

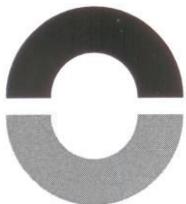
BOTANICAL ASSESSMENT

PROPOSED GREEN VALLEY AFFORDABLE HOUSING PROJECT ON PORTIONS 28 & 32 OF ERF 306, PLETTENBERG BAY

October 2017



View from northern end of proposed development site towards settlement on western side.



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Pr Sci Nat (reg. no. 400073/98)

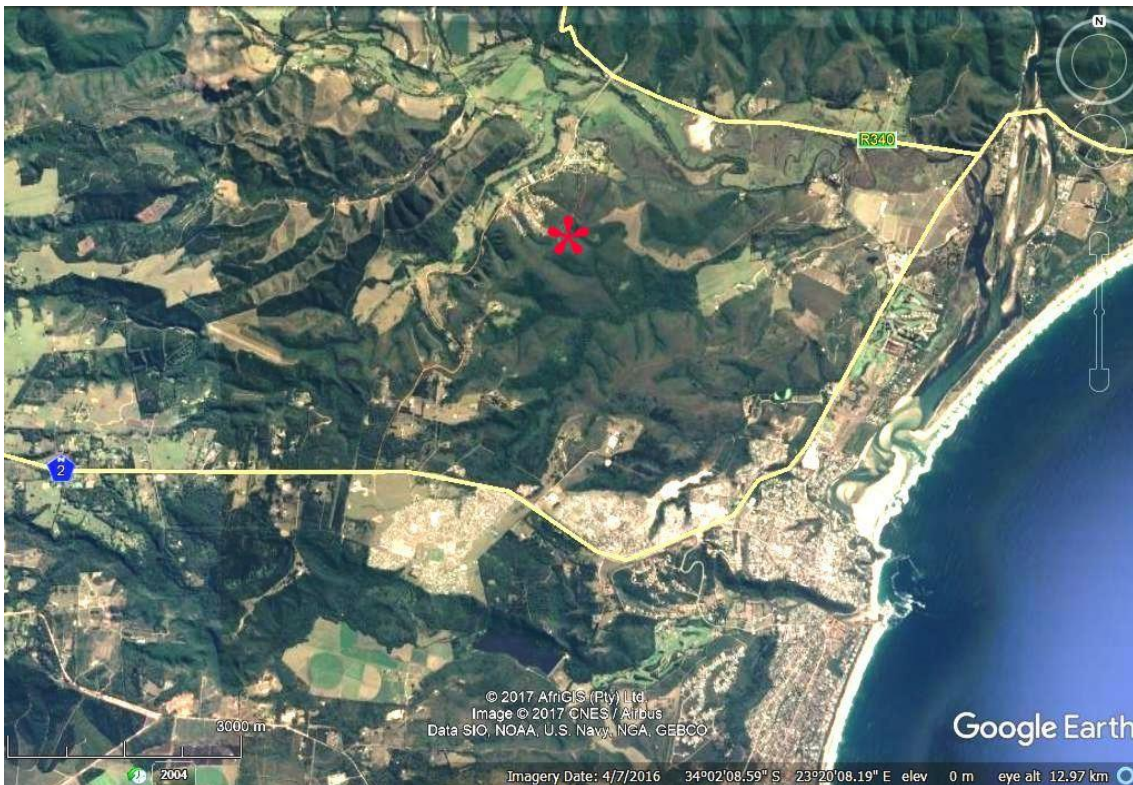
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1 INTRODUCTION

This report investigates the botanical impacts of a proposed affordable housing project on Portions 28 and 32 of Erf 306, northwest of Plettenberg Bay (see Map 1). The site is located on top of a hill directly above the Wittedrif settlement. Significant stretches of fynbos, as well as forest elements in the small valleys, were recorded. Disturbances, such as the remains of dwellings and other built structures, past farming activities, farm tracks, informal tracks, cattle grazing, alien plant infestation and wood collecting, were also noted in the area.



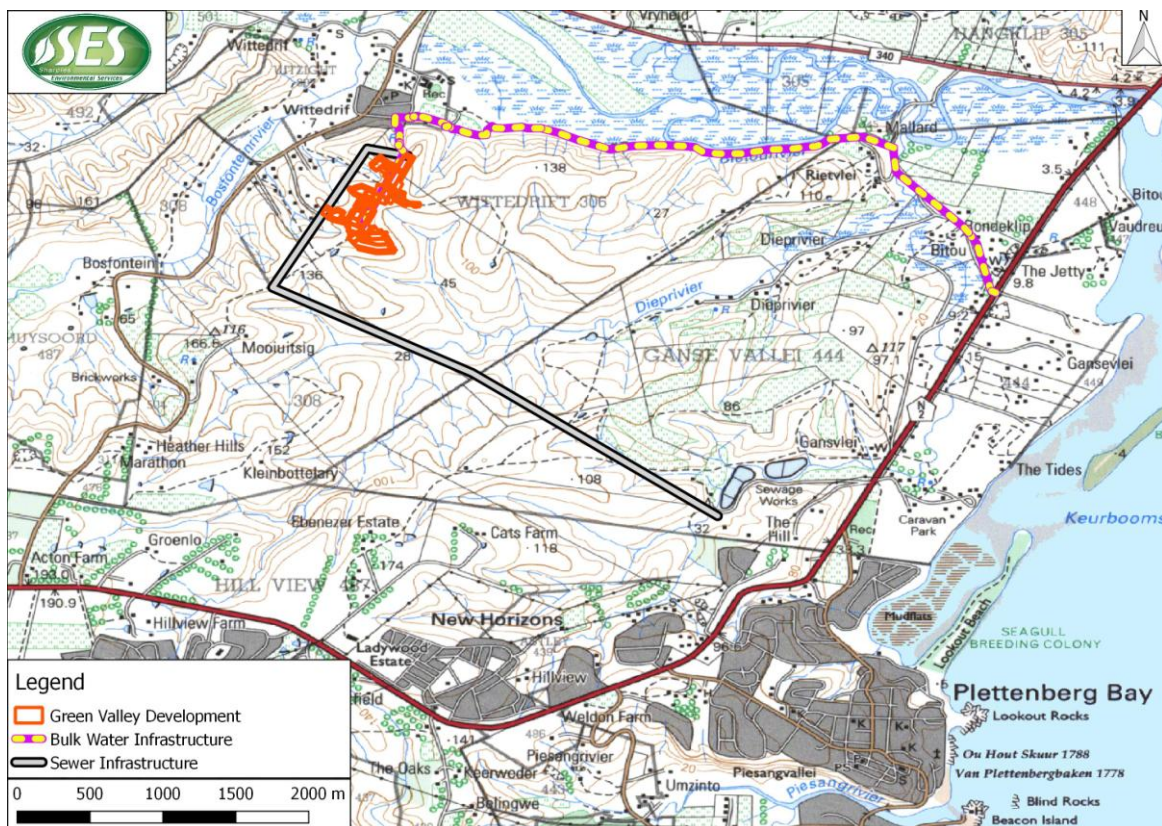
Map 1 Satellite photo showing the location of proposed project (red asterisk) northwest of Plettenberg Bay.

2 PROJECT DESCRIPTION

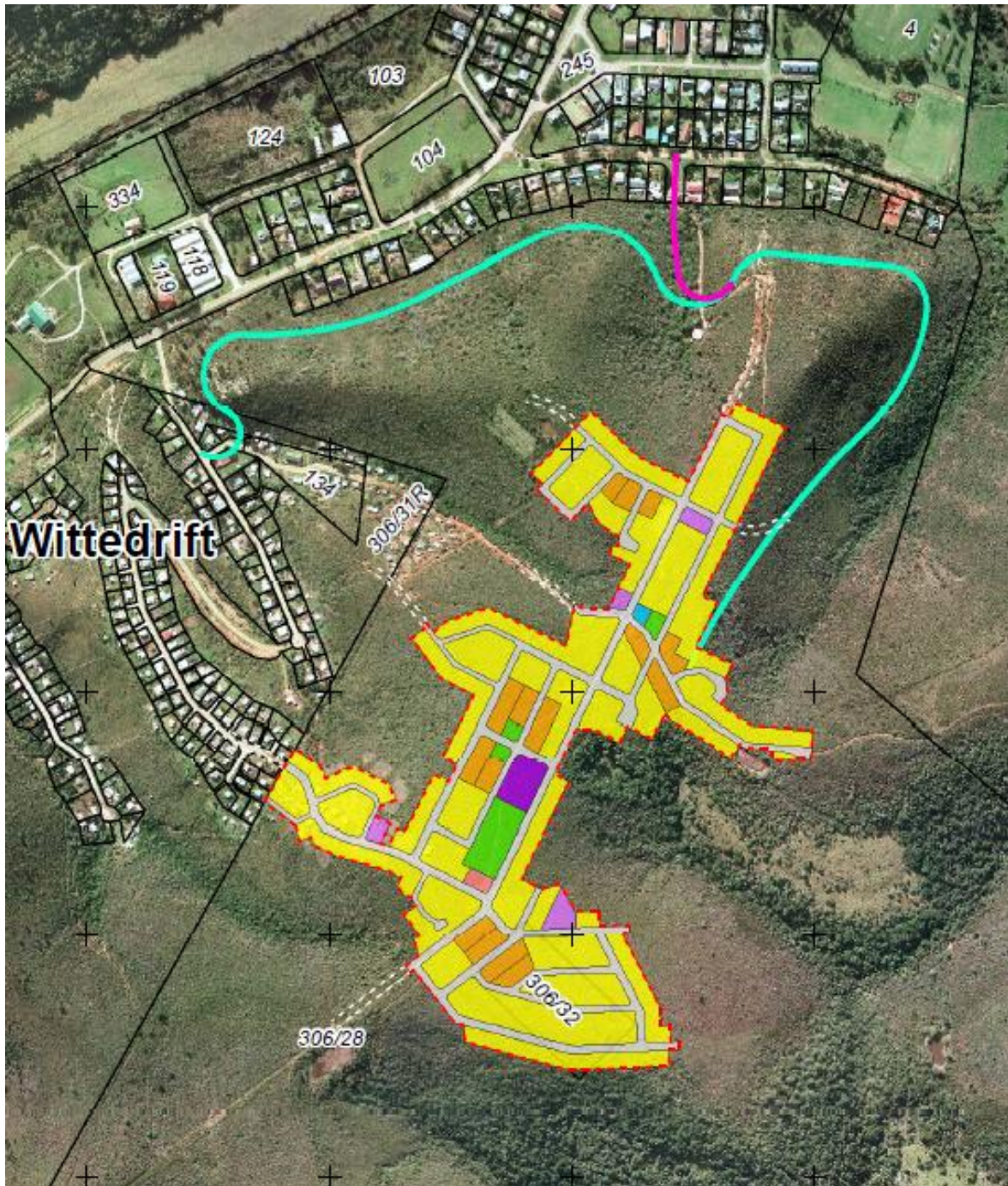
The Bitou Municipality proposes to develop a mixed-use development, consisting mainly of low and middle income housing units (730 units), and associated infrastructure (access roads, water supply and sewage pipelines). In addition, a business erf, community centre, an early childhood development centre, places of worship, and public open spaces are proposed. The development footprint is estimated to be 19.34 ha, excluding the bulk water and sewer infrastructure. It is further proposed to construct a ± 6 km long water supply pipeline to the N2, as well as a ± 5 km bulk sewer pipeline to the Ganse Valley wastewater treatment works (WWTW). The footprint of the bulk water and sewage infrastructure is estimated at ± 17 ha. The total development footprint, inclusive of services infrastructure, is therefore ± 36.34 ha.

The following is proposed to be developed (see Maps 2 & 3):

Type of Development	Number	Size
High density row housing	170 units	1.57 ha
Single storey residential	560 units	12 ha
Business	1 erf	0.04 ha
Community use	1 erf	0.27 ha
Early childhood development centre	1	0.06 ha
Place of worship	4	0.32 ha
POS	4	0.53 ha
Roads (preferred alternative)	1	4.55 ha
SUB TOTAL DEVELOPMENT FOOTPRINT *Excluding POS & bulk infrastructure		19.34 ha
Bulk sewage pipeline infrastructure *a new pump station is also proposed not included in the development footprint	5191 m x 160 mm \varnothing	\pm 8 ha
Bulk Water Pipeline Infrastructure *a new sump, 3 x booster pump stations, and a new reservoir is also proposed not included in the development footprint	355 m x 160 mm \varnothing 738 m x 160 mm \varnothing 4923 m x 355 mm \varnothing	\pm 9 ha
SUB TOTAL DEVELOPMENT FOOTPRINT		\pm17 ha
TOTAL DEVELOPMENT FOOTPRINT *Including POS and including bulk services		\pm36.34 ha



Map 2 Overall layout plan showing the position of proposed development and sewage and water supply pipelines.

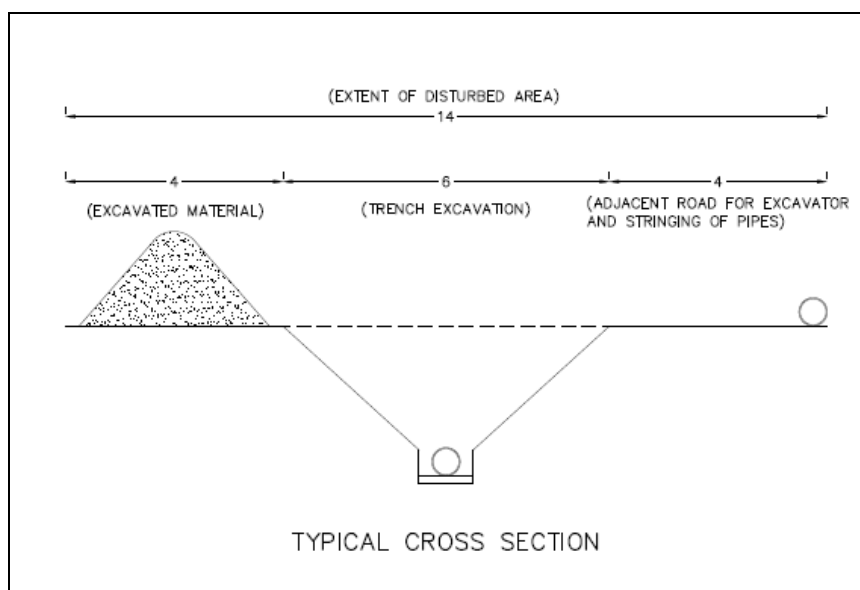


Map 3 Layout plan of the proposed mixed use development and access roads (blue and pink).

It is important to note that the sewer and water supply infrastructure identified and mapped by GLS Consulting is a preliminary assessment based on the 2016 Plettenberg Bay water and sewer master plans. A more detailed bulk water and sewer capacity report is therefore required before construction can take place. Without detailed design plans available at this stage, it has been estimated that the minimum required width for the proposed sewage and water supply pipelines is ± 15 m. Therefore, the development footprint for the bulk sewage infrastructure is ± 8 ha and that for the water supply infrastructure is ± 9 ha.

Anticipated construction activities along the pipeline route include trench excavation,

stockpiling of excavated material and road for use by excavator and stringing of pipes. A typical cross section is proposed to look like the cross section shown in the figure below:



3 TERMS OF REFERENCE

The terms of reference for this study are as follows:

- To determine if vegetation of high conservation value will be affected by the project. Reference will be made to its conservation value and potential impact on ecological linkages, CBA's, etc.
- To determine if any rare and threatened (Species of Conservation Concern) plant species will be affected.
- To assess the presented alternatives (if any) in terms of the identified impacts.
- To propose mitigation measures to be included in the Environmental Management Programme and/or conditions of approval to ensure that the impact on biodiversity is minimised.

4 METHODOLOGY

A botanical survey of the site was undertaken on 31 August 2017 by Mark Berry (see CV attached). A qualitative assessment of the type and condition of affected vegetation on site, disturbances and presence of alien species, Species of Conservation Concern and protected species was carried out. Plant species not identified in the field, were collected or photographed and identified at the Compton Herbarium at Kirstenbosch. Mucina & Rutherford's vegetation map and the latest floristic taxonomic literature and reference books were used for the purpose of this specialist study. Any plants classified as rare or endangered

in the Red List of South African Plants online database are highlighted. The assessment of the impacts follows Brownlie's (2005) guidelines for biodiversity assessments.

The following information was recorded during the site visit:

1. The condition of the vegetation. Is the vegetation either disturbed or degraded? A disturbed or degraded area could range from old/existing agricultural fields (fallow land), or areas previously disturbed by construction activities, to an area that has been severely eroded or degraded as a result of bad land management.
2. The species diversity. This refers to the numbers of different indigenous plant species occurring on site. Indigenous fauna will also be noted.
3. Species of Conservation Concern, as well as protected tree species occurring on site. This would include rare, vulnerable, endangered or critically endangered plants and animals (where possible).
4. Fatal flaws. These would include finding large numbers of threatened plants, local endemics or protected tree species that would be negatively impacted upon if project was allowed to continue.
5. Identification of the vegetation type(s) on the site. This would include trying to establish the known range of a vegetation type and whether or not this vegetation type is vulnerable (VU), endangered (EN) or critically endangered (CR).

5 LIMITATIONS TO THE STUDY

The vegetation affected by the proposed sewer and water supply pipelines was not assessed as the plans were presented to the specialist after the fieldwork was carried out. Only a desktop study was undertaken. A recent veld fire has also affected a large part of the site, which has made mapping of the vegetation difficult. Since fieldwork was carried out at the beginning of the spring season, flowering plants that only flower at other times of the year (e.g. late spring and autumn) may have been missed. For example, a few orchid species and other bulbs were recorded, but these could not be identified to species level as it only flowers later in the spring season. Take note that Plettenberg Bay receives most of its rain during summer and autumn, which may lead to a wider or more even spread of flowering times throughout the year. The overall confidence in the completeness and accuracy of the botanical findings of the area surveyed is considered to be fair to good.

6 LOCALITY & BRIEF SITE DESCRIPTION

The study site is located on a hill northwest of Plettenberg Bay, overlooking a subsidiary valley of the Bietou River in the Southern Cape. While significant areas, especially along the coast

and in the valleys around Plettenberg Bay, are still covered with good quality fynbos and forest, urban development and agriculture has transformed large parts of the landscape. Stretches of good quality fynbos, and Afrotemperate forest elements in the valleys, were recorded on site (see Photo 1). A large part of the site was affected by a recent veld fire (March 2017, see Photo 2). Considerable alien infestation was recorded, especially on the slopes directly above Wittedrif (see Photo 3).

The proposed development site is located inside good quality fynbos, fallow land (advanced succession), as well as highly disturbed areas. A part of the site on the western side extends into the informal settlement area of Wittedrif. Four impoundments (small farm dams) were recorded on and adjacent to the site. Disturbances, such as past agricultural activities (pastures), remains of informal dwellings and other built structures, farm tracks, informal tracks, cattle grazing, wood collecting and alien infestation, were noted. According to the 3322 Oudtshoorn 1:250 000 geological map, the site is underlain by Enon conglomerate of Cretaceous to Tertiary age.



Photo 1 Good quality fynbos in the centre of site overlooking a patch of forest inside the small valley directly east of site.



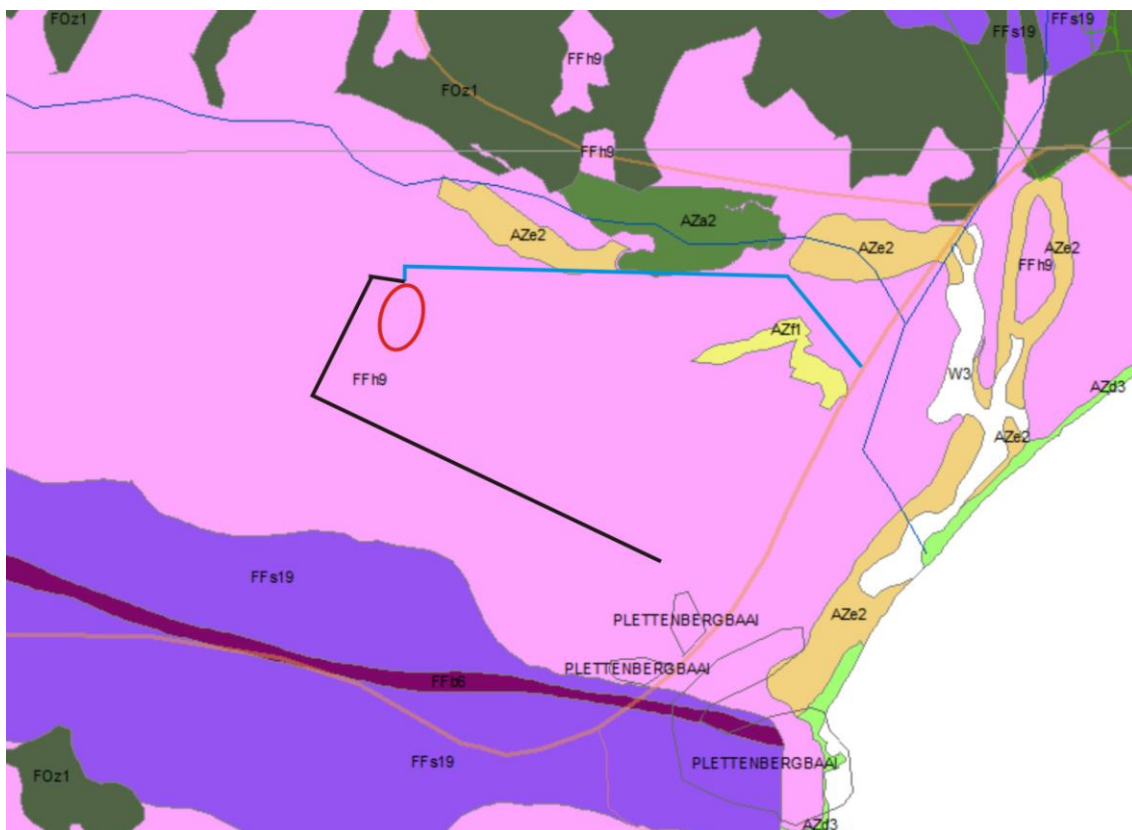
Photo 2 A termite (snout harvester termite) mound inside a patch of burnt fynbos in the central part of site.



Photo 3 A section of the hillslope above Wittedrif, with the lower slope infested with rooikrans.

7 BIOGEOGRAPHICAL CONTEXT

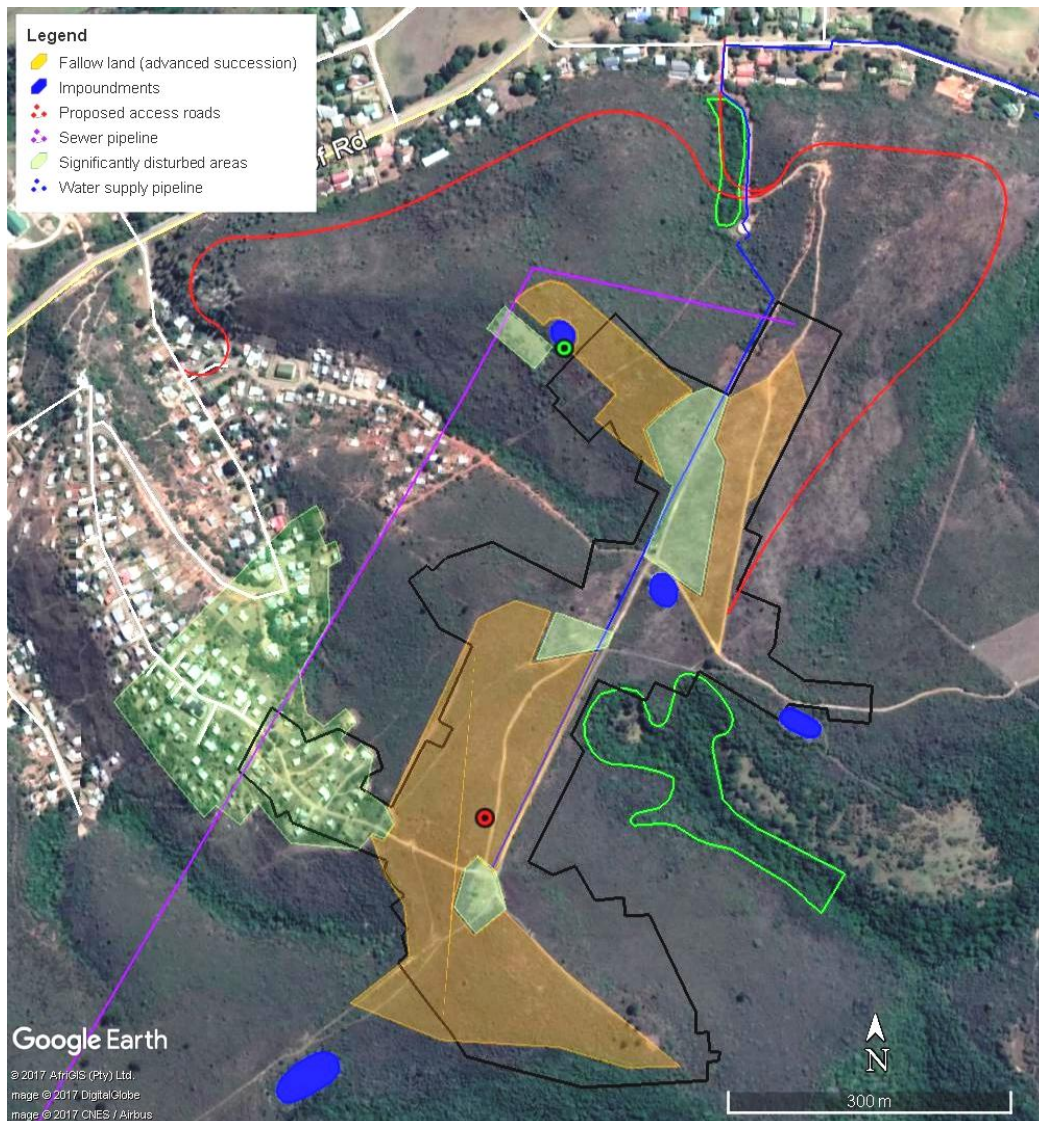
The study site is located in a typical fynbos environment on the Southern Cape coastal plain. This is confirmed by the presence of characteristic fynbos species, such as *Leucadendron salignum* and *Erica sparsa*. The Vegetation Map of South Africa (Mucina & Rutherford 2006) classifies the main vegetation found in the area as Garden Route Shale Fynbos (see Map 4). Please note that the mapped vegetation units as shown on Map 4 have not changed for the latest (2017) vegetation map. Garden Route Shale Fynbos occurs in patches along the coastal foothills from northeast of Heidelberg in the Western Cape to Clarkson in the Eastern Cape (Mucina & Rutherford 2006). Garden Route Shale Fynbos, along with South Outeniqua Sandstone Fynbos, is found on the undulating hills and plains of the coastal lowlands. Less than 50% of Garden Route Shale Fynbos is still left. Southern Afrotemperate Forest elements are also found in the small valleys around the site. The proposed water supply pipeline skirts Cape Estuarine Salt Marshes (AZe2) and Cape Lowland Alluvial Vegetation (AZa2) found along the Bietou River.



Map 4 Extract of the SA Vegetation Map (Mucina & Rutherford 2006), showing the position of the study site (red oval) inside Garden Route Shale Fynbos (FFh9). Also shown are the positions of the proposed sewage (black) and water supply (blue) pipelines. Other mapped vegetation units found in the area are South Outeniqua Sandstone Fynbos (FFs19), Southern Afrotemperate Forest (FOz1) and azonal types associated with the Bietou River.

8 VEGETATION & FLORA

The observed fynbos has been mapped as Garden Route Shale Fynbos, but shows the same floristic characteristics as South Outeniqua Sandstone Fynbos found on the Ebenhaezer site 2.5 km away to the south. Like the latter it is also found on a sandstone derived substratum, i.e. Enon conglomerate. This questions the reliability (and legitimacy) of the vegetation unit boundaries at this scale. As noted earlier large parts of the site have been affected by a recent veld fire (March 2017). The remaining fynbos can be described as senescent (woody) and infested with woody aliens (notably black wattle, rooikrans and black wood) on some of the steeper slopes. Structurally, it can be described as a mid-high (1.5-1.8 m) ericoid fynbos due to a dominance of micro-leaved shrubs, such as *Erica sparsa* and *Passerina corymbosa*. Map 5 shows the development footprint superimposed on the vegetation recorded on site.



Map 5 Satellite photo showing the proposed development site (outlined in black) and associated infrastructure. The areas outlined in green are forest areas, while the red marker indicates the position of a single *Euphorbia procumbens* and the green marker a milkwood tree. The remainder of site not shown as disturbed is considered good quality fynbos.

Significant areas on site have been disturbed by past farming activities (see Photos 4 & 5), some of which are in an advanced stage of succession. A recent veld fire (March 2017) has made an assessment of the condition of the veld in some areas difficult or impossible. A small area (540 m²) of forest is being encroached by the development on the eastern side. Good quality fynbos, however, remains on a significant part of the site and adjacent areas. The proposed access roads also run through relatively undisturbed fynbos, with the section directly above the village infested with rooikrans and some pines at the western end before the proposed road enters the village.

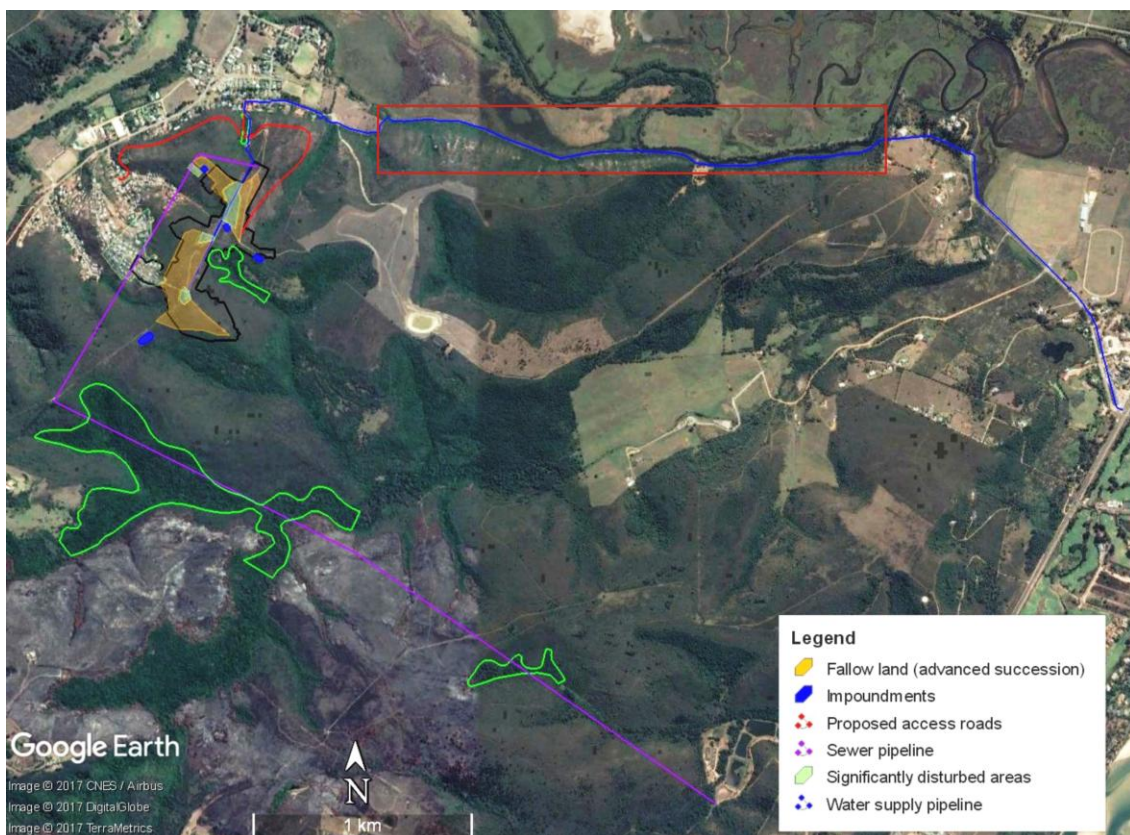
Historical Google Earth images were used to determine the approximate boundaries of the disturbed areas. The proposed water supply pipeline runs for its most part alongside existing roads and farm roads, some of it along what appears to be a thicket fringing the Bietou River (see Map 6). A 1 km section appears to run through an undisturbed stretch of fringe thicket. The proposed sewer line runs for its majority through undisturbed fynbos, and crosses a few forest patches in the smaller valleys (see Map 6).



Photo 4 One of several farm tracks through the site. Insert: *Euphorbia procumbens*



Photo 5 An area on site disturbed by past farming activities. Insert: *Babiana sambucina*



Map 6 Satellite photo of the overall study area. The areas outlined in green are perceived forest areas. The red boxed area is regarded as botanically highly sensitive, as well as the almost entire sewer line route which runs through undisturbed fynbos.

The following indigenous shrub species were recorded in the fynbos areas, namely *Leucadendron salignum*, *Passerina corymbosa* (dominant), *Struthiola cf. hirsuta*, *Searsia lucida*, *S. pallens*, *Erica sparsa* (dominant), *Osteospermum moniliferum*, *Helichrysum nudifolium*, *H. anomalum*, *Metalasia pungens*, *Conyza scabrida*, *Euryops virgineus* (dominant), *Ursinia anethoides*, *Notobubon laevigatum*, *Anthospermum aethiopicum*, *Diospyros dichrophylla*, *Hermannia flammea*, *Muralthia ericaefolia*, *Polygala garcinii*, *Indigofera cf. heterophylla*, *Otholobium cf. stachyerum*, *Asparagus suaveolens*, *Pelargonium candicans*, *Grewia occidentalis*, *Agathosma ovata*, *Freylinia undulata*, *Colpoon compressum* and *Euphorbia procumbens*. A single milkwood tree (*Sideroxylon inerme*) was recorded next to an impoundment nearby the northern end of the site.

Annuals, herbaceous species, hemicryptophytes and bulbs recorded (mainly in the fynbos) include *Monsonia emarginata*, *Selago corymbosa*, *Arctopus echinatus*, *Paspalum urvillei* (in the waterbodies), *Typha capensis* (in the waterbodies), *Babiana sambucina* subsp. *sambucina*, *Bobartia aphylla* and *Ornithogalum cf. dubium*. A few orchid species (*Satyrium* spp) were also recorded, but these were not in flower during the time of the survey and could not be identified. Members of the Restionaceae family are conspicuously absent, while Proteaceae is also relatively scarce. Scarcity of the latter can be ascribed to the lack of regular fires, which are required by sprouting members of the protea family, such as *Leucadendron salignum*. Restios also need fire in order to recruit successfully, but is also being replaced by C4 grasses as one move further eastwards into the summer rainfall region.

The following indigenous tree, shrub and creeping species were recorded in the Afrotropical forest elements directly east of the site and inside the depression in which one of the access road alternatives (pink route) is located, namely *Cassine peragua*, *Elaeodendron croceum*, *Lachnostylis hirta*, *Carissa bispinosa*, *Pterocelastrus tricuspidatus*, *Euclea schimperi*, *Olea capensis* subsp. *capensis*, *O. europaea*, *Pittosporum viridiflorum*, *Searsia refracta*, *Tarchonanthus littoralis*, *Scutia myrtina*, *Capparis sepriaria*, *Ochna serrulata*, *Burchellia bubaline*, *Asparagus racemosus* and *Kedrostis nana*. A *Viscum* species was also recorded parasitizing on the taller shrubs/trees.

Invasive woody aliens are abundant on the lower slopes, including black wattle (*Acacia mearnsii*), blackwood (*Acacia melanoxylon*), rooikrans (*Acacia cyclops*), port jackson (*Acacia saligna*), pines (*Pinus pinaster*) and hakea (*Hakea sericea*). Black wattle, which is indicative of past disturbances, is considered a serious threat to the environment and very difficult to control. In terms of the National Environmental Management: Biodiversity Act (Act 10 of 2004)

Alien and Invasive Species List (2016), the harbouring of black wattle and blackwood on a property is prohibited without a permit.

Species of Conservation Concern and protected tree species

Euphorbia procumbens is a potential Species of Conservation Concern¹ recorded on site. Despite being widespread between Riversdale and the Eastern Cape, its numbers are very low, with no collection records from the Plettenberg Bay area. Other known Species of Conservation Concern found in Garden Route Shale Fynbos, which may occur in the general area are *Ruschia duthiae* (Vul), *Erica glandulosa* subsp. *fourcadei* (Vul), *Acmadenia alternifolia* (Vul), *Felicia westae* (En), *Selago burchellii* (Vul) and *Muraltia knysnaensis* (En) (see online Red List of South African Plants). *Acmadenia alternifolia* is more common on steeper, rockier coastal areas, while *Felicia westae* is found along stream banks in low-lying areas. The latter, which habitat has been severely degraded by alien infestation, has apparently not been recorded since 1944. A single *Sideroxylon inerme* (protected tree species) was recorded on the side of an impoundment nearby the northern end of the site.

9 CONSERVATION STATUS OF THE AFFECTED VEGETATION TYPES & CRITICAL BIODIVERSITY AREAS

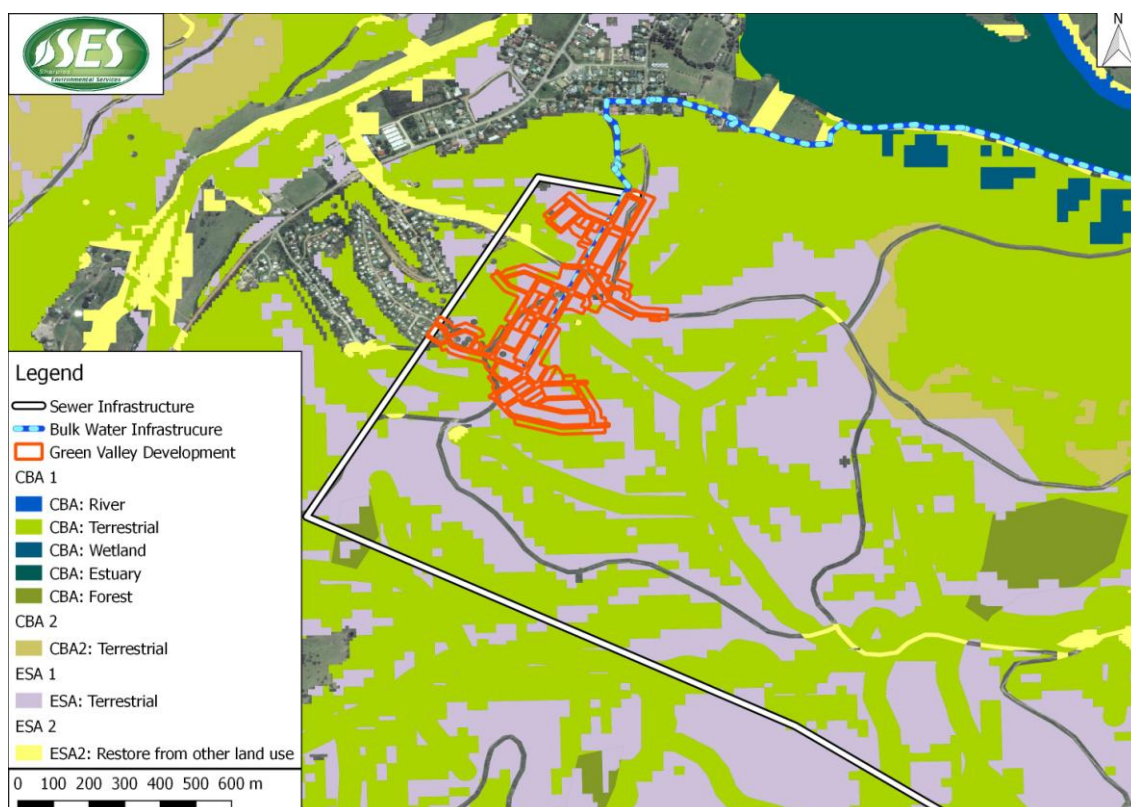
Less than 50% of Garden Route Shale Fynbos is still left and it is currently listed as Endangered in the 2017 Western Cape Biodiversity Spatial Plan (Pool-Stanvliet *et al.* 2017). Garden Route Shale Fynbos, along with other lowland fynbos types, has been significantly transformed by cultivation, pine plantations and urban development. Only 4% of Garden Route Shale Fynbos is formally protected in the Garden Route National Park and Boosmansbos Wilderness Area, Therefore, its protection should remain a priority in the coastal areas.

Southern Afrotropical Forest is still well represented in the larger area, with 97% still remaining (Mucina & Rutherford 2006). Nearly 60% of the original area of Southern Afrotropical Forest is formally conserved in the Garden Route National Park, Table Mountain National Park and numerous nature reserves. Only a small portion of forest has been transformed for plantations. The proposed water supply pipeline also encroaches on mapped Cape Estuarine Salt Marshes and Cape Lowland Alluvial Vegetation (see Maps 4 & 6). With less than 30% left and only 1% formally conserved, the latter is considered to be Critically Endangered. Cape Estuarine Salt Marshes is not threatened, with 21% formally

¹ The Red List of South African Plants (Raimondo *et al.* 2009) has assessed all plant species in South Africa, and all indigenous species are now technically Red Data Book species, and thus it is preferable to use the term Species of Conservation Concern to refer to species that are listed as either Threatened or Rare.

conserved in the West Coast and Garden Route National Parks, and several other nature reserves.

Map 7 shows the Critical Biodiversity Area's (CBA's) and Ecological Support Areas (ESA's) that are affected by the project. Being positioned mainly on the hilltop, the proposed development site is located mainly inside a mapped ESA. The CBA's are associated with the steeper slopes below the development site. The associated infrastructure, such as the access roads, sewage and water supply pipelines, are located inside a mixture of CBA's, ESA's and transformed areas. A section of the water supply pipeline runs along a boundary between an aquatic CBA (Bietou River floodplain) and terrestrial CBA (Garden Route Shale Fynbos). The terrestrial CBA's are associated with the main drainage courses and steeper slopes, while the ESA's fill out the areas in between. The authors of the CBA map argue that the drainage courses and steeper slopes, being cooler and moister, serve as refuges for biodiversity during climate change and that it should be protected.



Map 7 Critical Biodiversity Areas (CBA) map², showing the proposed development site (orange) and associated sewer and water supply pipelines superimposed on CBA's (green) and ESA's (purple).

CBA's are areas that are required to meet biodiversity targets for species, ecosystems or ecological processes and infrastructure (Pool-Stanvliet *et al.* 2017). These are areas of high

² The CBA layers were obtained from the 2017 Western Cape Biodiversity Spatial Plan online database.

biodiversity and ecological value and need to be kept in a natural or near-natural state, with no further loss of habitat or species. Only low-impact, biodiversity-sensitive land uses are considered appropriate in these areas. ESA's, on the other hand, are not essential for meeting biodiversity targets, but play an important role in supporting the functioning of protected areas and CBA's (Pool-Stanvliet *et al.* 2017). They include features such as regional climate adaptation corridors, water source and recharge areas, riparian habitat surrounding rivers or wetlands, and endangered vegetation.

10 IMPACT OF THE PROPOSED DEVELOPMENT ON BIODIVERSITY

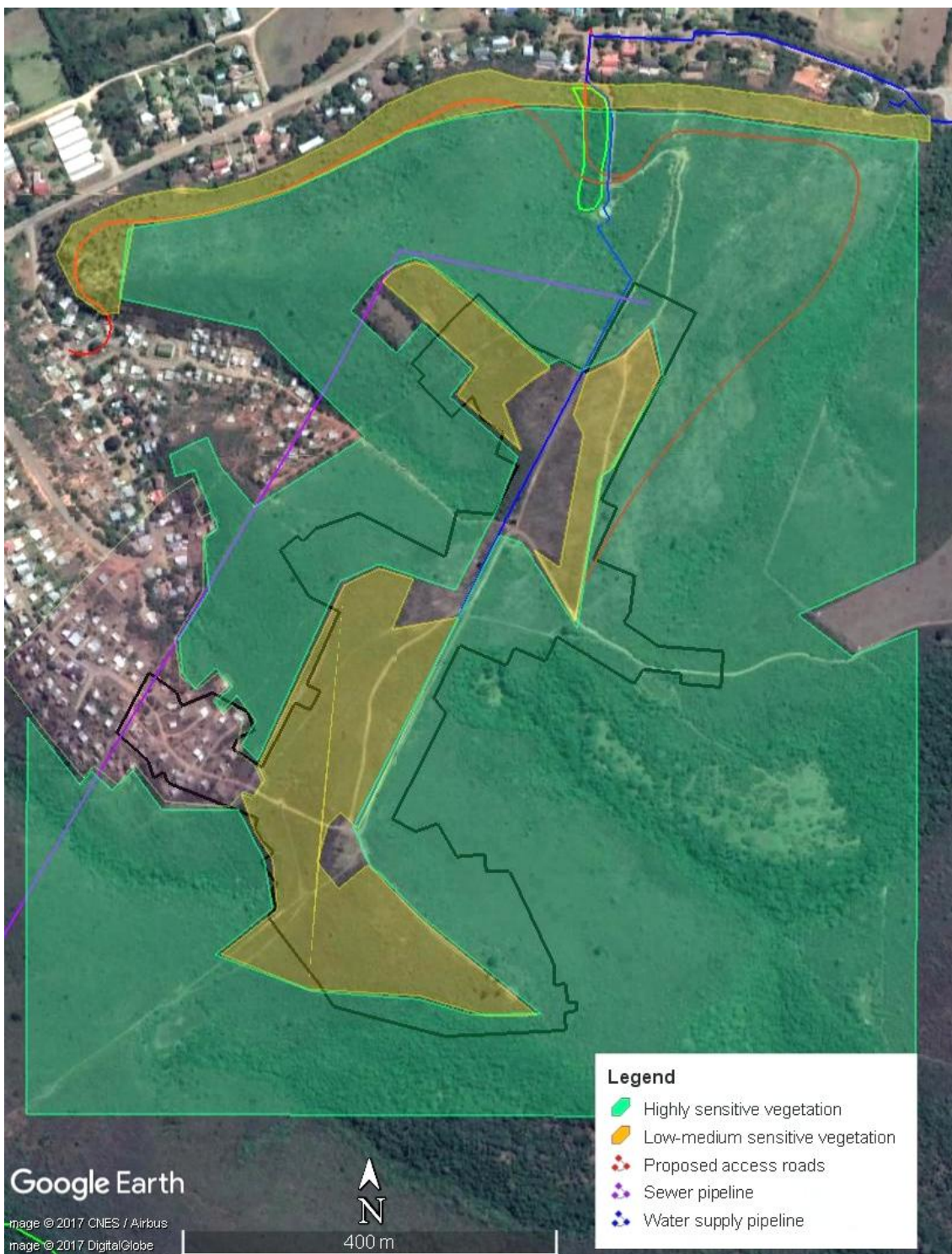
The proposed development site is located on a mixture of undisturbed fynbos, fallow land (in advanced succession) and highly disturbed or transformed areas. The vegetation type directly affected by the project, namely Garden Route Shale Fynbos, is listed as Endangered. Map 8 illustrates the botanical sensitivity of the site. Table 1 below summarises the estimated fynbos/forest areas affected by the project as currently presented. The total area of good quality fynbos that will be disturbed amounts to ± 15 ha, while 1.4 ha of Afrotropical forest and 3 ha of riverine fringe forest/thicket will be disturbed. In the case of the development (residential) footprint, the loss of fynbos will be permanent.

Table 1 Fynbos/forest areas affected by the project.

Development aspect	Fallow land/alien infested fynbos	Good quality fynbos	Afrotropical Forest	Riverine fringe forest/thicket
Development footprint	8.244 ha	7.827 ha	540 m ²	
Access roads (width unknown)	650 m	960 m	130 m	
Water supply pipeline (outside development footprint)		80 m (1200 m ²)		2.47 km (2.94 ha)
Sewer pipeline		3.97 km (5.96 ha)	850 m (1.28 ha)	

The impact during the construction of the sewer and water supply pipelines involves the removal of vegetation in a ± 15 m wide strip, followed by trenching for the laying of the pipe, backfilling and finally rehabilitation of the disturbed surface. In instances where the pipelines will follow existing roads or farm tracks, the footprint width should be less. In all likelihood, the species which originally occurred along the pipeline routes will return, including aliens that may be present in the area. The species composition and structure of the good quality fynbos areas will be altered in the short to medium term and may return to its original form in the long term, if invasive aliens are controlled. Erosion could be a concern on the steeper slopes. Care

must be exercised in the fynbos areas to avoid the unnecessary disturbance of the adjacent fynbos.



Map 8 Botanical sensitivity map, with the development footprint outlined in black. The green areas are regarded as highly sensitive and the yellow areas as low to medium sensitive. Please note that the survey focussed on the proposed development area and immediate adjacent areas and not the entire area in view. The majority of the bulk services pipelines are also located in highly sensitive vegetation.

The impact on the fynbos and forest vegetation types can potentially be lessened by adjustments to the layout, e.g. by slightly pulling back the development from the forest edge on the eastern side and by utilising the fallow areas outside the development footprint in favour of the good quality fynbos currently inside the footprint. With regards to the access roads, shorter route options to the village below will certainly lessen the impact and should be investigated. While the development footprint will impact on a fairly large fynbos area, the impact posed by the sewer pipeline will be profound as a large and relatively undisturbed fynbos area will be entered. Please note that this area was not investigated during the site survey. It is strongly recommended that alternative routes or solutions be found to deal with sewage disposal. Maybe Wittedrift deserves its own treatment plant, such as a lagoon plant and the treated effluent used for irrigation! Such a plant is recommended if the daily limit of wastewater received is about 500 Ml (Vilhelm Jensen of WorleyParsons pers. comm.). It will cost between R7 and 10 million to construct. If the substratum is clay, lining will probably not be needed, which will make it more affordable. Table 2 below summarises the impact on vegetation type.

Table 2 Impact on vegetation type and habitat.

Mitigation	Extent	Duration	Intensity	Probability of occurrence	Significance – Development footprint	Significance – Sewer pipeline (current route)	Significance – Water supply pipeline	Confidence
Without mitigation	Limited to site & surroundings	Med-perm	Med-high	High	High (-)	High (-)	High (-)	Med-high
With mitigation	Limited to site & surroundings	Med-perm	Med-high	High	Med (-)	Med (-)	Med (-)	Med-high
<p>Mitigation measures:</p> <ul style="list-style-type: none"> • Pull the development back from the forest edge on the eastern side of site. • Utilise all the fallow areas outside the development footprint in favour of the good quality fynbos inside the footprint. • With regards to the access roads, shorter route options to the village below will certainly lessen the impact and should be investigated. • It is strongly recommended that alternative routes or solutions be found to deal with sewage disposal. • Remove and protect topsoil from fynbos areas to be disturbed, especially along the sewer and water supply pipeline routes. It can be used for rehabilitation of the disturbed area after construction work has been completed. • Demarcate/fence off the construction area. • Search and rescue of suitable plant species, such as succulents and bulbs. 								

As observed earlier, the proposed development site is located mainly inside a mapped ESA. The associated access roads, sewage and water supply pipelines, on the other hand, are located inside a mixture of CBA's, ESA's and transformed areas. The CBA's are associated with the steeper slopes and drainage lines below the development site. A section of the water supply pipeline runs along a boundary between an aquatic CBA (Bietou River floodplain) and

terrestrial CBA (Garden Route Shale Fynbos). While the impact of the development footprint itself will be permanent, the impact of the service pipelines on ecological linkages, such as watercourses, CBA's and ESA's, is of a lesser concern since the pipeline routes follow a linear route underground. The extent of impact will be linear and not area based. Disturbance caused by trenching will be temporary and can potentially be rehabilitated after construction with little residual impact. At least a 10 m wide footprint can be rehabilitated, while the 4 m wide access road will probably be kept for maintenance purposes. Restoring the disturbed footprint back to fynbos may however prove difficult in areas infested with aliens. Table 3 below summarises the impact on CBA's and ESA's.

Table 3 Impact on CBA's and ESA's.

Mitigation	Extent	Duration	Intensity	Probability of occurrence	Significance – Development footprint	Significance – Sewer pipeline	Significance – Water supply pipeline	Confidence
Without mitigation	Limited to site & surroundings	Med-perm	Med-high	High	Med-high (-)	Med-high (-)	Med-high (-)	Med-high
With mitigation	Limited to site & surroundings	Med-perm	Med-high	High	Med (-)	Med (-)	Med (-)	Med-high
<p>Mitigation measures:</p> <ul style="list-style-type: none"> • With regards to the access roads, shorter route options to the village below will certainly lessen the impact and should be investigated. • It is strongly recommended that alternative routes or solutions be found to deal with sewage disposal. • Remove and protect topsoil from fynbos areas to be disturbed, especially along the sewer and water supply pipeline routes. It can be used for rehabilitation of the disturbed area after construction work has been completed. • Demarcate/fence off the construction area. • Search and rescue of suitable plant species, such as succulents and bulbs. • Rehabilitation of pipeline routes and alien control in the long term. 								

The only potential Species of Conservation Concern recorded in the area is a single *Euphorbia procumbens*. It should be easy to relocate the latter to a suitable area a safe distance away from the development. Most of the affected species are widespread and common throughout the region. However, a search and rescue of selected plant species, such as bulbs and succulents, is recommended if done at an appropriate time of the year, i.e. around August just before the main flowering season. Search and rescued species can be used for the rehabilitation of disturbed areas.

As an indirect impact, soil disturbance caused by earthworks will provide ideal conditions for the establishment of alien invasive vegetation. The presence of invasive aliens on site, such as black wattle, blackwood, rooikrans, hakea and port jackson, will exacerbate this impact. This can be partly mitigated by ongoing alien vegetation clearing in the area, a responsibility that will rest with the local authority. If rehabilitation is allowed for and invasive aliens along the

pipeline routes and around the site are cleared on a regular basis, the residual impacts on biodiversity should be minimal.

11 CONCLUSION & MITIGATION MEASURES

The proposed development site is located on a mixture of undisturbed fynbos, fallow land (in advanced succession) and highly disturbed or transformed areas. The vegetation type directly affected by the project, namely Garden Route Shale Fynbos, is listed as Endangered. As currently presented, the development will result in the removal of ±15 ha of good quality fynbos, 1.4 ha of Afrotropical forest and 3 ha of riverine fringe forest/thicket. Likewise, the project will also impact on mapped CBA's and ESA's. In the case of the main development footprint, the loss of fynbos will be permanent. The disturbed footprints of the sewer and water supply pipeline can be partially rehabilitated, thereby also partly restoring the functionality of the CBA'S and ESA's.

The impact on the fynbos and forest vegetation types can potentially be lessened by adjustments to the layout, e.g. by slightly pulling back the development from the forest edge on the eastern side and by utilising the fallow areas outside the development footprint in favour of the good quality fynbos currently inside the footprint. With regards to the access roads, shorter route options to the village below will certainly lessen the impact and should be investigated. The impact posed by the sewer pipeline will be profound as a large and relatively undisturbed fynbos area will be entered. It is strongly recommended that alternative routes or solutions be found to deal with sewage disposal. A follow-up botanical investigation will be required to assess the impact of the sewer and water supply infrastructure.

Strict mitigation measures will be required before and during the construction phase to minimise the impact. During construction, mitigation should focus on the protection of fynbos/forest vegetation adjacent to the works areas, search and rescue of suitable indigenous plant species, topsoil conservation and the rehabilitation of the disturbed areas post construction. The following mitigation measures should be considered:

- The construction areas (15 m wide strip for the pipeline routes) must be properly demarcated prior to the start of construction activities, and no disturbance may occur outside this area. In order to minimise the disturbance of fynbos/forest, proper fencing will be required. Fencing must not be moved during construction.
- Search and rescue of indigenous plants that transplant easily, such as succulents and bulbs, should be undertaken in the affected fynbos/forest areas ahead of construction activities. These plants must be properly bagged and then transplanted in rehabilitation areas or taken to a nursery for later replanting. Planting should only be done at an

appropriate time of the year, namely late autumn or early winter. An experienced contractor should be appointed to undertake search and rescue.

- Topsoil salvage and replacement would be critical for rehabilitation. Where possible, topsoil, containing indigenous plant seeds, should be transferred immediately to rehabilitation areas rather than being stockpiled, as stockpiling kills important fungi, microbes, seeds and soil fauna. Topsoil stockpiles must not exceed 0.5 m in height and must not be compacted.
- Great care must be taken if cement is to be mixed on site. It should rather be contained or mixed in large buckets and not allowed to spill onto bare ground. Any spillage must be cleaned up immediately. Cement water must also be contained in the above manner and allowed to dry out and then removed from site. Cement water, which is highly alkaline, poses a definite threat to the soil and seedbanks.
- Rehabilitation of the sewer and water supply pipeline routes where it pass through fynbos/forest areas should be undertaken after works in that area has been completed. A 10-11 m wide footprint can be rehabilitated, while the 4 m wide access road will probably be kept for maintenance purposes. The primary means of rehabilitation should involve the replacement of topsoil and the re-establishment of search and rescued species.
- There is a good chance that indigenous species will re-colonise the rehabilitations areas if the aliens are controlled. Regular follow-up clearing of aliens would be required in order to achieve rehabilitation successfully. It is assumed that the responsibility of alien clearing will rest with the local authority. If not, an alien clearing contractor should be employed to conduct alien clearing.
- A detailed botanical impact assessment based on a more detailed design of the routes for the bulk infrastructure and bulk infrastructure route alternatives is required during the EIA phase.

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Pool-Stanvliet, R., Duffell-Canham, A., Pence, G. & Smart, R. 2017. The Western Cape Biodiversity Spatial Plan Handbook. Stellenbosch: CapeNature.

DECLARATION OF INTEREST BY SPECIALIST

I Mark Gerald Berry, as the appointed specialist hereby declare/affirm the correctness of the information provided or to be provided as part of the application, and that I:

- in terms of the general requirement to be independent:
 - other than fair remuneration for work performed/to be performed in terms of this application, have no business, financial, personal or other interest in the activity or application and that there are no circumstances that may compromise my objectivity; or
 - am not independent, but another specialist that meets the general requirements set out in Regulation 13 have been appointed to review my work (Note: a declaration by the review specialist must be submitted);
- in terms of the remainder of the general requirements for a specialist, am fully aware of and meet all of the requirements and that failure to comply with any the requirements may result in disqualification;
- have disclosed/will disclose, to the applicant, the Department and interested and affected parties, all material information that have or may have the potential to influence the decision of the Department or the objectivity of any report, plan or document prepared or to be prepared as part of the application;
- have ensured/will ensure that information containing all relevant facts in respect of the application was/will be distributed or was/will be made available to interested and affected parties and the public and that participation by interested and affected parties was/will be facilitated in such a manner that all interested and affected parties were/will be provided with a reasonable opportunity to participate and to provide comments;
- have ensured/will ensure that the comments of all interested and affected parties were/will be considered, recorded and submitted to the Department in respect of the application;
- have ensured/will ensure the inclusion of inputs and recommendations from the specialist reports in respect of the application, where relevant;
- have kept/will keep a register of all interested and affected parties that participate/d in the public participation process; and
- am aware that a false declaration is an offence in terms of regulation 48 of the 2014 NEMA EIA Regulations.



Signature of the specialist:

Mark Berry Environmental Consultants cc

Name of company:

Date:

CURRICULUM VITAE

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QUALIFICATIONS: BSc (1988) University of Stellenbosch (majored in Botany and Zoology)
 BSc-Hons in Botany (1991) University of Stellenbosch
 MSc in Botany (1993) Nelson Mandela Metropolitan University
 PhD in Botany (2000) Nelson Mandela Metropolitan University

CAREER SUMMARY: **1997-2005:** Employed as an environmental specialist at **Planning Partners**, a multi-disciplinary consultancy specialising in town and regional planning, environmental planning and landscape architecture. Started **Mark Berry Environmental Consultants** in **June 2005**.

EXPERIENCE: **Environmental Impact Assessments (EIA's)** for residential, commercial, industrial, agricultural and civil engineering projects. EIA applications include the upgrading of Murray's Bay Harbour at Robben Island; an abalone farm near Saldanha; several bulk sewer and stormwater pipelines; the upgrading of access to and restoration of an archaeological site (Klipgat Cave) near De Kelders; the rehabilitation of the flood-damaged Koringlands River in Swellendam; a regional shopping mall in Hawston; low-cost housing projects; and cell phone masts in the Mossel Bay area.

With a PhD in the botanical field, I regularly undertake **biodiversity assessments** of fynbos, strandveld, renosterveld, thicket and karoo vegetation types as part of the EIA application process. For my PhD I have assessed the impact of informal settlement on the coastal vegetation and flora of the south-eastern Cape coastal zone.

Environmental Management Plans (EMP's) for a wide range of activities, including golf estates, residential and commercial developments, wineries, bulk municipal infrastructure, a harbour and several borrow-pits/quarries.

Environmental Control Officer (ECO) on construction sites, including residential and commercial developments, the upgrading of a harbour and other civil engineering projects.

CONFERENCES &

PUBLISHED PAPERS: The impact of informal housing settlements on coastal vegetation. *The Naturalist*, Eastern Province Branch of the Wildlife Society of Southern Africa, Vol 37(1) 1993.

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Aspects on the history and development of informal settlements in the south-eastern Cape coastal zone. *South African Geographical Journal* 86 (1): 23-39, 2004.

Impact of cutting and collecting of firewood associated with informal settlement in the south-eastern Cape coastal zone. *South African Journal of Botany* 71 (2): 2005.

South-eastern Cape vegetation and the impacts of informal settlements. Annual SAAB congress held at Wits, Johannesburg in 1994.

Informal settlements in the south-eastern Cape coastal region and associated environmental impacts. First International Geography Congress held at University of Durban-Westville in 1995.

EXAMINER:

Between 2000 and 2006 I have acted as examiner for the Board of Control for Landscape Architects (BOCLA), responsible for the setting up and marking of the Environmental Planning Section of exam paper.

PROFESSIONAL MEMBERSHIP:

Professional member (reg. no. 400073/98) of the South African Council for Natural Scientific Professions (SACNASP).

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BIODIVERSITY ASSESSMENT: PROPOSED GREEN VALLEY ACCESS ROAD & SEWER LINE, PLETTENBERG BAY

November 2020



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APPENDICES

CV OF SPECIALIST
DECLARATION OF INDEPENDENCE

1 INTRODUCTION

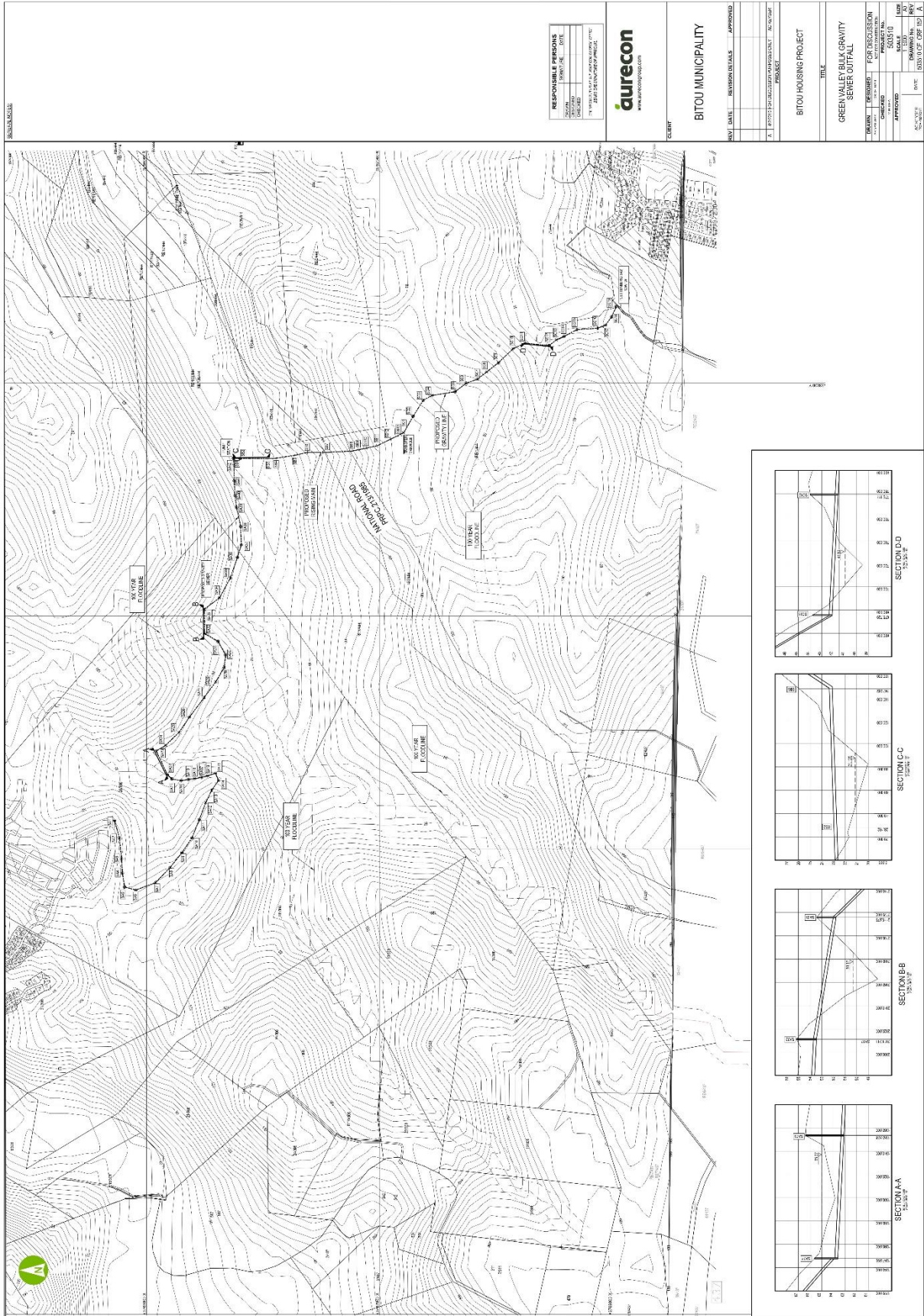
This report investigates the biodiversity impacts of proposed services infrastructure (sewer lines and access roads) for a new housing project on Portions 28 and 32 of Erf 306, northwest of Plettenberg Bay (see Map 1). The site is located on a hilltop directly south of Wittedrif. Significant stretches of fynbos, as well as forest in the small valleys, were recorded. The aim of the study, which was requested by Sharples Environmental Services (EAP), is to determine the biodiversity value of the affected area, to assess the impact imposed by the project and to recommend mitigation measures to minimise the resulting impact.



Map 1 Satellite photo showing the position of proposed infrastructure between Wittedrif and Plettenberg Bay.

2 PROJECT DESCRIPTION

Bitou Municipality proposes to construct two access roads to the planned Green Valley housing project, as well as two sewer pipelines connecting the development to the Ganse Valley wastewater treatment works (WWTW) and a shorter gravity line to Wittedrif to the north. The latter and the southern access road follow existing dirt roads/tracks down to the village. Maps 2 and 3 show the proposed WWTW sewer line (4.6 km) and access road options (1 km and 0.5 km for two northern access road options, respectively) in more detail. The minimum required width for the proposed sewage pipelines is ± 15 m. The gravity sewage line (1 km) to Wittedrif runs alongside an existing dirt road. Anticipated construction activities along the pipeline routes include trench excavation, stockpiling of excavated material and an access track for use by an excavator and stringing of pipes.



Map 2 Detailed layout plan of the proposed sewer pipeline (4.6 km) to the WWTW.



Map 3 Layout plans for the proposed access road options.

3 TERMS OF REFERENCE

- Identify and describe biodiversity patterns at a community and ecosystem level (main vegetation type, plant communities and threatened/vulnerable ecosystems), at species level (Species of Conservation Concern, protected species, presence of alien species) and in terms of significant landscape features;
- Describe the botanical sensitivity of the site and its immediate surroundings;
- Review the relevant biodiversity plans compiled in terms of the National Environmental Management Biodiversity Act (Act 10 of 2004);
- Adhere to the National Environmental Management Act (Act 107 of 1998) and CapeNature guidelines for biodiversity studies in the Western Cape.

4 METHODOLOGY

Botanical surveys of the site were undertaken on 27 December 2019, 3 February 2020 and 20 March 2020 by Mark Berry (see CV attached). The author was appointed as an independent specialist to undertake the study. A qualitative assessment of the type and condition of affected vegetation on site, disturbance and presence of alien species, Species of Conservation Concern (SCC) and protected tree species was carried out. Plant species not identified in the field, were collected and/or photographed and identified at the office and Compton (Kirstenbosch) Herbarium. The South African Vegetation Map and the latest floristic taxonomic literature and reference books were used for the purpose of the study. Any plants classified as endangered or rare in the Red List of South African Plants online database are highlighted. The assessment follows Brownlie's (2005), CapeNature and other relevant guidelines for biodiversity assessments.

The following information was recorded during the site visit:

1. The condition of the vegetation. Is the vegetation either disturbed or degraded? A disturbed or degraded area could range from agricultural fields (fallow land), or areas previously disturbed by construction activities, to an area that has been severely eroded or degraded as a result of bad land management or alien infestation.
2. The species diversity. This refers to the numbers of different indigenous plant species occurring on site. Indigenous fauna observed was also noted.
3. Species of Conservation Concern, as well as protected tree species occurring on site. This would include rare, vulnerable, endangered or critically endangered species. Species listed as vulnerable were mapped using Easy GPS v2.5 software on an iPhone. Accuracy is given as ± 4 m.
4. Identification of the vegetation type(s) and communities (if discernible) on the site. This

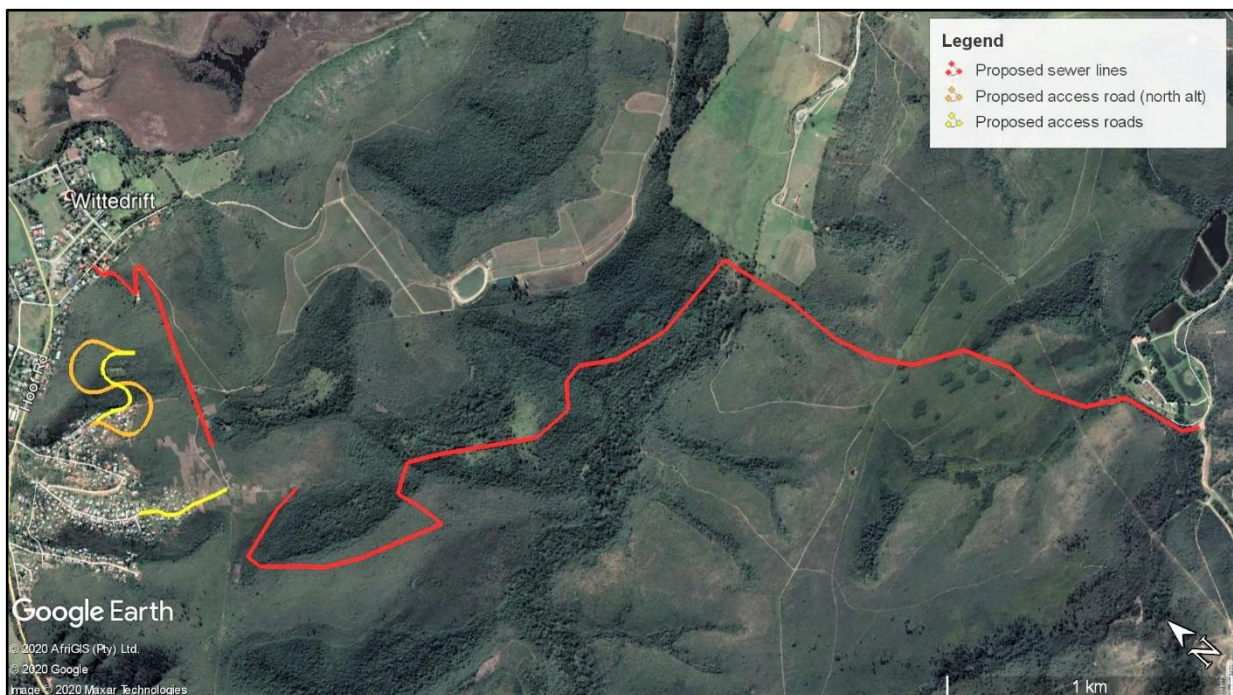
would include trying to establish the known range of a vegetation type and whether or not this vegetation type is vulnerable (VU), endangered (EN) or critically endangered (CR).

5 LIMITATIONS TO THE STUDY

Since fieldwork was carried out during the summer season and autumn, flowering plants that only flower at other times of the year (e.g. winter to spring), such as certain bulbs (Iridaceae and Orchidaceae), may have been missed. A veld fire in 2017 also affected a large area across the site and the veld is still recovering. The overall confidence in the completeness and accuracy of the botanical findings is however considered to be moderate to good.

6 SITE DESCRIPTION

The study site is located on a hill northwest of Plettenberg Bay, overlooking a subsidiary valley of the Bietou River in the Southern Cape. While significant areas, especially along the coast and in the valleys around Plettenberg Bay, are still covered with good quality fynbos and forest, urban development and agriculture has transformed large parts of the landscape. With regards to the study area, stretches of fynbos and pockets of Afrotemperate forest in the valleys were encountered (see Map 4; Photos 1 & 2). A large part of the site was affected by a veld fire in March 2017 and is still recovering. Considerable alien infestation was also recorded, especially on the slopes directly above Wittedrif. Agricultural activities (pastures), farm tracks, footpaths, cattle grazing, wood collecting and the remains of informal dwellings were also noted.



Map 4 Satellite photo showing the proposed road and sewer infrastructure in context with its surroundings.

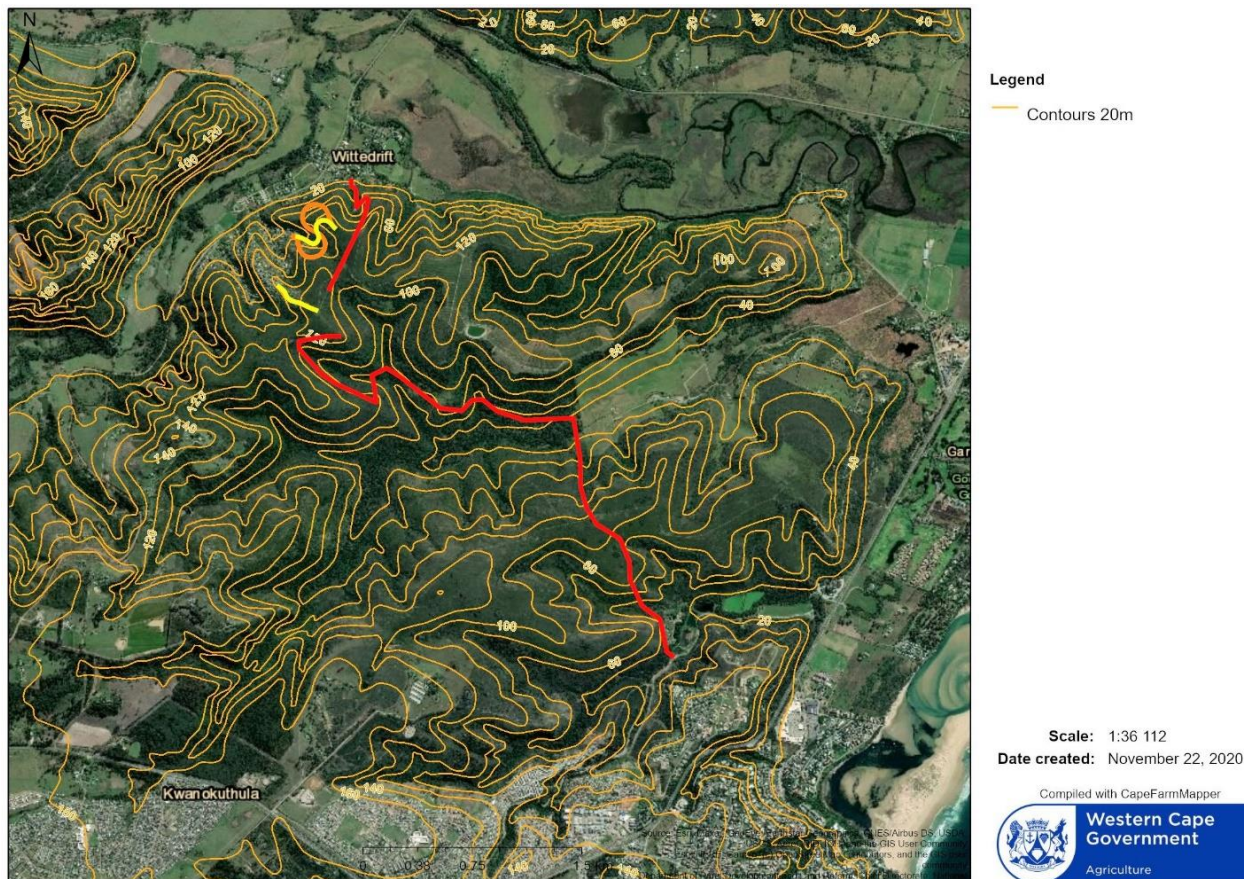


Photo 1 View of senescent fynbos across narrow strip of riverine forest in the vicinity of the proposed northern access road.



Photo 2 Small valley with Afrotemperate forest and part of the proposed sewer line route to the WWTW.

The topography of the site can be described as hilly, with the Tsitsikamma Mountains forming a backdrop to the north (see Map 5). While the proposed northern access road (both alignment options) will cross one minor drainage line, the proposed sewer line to the WWTW will cross at least five drainage lines due to its length. Due to the crossing of a small valley, a pump station will be needed at the bottom of the valley for the sewer line.



Map 5 Topographical (contour) map of study area.

The mean annual rainfall for the area is ± 650 mm (as per Cape Farm Mapper climatic data for 1950 to 2000). The peak rainfall periods are the months of March and August to October (i.e. bimodal rainfall regime), while the driest periods are the summer and winter months. The study area lies in a transitional area between winter and summer rainfall regions. Mean daily maximum and minimum temperatures are 23.4°C and 9°C for January-February and July, respectively (as per Cape Farm Mapper climatic data).

According to the 3322 Oudtshoorn 1:250 000 geological map, the site is underlain by Enon conglomerate of Cretaceous to Tertiary age. It comprises conglomerate, sandstone, siltstone and clay (see Photo 3).

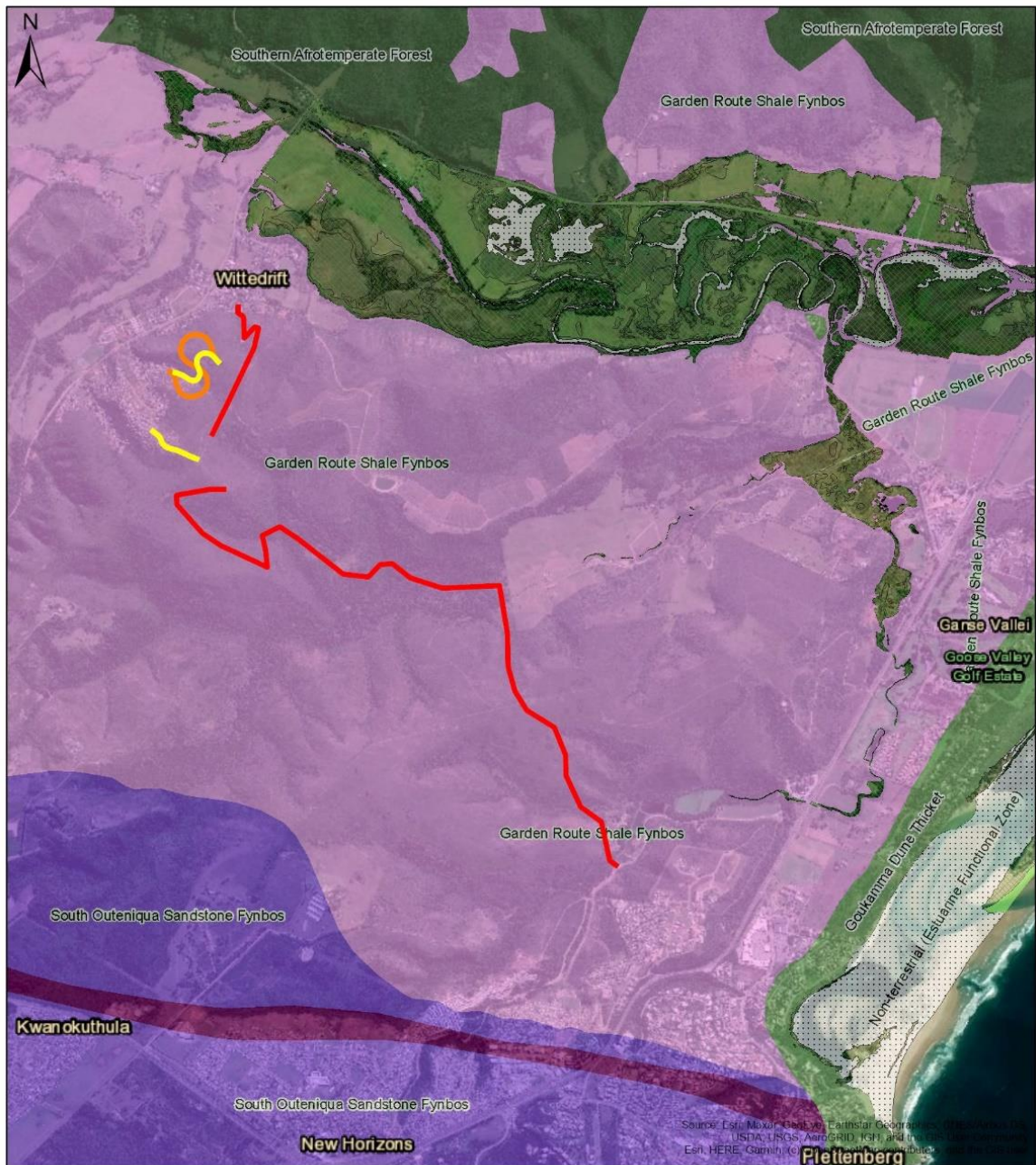


Photo 3 Exposed Enon conglomerate in the riverbed of small valley.

7 BIOGEOGRAPHICAL CONTEXT

The study site is located in a typical fynbos environment on the Southern Cape coastal plain. This is confirmed by the presence of characteristic fynbos species, such as *Erica peltata* and *Aspalathus opaca*. The Vegetation Map of South Africa classifies the main vegetation found in the area as Garden Route Shale Fynbos (see Map 6). Garden Route Shale Fynbos occurs in patches along the coastal foothills from northeast of Heidelberg in the Western Cape to Clarkson in the Eastern Cape (Mucina & Rutherford 2006).

Pockets of Southern Afrotemperate Forest are also found in the small valleys throughout the site. The largest extent thereof occurs in the valley along the north-western half of the proposed sewer line to the WWTW. It typically comprises tall evergreen tree species, including yellowwoods, saffron, candlewood, ironwood, false ironwood, etc. It is mainly found in the Western and Eastern Cape Provinces, with the largest complex found in the southern Cape between Mossel Bay in the west and Humansdorp in the east (Mucina & Rutherford 2006). It grows on sheltered (fire-protected) slopes, plateaux, coastal scarps and valleys (Mucina & Rutherford 2006).



Map 6 Extract of the 2018 SA Vegetation, showing the position of the proposed sewer (red) and road (yellow/orange) infrastructure inside Garden Route Shale Fynbos.

8 VEGETATION & FLORA

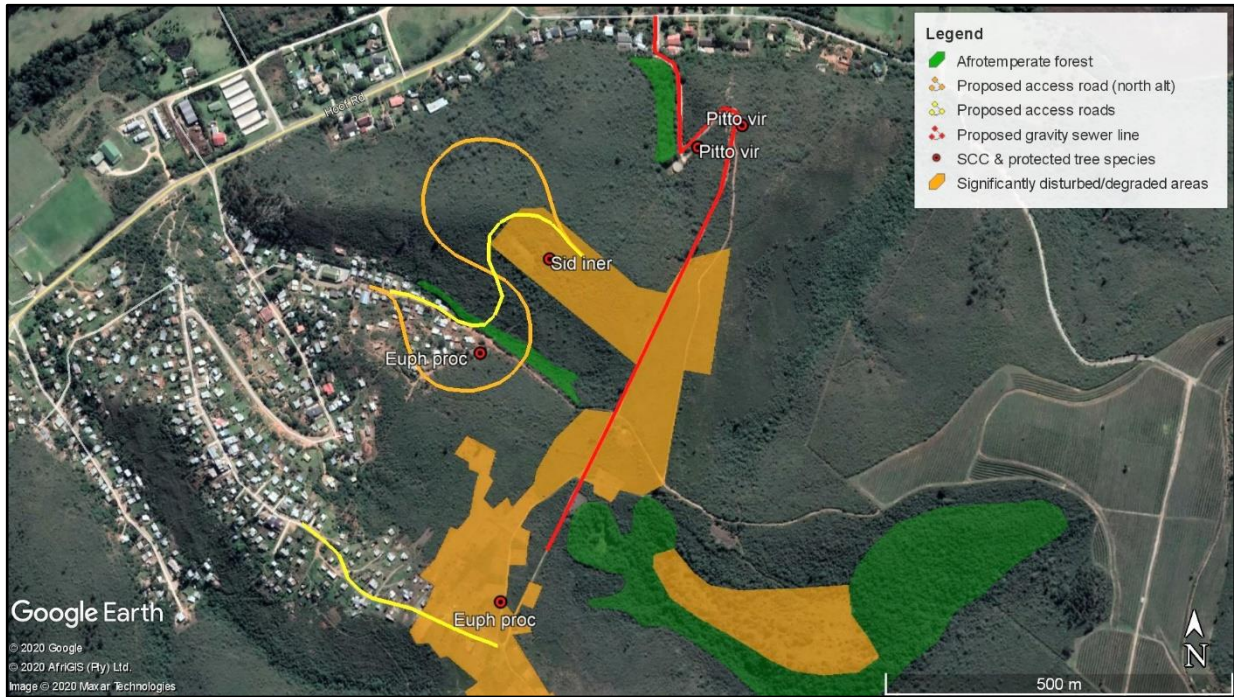
As noted earlier a large part of the study area has been affected by a veld fire in March 2017. The remaining fynbos can be described as senescent (woody) and often infested with woody

aliens (notably black wattle and rooikrans) on some of the steeper slopes. Senescent fynbos was recorded on the slope in the vicinity of the proposed northern access road (see Photo 4), along the northern section of the proposed gravity sewer where the route follows an existing dirt road down the slope towards Wittedrif, and also the north-western end of the proposed sewer line to the WWTW before it descends down into the small valley (see Maps 7 & 8). Structurally, it can be described as a mid-high (1.5-1.8 m) closed ericoid shrubland following Campbell's (1981) classification. Micro-leaved shrubs, such as *Erica* species and *Passerina corymbosa*, are prominent.



Photo 4 Close-up view of the senescent fynbos in the vicinity of proposed northern access road. Insert: *Euphorbia procumbens*

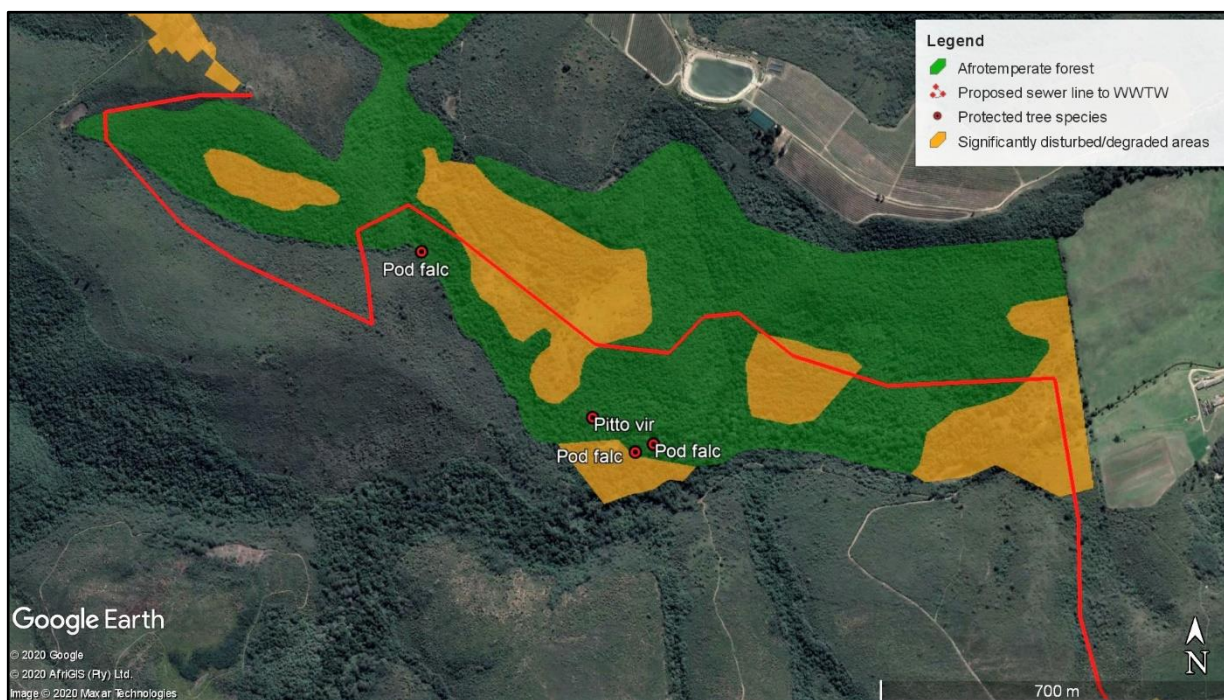
The recovering fynbos in the previously burnt areas is currently dominated by only a few species, such as *Anthospermum aethiopicum*, *Euryops virgineus* and *Passerina* species. The fynbos regrowth is also lower (<1 m) than for the senescent fynbos and can be described as a low closed ericoid shrubland. It was recorded along the proposed gravity sewer, as well as along the south-eastern section of the proposed sewer line to the WWTW where it runs over a hill and then down the slope towards the WWTW. A part of this section appears to be fallow land as evidenced by the low number of indigenous species encountered, as well as historical Google Earth photographs (see Photo 5). It has subsequently been indicated as degraded on Map 9.



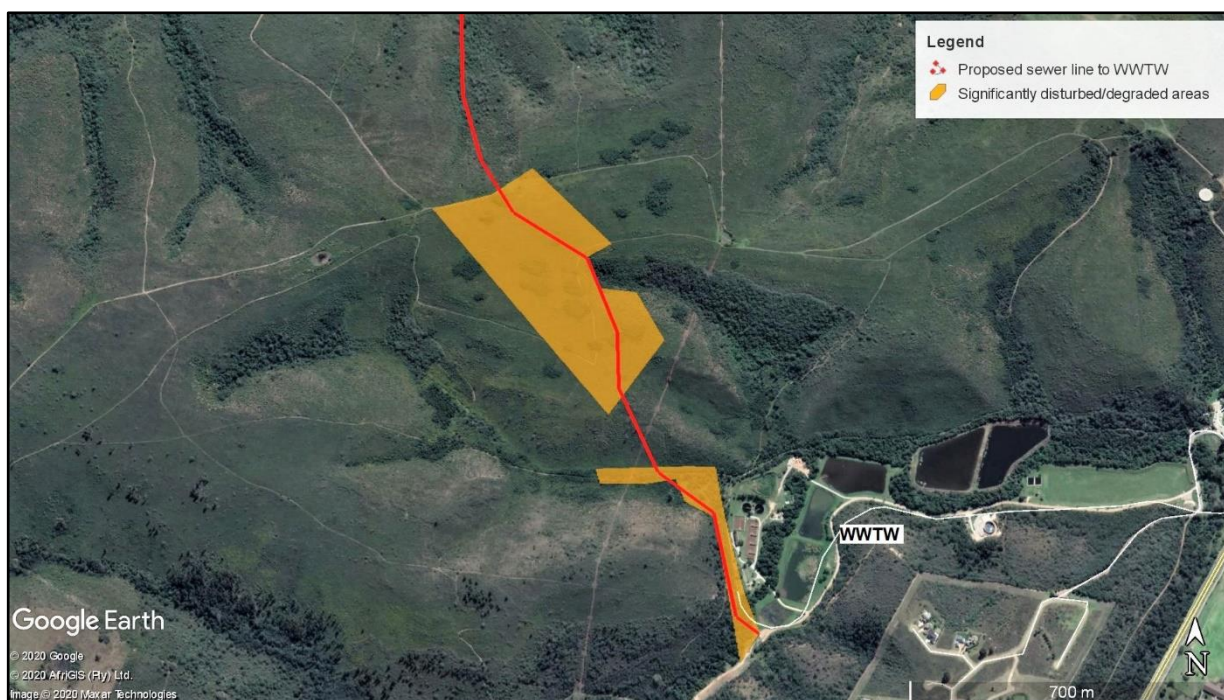
Map 7 Botanical attributes map of the north-western part of the study area. The untuned areas in the proximity of the proposed infrastructure represent fynbos.



Photo 5 Regrowth in a fallow land along the proposed sewer line on route to the WWTW. Plettenberg Bay can be seen in the background.



Map 8 Botanical attributes map of the central part of the study area. The Afrotemperate forest is confined to a small valley, mainly the valley bottom and its south-facing slope.



Map 9 Botanical attributes map of the south-eastern part of the study area, showing the proposed sewer line approaching the WWTW. No significant botanical features were recorded here.

The following indigenous shrub and tree species were recorded in the fynbos areas, namely *Passerina corymbosa*, *P. montivaga*, *Erica peltata*, *Erica cf sparsa*, *Osteospermum moniliferum*, *Helichrysum nudifolium*, *H. cymosum*, *Senecio ilicifolius*, *Metalsia pungens*, *Nidorella ivifolia*, *Elytropappus rhinocerotis*, *Euryops virgineus*, *Oedera calycina*, *Berkheya rigida*, *Delosperma virens*, *Carpobrotus* sp, *Crassula subulata*, *Euphorbia procumbens* (± 5 plants), *Anthospermum*

aethiopicum (dominant), *Searsia lucida*, *S. pallens*, *Myrsine africana*, *Indigofera cf heterophylla*, *Otholobium stachyerum*, *Aspalathus opaca* ssp *rostriloba*, *Asparagus africanus*, *Pelargonium alchemilloides*, *P. capitatum*, *P. candicans*, *Sideroxylon inerme*, *Olea europaea*, *Euclea crispa*, *Agathosma ovata*, *Rubus rigidus*, *Montinia caryophyllacea*, *Freylinia undulata*, *Barleria pungens*, *Exomis microphylla*, *Selago corymbosa* and *Leonotis ocymifolia*. A single milkwood tree (*Sideroxylon inerme*) was recorded next to an impoundment in the vicinity of the proposed northern access road. A few bulbs were also recorded, including *Hypoxis sobolifera* and *Bobartia aphylla*. Members of the Restionaceae family are conspicuously absent, while Proteaceae is also absent or relatively scarce. Scarcity of the latter can be ascribed to the lack of regular fires, which are required by both re-seeding and sprouting members of the protea family. Restios also need fire in order to recruit successfully, but is also being replaced by C4 grasses as one move further eastwards into the summer rainfall region.

Sections of the proposed infrastructure also runs through or alongside pockets of Afrotemperate forest (see Photo 6). The proposed northern access road (both alignment options) cuts through a narrow strip of riverine forest, while the northern end of the proposed gravity sewer runs alongside a similar, but more developed strip of riverine forest before entering the village below. The most extensive forest in the study area was encountered in the small valley, which is skirted and crossed in a few places by the north-western section of the proposed sewer line to the WWTW (see Map 8). The most mature forest was found in the valley bottom and is fortunately not significantly affected by the proposed project. Several large yellowwoods and saffrons were encountered here. Parts of the sewer line route to the WWTW are inaccessible due to dense, tall scrub, notably a section on the south-facing hill slope west of the proposed pump station.

The following indigenous tree, shrub and creeping species were recorded in the Afrotemperate forest some of which are also shared with the adjacent fynbos, namely *Podocarpus falcatus*, *Cassine peragua*, *Gymnosporia nemorosa*, *G. buxifolia*, *Elaeodendron croceum*, *Lauridia tetragona*, *Mystroxyton aethiopicum*, *Putterlickia pyracantha*, *Lachnostylis hirta*, *Carissa bispinosa*, *Pterocelastrus tricuspidatus*, *Olea capensis* subsp *capensis*, *Pittosporum viridiflorum*, *Nuxia floribunda*, *Searsia lucida*, *S. refracta*, *S. rehmanniana* var. *glabrata*, *S. chirindensis*, *Tarchonanthus littoralis*, *Helichrysum petiolare*, *Gymnanthemum capense*, *Scutia myrtina*, *Calodendrum capense*, *Vepris lanceolata*, *Ochna serrulata*, *Afrocanthium cf mundianum*, *Burchellia bubalina*, *Schotia afra*, *Virgilia cf. divaricata*, *Grewia occidentalis*, *Anisodonteia scabrosa*, *Colpoon compressum*, *Euclea undulata*, *E. crispa*, *E. schimperi*, *Diospyros dichrophylla*, *Trimeria grandifolia*, *Cussonia thyrsoiflora*, *Buddleja saligna*, *Halleria lucida*, *Polygala myrtifolia*, *Notobubon laevigatum*, *Chironia* sp, *Asparagus aethiopicus*, *A. retrofractus* and *Trichocladus crinitus*. Vines, herbaceous species and hemicryptophytes recorded in the forest understorey include *Rhoicissus tridentata*, *Kedrostis nana*, *Senecio*

angulata, *Mesembryanthemum cordifolium*, *Cynanchum obtusifolium* and *Asplenium rutifolium*. A *Viscum rotundifolium* was also noted parasitizing on *Tarchonanthus littoralis*. The sedges *Cyperus fastigiatus* and *Eleocharis limosa*, along with the invasives *Cirsium vulgare* and *Ricinus communis*, were recorded at an impoundment in the valley directly west of the proposed pump station.



Photo 6 Inside the forest in small valley in the vicinity of the sewer line route to the WWTW.

It is evident on the above maps that significant areas on site have been disturbed/transformed by past farming activities (see Photos 4 & 5), some of which are slowly recovering. Species diversity in these areas however remain low. The greatest diversity was encountered on the slope above Wittedrif where the northern access road will be located and in the Afrotemperate forest areas.

The lower hill slope directly above the village as well as certain areas along the proposed sewer line to the WWTW are infested with *Acacia mearnsii* (black wattle), *A. cyclops* (rooikrans), *Pinus* sp. (pines), *Hakea sericea* (silky hakea), *Cirsium vulgare* (Scotch thistle), *Ricinus communis* (castor-oil plant) and *Pennisetum clandestinum* (kikuyu) (see Photo 7). All these are listed invasive aliens. In terms of the National Environmental Management: Biodiversity Act (Act 10 of 2004) Alien and Invasive Species List (2016), the harbouring of black wattle and castor-oil plant on a property is prohibited without a permit. The presence of dense stands of black wattle is

indicative of past disturbances or agricultural activities. It typically invades watercourses and, along with the other woody aliens, presents a serious fire risk.



Photo 7 Black wattle infestation in the vicinity of the proposed sewer pump station for the sewer line to WWTW.

Species of Conservation Concern and protected tree species

Euphorbia procumbens is a potential Species of Conservation Concern¹ recorded on site in the vicinity of the proposed access roads. Despite being widespread between Riversdale and the Eastern Cape, its numbers are very low, with only one historical collection record from the Plettenberg Bay area. Its chances of survival with the prospect of development are slim. Other known Species of Conservation Concern found in Garden Route Shale Fynbos, which may occur in the area are *Ruschia duthiae* (Vul), *Erica glandulosa* subsp. *fourcadei* (Vul), *Acmadenia alternifolia* (Vul), *Felicia westae* (En), *Selago burchellii* (Vul) and *Muraltia knysnaensis* (En) (see online Red List of South African Plants). *Acmadenia alternifolia* is more common on steeper, rockier coastal areas, while *Felicia westae* is found along stream banks in low-lying areas. The latter, which habitat has been severely degraded by alien infestation, has apparently not been recorded since 1944, but was rediscovered by CREW members in 2015.

A single *Sideroxylon inerme* (milkwood, protected tree species) was recorded in the vicinity of

¹ The Red List of South African Plants (Raimondo *et al.* 2009) has assessed all plant species in South Africa, and all indigenous species are now technically Red Data Book species, and thus it is preferable to use the term Species of Conservation Concern to refer to species that are listed as either Threatened or Rare.

the proposed northern access road next to an impoundment. It appears to be located inside or very close to the future development site. Other protected tree species (in terms of the National Forests Act 84 of 1998) recorded on site include *Afrocarpus falcatus* (Outeniqua yellowwood) and *Pittosporum viridiflorum* (cheesewood). These are mainly associated with the Afrotropical forest areas. While *P. viridiflorum* is fairly common throughout the area, *A. falcatus* is confined to mature forest areas in the valley bottom away from the proposed infrastructure. The removal of these tree requires a permit from the Department of Forestry.

9 CONSERVATION STATUS & BIODIVERSITY NETWORK

Less than 50% of Garden Route Shale Fynbos is still left and it is currently listed as Vulnerable in the 2018 National Biodiversity Assessment report (Skowno *et al.* 2019). It is also considered to be poorly protected. Garden Route Shale Fynbos, along with other lowland fynbos types, has been significantly transformed by cultivation, pine plantations and urban development. Only 4% of it is formally protected in the Garden Route National Park and Boosmansbos Wilderness Area. Therefore, its protection should remain a priority in the coastal areas. Southern Afrotropical Forest, on the other hand, is still well represented in the larger area, with 80.2% still remaining (Skowno *et al.* 2019). Nearly 60% of the original area of Southern Afrotropical Forest is formally conserved in the Garden Route National Park, Table Mountain National Park and numerous nature reserves (Mucina & Rutherford 2006). Only a small portion of forest has been transformed for plantations.

Map 10 shows the Critical Biodiversity Area's (CBA's) and Ecological Support Areas (ESA's) that are affected by the project. Being located in a hilly, rural part of Plettenberg Bay, the proposed road and sewer line infrastructure is located almost entirely inside a mixture of mapped CBA's and ESA's. The terrestrial CBA's are associated with the steeper hill slopes and drainage lines, while the ESA's correspond with the flatter and seemingly more disturbed areas (fallow land areas). The proposed sewer line to the WWTW also skirts the bottom edge of a CBA forest in the small valley west of the proposed pump station. Reasons for the mapped CBA's and ESA's include the presence of a threatened vegetation type (Garden Route Shale Fynbos), watercourse protection, climate adaptation corridor and indigenous forest type. The Wadriif Private Nature Reserve is located about 2 km to the north on the northern side of the Keurbooms River. The Garden Route National Park is located further away to the west.

CBA's are areas that are required to meet biodiversity targets for species, ecosystems or ecological processes and infrastructure (Pool-Stanvliet *et al.* 2017). These are areas of high biodiversity and ecological value and need to be kept in a natural or near-natural state, with no further loss of habitat or species. Only low-impact, biodiversity-sensitive land uses are

considered appropriate in these areas. ESA's, on the other hand, are not essential for meeting biodiversity targets, but play an important role in supporting the functioning of protected areas and CBA's (Pool-Stanvliet *et al.* 2017). They include features such as regional climate adaptation corridors, water source and recharge areas, riparian habitat surrounding rivers or wetlands, and endangered vegetation.



Map 10 Biodiversity network map, with the proposed sewer line and road infrastructure indicated in red and yellow/orange, respectively.

10 IMPACT OF THE PROPOSED PROJECT ON BIODIVERSITY

The proposed infrastructure is located in a mixture of fynbos, fallow land (in various stages of succession), Afrotemperate forest and transformed or highly disturbed areas. The latter include areas previously subject to land invasion, existing farm roads and areas transformed by agricultural activities and subsequently infested with alien plants. The vegetation types directly affected by the project include Garden Route Shale Fynbos, which is listed as Endangered, and Southern Afrotemperate Forest. The latter is best represented in the small valley traversed by the proposed sewer line to the WWTW.

For the proposed northern access road, it is estimated that 190 m of fynbos and a 25 m passage through riverine forest will be cleared for the shorter route option (shown in yellow on plans), and 720 m of fynbos and the same length through riverine forest for the longer option (shown in orange). Clearly the shorter option is favoured due to its length and perceived lesser impact. This fynbos is considered to be of moderate to high conservation value due to its condition, threat status and inclusion in the biodiversity network (see Map 10). The southern proposed access road follows an existing farm track through an already disturbed/transformed area subject to land invasion.

With regards to the proposed gravity sewer line, it follows an existing farm track down into Wittedrif. It is currently uncertain how much of the adjacent vegetation will need to be cleared in order to lay the pipeline, but a significant portion of the route runs through or alongside fallow land with medium conservation value. Fynbos species are, however, returning and it is considered a valuable component (ecological support area) of the biodiversity network. A few cheesewoods (protected) were noted at the northern end of the route where it drops down to the village, but can be easily avoided during the construction phase by means of fencing, etc. A strip of riverine forest is also present here, which should be considered during construction.

The sewer line to the WWTW will result in the greatest impact due to its length (4.6 km) and passage through stretches of fynbos and Afrotemperate forest. About 1700 m runs through fynbos and 1040 m through forest. The rest runs through fallow land and other disturbed/degraded areas covered with grasses and invasive species. The more mature forest and accompanying yellowwoods and cheesewoods in the valley bottom are avoided, thereby lessening the impact. The proposed sewer line traverses the valley slopes, but has to cross a few watercourses along the way. While the impact imposed by the proposed access roads will be permanent, the impact of the sewer lines will be temporary as the disturbed surface can be rehabilitated after completion of construction work. Table 1 summarises the anticipated impact

on vegetation type and habitat.

Table 1 Construction phase impact on vegetation type and habitat.

Mitigation	Extent	Duration	Intensity	Probability of occurrence	Significance – shorter route option for northern access road	Significance – longer route option for northern access road	Confidence
Without mitigation	Limited to site & immediate surroundings	Med-perm	Med	High	Med-high (-)	High (-)	Med-high
With mitigation	Limited to site & immediate surroundings	Med-perm	Med	High	Low-med (-)	Med (-)	Med-high
Mitigation measures: <ul style="list-style-type: none"> • Utilise farm tracks, fallow land and disturbed/degraded areas optimally in the positioning of infrastructure to minimise the impact on fynbos and Afrotemperate forest. • Remove and protect topsoil from fynbos/forest areas to be disturbed. It can be used for rehabilitation of the disturbed area after construction work has been completed. • Demarcate/fence off the construction corridors through fynbos and Afrotemperate forest areas. 							

The above impact involves the removal of vegetation in a ± 15 m wide strip, followed by trenching for the laying of the pipe, backfilling and finally rehabilitation of the disturbed surface. In instances where the pipelines will follow existing farm tracks, the footprint width should be less. In all likelihood, the species which originally occurred along the pipeline routes will return, including aliens that may be present in the area. The species composition and structure of the good quality fynbos areas will be altered in the short to medium term and may return to its original form in the long term, if invasive aliens are controlled. Erosion could be a concern on the steeper slopes and stormwater berms should be constructed where needed. Care must be exercised to avoid the unnecessary disturbance of the adjacent fynbos and forest vegetation.

Impact on protected tree species can be lessened by arranging for a walkdown of the proposed routes by a botanist during its staking to mark protected tree species for protection. Potential impact on protected trees can thus be avoided or minimised before the start of construction work. The only potential Species of Conservation Concern recorded in the area is *Euphorbia procumbens*. It should be easy to search and rescue the latter for relocation in a suitable receiving area away from the development. The other affected species are all widespread and common. A search and rescue of selected plant species, such as bulbs and succulents, is recommended. Search and rescued species should be transplanted in suitable rehabilitation areas nearby in a similar vegetation type from which it originates. Table 2 summarises the anticipated impact on Species of Conservation Concern and protected tree species.

Table 2 Construction phase impact on SCC and protected tree species.

Mitigation	Extent	Duration	Intensity	Probability of occurrence	Significance – shorter route option for northern access road	Significance – longer route option for northern access road	Confidence
Without mitigation	Limited to site & immediate surroundings	Med-perm	Med	High	Med (-)	Med (-)	Med-high
With mitigation	Limited to site & immediate surroundings	Med-perm	Med	High	Low (-)	Low (-)	Med-high
Mitigation measures: <ul style="list-style-type: none"> • Arrange for a walkdown of the proposed routes by a botanist during its staking to mark protected tree species for protection. • A search and rescue of selected plant species, such as bulbs and succulents, is recommended if done at an appropriate time of the year, i.e. around July-August just before the main flowering season. Search and rescued species should be transplanted in suitable rehabilitation areas nearby in a similar vegetation type from which it originates. • If <i>Euphorbia procumbens</i> is found in a construction area it should be collected and transplanted in a suitable receiving area away from the development, such as a nearby nature reserve. 							

With regards to the impact on the biodiversity network, the proposed infrastructure is located almost entirely inside a mixture of mapped CBA's and ESA's. The CBA's are associated with the steeper hill slopes and drainage lines, while the ESA's correspond with the flatter and seemingly more disturbed areas (fallow land areas). In the context of the proposed Green Valley housing development, the expected impact of the infrastructure on the biodiversity network seems moot. While the impact of the proposed access roads will be permanent, the impact of the sewer lines is of a lesser concern since the pipelines follow a linear route underground. The extent of impact will be linear and not area based. Disturbance caused by trenching will be temporary and can be rehabilitated after construction with little residual impact. At least a 10 m wide footprint can be rehabilitated, while a 4 m wide access road will probably be kept for maintenance purposes. Restoring the disturbed footprint back to fynbos may however prove difficult in areas infested with aliens. Table 3 summarises the impact on the biodiversity network.

Operational phase impacts will relate to erosion and alien control. The former can possibly be contained by means of erosion control measures, such as stormwater berms on steep slopes, implemented during the construction phase. However, continuous monitoring of the steeper areas will still be needed to address future erosion problems. As an indirect impact, soil disturbance caused by earthworks will provide ideal conditions for the establishment of alien invasive vegetation. The presence of invasive aliens on site, such as black wattle, rooikrans and hakea, will exacerbate this impact. This can be partly mitigated by ongoing alien clearing along the service corridors, a responsibility that will rest with the local authority. If rehabilitation is allowed for and invasive aliens along the service routes cleared on a regular basis, the residual impacts on biodiversity should be minimal.

Table 3 Construction phase impact on the biodiversity network.

Mitigation	Extent	Duration	Intensity	Probability of occurrence	Significance – shorter route option for northern access road	Significance – longer route option for northern access road	Confidence
Without mitigation	Limited to site & immediate surroundings	Med-perm	Med	High	Med (-)	Med (-)	Med-high
With mitigation	Limited to site & immediate surroundings	Med-perm	Med	High	Low (-)	Low-med (-)	Med-high
Mitigation measures: <ul style="list-style-type: none"> • Demarcate/fence off the construction corridors through fynbos and Afrotemperate forest areas. • Rehabilitation of pipeline routes and road verges • Control aliens, such as black wattle, rooikrans and hakea, as a long-term management requirement. 							

11 SUMMARY & RECOMMENDATIONS

The proposed infrastructure is located in a mixture of fynbos, fallow land, Afrotemperate forest and transformed or highly disturbed areas. The vegetation types directly affected by the project include Garden Route Shale Fynbos, which is listed as Endangered, and Southern Afrotemperate Forest. For the proposed northern access road, it is estimated that 190 m of fynbos and a 25 m passage through riverine forest will be cleared for the shorter route option, and 720 m of fynbos and the same length through riverine forest for the longer option. Clearly the shorter option is favoured due to its perceived lesser impact.

With regards to the proposed gravity sewer line, it follows an existing farm track down into Wittedrif. It is currently uncertain how much of the adjacent vegetation will need to be cleared in order to lay the pipeline, but a significant portion of the route runs through or alongside fallow land with medium conservation value. The sewer line to the WWTW will result in the greatest impact due to its length and passage through stretches of fynbos and Afrotemperate forest. About 1700 m runs through fynbos and 1040 m through forest. The rest runs through fallow land and other disturbed/degraded areas. The more mature forest and accompanying yellowwoods and cheesewoods in the valley bottom are avoided.

While the impact imposed by the proposed access roads, especially the northern access road, will be permanent, the impact of the sewer lines will be temporary as the disturbed surface can be rehabilitated after completion of construction work. Likewise, the project will also impact on mapped CBA's and ESA's. In the case of the main Green Valley development, the loss of fynbos will be permanent. The disturbed footprints of the sewer pipelines can be rehabilitated, thereby restoring the functionality of the biodiversity network in the affected areas.

Strict mitigation measures will be required before and during the construction phase to minimise the impact. During construction, mitigation should focus on the protection of fynbos/forest vegetation and protected tree species adjacent to the construction areas. If project is allowed to proceed, the following mitigation measures should be considered:

- Utilise farm tracks, fallow land and disturbed/degraded areas optimally in the positioning of infrastructure to minimise the impact on fynbos and Afrotemperate forest.
- Remove and protect topsoil from fynbos/forest areas to be disturbed. It can be used for rehabilitation of the disturbed area after construction work has been completed. Topsoil stockpiles must not exceed 0.5 m in height and must not be compacted.
- Demarcate/fence off the construction corridors (± 15 m wide strip for the pipeline routes) through fynbos/forest areas prior to the start of construction activities. No disturbance may occur outside these areas. Fencing must not be moved during construction.
- Arrange for a walkdown of the proposed routes by a botanist during its staking to mark protected tree species for protection.
- Search and rescue of indigenous plants that transplant easily, such as succulents and bulbs, should be undertaken in the affected areas ahead of construction activities. These plants must be properly bagged and then transplanted in nearby rehabilitation areas in a similar vegetation type from which it originates. If not, it must be taken to a nursery for later replanting. Planting should ideally be done at an appropriate time of the year during the rainy season. An experienced contractor should be appointed to undertake search and rescue. If *Euphorbia procumbens* is found in a construction area it should be collected and transplanted in a suitable receiving area away from the development, such as a nearby nature reserve.
- Rehabilitation of the pipeline routes and road verges where it pass through fynbos/forest areas should be undertaken after works in that area has been completed. A 10 m wide footprint can be rehabilitated, while the 4 m wide access road will probably be kept for maintenance purposes. The primary means of rehabilitation should involve trimming, the of replacement of topsoil, prevention of erosion and alien control.
- There is a good chance that indigenous species will re-colonise the rehabilitations areas if aliens, such as black wattle and rooikrans, are controlled as a long-term maintenance requirement. Its spread into the fynbos/forest areas must be prevented. One-year old seedlings can be hand-pulled, preferably when soil is wet after a rainfall. If left to grow, removal becomes more difficult and costly. The use of heavy plant, such as bush cutters or D9 Caterpillar, for alien clearing is not recommended. Black wattle stumps should also be treated with herbicides to prevent coppicing. Long-term control of black wattle is difficult as it produces large quantities of seed. Ring-barking is also a successful method for killing large trees. Regular follow-up clearing of aliens would be required. It is assumed that the

responsibility of alien clearing will rest with the local authority. If not, an alien clearing contractor should be employed to conduct alien clearing.

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CONDENSED CV OF SPECIALIST

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PROFESSIONAL STATEMENT

Environmental assessment professional and biodiversity specialist with over 20 years of experience mainly in the Western Cape Province, but also in the Northern Cape and Eastern Cape. Experience in Environmental Impact Assessments (EIA's), biodiversity assessments, Environmental Management Programmes (EMPr's), Environmental Control Officer (ECO) duties and environmental due diligence investigations.

WORK EXPERIENCE

- 1989-1990** Nature Conservation Officer in the South African Air Force, based at Langebaan Road Air Force Base
- 1997-2005** Employed as principal environmental specialist at Planning Partners, a multi-disciplinary consultancy specialising in town and regional planning, environmental planning and landscape architecture. Duties included the conducting of EIA's, compiling EMPr's, ECO duties, biodiversity surveys and status quo environmental assessments for spatial development frameworks.
- 2000-2006** Examiner for the Board of Control for Landscape Architects (BOCLA), responsible for the setting up and marking of the Environmental Planning Section of exam paper.
- 2005-current** Started Mark Berry Environmental Consultants in June 2005. Responsibilities include office management, seeking tenders, conducting EIA's, compiling EMPr's, construction site environmental audits, biodiversity surveys, etc. A relationship is maintained with previous employer, and, among other, undertook land-use surveys and reporting for the Eskom's site safety reports for three proposed nuclear power plants in the Western and Eastern Cape Provinces.

QUALIFICATIONS

- BSc (1988) University of Stellenbosch
- BSc-Hons in Botany (1991) University of Stellenbosch
- MSc in Botany (1993) Nelson Mandela Metropolitan University
- PhD in Botany (2000) Nelson Mandela Metropolitan University.

PROFESSIONAL MEMBERSHIP

Professional member (reg. no. 400073/98) of the South African Council for Natural Scientific Professions (SACNASP).

REFERENCES

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DECLARATION OF INDEPENDENCE

I Mark Gerald Berry, as the appointed Specialist hereby declare/affirm the correctness of the information provided or to be provided as part of the application, and that I :

- in terms of the general requirement to be independent:
 - **other than fair remuneration for work performed in terms of this application, have no business, financial, personal or other interest in the development proposal or application and that there are no circumstances that may compromise my objectivity**; or
 - am not independent, but another specialist (the "Review Specialist") that meets the general requirements set out in Regulation 13 has been appointed to review my work (Note: a declaration by the review specialist must be submitted);
- in terms of the remainder of the general requirements for a specialist, have throughout this EIA process met all of the requirements;
- have disclosed to the applicant, the EAP, the Review EAP (if applicable), the Department and I&APs all material information that has or may have the potential to influence the decision of the Department or the objectivity of any report, plan or document prepared or to be prepared as part of the application; and
- am aware that a false declaration is an offence in terms of Regulation 48 of the EIA Regulations, 2014 (as amended).



Signature of the Specialist:

Mark Berry Environmental Consultants

Name of Company:

27 November 2020

Date: