigation guidelines for interpreting the various SEI categories for the proposed development activities (SANBI, 2020).

Site Ecological Importance	Recommendation for activities based on the mitigation hierarchy
Very High	Avoidance mitigation – no destructive development activities should be considered. Offset mitigation not acceptable/not possible (i.e. last remaining populations of species, last remaining good condition patches of ecosystems/unique species assemblages). Destructive impacts for species/ecosystems where persistence target remains.
High	Avoidance mitigation wherever possible. Minimisation mitigation – changes to project infrastructure design to limit the amount of habitat impacted; limited development activities of low impact acceptable. Offset mitigation may be required for high impact activities.
Medium	Minimisation and restoration mitigation – development activities of medium impact acceptable followed by appropriate restoration activities.
Low	Minimisation and restoration mitigation – development activities of medium to high impact acceptable followed by appropriate restoration activities.
Very Low	Minimisation mitigation – development activities of medium to high impact acceptable and restoration activities may not be required.

5.1 Methodology

In short, the CI and FI are combined to arrive at the overall BI of an area (Table 11). The RR refers to the current state of the ecology of a site and is directly related to the ability of a site to recover following an alteration in the prevailing disturbance regime. Together BI and RR are used to arrive at the final SEI score (Table 13). The definitions for the criteria used to determine the SEI are provided in Table 11 and a detailed explanation of the SEI method is provided by SANBI (2022).

Table 11: Definitions for criteria used to determine the SEI.

SEI Criteria	Definition
Conservation Importance (CI)	The importance of a site for supporting biodiversity features of conservation concern present, e.g., populations of IUCN threatened and Near Threatened species (CR, EN, VU and NT), rare species, range-restricted species, globally significant populations of congregatory species, and areas of threatened ecosystem types, through predominantly natural processes.
Functional Integrity (FI)	A measure of the ecological condition of the impact receptor as determined by its remaining intact and functional area, its connectivity to other natural areas and the degree of current persistent ecological impacts
Receptor Resilience (RR)	The intrinsic capacity of the receptor (i.e., habitat type in question) to resist major damage from disturbance and/or to recover to its original state with limited or no human intervention

Table 12: The matrix that defines the biodiversity importance (BI) of a given vegetation/habitat type, as identified from a desktop and field assessment.

Biodiversity Importance		Conservation Importance				
		Very High	High	Medium	Low	Very Low
Functional Integrity	Very High	Very High	Very High	High	Medium	Low
	High	Very High	High	Medium	Medium	Low
	Medium	High	Medium	Medium	Low	Very Low
	Low	Medium	Medium	Low	Low	Very Low
	Very Low	Medium	Low	Very Low	Very Low	Very Low

Table 13: The matrix that defines the site ecological importance (SEI) of a given vegetation/habitat type, as identified from a desktop and field assessment.

Site Ecological Importance		Biodiversity Importance				
		Very High	High	Medium	Low	Very Low
Receptor Resilience	Very Low	Very High	Very High	High	Medium	Low
	Low	Very High	Very High	High	Medium	Very Low
	Medium	Very High	High	Medium	Low	Very Low
	High	High	Medium	Low	Very Low	Very Low
	Very High	Medium	Low	Very Low	Very Low	Very Low

5.2 SEI for Aalwyndal

The SEI for each property (Figure 11) was determined based on the vegetation type and corresponding D-score (Disturbance Score; Figure 10) mapped for the property. The CI, FI,

RR and BI categories assigned for each combination of vegetation type and D-score is provided in Table 14. In most instances the ecosystem threat status of the vegetation type was primarily used to define the CI of the vegetation (i.e. Very High for critically endangered MBSR and High for endangered SSF). Where the presence of specific SCC were confirmed these were used as an additional criteria to define the CI (e.g. the presence of the critically endangered *Haworthia pygmaea* in a property covered by endangered SSF elevated the CI from High to Very High). FI and RR were determined primarily by the D-score assigned to vegetation on the property.

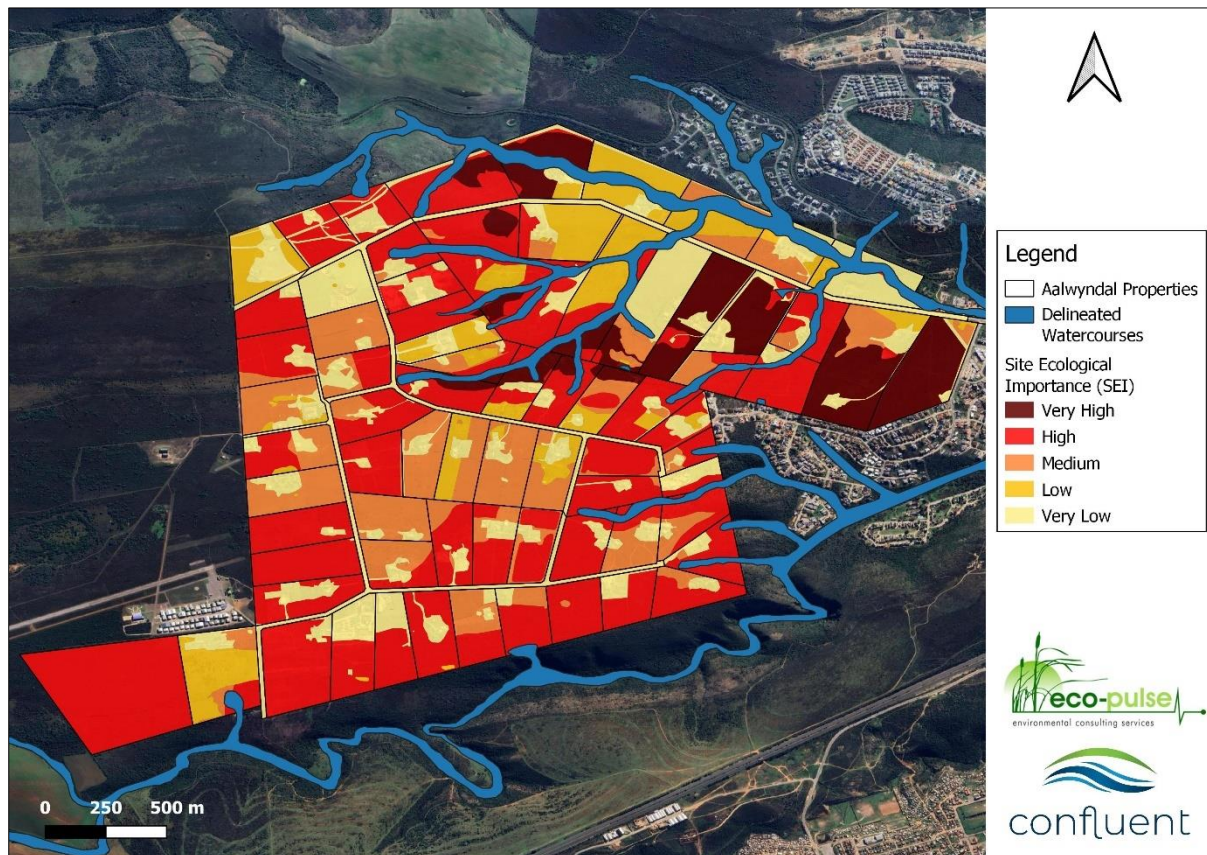


Figure 11. The SEI map with watercourses based on refined desktop and site assessments.

Table 14: The evaluation of the SEI for the vegetation / habitats in Aalwyndal.

Vegetation Type	Conservation Importance (CI)	Functional Integrity (FI)	Receptor Resilience (RR)	Site Ecological Importance (SEI)
Offstream Dams	High Confirmed or highly likely occurrence of CR, EN, VU species with an *EOO > 10 square km, and thicket that is EN ecosystem type.	Medium Mostly minor current negative ecological impacts with some major impacts (e.g. established population of alien and invasive flora, earth movement)	High VAST class V Dams are likely to remain dams, with plant species there likely to remain when disturbances occur in and around the dam.	Low BI: Medium RR: High
HDT – (Disturbance score 0-3)	High Confirmed or highly likely	High Good connectivity, however most of the	Medium VAST class I	High BI: High RR: Medium

Vegetation Type	Conservation Importance (CI)	Functional Integrity (FI)	Receptor Resilience (RR)	Site Ecological Importance (SEI)
	occurrence of CR, EN, VU species with an EOO > 10 square km, and thicket that is EN ecosystem type.	thicket on the site is in steep valleys. The thicket near the entrance of Aalwyndal is relatively isolated, and there are roads and cleared fields between intact habitat patches. However, this thicket could potentially form a part of a functional ecological corridor. Good rehabilitation potential.	Following disturbance where the thicket can come back, it will recover slowly (~ more than 10 years) to > 75% of the original species composition and functionality of the receptor functionality. Thicket species have a moderate likelihood to remain following unnatural disturbance regimes, but invasive plants also have a moderate likelihood of becoming more abundant & dominant.	
HDT – (Disturbance score 4-7)	High Confirmed or highly likely occurrence of CR, EN, VU species with an EOO > 10 square km, and thicket that is EN ecosystem type.	Medium Relatively narrow corridors of good habitat connectivity with an existing road network between intact patches of veld	Medium VAST class II Following disturbance where the thicket can come back, it will recover slowly (~ more than 10 years) to > 75% of the original species composition and functionality of the receptor functionality. Thicket species have a moderate likelihood to remain following unnatural disturbance regimes, but invasive plants also have a moderate likelihood of becoming more abundant & dominant.	Medium BI: Medium RR: Medium
SSF & mostly fynbos transitional areas – (Disturbance Score 0-3)	High Confirmed or highly likely occurrence of CR, EN, VU species with an EOO > 10 square km, and fynbos that is assumed to be the equivalent of an EN ecosystem type	High Good habitat connectivity with potentially functional ecological corridors and a regularly used road network between intact habitat patches. Only minor current negative ecological impacts (e.g. few livestock utilising area) with no signs of major past disturbance (e.g. ploughing) and good rehabilitation potential.	Medium VAST class I Following disturbance where the fynbos can come back, it will recover slowly (~ more than 10 years) to > 75% of the original species composition and functionality of the receptor functionality. Thicket species have a moderate likelihood to remain following unnatural disturbance regimes, but invasive plants also have a moderate likelihood of becoming more abundant & dominant.	High BI: High RR: Medium
SSF & mostly fynbos transitional areas – (Disturbance Score 4-7, in areas where <i>Haworthia pygmaea</i> occurs¹)	Very High Confirmed occurrence of previously CR species listed as having an EOO <10 square kilometers, and an EOO <100 square	Medium Relatively narrow corridors of good habitat connectivity with an existing road network between intact patches of veld. Mostly minor current negative ecological impacts with some major impacts (e.g.	Medium VAST class I Following disturbance where the fynbos can come back, it will recover slowly (~ more than 10 years) to > 75% of the original species composition and functionality of the receptor functionality. Thicket species	High BI: High RR: Medium

¹ Despite currently being DDT, *Haworthia pygmaea* is the only SCC observed that likely fulfils the <10 square km criteria in the species guideline for a very high CI, based on past assessments of the species (and related species). Therefore, none of the other SCC are mentioned

Vegetation Type	Conservation Importance (CI)	Functional Integrity (FI)	Receptor Resilience (RR)	Site Ecological Importance (SEI)
	kilometers, and fynbos that is assumed to be the equivalent of an EN ecosystem type	established population of alien and invasive flora) and a few signs of minor past disturbance. Moderate rehabilitation potential.	have a moderate likelihood to remain following unnatural disturbance regimes, but invasive plants also have a moderate likelihood of becoming more abundant & dominant.	
SSF & mostly fynbos transitional areas (Disturbance Score 4-7)	High Confirmed or highly likely occurrence of CR, EN, VU species with an EOO > 10 square km, and fynbos that is assumed to be the equivalent of an EN ecosystem type	Medium Relatively narrow corridors of good habitat connectivity with an existing road network between intact patches of veld. Mostly minor current negative ecological impacts with some major impacts (e.g. established population of alien and invasive flora) and a few signs of minor past disturbance. Moderate rehabilitation potential.	Medium VAST class II Following disturbance where the fynbos can come back, it will recover slowly (~ more than 10 years) to > 75% of the original species composition and functionality of the receptor functionality. Thicket species have a moderate likelihood to remain following unnatural disturbance regimes, but invasive plants also have a moderate likelihood of becoming more abundant & dominant.	Medium BI: Medium RR: Medium
SSF & mostly fynbos transitional areas – (Disturbance Score 8-10)	High Confirmed or highly likely occurrence of CR, EN, VU species with an EOO > 10 square km, and fynbos that is assumed to be the equivalent of an EN ecosystem type	Low The landscape is modified-degraded with existing road networks between patches of habitat. Several minor and major current negative ecological impacts which also mean low rehabilitation potential	High VAST class III The modified to degraded landscape is likely to remain this way and recover to the current state relatively quickly following disturbance.	Low BI: Medium RR: High
MBSR & mostly renosterveld transitional areas– (Disturbance Score 0-3)	Very High Any area of natural habitat of a CR ecosystem type.	High Good habitat connectivity with potentially functional ecological corridors and a regularly used road network between intact habitat patches. Only minor current negative ecological impacts (e.g. few livestock utilising area) with no signs of major past disturbance (e.g. ploughing) and good rehabilitation potential.	Medium VAST class I Following disturbance where the renosterveld can come back, it will recover slowly (~ more than 10 years) to > 75% of the original species composition and functionality of the receptor functionality. Thicket species have a moderate likelihood to remain following unnatural disturbance regimes, but invasive plants also have a moderate likelihood of becoming more abundant & dominant.	Very High BI: Very High RR: Low
MBSR & mostly renosterveld transitional areas –	Very High Any area of natural habitat of a CR ecosystem type.	Medium Relatively narrow corridors of good habitat connectivity with an existing road network between intact patches	Medium VAST class II Following disturbance where the renosterveld can come back, it will recover slowly (~ more than 10 years) to >	High BI: High RR: Medium

Vegetation Type	Conservation Importance (CI)	Functional Integrity (FI)	Receptor Resilience (RR)	Site Ecological Importance (SEI)
(Disturbance Score 4-7)		of veld. Mostly minor current negative ecological impacts with some major impacts (e.g. established population of alien and invasive flora) and a few signs of minor past disturbance. Moderate rehabilitation potential.	75% of the original species composition and functionality of the receptor functionality. Thicket species have a moderate likelihood to remain following unnatural disturbance regimes, but invasive plants also have a moderate likelihood of becoming more abundant & dominant.	
MBSR & mostly renosterveld transitional areas– (Disturbance Score 8-10)	Very High Any area of natural habitat of a CR ecosystem type.	Low The landscape is modified-degraded with existing road networks between patches of habitat. Several minor and major current negative ecological impacts which also mean low rehabilitation potential The landscape is modified-degraded with existing road networks between patches of habitat. Several minor and major current negative ecological impacts which also mean low rehabilitation potential	High VAST class III The modified to degraded landscape is likely to remain this way and recover to the current state relatively quickly following disturbance.	Low BI: Medium RR: High
Transformed – mostly managed	Low < 50% of receptor contains natural habitat with limited potential to support SCC.	Low Degraded and transformed areas with Several minor and major current negative ecological impacts. Low rehabilitation potential.	Very High VAST classes IV, V, & VI Transformed areas on the site are highly likely to remain transformed.	Very Low BI: Low RR: Very High

* EOO = Extent of Occurrence

6. SPATIAL DELINEATION OF THE CORE AREA

Three spatial categories were created for the revised precinct plan and are summarised as follows:

- **Core Area:** includes areas considered not developable because the biodiversity features therein are irreplaceable and do not qualify for an offset. Also includes areas of High and Medium SEI that constitute areas of well-connected, avoidable impacts that can reduce the impact of development in Aalwyndal in general. This is a No-go area for private development. These areas can also potentially be included as onsite offset areas;
- **Offset Required:** areas that trigger a biodiversity offset (e.g. areas where Listed Threatened Ecosystems and/or CBAs exist and would be impacted and where such impacts cannot be avoided, mitigated or rehabilitated); and
- **No Offset Required:** Low and Very Low SEI areas that are developable with no biodiversity offset required.

The delineation of these categories followed the established mitigation hierarchy for protection of biodiversity and ecosystems. Spatial information used to delineate these categories is provided in Table 15.

Table 15. Spatial layers mostly incorporated for each of the three categories in the revised precinct plan.

Category	Spatial Layer Inputs
Core Area	• All delineated watercourses including instream dams & 30 m buffers • Very High terrestrial, botanical, & animal theme site ecological importance (SEI) units • High SEI units where considered feasible and reasonable for inclusion in corridors and as linkage areas beyond the precinct. • Medium SEI units considered offering strategic connections to areas of High/Very High Sensitivity and/or off-site natural areas. • 1:4 slopes and 30 m buffers
Offset required areas	• Remaining Very High, High and Medium terrestrial, botanical, & animal theme SEI.
No offset required	• Off-channel dams (although these should ideally be retained for consideration as regional controls for stormwater management) • Low and Very Low terrestrial, botanical & animal theme SEI.

6.1 Mitigation Hierarchy

The protection of ecosystems and biodiversity generally begins with the avoidance of adverse impacts and where such avoidance is not feasible; to apply appropriate mitigation in the form of reactive practical actions that minimizes or reduces impacts. Mitigation requires proactive planning that is enabled by following the 'mitigation hierarchy' (Figure 12). The application of the mitigation hierarchy is intended firstly, to avoid disturbance and/or loss of ecosystems, and where this cannot be avoided, to minimise, rehabilitate, and then finally offset any remaining significant residual impacts. The mitigation hierarchy is inherently proactive, requiring the on-going and iterative consideration of alternatives in terms of project location, siting, scale, layout, technology and phasing until the proposed development can best be accommodated without incurring significant negative impacts to the receiving environment. In the case of

particularly sensitive ecosystems, where ecological impacts can be severe, the guiding principle should generally be “anticipate and prevent” rather than “assess and repair”.

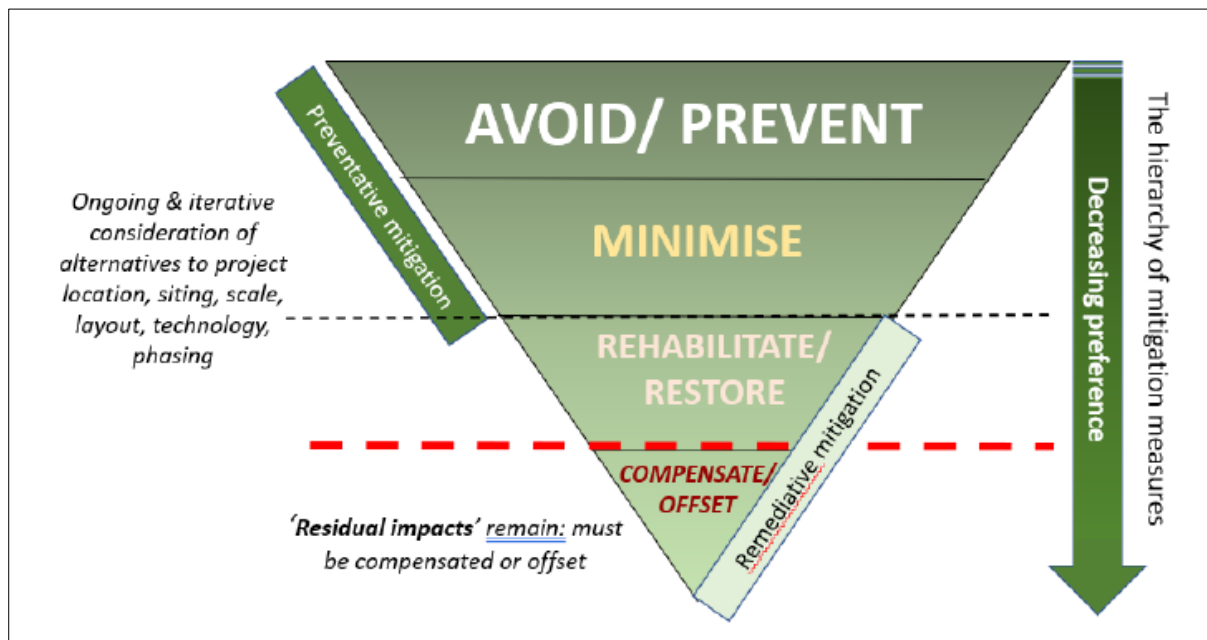


Figure 12: The mitigation hierarchy: Successive steps in the hierarchy should only be considered once the previous step has been exhausted. Avoidance of negative impacts is a priority, with compensation/offsets a 'last resort' (DFFE, 2023).

6.2 Application of Mitigation Hierarchy

6.2.1 Avoidance

The Core Area is specifically designed to avoid impacts primarily to Very High, High, and Medium sensitivity vegetation and the location of these SEI units was used as primary inputs into the delineation of the Core Area.

It was also however acknowledged that isolated fragments of this vegetation would ultimately lead to its decline over time through overly complex management requirements, and high edge to area ratios. Thus, an additional consideration was to prioritise *connectivity* between fragments of sensitive vegetation by establishing corridors across the precinct with links to areas outside of the precinct that could potentially act as offsite offset areas. These areas included undeveloped areas to the north, west, south and east of the precinct which are generally farmed to an extent and zoned as Agricultural Zone 1. These corridors are not only important in terms of managing vegetation on site (e.g. managing controlled burns which are important for maintaining vegetation in the Core Area in a good condition) but also for allowing wildlife associated with these areas to move throughout the precinct and into adjacent more natural areas. Additional inputs included in the delineation of the Core Area are the delineated watercourses, 1 in 4 slopes and their associated 30 m buffers (Table 15).

Corridor width was another important consideration. Corridors within urban landscapes provide refuge for animals from disturbances like artificial lighting and noise, and more subtle disturbance associated with edge effects. While larger corridors obviously provide the greatest conservation value, existing landscape modifications and infrastructure made the delineation of large corridor widths challenging in certain areas. Fauna expected to utilize corridors include

Bushbuck, Cape Gysbok, Grey Mongoose, Caracal, Porcupines, and Small-spotted Genet. A minimum effective corridor width for these small- to medium-sized mammals is considered 60m – 100m (Bentrop, 2008). This aligns with the minimum corridor width of 60m advocated by CapeNature in a recent development in the City of Cape Town². The resulting Core Area has applied this minimum width where site-specific constraints dictate, but the greater majority of corridor widths are substantially wider across the precinct.

Given that the primary function of the Core Area is to conserve sensitive vegetation and wildlife within a matrix of increasing urbanisation, it is likely that fencing will be required. Consideration was therefore given to ensure practical alignment of fencing that avoided overly complex configurations. As a result, some small pockets of Very High sensitivity vegetation were excluded from the Core Area.

A few properties are currently undeveloped and have therefore not exercised their primary development right. It was agreed with stakeholders that the average development area exercised at present was around 1 ha. Therefore, **an area of at least 1 ha had to be excluded from the Core Area to preserve the landowner's primary development right.** As far as possible, the selected area aimed to avoid all sensitive features previously described and minimise fragmentation in well-connected areas. However, this was not always feasible.

The resulting Core Area thus represents the best available configuration of sensitive biodiversity features within Aalwyndal that can be considered **feasible**, which is aligned with the NBOG (2023). The proposed Core Area (Version 5) is presented in Figure 13. Tables providing estimates of the total area of different SEI units and vegetation types included and excluded from the Core Area is provided in Table 16 and Table 17. For comparative purposes, the tables include areas for all precinct layouts developed for Aalwyndal to date which include:

1. Mossel Bay Municipality (MBM) spatial development framework (Mossel Bay Municipality, 2022)
2. Sharples Environmental Services (SES, 2019),
3. Brownlie et al. (2021).

In all instances, the coverage of the respective precinct layouts was compared based on the SEI as developed in this study – and not on previous environmental sensitivities that were developed at the time these layouts were developed. This information is summarised as follows:

- The revised precinct plan (Confluent Precinct Plan) includes **98 % of Very High sensitivity vegetation in the Core Area**. This vegetation is mainly critically endangered Mossel Bay Shale Renosterveld (MBSR) located towards the north-eastern section of the precinct. Very High sensitivity vegetation included in the Core Area for other precinct plans developed to date is as follows:
 - MBM: 23 %
 - SES: 63 %

² APPLICATION FOR ENVIRONMENTAL AUTHORISATION IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 (ACT NO. 107 OF 1998) ("NEMA") AND THE ENVIRONMENTAL IMPACT ASSESSMENT ("EIA") REGULATIONS, 2014 (AS AMENDED): THE PROPOSED CONSTRUCTION OF THE WESTBROOK RESIDENTIAL DEVELOPMENT AND ASSOCIATED INFRASTRUCTURE ON ERF 644, SCHAAPKRAAL

- Brownlie: 40 %
- **61 % of High sensitivity vegetation is included**, covering elements of all three vegetation types, including MBSR, Swellendam Silcrete Fynbos (SSF) and a small patch of Hartenbos Dune thicket (HDT). High sensitivity vegetation included in the Core Area for other precinct plans developed to date is as follows:
 - MBM: 15 %
 - SES: 47 %
 - Brownlie: 18 %
- In total **48.8 % (or 299.4 ha)** of the total precinct would fall within the Core Area. Of the remaining areas falling outside of the Core Area, a total of **164.08 ha** (including remaining Very High, High and Medium SEI units) would require an offset. Total area of the precinct included in the Core Area for other precinct plans developed to date is as follows:
 - MBM: 16 % (99 ha)
 - SES: 38 % (231 ha)
 - Brownlie: 20 % (125 ha)
- The Core Area would conserve **95, 64 and 48 % of HDT, MBSR and SSF, respectively**. Percentage of the total area of the respective vegetation types included in the Core Area of other precinct plans developed to date is as follows:
 - MBM: 32, 20 and 10 % of HDT, MBSR and SSF, respectively.
 - SES: 92, 51 and 32 % of HDT, MBSR and SSF, respectively.
 - Brownlie: 90, 27 and 10 % of HDT, MBSR and SSF, respectively.

The comparative assessment provided in Table 16 indicates that the MBM and Brownlie layouts do not adequately protect Very High sensitivity vegetation within the precinct. The Confluent Core Area covers a greater area and a far greater extent of Very High and High sensitivity vegetation compared to the SES Core Area. In terms of vegetation type, all precinct plans protect a greater proportion of the critically endangered MBSR vegetation type relative to the SSF vegetation type, which is justified considering its critically endangered threat status. For both vegetation types, this corresponds to less than 1 % loss of the remaining natural extent of each vegetation type (Table 18 and Table 19).



Figure 13: The revised and updated Core Area map (Version 5) that covers most of the Very High SEI areas and prioritises functional corridor connectivity between the Aalwyndal precinct and proposed offsite offset site in natural areas beyond (as determined in subsequent reports).

The revised Core Area (Version 5) has aimed to address and balance concerns raised by MBM, DEA&DP and CN through multiple iterations of the plan. It has also been applied to the revised SEI which was informed by additional ground-truthing to improve confidence in ecological sensitivity. The Core Area aims to preserve all irreplaceable (very high SEI) biodiversity, and a significant portion of high sensitivity (high SEI) habitat where connectivity is achievable. In one instance where corridor connections between different sections are impractical due to existing transformation, numerous roads, or existing approved developments, an individual open space 'plant reserve' was delineated along the western boundary. While not connected to the Core Area within Aalwyndal, this area connects to municipal land around the Mossel Bay airfield to the west. However, given the likelihood of some future development around the airfield it is likely that this area will remain a fairly isolated botanical reserve.

One of the concerns raised by CN is that the Core Area should not preserve watercourses and steep slopes alone. To demonstrate the spatial relationship between the revised Core Area (V5) and delineated watercourses and steep slopes these features were mapped and presented in Figure 14. The only areas where the Core Area follows watercourses or slopes closely is where there is existing hard infrastructure or completely transformed vegetation (Very Low SEI). Where this has occurred, the Core Area was extended on the opposite side of the features (usually a watercourse) to compensate for this narrowing of the corridor.

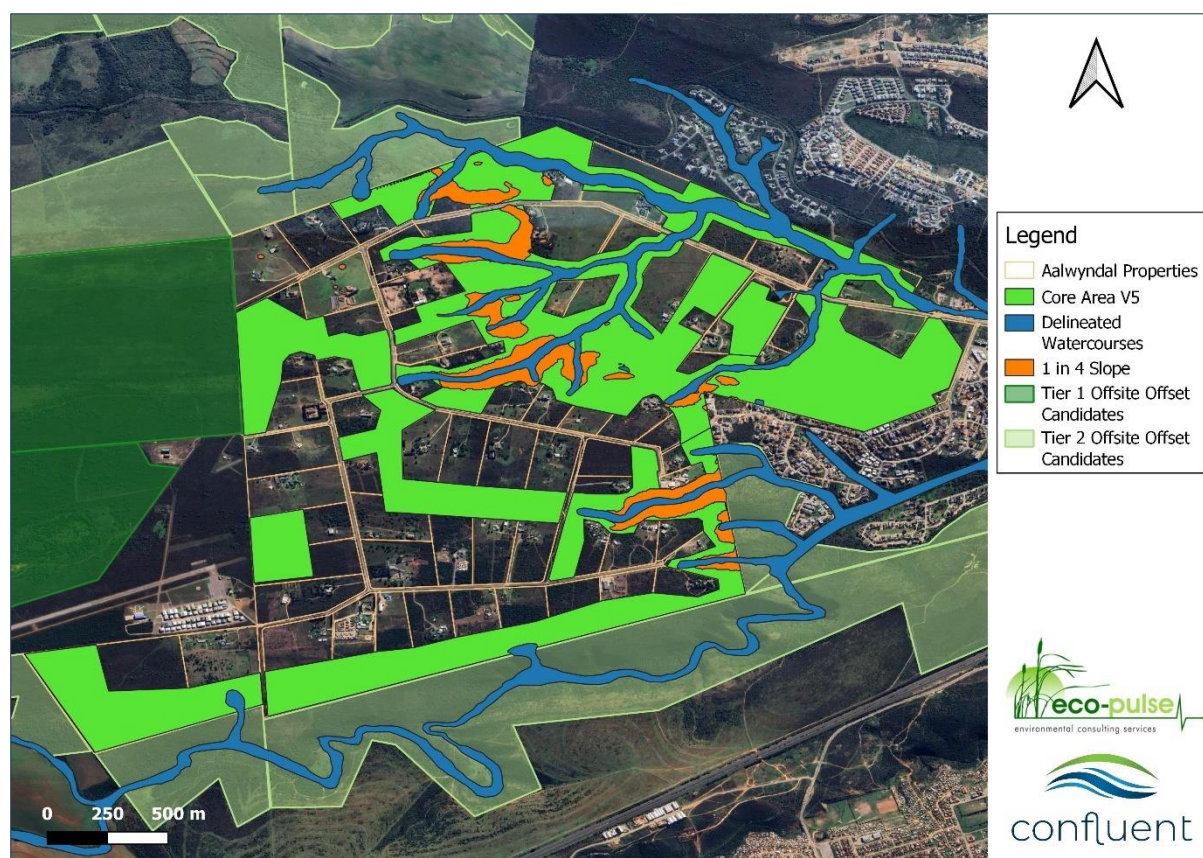


Figure 14. Core Area (Version 5) overlaid with delineated watercourses and 1:4 slopes in Aalwyndal.

Table 16: Table indicating area of watercourses and vegetation sensitivities included within the open space network of all precinct plans developed for Aalwyndal.

Sensitivity	Precinct Area	Core Area (Conserved)		Developable Area (Loss)	
	(ha)	(ha)	(%)	(ha)	(%)
Confluent & Eco-Pulse Precinct Plan					
Watercourses	38.2	37.3	97.6	0.9	2.4
Very Low	117.2	12.2	10.4	104.7	87.8
Low	58.1	14.5	24.9	43.7	85.5
Medium	96.2	29.1	30.2	67.1	70.9
High	247.6	151.1	61.0	96.1	39.0
Very High	56.6	55.4	97.8	1.2	2.2
TOTAL	613.9	299.4	48.8	313.7	51.2
MBM Precinct Plan					
Watercourses	38.2	29.0	76.1	9.1	23.9
Very Low	117.2	6.7	5.7	110.5	94.3
Low	58.1	7.0	12.0	51.1	88.0
Medium	96.2	4.2	4.4	91.9	95.6
High	247.6	39.4	15.9	208.2	84.1
Very High	56.6	13.0	22.9	43.6	77.1
TOTAL	613.9	99.3	16.2	514.6	83.8

Sensitivity	Precinct Area	Core Area (Conserved)		Developable Area (Loss)	
	(ha)	(ha)	(%)	(ha)	(%)
SES Precinct Plan					
Watercourses	38.2	36.7	96.2	1.5	3.8
Very Low	117.2	13.5	11.5	103.8	88.5
Low	58.1	14.8	25.5	43.3	74.5
Medium	96.2	14.1	14.6	82.1	85.4
High	247.6	115.9	46.8	131.7	53.2
Very High	56.6	35.8	63.3	20.8	36.7
TOTAL	613.9	230.8	37.6	383.1	62.4
Brownlie Precinct Plan					
Watercourses	38.2	33.8	88.7	4.3	11.3
Very Low	117.2	9.8	8.4	107.4	91.6
Low	58.1	8.0	13.7	50.2	86.3
Medium	96.2	4.8	5.0	91.3	95.0
High	247.6	45.2	18.3	202.3	81.7
Very High	56.6	22.8	40.3	33.8	59.7
TOTAL	613.9	124.6	20.3	489.3	79.7

Table 17: Areas of different vegetation types included within the open space network of all precinct plans developed for Aalwyndal.

Sensitivity	Precinct Area	Core Area (Conserved)		Developable Area (Loss)	
	(ha)	(ha)	(%)	(ha)	(%)
Confluent & Eco-Pulse Precinct Plan					
HDT	15.2	14.5	95.2	0.7	4.8
MBSR	128.0	80.7	64.0	46.0	36.0
SSF	315.7	152.9	48.4	162.8	51.6
MBM Precinct Plan					
HDT	15.2	4.9	32.4	10.3	67.6
MBSR	128.0	26.1	20.4	101.9	79.6
SSF	315.7	32.6	10.3	283.1	89.7
SES Precinct Plan					
HDT	15.2	13.9	91.7	1.3	8.3
MBSR	128.0	65.0	50.8	62.9	49.2
SSF	315.7	101.2	32.1	214.5	67.9
Brownlie Precinct Plan					
HDT	15.2	13.6	89.6	1.6	10.4
MBSR	128.0	34.5	26.9	93.5	73.1
SSF	315.7	32.8	10.4	282.9	89.6

HDT = Hartenbos Dune Thicket; MBSR = Mossel Bay Shale Renosterveld; SSF = Swellendam Silcrete Fynbos

Table 18: Preliminary evaluation of residual impacts and effect on conservation targets for Mossel Bay Shale Renosterveld

	MBM	SES	Brownlie	Confluent
Initial Extent (Ha)	86 649			
Initial Remaining Extent (Ha)	32 927			
% Natural	38 %			
Habitat Affected (Ha)	101.9	62.9	93.5	46.0
Remaining Extent (Ha)	32 825.1	32 864.1	32 833.5	32 881
Remaining Extent (%)	38	38	38	38
Residual Loss (% of remaining)	< 1 %	< 1 %	< 1 %	< 1 %

Table 19: Preliminary evaluation of residual impacts and effect on conservation targets Swellendam Silcrete Fynbos (initial and initial remaining extent revised based on reclassification of vegetation type as described in Section 3).

	MBM	SES	Brownlie	Confluent
Initial Extent (Ha)	88 776			
Initial Remaining Extent (Ha)	39 395.8			
% Natural	44 %			
Habitat Affected (Ha)	283.1	214.5	282.9	162.8
Remaining Extent (Ha)	39 112.7	39 181.3	39 112.9	39 233
Remaining Extent (%)	44	44	44	44
Residual Loss (% of remaining)	< 1 %	< 1 %	< 1 %	< 1 %

6.2.2 Property-specific Core Area Reasons

Planning and layout of the Core Area involved desktop and field-based methods already explained. In most cases, multiple reasons exist for delineating the Core Area through a particular property, although these may not always be immediately clear. To provide greater clarity on this aspect for landowners and other stakeholders a list including each property within the Core Area was provided along with reasons for inclusion/exclusion from the Core Area (Table 20). An estimate of the remaining area available for development per property was provided.

It should be noted that space left open for development, particularly where the primary development right has not yet been exercised, has been selected based on the principles of avoidance and minimisation of impacts while allowing for at least 1 ha for future development. Therefore, developments should ideally not be proposed beyond the allocated space.

Some erven with relatively large areas of High SEI were excluded from the Core Area. The most frequent reasons for this were that they were simply too spatially isolated from other sensitive features or disconnected by multiple conflict layers such as roads and would result in a 'park-like' green space with high edge effects. These would create a significant biodiversity management challenge in the future (e.g. burning).

Priority was given to areas connecting to candidate offsite offset areas beyond the precinct, as they represent the best opportunities for continued movement of wildlife and genetic exchange of plant and animal populations. Of the 73 properties in Aalwyndal, a total of 65 properties have been included in the Core Area to some extent.

Table 20. Reasons for inclusion (in green) of properties in the Aalwyndal Core Area.

Property Description	30m watercourse buffer	30m 1:4 slope buffer	Irreplaceable (Very High SEI)	Population of plant Species of Conservation Concern	Buffer for bird Species of Conservation Concern	Well connected to any preceding reasons	Well connected to candidate offset sites beyond the precinct	Space available for Development (ha)
21238	✓	✓	X	X	✓	✓	✓	1,1
21239	✓	✓	✓	X	✓	✓	✓	1,8
21240	✓	✓	X	X	X	✓	X	5,1
21241	✓	✓	X	X	X	✓	X	2,6
21242	✓	X	X	X	X	✓	X	4
21243	✓	X	X	X	X	✓	X	2,3
21244	X	X	✓	✓	X	✓	X	1,6
21245	X	X	✓	X	X	✓	X	5,6
21246	✓	✓	X	X	X	✓	X	2,8
21247	X	X	✓	X	X	✓	X	1,4
21248	✓	✓	✓	X	X	✓	X	7,3
21249	✓	✓	✓	X	X	✓	X	4,2
21250	✓	✓	X	X	X	✓	X	8,7
21251	✓	✓	X	X	X	✓	X	1,7
21252	✓	✓	✓	✓	X	✓	X	1,7
21254	X	X	X	X	X	✓	X	2,6
21255	X	X	X	X	X	✓	X	5,4
21256	X	X	X	X	X	X	X	6,9
21257	X	X	X	X	X	✓	X	5,6
21258	X	X	X	X	X	✓	X	5,3
21259	X	X	X	X	X	✓	X	4,9
21260	✓	✓	X	X	X	✓	X	2,5
21261	✓	✓	X	X	X	✓	X	4,3
21262	✓	✓	X	X	X	✓	✓	2,5
21263	✓	✓	X	X	X	✓	✓	1,3
21264	X	X	X	X	X	✓	✓	2,9
21265	X	X	X	X	X	✓	✓	2,7
21266	X	X	X	X	X	✓	✓	3,1
21267	✓	✓	X	X	X	✓	✓	3,8
21268	X	X	X	X	X	✓	✓	4,3
21269	X	X	X	X	X	✓	✓	4,9
21270	X	X	X	X	X	✓	✓	3,8
21271	X	X	X	X	X	✓	✓	4,8
21272	X	X	X	X	X	✓	✓	6,4
21273	X	X	X	X	X	X	X	7,4
21274	X	X	X	✓	X	✓	X	3,7
21275	X	X	X	✓	X	✓	X	3,4
21276	X	X	X	X	X	X	X	7,5
21277	X	X	X	X	X	X	X	7,7
21278	X	X	X	X	✓	✓	✓	4,8
21279	X	X	X	X	✓	✓	✓	1,8
21280	X	X	X	X	✓	✓	✓	1,4
21281	X	X	X	X	✓	✓	✓	8,3

Property Description	30m watercourse buffer	30m 1:4 slope buffer	Irreplaceable (Very High SEI)	Population of plant Species of Conservation Concern	Buffer for bird Species of Conservation Concern	Well connected to any preceding reasons	Well connected to candidate offset sites beyond the precinct	Space available for Development (ha)
193/220	X	X	X	X	✓	X	✓	6,2
194/220	✓	✓	X	X	✓	✓	✓	2,4
195/220	✓	✓	X	X	X	✓	X	2,7
197/220	✓	✓	X	X	X	✓	X	1
198/220	✓	✓	X	X	X	✓	X	4,4
199/220	✓	✓	X	X	X	✓	X	2,1
200/220	✓	✓	X	X	X	✓	X	1,1
201/220	✓	✓	X	X	X	✓	X	3,2
202/220	✓	✓	X	X	X	✓	X	2,5
203/220	✓	✓	X	X	X	✓	X	2
205/220	X	✓	X	X	X	✓	✓	1,7
206/220	✓	✓	X	X	X	✓	✓	1,1
207/220	✓	✓	X	X	X	✓	✓	1,5
208/220	✓	✓	X	X	X	✓	X	2
209/220	X	X	X	X	X	✓	X	3,5
210/220	X	X	X	X	X	✓	X	5,2
211/220	X	X	X	X	X	✓	X	6,5
212/220	X	X	X	X	X	✓	X	5,5
213/220	X	X	X	X	X	✓	X	5,6
214/220	X	X	X	X	X	✓	X	3,1
215/220	X	X	X	X	X	✓	X	2,18
216/220	X	X	X	X	✓	✓	✓	3
217/220	X	X	X	X	X	X	X	6,8
256/220	✓	✓	X	X	X	✓	X	1,3
6/221	X	X	X	X	✓	✓	✓	8,4
RE/178/220	✓	X	✓	X	X	✓	X	3,4
RE/196/220	X	X	X	X	X	✓	X	5,3
RE/21246	✓	✓	X	X	X	✓	X	1
RE/252/220	✓	✓	X	X	X	✓	X	3,7
RE/4/221	✓	✓	X	X	X	✓	✓	7,9

6.2.3 Minimisation

The Aalwyndal precinct was identified in the Mossel Bay Growth Options Study (2015), Mossel Bay SDF/EMF (2022) and the Aalwyndal Precinct Plan (de Kock Associates, 2018) as a crucial intensification area which will facilitate urban expansion in Mossel Bay. Given the scale and planned zoning of the development proposed, little can be done to successfully minimize impacts outside of the Core Area. In addition, detailed, finalised plans of services (e.g. roads, sewage and stormwater infrastructure) are not currently available. As a result, the delineation of the Core Area itself does not take detailed conflicts between these services into account, which could undermine the potential effectiveness of the corridor for certain elements of biodiversity. It is therefore important that planning of these services must take the sensitivities of the Core Area and sensitive vegetation outside of the Core Area into account.

Development of areas outside of Core Area would not be exempt from the need for an Environmental Impact Assessment (EIA) process and possibly a Water Use Authorisation in terms of the National Water Act (Act No. 36 of 1998). During specialist assessments, additional mitigation measures designed to minimise both construction and operational phase impacts on habitats and biodiversity must be formulated. Appropriate implementation of such measures will be important to ensure that impacts are confined to the development footprint as far as possible and that secondary impacts to the Core Area and/or watercourses are minimised.

6.2.4 Rehabilitation, Realignment and Decommissioning

Some rehabilitation of Low and Very Low sensitivity areas that fall within the Core Area will be required. These areas have mostly been disturbed through vegetation removal and soil disturbance by current / previous owners. These areas could serve as receiving sites for plants rescued from High Sensitivity areas outside of the Core Area during the pre-construction phase. Topsoil removed during the construction phase of developments within the precinct could be used where soil rehabilitation is required as it will contain suitable and valuable seed for germination of indigenous plants from the area.

A small number of properties have driveways / access roads which would need to be re-aligned to alternative locations to ensure connectivity of the Core Area (Table 21). These conflicts have only been located where an alternative access road is available and appears to be feasible. The MBM town planning department would need to work with landowners in this case to approve alternative access routes if necessary. Where financing of the alternative access roads is provided through biodiversity offset credits or conservation levies the access road should be on a like for like basis (ie. The same standard).

Table 21. Summary of driveways to be realigned outside of the Core Area.

Property	Existing driveway to be removed	New driveway proposed
21260	85m dirt track from west	262m dirt track from south
214/220	165m dirt track from east	117m dirt track from north
215/220	216m dirt track from east	92m dirt track from west

Three dwellings are located in the Core Area. These are on Portions 216/220, 21251 and 22978. In these cases, the properties have landowners / buyers mostly intent on higher density development in areas outside of the Core Area on their property, and it is understood that decommissioning of the buildings and associated driveways within the Core Area would be considered.

It is envisaged that these issues would follow discussions with landowners and developers and would form conditions as part of final approvals for development granted by the MBM and DEA&DP.

6.2.5 Selection of Precinct Layouts for Comparative Impact Assessment

While the revised Core Area (V5) as presented in Figure 13 could be considered the preferred development alternative, this assessment also considers the impacts of the minimal conservation area proposed as the open space network by the Brownlie Precinct Plan. It is conventional when assessing the impacts of a development to consider at least two feasible alternative development scenarios. While it is acknowledged that the Brownlie Precinct Plan

was not specifically developed to comply with the requirements of the NBOG (DFFE, 2023), the Mossel Bay Municipality views this as a feasible alternative for meeting their development objectives and was used in the comparative impact assessment. The purpose of the comparative impact assessment in its current context was to compare the Confluent/EcoPulse Precinct Plan – CEPP (as defined by the Core Area presented in Figure 13) and the Brownlie Precinct Plan (BPP) in terms of satisfying the principles and objectives of the NBOG (DFFE, 2023), and to establish their residual negative impacts.

6.2.6 Residual Impacts and Offset Requirements

The definition of a Biodiversity Offset is provided in Box 1.

Box 1: Definition of a Biodiversity Offset
National Biodiversity Offset Guideline (NBOG; DFFE, 2023)

“Biodiversity offset” means the measurable outcome of compliance with a formal requirement contained in an Environmental Authorisations to implement an intervention that has the purpose of counterbalancing the residual negative impacts of an activity, or activities, on biodiversity, through increased protection and appropriate management, after every effort has been made to avoid and minimise impacts, and rehabilitate affected areas.

Following the application of the mitigation hierarchy, the residual impacts are negative impacts (including direct, indirect and cumulative) that remain after all reasonable and practical changes have been made to the location, scale, siting, technology and design of the proposed development. Residual negative impacts imply that the preceding steps in the mitigation hierarchy have been exhausted.

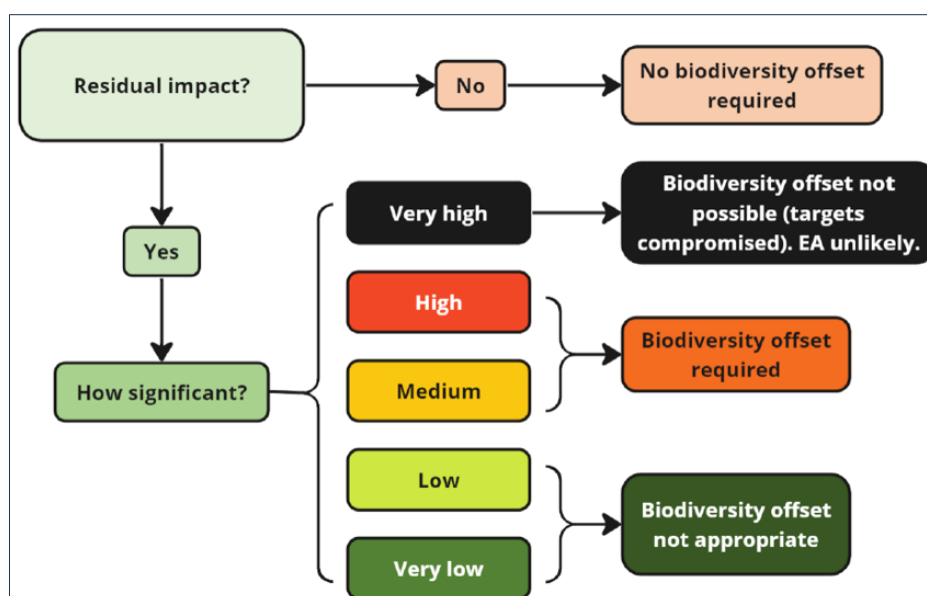


Figure 15. Offset decision tree adapted from the NBOG (DFFE, 2023).

According to the NBOG (DFFE, 2023) the principles underpinning biodiversity offsets are:

- Offsets are the final option in the mitigation hierarchy;

- Ecological equivalence (like for like) is the preferred offset type; trading up can be considered;
- Residual impacts on irreplaceable biodiversity cannot be offset;
- The significance of residual impacts on biodiversity must be considered in decision making involving biodiversity offsetting;
- Biodiversity offsets should embody the ecosystems approach and promote connectivity in the wider landscape;
- Long-term protection and management of priority biodiversity must result from a biodiversity offset.
- The design of offsets must be evidence-based and transparent;
- A risk averse and cautious approach must be adopted;
- Offsets must be fair and equitable;
- The timing of interventions requires that offsets occur before impacts;
- Offsets must be measurable, enforceable, and auditable.

In contrast to the Western Cape Guideline on Biodiversity Offsets (DEA&DP, 2015), the NBOG (DFFE, 2023) does not recognise out of kind offsets where a different type of habitat is protected in a priority conservation area. This is in opposition to the 'like for like' principle in the NBOG (DFFE, 2023). Furthermore, monetary compensation in the form of contributions to biodiversity conservation trusts for the purpose of managing priority biodiversity habitat is not acceptable in the NBOG as this may not achieve the 'like for like' principle.

The NBOG caters for biodiversity offset banks from which biodiversity credits can be purchased through an approved scheme approved by the relevant authority. Credits can only be traded in the same ecosystem or species habitat and must be of sufficient quantity. The DEA&DP has taken the approach that if conflicts arise between the Western Cape Guideline (DEA&DP, 2015) and the NBOG (DFFE, 2023), then the NBOG prevails. However, the Western Cape Guideline is currently being updated to remove any conflicts.

6.2.7 Impact Assessment

As described above the CEPP (Figure 13) was compared to the BPP. The open space network proposed in the BPP was mapped along with the updated Site Ecological Importance and watercourses determined for the precinct (Figure 16). According to calculations in Table 16, the total area conserved through open space in the BPP is 124.6 ha compared to 299.4 ha in the CEPP. Some areas of watercourse are also lost in the BPP which conserves 33.8 ha compared to the CEPP which conserves 37.3 ha of watercourses.



Figure 16. The open space network proposed by Brownlie in relation to the Site Ecological Importance and watercourses (excluding buffers) of Aalwyndal.

The CEPP will conserve approximately 48.8 % of the total precinct area, which includes 206 ha of High and Very High sensitivity vegetation, comprising mostly of the critically endangered MBSR vegetation type. However, 98 ha of High sensitivity vegetation (comprising mostly of endangered SSF vegetation type) will remain outside of the Core Area. All negative impacts on High sensitivity biodiversity can therefore not be avoided and, given the planned zoning of the precinct, impact minimisation applied within each development will not fully mitigate the cumulative impacts of the proposed activities on plant and terrestrial biodiversity in particular. Development outside of the Core Area will therefore have residual negative impacts on biodiversity which have been rated as High (Table 22). **An offset will therefore be required for the CEPP alternative.**

The alternative BPP will conserve 20 % of the total precinct area, which includes 73 ha of High and Very High sensitivity vegetation. The plan will however result in the loss of approximately 34 ha of critically endangered MBSR (which has been evaluated as being of Very High SEI) and SCC. Furthermore, minimal area covered by the open space proposed in the BPP offers little value in terms of connectivity both within and beyond the area of the precinct and is vulnerable to degradation and biodiversity loss over time due to high edge effects.

Residual negative impacts of the BPP (after mitigation, which includes the establishment of the 124.6 ha open space network) are Very High, which, according to NBOG (DFFE, 2023), cannot be offset, representing a fatal flaw in the development layout of the BPP.

Table 22: Assessment of residual negative impacts (after mitigation), following the methods recommended in the NBOG (DFFE, 2023) Western Cape Guideline on Biodiversity Offsets (2015). This assessment assesses impacts and mitigation thereof prior to the implementation of an offset.

Criteria	Confluent/Ecopulse Precinct Plan (High Conservation Alternative)	Brownlie Precinct Plan (Low Conservation Alternative)
Nature of impact:	Development of commercial and residential properties outside of the Core Area	Development of commercial and residential properties outside of the Core Area
Extent of impact:	Local: Limited to the site and the immediate surrounding area (1-10km).	Local: Limited to the site and the immediate surrounding area (1-10km).
Duration of impact:	Permanent: Commercial and high-density residential developments will result in the permanent transformation of high sensitivity vegetation on properties	Permanent: Commercial and high-density residential developments will result in the permanent transformation of high sensitivity vegetation on properties
Consequence of impact:	Loss of up to 96.1 ha high sensitivity vegetation (predominantly endangered SSF) and up to 67.1 ha medium sensitivity vegetation	Loss of 34 ha very high, 208 ha high and 91 ha medium sensitivity vegetation (predominantly endangered SSF as well as critically endangered MBSR).
Probability of occurrence:	Highly probable: Most likely that the impact will occur	Highly probable: Most likely that the impact will occur
Degree to which the impact may cause irreplaceable loss of resources:	Significant loss: 39 % and 70 % of high and medium sensitivity vegetation, respectively	Significant loss: 60 %, 82 % and 95 % of very high, high and medium sensitivity vegetation, respectively
Degree to which the impact can be reversed:	Irreversible: Commercial and high-density residential developments will result in the permanent transformation of high sensitivity vegetation on properties	Irreversible: Commercial and high-density residential developments will result in the permanent transformation of high sensitivity vegetation on properties
Cumulative impact prior to mitigation:	High	High
Significance rating of impact prior to mitigation	High Negative.	Very High Negative
Degree to which the impact can be avoided:	Low: the impact is difficult to avoid and will require significant mitigation measures	Low: the impact is difficult to avoid and will require significant mitigation measures
Degree to which the impact can be managed:	Low: the impact is difficult to manage and will require significant mitigation measures	Low: the impact is difficult to manage and will require significant mitigation measures
Degree to which the impact can be mitigated:	Moderate	Low
Proposed mitigation:	Avoidance: Establishment of Core Area for protection of 299 ha of Medium (29 ha), High (151 ha) and Very High (55 ha) sensitivity vegetation. Minimise: Minimisation of impacts as defined during EIA process	Avoidance: Establishment of Open Space network for protection of 73 ha of High and Very High sensitivity vegetation. Minimise: Minimisation of impacts as defined during EIA process
Residual impacts:	High: Irreversible and irreplaceable loss of ecosystem or species, including impacts on endangered SSF, and areas evaluated as being of High site ecological importance (SEI)	Very High: Irreversible and irreplaceable loss of ecosystem or species, including impacts on critically endangered MBSR, and areas evaluated as being of Very High site ecological importance (SEI)
Cumulative impact post mitigation:	Medium	High
Significance rating of impact after mitigation	High Negative.	Very High Negative

6.3 Conflict Layers and Practices

Land uses or activities that create a conflict with the objective of maintaining the integrity of the Core Area were considered in the present and future context, although the latter was poorly informed due to limited information available at the time of writing.

Conflicting land uses include any built infrastructure, disturbance or action that limits connectivity, activity that creates a hazard for wildlife, contributes to edge effects, requires ongoing disturbance (e.g. maintenance along servitudes), or represents a complete transformation/loss of habitat within the designated Core Area (e.g. construction of a new road). Conflicting land uses and practices considered were:

- Roads including road reserves which include existing roads as well as provisional future roads according to the MBM;
- Fencelines, assumed to be around each property, and possibly around each house (mainly for dogs), although the latter is not mapped. Each property boundary was used as a proxy for boundary fencing;
- Services including power, water and sewer lines which are often indicated by servitudes and by implication will be disturbed periodically for maintenance and upgrades.
- Free-roaming pets including cats and dogs can chase away, injure or kill a wide range of wildlife.

A map depicting the described infrastructure layers was compiled using the Layout Plan of Existing Civil Services (Tuiniqua Engineers, 2017) and the Existing and Proposed Electrical Network for Aalwyndal (CVW Electrical, 2017) along with a provisional roads layout provided by the MBM. This map is shown in Figure 17. Unfortunately, the new roads network for Aalwyndal has not yet been finalised, although a preliminary layout was provided by the MBM. The results from this assessment (revised precinct plan and SEI) were shared with SMEC Engineering who are further developing the roads layout with the aim to reduce conflict areas with the Core Area wherever feasible.

According to the Mossel Bay Municipality (2022) sewerage is currently handled by a combination of suction and septic tanks with soak-aways. The closest waterborne sewerage reticulation is in the residential suburb of Island View to which any future sewerage reticulation in Aalwyndal will need to be linked. No master planning for sewerage reticulation in Aalwyndal had been completed at the time of writing.



Figure 17. Conflict Layers identified for the revised precinct layout.

The existing civil services including water, sewer and electrical lines all follow existing roads or alternatively follow a servitude along the northern boundary of the Aalwyndal precinct (Figure 17). The servitude is presumably not disturbed on a continuous basis, and many signs of animals using the access road were observed during a site visit.

For the most part, the Core Area has been laid out to exclude existing infrastructure and areas of Low and Very Low SEI that have high levels of transformation. This means that the continuity of the corridor is not ideal at times and could create localised edge-related impacts (Figure 18). Existing and future residential developments bring pets which can seriously impact on wildlife. Recommendations will therefore be to install pet-proof fencing around the perimeter of the Core Area.

Potable water is currently supplied via two reservoirs, being the Aalwyndal Reservoir on Erf 21281 and the Langeberg Reservoir northeast of the precinct. Most power lines have an overhead and underground component, and pipelines are mostly underground. This implies that periodic maintenance is required which can involve heavy machinery and excavations.

Aalwyndal currently has no formal sewerage systems in place and properties generally utilise septic tanks. In the future development scenario, it will be necessary to install new sewer pipelines and upgrade pump stations.

A stormwater master plan had been recently compiled at the time of writing (Sky High Consulting, 2024). While this plan was not compiled at the detailed design level it made some recommendations about stormwater management for future development:

- Post-development peak runoff must be reduced on-site to match pre-development rates for storms ranging from 1:5 year to 1:50 year intervals, based on each development's Site Development Plan (SDP).
- Parameters like slopes, flow paths, and impervious areas must be calculated from the SDP to determine post-development flows, and attenuation facilities sized accordingly.
- Attenuation facilities must include a forebay for litter and sediment collection, a main storage area for runoff, and a controlled outlet to discharge water at pre-development rates.

It is expected that most stormwater pipelines will follow existing and internal roads within developments, and any additional attenuation structures required to achieve the stormwater management guidelines must be located within the development area. Not the Core Area. Every effort should be made in the planning and design phase of each development to ensure that stormwater-related infrastructure (pipes and outlets) are kept out of the Core Area. This means the principles of SuDS (Sustainable Drainage Systems) are reviewed and implemented wherever possible.

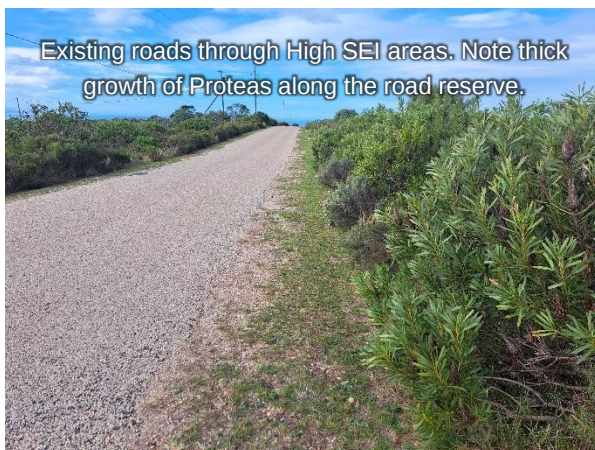
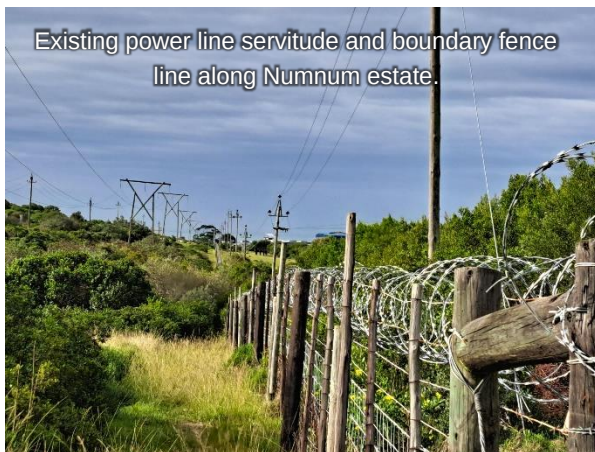




Figure 18. Photos of conflicting land use, activities or infrastructure which could compromise the value of the Core Area if not effectively addressed.

Perimeter fencing in Aalwyndal currently varies dramatically from solid brick walls to wire mesh fences of various types (most common), and some low security single strand wire fences on less developed erven. Fencing occurs around most erven to some degree at present, which is why property boundaries were used as a proxy for fencing (Figure 17). Several properties that have been inspected in detail have wire fencing that would exclude the movement of larger mammals like buck across property boundaries, but small wildlife like porcupines and mongoose have managed to dig scrapes beneath the fences to get through (Figure 19). An additional impact to vegetation is that landowners are required to clear firebreaks along their boundary fence-line of 4m wide. While firebreaks are necessary for risk management the incorporation of multiple properties into the Core Area means that these areas can be reduced. Details of suitable blocks for burning and firebreaks would form part of a Fire Management Plan which must be developed for Aalwyndal.



Figure 19. Fencelines showing typical animal scrapes underneath the fence (left) and cleared strips along fence lines for firebreaks (right).

It is anticipated that the revised precinct plan will be used as a biodiversity overlay zone once approved, which will be used to inform layouts of future infrastructure. Current and anticipated conflict layers were reviewed and measures that could potentially avoid or minimise conflicts were provided (Table 23).

Table 23. Conflict points within the proposed core area with possible solutions to reduce these impacts.

Conflict Point	High Level Solutions
Existing roads crossing through the Core Area.	- Traffic calming measures on either side of <i>at least</i> one corridor connection per affected road. These areas should become formal crossing zones for wildlife. - Set the minimum possible speed limit for Aalwyn Way. Speeding is already a problem on this road. - Install box culverts beneath the road to act as an underpass. Crossing zones will therefore need to be planned where culverts can be feasibly constructed. - Minimise street lighting in these areas or install low level bollards with amber coloured LEDs instead of elevated lights. - Any planned road expansions should aim to remain within the road reserve while accommodating space for new or existing services. - As far as possible, expansion of roads and services should not encroach into the Core Area.
Planning new roads.	- Consider re-routing historically planned roads west of Aalwyndal precinct, as these intersect areas of Very High SEI related to fauna and flora (numerous plant and bird SCCs). - As far as possible, no further fragmentation of Very High SEI habitat should occur. There are roads planned in areas of Very High SEI where alternative alignments should be considered. - Avoid fragmentation of High SEI areas where areas are continuous or located within the proposed Core Area. - Watercourse crossings should be perpendicular and not run alongside the aquatic feature. - Use existing roads and boundaries as far as possible. - Follow lines of existing disturbance (Low and Very Low SEI as far as possible) - Avoid 1:4 steep slopes and watercourse crossings as far as possible.
Some proposed roads are aligned along watercourses and in buffers with more crossings than appear to be necessary.	- Aim for perpendicular crossings at watercourses. - Avoid roads that run along watercourses or buffers as this significantly increases impacts. - Provided this feedback to MBM and SMEC engineers along with sensitivity layers to inform the finalisation of roads layout.
Property boundary fence lines that intersect the Core Area.	- All internal fencing intersecting the corridor should be removed when a section of the Core Area is being established. - Fencing of the Core Area will be standardised with the aim of ensuring security, protecting wildlife, and excluding pets. - Where fencing across the corridor is essential, consider options such as palisade which allow small mammals and reptiles freedom of movement. Periodic larger openings at inconspicuous points could be created for larger mammals such as buck. This could potentially work well along wildlife crossing points at roads.

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