Environmental Impact Assessment (EIA) for the proposed construction, operation and decommissioning of the Saldanha Regional Marine Outfall Project of Frontier Saldanha Utilities (Pty) Ltd. at Danger Bay in the Saldanha Bay region

FINAL EIA REPORT

VOLUME II
APPENDIX B

Terrestrial Ecology

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ECOLOGICAL IMPACT ASSESSMENT OF PROPOSED FRONTIER RARE EARTHS SALDANHA REGIONAL MARINE OUTFALL PIPELINE, WESTERN CAPE.

Compiled for: CSIR Consulting and Analytical Services, Stellenbosch

Client: Frontier Rare Earths (Pty) Ltd

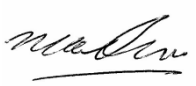
17 March 2015

Draft: 26 Sep 2014

DECLARATION OF INDEPENDENCE

In terms of Chapter 5 of the National Environmental Management Act of 1998 specialists involved in Impact Assessment processes must declare their independence and include an abbreviated Curriculum Vitae. (See CV on last page of this document).

I, N.A. Helme, do hereby declare that I am financially and otherwise independent of the client and their consultants, and that all opinions expressed in this document are substantially my own.



NA Helme

EXECUTIVE SUMMARY

This ecological impact assessment was commissioned in order to help inform the planning and environmental authorisation process for a proposed marine outfall pipeline in the Saldanha Bay region of the Western Cape. Two alternative routes were proposed for assessment, although for about 70% of their length they either share the same alignment or are on opposite sides of the same road.

The study area is part of the greater West coast region, and lies within what may be termed the Saldanha Peninsula bioregion. This bioregion has a fairly distinct flora, and a particularly high number of locally and regionally endemic plant species, as well as plant Species of Conservation Concern (SCC) (Helme & Koopman 2007).

The study area lies within the Fynbos biome and the Core Cape Floristic Region (CFR). The latest data from the Red Data Book listing process undertaken for South Africa is that 67% of the rare or threatened plant species in the country occur only in the southwestern Cape, and these total over 1800 species (Raimondo *et al* – 2009). It should thus be clear that the southwestern Cape is a major national and global conservation priority, and is quite unlike anywhere else in the country in terms of the number of threatened plant species.

The study area is within the planning domain of the Saldanha Fine Scale Conservation Plan (Pence 2008), which has identified and mapped Critical Biodiversity Areas (CBAs) throughout the region. Critical Biodiversity Areas are regarded as essential areas for the achievement of regional conservation targets, and are designed to ensure minimum land take for maximum result (Maree & Vromans 2010). The Fine Scale Plan indicates that both route alternatives cross significant CBAs. As many as 25 different plant SCC are potentially found within 200 m of both proposed routes, usually where these cross CBAs. If any of these SCC are within the study area they are likely to be within the mapped areas of Very High Sensitivity, and are not likely to be found in significant numbers outside the Very High Sensitivity areas.

Faunal sensitivity is expected to mirror the botanical sensitivity. Two faunal Species of Conservation Concern have been recorded from the study area Rose's Rainfrog (*Breviceps rosei*)– SW coastal endemic, and Black Girdled Lizard (*Cordylus niger)* – Near Threatened), and a further six reptile SCC may occur (probably in low numbers) within the study area.

About 8500 m of the blue pipeline alternative is within mapped CBAs, whereas this figure is about 9615 m for the purple alternative (Figure 1 of this report). The latter thus crosses about 11% more CBA than the former.

The SA vegetation map (Mucina & Rutherford 2006) and the more accurate and higher resolution Saldanha Fine Scale Vegetation Map (Helme & Koopman 2007) indicate that the proposed route crosses four main terrestrial vegetation types. **Saldanha Flats Strandveld** is regarded as Endangered on a national basis (Rouget *et al* 2004; DEA 2011). **Saldanha Granite Strandveld** is listed as an Endangered vegetation type (DEA 2011), and the coastal form in the area

between Jacobsbaai and Danger Bay supports an unusual assemblage of species that does not occur elsewhere (pers. obs). **Saldanha Limestone Strandveld** was previously listed as an Endangered vegetation type (Rouget et al 2004), and then was unfortunately downgraded to Least Threatened (DEA 2011), due to an oversight by the South African Biodiversity Institute (SANBI), and this error will apparently only be remedied in about 2015. The unit has the highest number of threatened and localised plant species of all vegetation types in the Saldanha region, and the Jacobsbaai area is one of two primary hotspots for highly localised species (Helme & Koopman 2007). The unit is also poorly conserved (represented) in the West Coast National Park. **Langebaan Dune Strandveld** was regarded as Vulnerable in terms of the National Spatial Biodiversity Assessment (Rouget *et al* 2004), but the unit is now not listed as a Threatened Ecosystem on the National List (DEA 2011), mainly because large areas are well protected within the West Coast National Park.

In terms of the construction of the proposed infrastructure the following potentially negative ecological issues have been identified:

- Direct, permanent loss of natural vegetation, associated plant and faunal SCC, and faunal habitat at the construction phase;
- Temporary to long term direct loss and degradation of natural vegetation and faunal habitat at the construction phase (laydown and soil storage areas; work areas); and
- Indirect ecological impacts at the operational phase (introduction of invasive alien plants; fragmentation of natural habitat and ecological corridors; fragmentation and reduction of subpopulations of rare/threatened plant species).

No potentially positive ecological impacts associated with this project have been identified. However, if a suitable financial contribution to a biodiversity offset is implemented then certain positive impacts could be realized, notably by providing funding for ecological management of valuable land parcels as identified by CapeNature or another authority or institution. It should be noted that the magnitude and hence significance of the positive impact is related to the scale of the offset.

- All construction and operational phase mitigation and management requirements outlined in Section 8 of this report must be required as Conditions of Approval.
- Pump Stations A, B, C and D (and their proposed access roads) have negligible ecological impact and require no specific mitigation.
- Pump Station E is likely to have a Medium negative botanical impact (Low – Medium negative faunal impact), before and after mitigation.
- Both proposed pipeline routes will have some negative botanical and faunal impacts which cannot be avoided or mitigated. Without mitigation the **blue route** (Jacobsbaai Western Corridor) will have a High negative botanical impact (Medium negative faunal impact), which could be reduced to Medium negative with mitigation (Low negative for faunal impact). The required mitigation includes rerouting a portion of the route (from Pumpstation C to D). Without mitigation the Jacobsbaai Western corridor will have a High negative botanical impact which could be reduced to Low – Medium negative with financial contribution to a biodiversity offset.

- The **purple route** (Jacobsbaai Eastern Corridor) will have a Medium negative botanical impact, both before and after mitigation. Faunal impact is likely to be Medium negative before mitigation, and Low negative after mitigation.
- Thus if rerouting of a portion of the blue route is undertaken, and all mitigation is put in place then there is **no strongly preferred routing** alternative from a botanical or faunal perspective.

Detailed mitigation and construction and operational phase EMP requirements are given.

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ABBREVIATIONS

CBA	Critical Biodiversity Area
CFR	Cape Floristic Region
CREW	Custodians of Rare and Endangered Wildflowers
GRP	Glass Reinforced Plastic
HDPE	High Density Poly-Ethylene
IDZ	Industrial Development Zone
MV	Medium Voltage
NEMA	National Environmental Management Act
NSBA	National Spatial Biodiversity Assessment
NWA	National Water Act (1998)
REE	Rare Earth Elements
RO	Reverse Osmosis
SANBI	South African Biodiversity Institute
S&R	Search and Rescue
SCC	Species of Conservation Concern
SRMO	Saldanha Regional Marine Outfall
SSP	Saldanha Separation Plant
OHL	Overhead lines
WCDM	West Coast District Municipality
WWTW	Waste Water Treatment Works

1 INTRODUCTION

This botanical impact assessment was commissioned in order to help inform the planning and environmental authorisation process for a proposed marine outfall pipeline in the Saldanha Bay region of the Western Cape.

It is proposed that the transfer pipeline will follow to a large extent the same terrestrial corridor as that proposed in the EIA for the proposed West Coast District Municipality (WCDM) desalination plant potable water pipeline leading to the Besaansklip reservoir. The proposed transfer system will consist of a pipeline with transfer pump stations located along the pipeline route. The positions of the transfer pump stations will depend on topography and pumping requirements as well as the availability and proximity of electrical power to the pump stations.

The project will thus consist of the following infrastructure:

- A terrestrial pipeline corridor (see Figure 1). This corridor will be approximately 27 km long from the proposed Saldanha Separation Plant (SSP) proposed by Frontier Separation Pty (Ltd) to the outfall in Danger Bay. The pipeline will have a diameter of approximately 900 mm and will be constructed from high density polyethylene (HDPE) or will be a glass reinforced plastic (GRP) pipe;
- Electrical corridors connecting to the pump stations. Either Medium Voltage (MV) cabling — which will be buried depending on the width of the pipeline servitude — will be utilised or Medium Voltage Overhead Lines (OHL) in traditional Delta A-Frame positions (wooden poles), at a height of 12 m, will be used;
- Five pump stations including brine transfer tanks, mechanical pumps, electrical distribution networks and standby generator located within the servitude located at positions A, B, C, D and E (refer to Figure 2 and 3);
- Gravel service roads to the pumps stations; and
- A marine outfall with diffuser system in Danger Bay.

Figure 1: Map showing the alternative pipeline routes assessed (in blue and purple).

2 TERMS OF REFERENCE

The terms of reference for this study were as follows:

- Describe the vegetation and fauna along the study area, and note the presence or likelihood of locally and regionally endemic plant species and plant and faunal Species of Conservation Concern (SCC; previously known as Red Data Book species).
- Assess the local (Saldanha) and regional (West Coast) conservation value of the study area, referring to specialist knowledge and to the National Spatial Biodiversity Assessment (NSBA, Rouget *et al* 2004) and to CapeNature's Fine Scale Conservation Plan for the Saldanha Municipality (Pence 2008).
- Identify and assess the likely botanical and faunal impacts as a result of the proposed infrastructure development.
- Provide recommendations for the mitigation of the issues identified, where possible.
- Indicate the preferred alternatives, from an environmental perspective.

3 LIMITATIONS, ASSUMPTIONS AND METHODOLOGY

No specific site visit was undertaken for this project, as the route largely follows an alignment assessed by the author in 2012 (see Helme 2012), for which fieldwork was undertaken. Significant additional fieldwork has been undertaken in most of the study area over the last ten years, and this, in combination with the available Google Earth imagery (the most recent being April 2011, which is of a high resolution and is easily interpreted) and a habitat based approach, means that the confidence in the botanical findings is high. A range of references noted in this report were consulted.

Conservation value and sensitivity (terms which are often used interchangeably in ecological assessments) of habitats are a product of species diversity, plant community composition, rarity of habitat, degree of habitat degradation, rarity of species, ecological viability and connectivity, vulnerability to impacts, and reversibility of threats (which in this case generally refers to the rehabilitation potential of the habitat; high sensitivity habitats having low rehabilitation potential).

Reference was made to the GIS-based database of rare plant localities maintained by CREW (Custodians of Rare and Endangered Wildflowers, based at Kirstenbosch), to the Red List of South African plants (Raimondo *et al* 2009), to the Fine Scale Vegetation map of the Saldanha Municipality (Helme & Koopman 2007), and to CapeNature's Fine Scale Conservation Plan for the Saldanha Municipality (Pence 2008).

No assessment of birds is included in this study, and the only invertebrates assessed were butterflies, as this is the only invertebrate group for which a Red Data Book is available (Mecenero *et al* 2013). Pipelines are in any event not likely to have any significant impact on highly mobile vertebrates like birds.

It is assumed that the installation of the pipeline will result in disturbance of a corridor up to 12m wide (including an adjacent access track (at least for construction, where not close enough to any existing road), trenches and temporary piling of fill). It is also assumed that the pipeline will run either within or just outside the existing or new proposed road reserves (in the case where roads are proposed for upgrade).

The position of the proposed pump stations as assessed is shown in Figures 2 & 3. The electrical infrastructure associated with these is assumed to follow the pipelines,and is not specifically assessed as it is likely to have negligible additional botanical impact. According to the Final Scoping Report (CSIR, 2014) the pump stations will mainly consist of a brine transfer tank, mechanical pumps (duty and standby) located in a bunded area, an electrical distribution and control centre and a diesel standby generator to supply power to the system during electrical power outages (4 hours capacity). Approximately 600 ℓ of diesel will be stored at the pump stations for the standby electrical generators. The pump stations and pipeline route will be accessed via existing or new gravel service roads, which were shown provisionally on the maps provided, and are likely to be as short as possible. Access will be limited to monitoring and maintenance functions. The pump stations will be remotely monitored and controlled via a centralized off site control room.

Figure 2: Map showing proposed pump stations A, B and C.

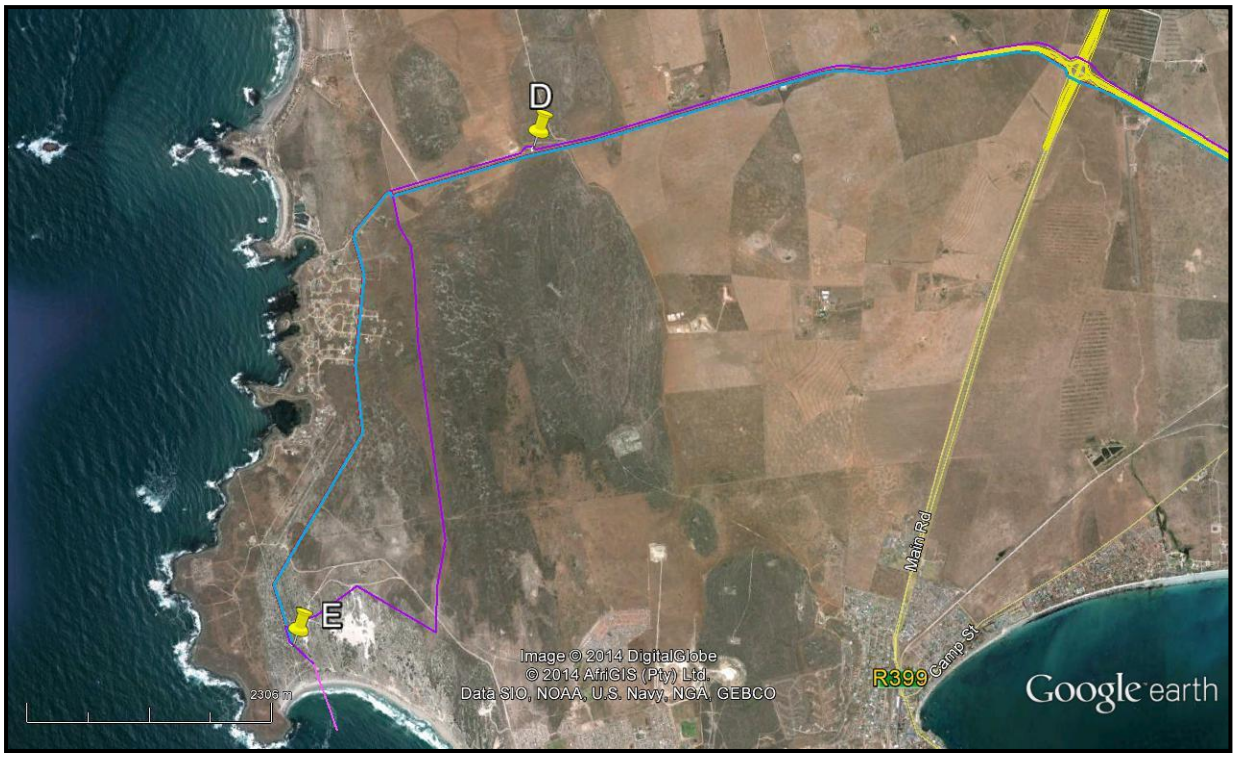

Figure 3: Map showing proposed pump stations D and E.

4 STUDY AREA AND REGIONAL CONTEXT

The study area lies within the Fynbos biome and the Core Region of the Greater Cape Floristic Region (CFR). The CFR is one of only six floristic regions in the world, and is the only one confined to a single country. It is also by far the smallest floristic region, occupying only 0.1% of the world's land surface, and supporting about 9000 plant species - almost half of all the plant species in South Africa. At least 70% of all the species in the Cape region do not occur elsewhere, and many have very small home ranges (these are known as narrow endemics). Most of the lowland habitats are under pressure from agriculture, urbanisation and alien plants, and thus many of the range restricted species are also under severe threat of extinction, as their habitat is reduced to extremely small fragments. The latest data from the Red Data Book listing process recently undertaken for South Africa is that 67% of the rare or threatened plant species in the country occur only in the southwestern Cape, and these total over 1800 species (Raimondo *et al* – 2009). It should thus be clear that the southwestern Cape is a major national and global conservation priority, and is quite unlike anywhere else in the country in terms of the number of threatened plant species. Developments in this area thus need to take this into account.

The study area is part of the greater West coast region, and lies within what may be termed the Saldanha peninsula bioregion. This bioregion has a fairly distinct flora, and a particularly high number of locally and regionally endemic plant species, as well as plant Species of Conservation Concern (Helme & Koopman 2007). The Saldanha Industrial Development Zone (IDZ) and associated development mean that significant impacts on the important remaining biodiversity can be expected.

The study area is within the planning domain of the Saldanha Fine Scale Conservation Plan (Pence 2008), which has identified and mapped Critical Biodiversity Areas (CBAs) throughout the region. Critical Biodiversity Areas are regarded as essential areas for the achievement of regional conservation targets, and are designed to ensure minimum land take for maximum result (Maree & Vromans 2010). The Fine Scale Plan indicates that both routes cross extensive CBAs in the eastern and western sections, as shown in Figure 4. The CBAs were identified as such for various reasons, including because the patches help achieve national conservation targets for that vegetation type; because they may be part of

large patches of natural habitat; because they have ecological linkage value; and because of the known presence of plant Species of Conservation Concern (Pence 2008).

About 8 500 m of the blue pipeline alternative (Jacobsbaai Western Corridor) is within mapped CBAs, whereas this figure is about 9 615 m for the purple alternative (Jacobsbaai Eastern Corridor). The latter thus crosses about 11% more CBAs than the former.

Figure 4: Extract of the Saldanha Municipality Fine Scale Conservation Plan (Pence 2008), showing the two alternative pipeline routes (blue and purple lines) in relation to the mapped terrestrial Critical Biodiversity Areas (in green). The two red arrows mark additional, subsequently identified areas of botanical importance that were not selected as Critical Biodiversity Areas due to a lack of data at the time (2008).

5 OVERVIEW OF THE ECOLOGY

5.1 Vegetation

The SA vegetation map (Mucina & Rutherford 2006) and the more accurate Saldanha Fine Scale Vegetation Map (Helme & Koopman 2007; Figure 5) indicate that the proposed route crosses four main terrestrial vegetation types. It should be noted that Figure 5 shows what would originally (prior to disturbance) have been the extent of the vegetation types, and that in fact less than 20% of the original natural

vegetation is left along the route, with most having been lost to agriculture, and increasingly, to urban and industrial development. Most of what remains is thus a CBA, and if not a CBA can anyway be considered sensitive, especially if it is in good condition and has not been previously heavily disturbed.

Saldanha Flats Strandveld is regarded as Endangered on a national basis (Rouget *et al* 2004; DEA 2011).

Saldanha Granite Strandveld is listed as an Endangered vegetation type (DEA 2011), and the coastal form in the area between Jacobsbaai and Danger Bay supports an unusual assemblage of species that does not occur elsewhere (pers. obs).

Saldanha Limestone Strandveld was previously listed as an Endangered vegetation type (Rouget et al 2004), and then was unfortunately downgraded to Least Threatened (DEA 2011), due to an oversight by SANBI, and this error will apparently only be remedied in about 2015. The unit has the highest number of threatened and localised plant species of all vegetation types in the Saldanha region, and the Jacobsbaai area is one of two primary hotspots for highly localised species (Helme & Koopman 2007). The unit is also poorly conserved (represented) in the West Coast National Park.

Langebaan Dune Strandveld was regarded as Vulnerable in terms of the NSBA (Rouget *et al* 2004), but the unit is now not listed as a Threatened Ecosystem on the National List (DEA 2011), mainly because large areas are well protected within the West Coast National Park.

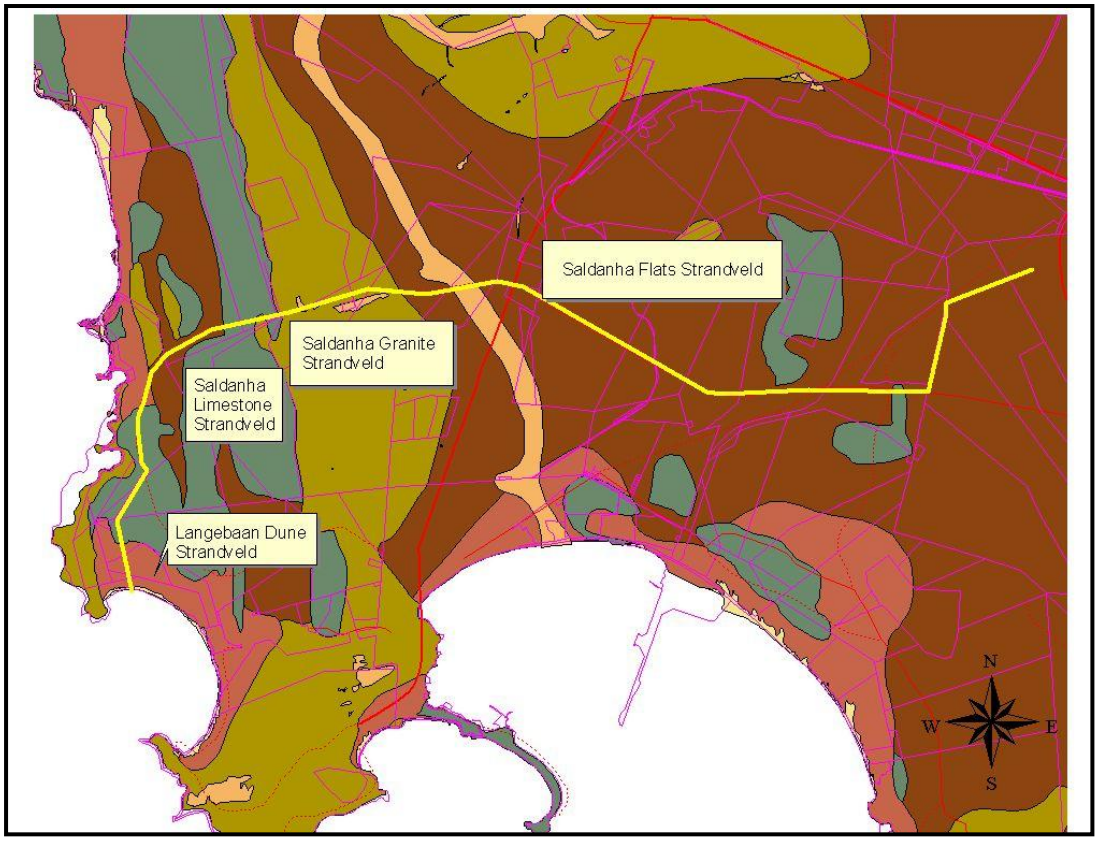

Figure 5: Extract of the CapeNature Fine Scale Vegetation Map (Helme & Koopman 2007) for the area, showing the four main vegetation types crossed by the route (yellow line).

The dunes in the vicinity of the discharge area in fact have many elements of another vegetation type - **Cape Seashore Vegetation**, which is typically associated with coastal dune systems in the southwestern Cape. This is also a Least Threatened vegetation type (Rouget *et al* 2004; DEA 2011).

Plant Species of Conservation Concern

At least twenty five plants SCC (Raimondo *et al* 2009) have been recorded from the vicinity of the project area (defined as being within 200 m of the proposed route). Many of these are endemic to the Saldanha region*, i.e.* they occur nowhere else, and many occur in very small, isolated populations which are easily destroyed or damaged by development.

The known or likely SCC within or close to the study area include *Daubenya zeyheri* (Vulnerable), *Cephalophyllum rostellum* (Endangered), *Limonium acuminatum* (Vulnerable), *Limonium capense* (Near Threatened), *Passerina ericoides* (Vulnerable), *Lampranthus vernalis* (Near Threatened), *Ruschia langebaanensis*

(Threatened), *Ruschia cupulata* (Vulnerable), *Drosanthemum marinum* (Near Threatened), *Agathosma thymifolia* (Vulnerable), *Otholobium bolusii* (Vulnerable), *Passerina filiformis* ssp. *glutinosa* (Near Threatened), *Arctopus dregei* (Near Threatened), *Aloe distans* (endemic, should be regarded as a subspecies of *A. perfoliata*), *Felicia elongata* (Vulnerable), *Romulea elliptica* (Endangered), *Romulea barkerae* (Endangered), *Moraea calcicola* (Endangered), *Cheiridopsis rostrata* (Vulnerable), *Anessorhiza calcicola* (Vulnerable), *Osteospermum calcicola* (Vulnerable), *Bulbinella calcicola* (Critically Endangered), *Sparaxis calcicola* (not yet assessed), *Moraea hainebachiana* (Vulnerable), *Zaluzianskya parviflora* (Near Threatened) and *Wiborgiella dahlgrenii* (Endangered).

If any of these SCC are within the study area they are likely to be within the Very High Sensitivity areas shown in Figures 6 and 7, and are not likely to be found in significant numbers outside the Very High Sensitivity areas. It should however be noted that the Very High Sensitivity areas shown are only shown within 200 m of the proposed routes, and even though they may extend more than 200 m away they are not shown in those areas.

The sensitive area shown in Figure 6 is driven mainly by the known occurrence of *Romulea elliptica*, an Endangered bulb species known from only four small patches. It would appear that the proposed pipeline will be located just to the north of the position of the *Romulea elliptica*, and it should thus impact on the species here.

The pipeline through Jacobsbaai has the potential to cause significant damage to sensitive habitat and SCC, but if located west of the main road this damage is likely to be significantly less than if located east of the road, as most of the SCC are located east of the road. The only four SCC known from within 12 m of the west side of the road are *Zaluzianskya parviflora* (Near Threatened), *Limonium capense* (Near Threatened), *Felicia elongata* (Vulnerable) and *Ruschia langebaanensis* (Threatened).

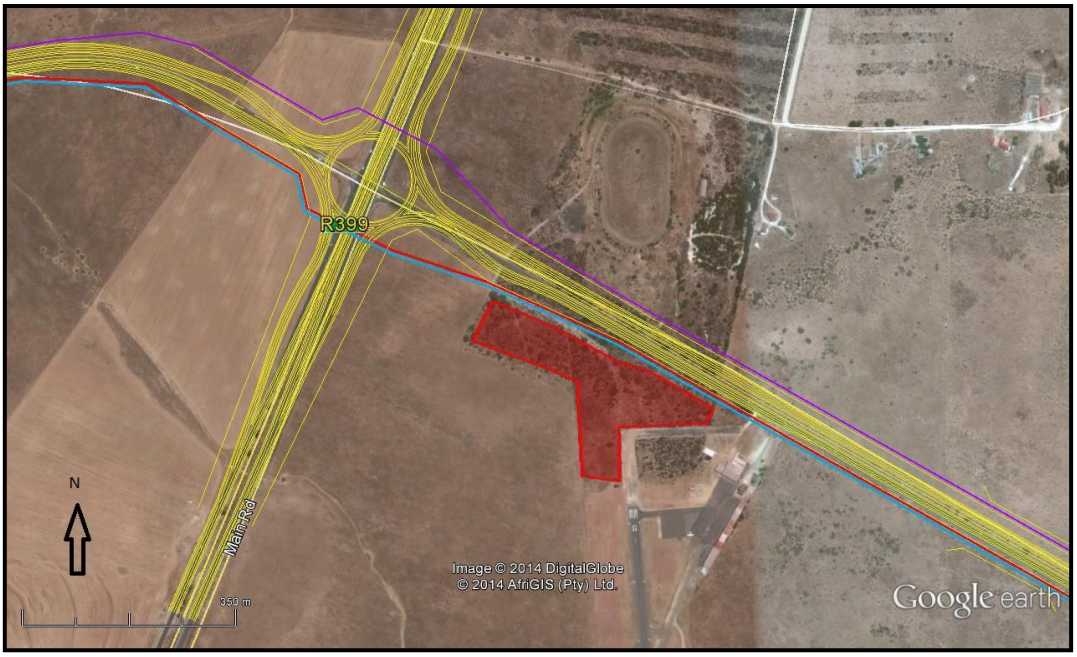

Figure 6: Map showing the Very High Sensitivity botanical area (red shading and outline) between the proposed pipeline and the airfield, just east of the Vredenburg – Saldanha road.

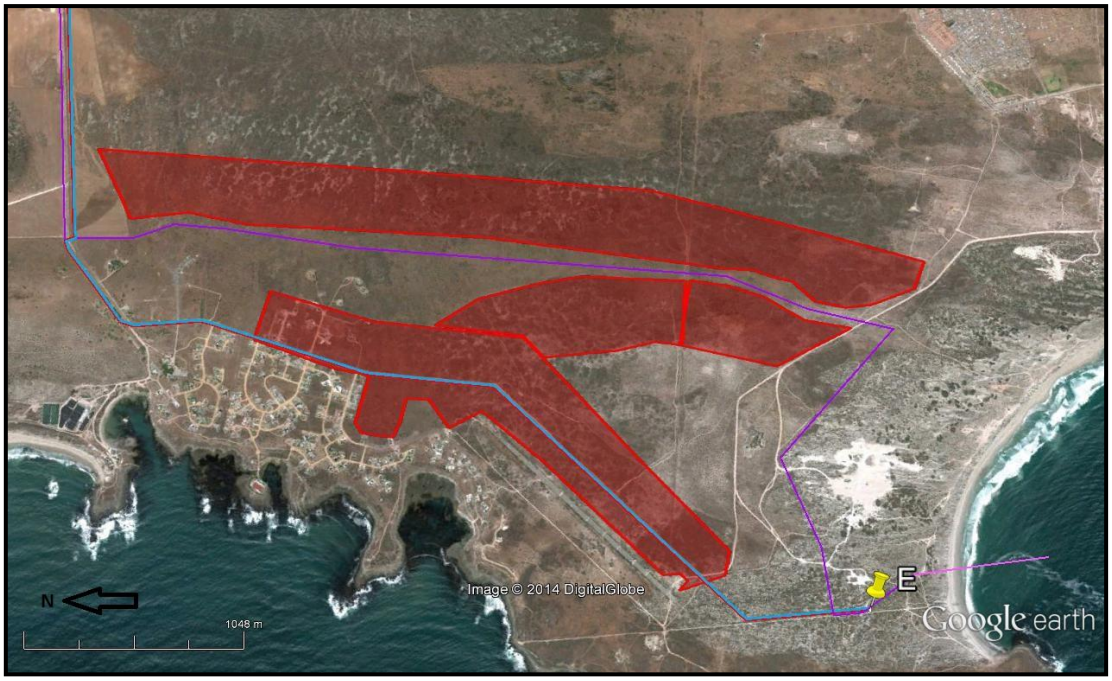

Figure 7: Map showing the Very High Sensitivity botanical areas (red shading and outline) within 200 m of the routes through the Jacobsbaai area. Unshaded areas within 200 m of the routes are of Low or Medium botanical sensitivity.

Figure 8: The blue shaded area is a sensitive wetland (faunal perspective) and botanical area just south of the Jacobsbaai road. This area would be negatively impacted by the blue route alternative.

5.2 Fauna

Highly mobile vertebrates like birds and most surface dwelling (non-fossorial) mammals are not likely to be significantly or permanently impacted by pipeline construction, and are thus not further discussed. However, tortoises, frogs and snakes are a particular concern when trenches are dug, as they are liable to fall in and become trapped. There is a high density of tortoises in the area (pers. obs.), and the only species in the area is the widespread Angulate Tortoise (*Chersina angulata*).

Burrowing mammals like golden moles could theoretically be impacted by construction, and two species of concern could occur in the general study area - Grant's Golden Mole *Eremitalpa granti* (Vulnerable; EWT 2004) and Cape Golden Mole *Chrysochloris asiatica* (Data Deficient; EWT 2004). Their presence or abundance in the area is entirely unknown.

Most of the potential faunal SCC in the area are reptiles, with one frog. There are confirmed records of Rose's Rainfrog (*Breviceps rosei*) from the study area, and of the Black Girdled Lizard (*Cordylus niger*), but all the other six threatened reptiles are only potential occurrences, and probably occur at low densities.

Rose's Rainfrog (*Breviceps rosei)* is a declining Western Cape endemic species with a restricted coastal distribution, and has been heard by the author within the study area. It is not Red Listed as threatened. The area from Paternoster to Postberg is also home to a disjunct population of the Black Girdled Lizard (*Cordylus niger*), a species otherwise found only in montane regions on the Cape Peninsula, and is able to survive here due to the cooler conditions caused by the prevailing southern, summer winds which cross cold water. This species is Red Listed as Near Threatened (Bates *et al* 2014), and it is fairly common on most rocky outcrops in the Jacobsbaai area, especially within 400 m of the sea.

The following faunal SCC could potentially occur on site: Cape Sand Snake *Psammophis leightoni* (Vulnerable; Bates *et al* 2014); Kasner's Dwarf Burrowing Skink *Scelotes kasneri* (west-coast endemic; Near Threatened; Bates *et al* 2014); Gronovi's Dwarf Burrowing Skink *Scelotes gronovii* (west-coast endemic; Near Threatened; Bates *et al* 2014); Blouberg Dwarf Burrowing Skink *Scelotes montispectus* (west-coast endemic; Near Threatened; Bates *et al* 2014); and Southern Adder *Bitis armata* (Vulnerable; Bates *et al* 2014).

No threatened butterfly species are known from any of the vegetation types occurring in the study area (Mecenero *et al* 2013).

6 ISSUES IDENTIFIED

In terms of the construction of the proposed infrastructure the following potentially negative ecological issues have been identified:

- Direct, permanent loss of natural vegetation, faunal habitat and associated plant and faunal SCC at the construction phase;
- Temporary to long term direct loss and degradation of natural vegetation and faunal habitat during the construction phase (laydown and soil storage areas; work areas); and
- Indirect ecological impacts during the operational phase (introduction of invasive alien plants; fragmentation of natural habitat and ecological corridors; fragmentation and reduction of subpopulations of rare/threatened plant species).

No potentially positive ecological impacts associated with this project have been identified. However, if a suitable financial contribution to a biodiversity offset is

implemented then certain positive impacts could be realized, notably by providing funding for ecological management of valuable land parcels as identified by CapeNature or another authority or institution. It should be noted that the magnitude and hence significance of the positive impact is related to the scale of the offset.

7 ASSESSMENT OF IMPACTS

Impacts may be both direct and indirect, with the former occurring mostly during the construction stage and the latter mostly during the operational stage.

In the case of this project the primary direct impacts are loss of natural vegetation and faunal habitat within the development footprint, the loss of Very High sensitivity vegetation in the Jacobsbaai area being the primary concern. It is perhaps debatable as to whether the temporary disturbance for a pipeline installation creates a permanent loss of natural vegetation, as there will be some natural (passive) rehabilitation, but most of the plant SCC are sensitive to disturbance and will not re-establish, and much of what does re-establish are weedy, pioneer species, as well as alien invasive species. In this regard the impact can be viewed as a permanent impact.

The primary sources of temporary and long-term loss include excavation and soil piles for large trenches, lay down areas, temporary vehicle tracks. Temporary to long term impacts are technically at least partly reversible. As noted there is a continuum from temporary to long term to permanent in terms of vegetation impacts. Some species will simply take longer to return than others (10 years versus 5 years for example), whilst others may become permanently displaced (which would then be a permanent impact).

Aside from faunal habitat loss and degradation there may be some direct negative faunal impact, particularly if there is a high incidence of species like tortoises, frogs and snakes falling into the open trenches and becoming trapped.

The main indirect impacts are likely to be habitat fragmentation, the disruption to current ecological connectivity, the introduction of invasive alien plants (wherever

vegetation and soil is disturbed), and loss of local subpopulations of rare or threatened plant species.

Apart from some of the indirect impacts, the impacts are mostly at the site (local) scale, and impacts are generally greater at the site scale than the regional scale.

Loss or degradation of areas mapped as CBAs equates to a loss of Irreplaceable biodiversity resources, and Irreplaceability is thus high.

7.1 Direct Impact: Permanent loss of natural vegetation

Pump Stations

The only pump station and access road located within currently natural vegetation is Pump Station E, which is located within Langebaan Dune Strandveld of Medium sensitivity. All other pump stations are in areas with no significant natural vegetation, and the significance of the loss of vegetation in these areas is thus Low negative. The significance of the loss of vegetation in the Pump Station E area is likely to be Low – Medium negative, as this is not currently a threatened vegetation type, and no plant SCC are known from that particular area.

Purple route alternative: East of the R399 (Vredenburg – Saldanha road) the purple route crosses very little natural vegetation that has not already been disturbed, and the impact is likely to be Low negative, and it is the preferred routing in this area.

West of the R399 the routing also crosses mostly disturbed land until it enters the Jacobsbaai area, and it is also the preferred routing in this section up to Jacobsbaai.

Just east of Jacobsbaai the routing follows a line identified by Helme (2012) as a less sensitive alternative to the route along Jacobsbaai main road. This route follows a lower sensitivity area of deeper, sandy soils (much of which was previously cultivated) between high sensitivity surface limestone, and as this habitat would be relatively easy to rehabilitate most of the impacts would be long term in nature rather than permanent. Although there are likely to be populations of a few SCC along the route it is in indeed likely to be less sensitive than the main road route, and the overall significance of the botanical impact is likely to be Medium negative.

Blue route alternative: The blue route crosses an area with some existing natural vegetation in the area east of the Orex rail terminal, including the locally endemic *Aloe distans* (now part of the widespread and not threatened *Aloe perfoliata*). It then follows the same route as the purple alternative to a point just east of pump station C, where it crosses to the south of the road. It narrowly avoids the Very High sensitivity area just east of the R399, and then impacts on a sensitive seasonal wetland area just east of Jacobsbaai (see Figure 8). This seasonal wetland supports various birds, but as birds are highly mobile the project is not likely to have a significant impact on them.

The blue route then moves to the west side of the Jacobsbaai main road and runs through an extensive area of Very High botanical sensitivity (Figure 7), where at least four SCC are known to occur, with a good likelihood of others being present.

Table 1: Impact assessment table for permanent loss of vegetation and associated plant species of conservation concern on site during construction phase.

Alternative	Status	Extent	Duration	Intensity	Probability	Revers-ability	Irreplace-ability	Significance without mitigation	Mitigation	Significance with mitigation	Confidence level
Pump Station A	Negative	Local	Permanent	Low	Definite	Low	Low	Low	None required	Low	High
Pump Station B	Negative	Local	Permanent	Low	Definite	Low	Low	Low	None required	Low	High
Pump Station C	Negative	Local	Permanent	Low	Definite	Low	Low	Low	None required	Low	High
Pump Station D	Negative	Local	Permanent	Low	Definite	Low	Low	Low	None required	Low	High
Pump Station E	Negative	Local	Permanent	Medium	Definite	Low	Medium	Medium	None required	Medium	High
Purple Pipeline Route (Jacobsbaai Eastern Corridor)	Negative	Local & regional	Permanent	Medium	Definite	Medium	Medium - High	Medium	Search & Rescue of rare species; Rehabilitation	Medium	High
Blue Pipeline Route (Jacobsbaai Western Corridor)	Negative	Local & regional	Permanent	Medium - High	Definite	Low - Medium	High	High	Reroute to north of road between Pump Stations C and D; Search & Rescue of all bulbs and succulents in footprint; Confine construction footprint within road reserve for section of 2 000 m traversing sensitive vegetation; Bury pipeline on the western (seaward) side of the road (for approximately 2 000 m section traversing through an area with endangered vegetation (within and to the south of Jacobsbaai); Determine an appropriate financial contribution to a biodiversity offset.	Medium; Low – Medium with financial contribution to a biodiversity offset	High

7.2 Direct Impact: Long term but partly reversible loss or degradation of natural vegetation

The existing natural vegetation is likely to be temporarily severely disturbed and degraded (as opposed to permanently lost) in all areas where construction related disturbance occurs in natural habitats that are capable of moderate to good rehabilitation. Rocky habitats and those with shallow soils (such as where shallow sands overly limestone or granite) are considered particularly sensitive as the success of vegetation rehabilitation is poor in these specialised habitats. Reversibility is low in these habitats, with high irreplaceability. Natural (passive) rehabilitation will be best where there is surrounding natural vegetation as a source of seed, and where subsequent disturbance (such as livestock grazing) is negligible. Dune systems, being prone to natural disturbance (by wind erosion) are likely to rehabilitate better than rocky areas (which are naturally highly stable systems), and hence reversibility potential is higher. Rehabilitation will be significantly inhibited where soil chemistry and structure is altered, such as by deep trenching or inputs of oil or other chemicals. The more sensitive plant species (often those that are regionally endemic and thus those of greater conservation significance) are unlikely to return after significant disturbance (reversibility is thus low and irreplaceability is high), and soil disturbance typically facilitates the invasion of alien plant (annuals, grasses, herbs and perennials) and animal (notably ant) species, which often rapidly dominate disturbed habitats, further inhibiting rehabilitation.

Table 2: Impact assessment table for long term disturbance and degradation of natural vegetation during construction phase.

Alternative	Status	Extent	Duration	Intensity	Probability	Revers-ability	Irreplace-ability	Significance without mitigation	Mitigation	Significance with mitigation	Confidence level
Pump Station A	Negative	Local	Permanent	Low	Definite	Low	Low	Low	None required	Low	High
Pump Station B	Negative	Local	Permanent	Low	Definite	Low	Low	Low	None required	Low	High
Pump Station C	Negative	Local	Permanent	Low	Definite	Low	Low	Low	None required	Low	High
Pump Station D	Negative	Local	Permanent	Low	Definite	Low	Low	Low	None required	Low	High
Pump Station E	Negative	Local	Permanent	Medium	Definite	Low	Low-Medium	Low -Medium	None required	Low- Medium	High
Purple Pipeline Route (Jacobsbaai Eastern Corridor)	Negative	Local & regional	Permanent	Medium	Definite	Medium	Medium - High	Medium	Rehabilitation	Low	High
Blue Pipeline Route (Jacobsbaai Western Corridor)	Negative	Local & regional	Permanent	Medium - High	Definite	Low - Medium	High	High	Reroute to north of road between Pump Stations C and D; Search & Rescue of all bulbs and succulents in footprint; Confine construction footprint within road reserve for section of 2 000 m traversing sensitive vegetation; Bury pipeline on the western (seaward) side of the road (for approximately 2 000 m section traversing through an area with endangered vegetation (within and to the south of Jacobsbaai); Determine an appropriate financial contribution to a biodiversity offset.	Medium; Low – Medium with financial contribution to a biodiversity offset	High

7.3 Direct impacts on Fauna

No significant faunal impacts are expected to occur during the operational phase of the project, and the primary impacts are thus related to the construction phase.

Rose's Rainfrog (*Breviceps rosei*) has been heard calling within 100m of the Pump Station E, but this species is capable of moving in response to site disturbance, although it is dormant underground throughout the dry season and would then be unlikely to move, meaning that specimens might be dug up or killed during excavation both for the pipeline and the pump station construction.

Cordylus niger is present on rocky outcrops around Jacobsbaai, but none of the infrastructure is likely to be located within 20 m of any such outcrops, and thus impacts are likely to be avoided.

The primary direct impact is likely to relate to the actual trench, and animals falling into this and becoming trapped. This is a potential problem for frogs, snakes and tortoises. It is easily mitigated by having a dedicated person (perhaps the ECO) who checks any open trenches twice a day and removes any animals that have fallen in, or alternatively by erecting a catchfence along the entire length of the open trench that prevents any small animals from actually getting into the trench.

Table 3: Summary impact assessment table for loss of faunal habitat, direct impact on fauna and faunal species of conservation concern on site during construction phase.

Alternative	Status	Extent	Duration	Intensity	Probability	Irreplace-ability	Significance without mitigation	Mitigation	Significance with mitigation	Confidence level
Pump Station A	Negative	Local	Long term	Low	Likely	Low	Low	None required	Low	High
Pump Station B	Negative	Local	Long term	Low	Likely	Low	Low	None required	Low	High
Pump Station C	Negative	Local	Long term	Low	Likely	Low	Low	None required	Low	High
Pump Station D	Negative	Local	Long term	Low	Likely	Low	Low	None required	Low	High
Pump Station E	Negative	Local	Long term	Medium	Likely	Medium	Low-Medium	None required	Low-Medium	High
Purple Pipeline Route (Jacobsbaai Eastern Corridor)	Negative	Local	Long term	Medium	Likely	Medium	Medium	Search & Rescue of all animals that fall into open trenches; catchfences along all open trenches	Low	High
Blue Pipeline Route (Jacobsbaai Western Corridor)	Negative	Local	Long term	Medium	Likely	Medium	Medium	Reroute to north of road between Pump Stations C and D; Search & Rescue of all animals that fall into open trenches; catchfences along all open trenches	Low	High

7.4 Indirect impacts

The proposed development may result in a degree of habitat fragmentation and disruption of current ecological connectivity across the site/s, although the pipelines themselves will be buried and thus habitat connectivity will be partially restored once the disturbed areas have been partly rehabilitated, and hence habitat fragmentation due to the actual pipelines will be minimal. The size and positioning of the pump stations means that they will have very minor impacts in terms of habitat fragmentation.

A further possible (relatively minor) indirect impact may be the spread of alien invasive vegetation (mainly grasses and herbs, many of which are annuals, but also woody *Acacia* species) into currently natural and partly natural areas of vegetation. Soil disturbance is the primary stimulus for invasion by alien vegetation. Some alien plant invasion is likely to occur as a result of the soil disturbance associated with the installation of any infrastructure into currently largely natural vegetation. In the case of woody (shrubby) invasives this is easily mitigated by ongoing alien vegetation management during the operational phase, but the often less obvious invasive annuals are usually ignored by management teams, to the detriment of the natural environment. Technically most invasion by alien vegetation is reversible, although in reality this is often not adequately managed.

As the habitats concerned are not fire-driven the proposed developments should not have an impact on the current fire frequencies in the surrounding veld.

When a species has a very small local subpopulation, as is often the case for rare species, loss of even small numbers of this subpopulation may have significant negative impacts on the overall ecological fitness and viability of that species. Irreplaceability in this case would be high. There may be a critical threshold below which a population is no longer viable, but actually assessing the significance of this potential loss is however an exceedingly complex and difficult task, as it requires extensive research both prior to (for baseline data) and after the project development, and this is usually not feasible, for a variety of reasons.

Table 4: Impact assessment table for all indirect ecological impacts of development on vegetation and fauna, mainly during the operational phase. Note that only botanical mitigation is included in this table.

Alternative	Status	Extent	Duration	Intensity	Probability	Revers-ability	Irreplace-ability	Significance without mitigation	Mitigation	Significance with mitigation	Confidence level
Pump Station A	Negative	Local	Permanent	Low	Definite	Low	Low	Low	None required	Low	High
Pump Station B	Negative	Local	Permanent	Low	Definite	Low	Low	Low	None required	Low	High
Pump Station C	Negative	Local	Permanent	Low	Definite	Low	Low	Low	None required	Low	High
Pump Station D	Negative	Local	Permanent	Low	Definite	Low	Low	Low	None required	Low	High
Pump Station E	Negative	Local	Permanent	Medium	Definite	Low	Medium	Medium	None required	Medium	High
Purple Pipeline Route (Jacobsbaai Eastern Corridor)	Negative	Local & regional	Permanent	Medium	Definite	Medium	Medium - High	Medium	Rehabilitation of disturbed areas; alien vegetation management along route for a minimum of 5 yrs after construction	Medium	High
Blue Pipeline Route (Jacobsbaai Western Corridor)	Negative	Local & regional	Permanent	Medium	Definite	Low - Medium	High	Medium	Rehabilitation of disturbed areas; Reroute to north of road between Pump Stations C and D; alien vegetation management along route for a minimum of 5 yrs after construction	Medium	High

7.5 Cumulative impacts

To some extent a cumulative impact is a regional impact, rather than the local site scale impact, i.e. if something has a regional impact it also has a cumulative impact. The remaining vegetation and faunal habitat in the Saldanha Municipality is under heavy development pressure (pers. obs.), and thus all new developments in the region have a cumulative impact, especially on the three vegetation types largely restricted to the region, and on the 60 or so regionally endemic plant species (Helme & Koopman 2007). No faunal species covered in this report are known to be restricted to the Saldanha Municipality.

The impacts of the proposed development will be significantly less than for various past, recent and proposed agricultural, mining, industrial and urban developments in the region (which are based on large scale habitat transformation). Cumulative impacts are thus important, but may be seen as potentially relatively low when compared with certain other development related impacts. However, further loss of rare or threatened species, many of which have lost large parts of their original populations, could be seen as a severe cumulative impact, and thus ones perspective in fact determines how the cumulative impact is seen.

There is unlikely to be a significant difference in terms of cumulative impacts between the blue and purple routes, provided that the blue route is rerouted to north of the Jacobsbaai road between Pump station C and D. If not rerouted, the blue route alternative could have a greater negative cumulative impact than the purple route.

7.6 Positive Impacts

No potentially positive benefits of this project have been identified, at least not in terms of vegetation or fauna. However, if a suitable biodiversity offset is implemented then certain positive impacts could be realized, notably by providing funding for ecological management of identified but as yet unformalised nearby conservation areas. It should be noted that the magnitude and hence significance of the positive impact is related to the scale of the offset.

7.7 Assessment of No Go alternative

On balance the status quo is deemed to have a Neutral impact on the natural vegetation and fauna in the study area. However, given the fairly rapid pace of development in the region alternative (negative) development impacts can confidently be expected to occur in at least part of the currents study area within a fairly short period. There is currently negligible grazing impact on most of the various study areas, with the obvious exception of the cultivated lands, which are anyway of Low botanical sensitivity.

7.8 Impact Statement

Pump Stations

Pump Stations A, B, C and D have negligible botanical and faunal impact and require no specific mitigation.

Pump Station E is likely to have a Medium negative botanical impact, before and after mitigation, and Low - Medium negative faunal impact, before and after mitigation.

Pipeline Alternatives

Both proposed pipeline routes would have some negative botanical and faunal impacts which cannot be avoided or mitigated.

Without mitigation the **blue route (Jacobsbaai Western Corridor)** would have a High negative botanical impact, which could be reduced to Medium negative with mitigation. The required mitigation includes rerouting a portion of the route. The impact could also be reduced to Low – Medium negative with a financial contribution to a biodiversity offset. Faunal impact is likely to be Medium negative before mitigation, and Low negative after mitigation.

The **purple route (Jacobsbaai Eastern Corridor)** would have a Medium negative botanical impact, both before and after mitigation. Faunal impact is likely to be Medium negative before mitigation, and Low negative after mitigation.

Thus if rerouting of a portion of the blue route is undertaken, and all mitigation is put in place then there is **no strongly preferred routing alternative** from a botanical or faunal perspective.

8 REHABILITATION GUIDELINES, CONSTRUCTION PHASE EMP & OPERATIONAL PHASE EMP REQUIREMENTS AND MITIGATION

Areas requiring rehabilitation include all areas of natural or partly natural vegetation disturbed during the construction phase and that are not required for regular maintenance operations. The main areas thus requiring rehabilitation will be disturbance to the edges of any new access roads that pass through natural vegetation, pipeline routes through natural vegetation, and areas around the Pump Station E. The areas around the Pump stations A-D should also be monitored for alien vegetation and any invasive alien species should be removed on an annual basis.

Rehabilitation should only commence once all construction related disturbance associated with the project has been completed.

Detailed requirements for the **Construction Phase Environmental Management Plan (CEMP)** are:

1) All approved development footprints within areas of natural vegetation should be surveyed and fenced/cordoned off with coloured rope. Only once this has been done can anything else proceed. It should be made very clear to all contractors that there is to be no disturbance of natural vegetation outside these demarcated areas, at least not without the permission of the Environmental Control Officer (ECO). Penalties for violation of areas outside those demarcated for construction purposes should be incorporated into the contracts of all contractors and sub-contractors.

2) Prior to any construction a plant Search and Rescue programme (S&R) should be undertaken within all development footprint that occur within areas of natural vegetation. S&R shall involve translocation of selected succulents, shrubs and bulbs occurring in the pipeline footprint, with emphasis on any SCC. The timing of the S&R operation is critical - it cannot be done during the dry summer months, for example. All such development footprints must be surveyed and pegged out as soon as possible after project commencement (see point 1), and then a local horticulturist with S&R experience (such a person could be recommended by the botanist) should be appointed to undertake the S&R, just

after flowering has been completed. The horticulturist must liaise with the botanist. All rescued species should be bagged (and cuttings taken where appropriate) and kept in the horticulturist's nursery, and should be returned to site once all construction is completed and rehabilitation of disturbed areas is required. Replanting should only occur in autumn or early winter (April – May), once the first rains have fallen, in order to facilitate establishment. The consultant botanist must confirm in writing that this process has been completed successfully.

3) Mr Koos Claassens of Jacobsbaai should be used as a specialist on- site adviser for the Search and Rescue work in the mapped Very High sensitivity areas in Jacobsbaai, as he knows the area and flora intimately.

4) If the blue route alternative (Jacobsbaai Western Corridor) is chosen it must be rerouted to run north of the Jacobsbaai road between Pump stations C and D, in order to avoid the two sensitive wetland areas south of this road.

5) It is recommended that for the section pipeline of approximately 2 000 m traversing through an area with endangered vegetation (within and to the south of Jacobsbaai), the pipeline construction disturbance footprint should be entirely within the road reserve west of the main road, to reduce impacts on sensitive vegetation along the pipeline corridor. Most of the Species of Special Concern are located east of the main road, or outside of the road reserve. This recommendation has been accepted by Frontier Saldanha Utilities;

6) It is recommended that for the section pipeline of approximately 2 000 m traversing through an area with endangered vegetation (within and to the south of Jacobsbaai) the proposed pipeline must be buried on the western (seaward) side of the road as this side is more disturbed and hence less sensitive than the eastern side;

7) Disturbance must be minimised during construction in the Very High Sensitivity areas through Jacobsbaai, and in this regard all heavy machinery and soil piles should be kept within the current road shoulder edge. In other words, no disturbance may take place west of the actual trench to be dug – no vehicular activity, and no pipe or soil storage.

8) An ECO must visit the area at least twice a week for the duration of the construction phase, or more often as required.

9) The ECO must ensure that no laydown or material storage areas are located within areas of natural vegetation.

10) Topsoil (top 30 cm) must be replaced last when infilling the trenches, and compacted only by hand once replaced.

11) All open trenches must be fenced off at ground level on the open side (the side opposite the side where the excavated soil is stacked) in order to prevent small animals like frogs, snakes and tortoises falling in and becoming trapped. Shadecloth of 30 cm high should be used, and fastened to fence droppers hammered in every 5 m, with the bottom staked down at ground level, leaving no gaps.

12) No sections of pipeline trenches more than 50 m long may be left open for more than a week, and they should preferably be closed up within a day, using the carefully stockpiled soil that came out of the trench.

13) If trenches are left open for more than a day the ECO must inspect all such sections every morning and evening and remove any animals that may have fallen into the trench. If the ECO is not on site the contractor must designate a team member to do this checking and removal twice a day.

14) No dumping or temporary storage of any materials may take place outside designated and demarcated laydown areas. Laydown areas may not be located within areas of natural vegetation.

15) Only suitable locally indigenous Strandveld plant species should be used for rehabilitation or planting anywhere on site. This means that no exotic or invasive species should be used for rehabilitation, and this includes the commonly used but highly invasive grass species such as ryegrass (*Lolium* spp).

Operational Phase EMP Requirements:

16) All temporary fencing (or coloured rope) and danger tape should be removed once the construction phase has been completed.

17) Ongoing invasive alien plant monitoring and removal must be undertaken in all areas of natural vegetation within the project area on an annual basis (in October or November), for a minimum of five years after completion. DWA approved methods should be employed for all alien clearing operations. No earthmoving machinery should be used for this purpose, as this disturbs the

soil and creates ideal conditions for re-invasion. For woody plants all stems must be cut as close to ground level as possible, using loppers or chainsaws (depending on size), and stumps must be immediately hand painted with a suitable Triclopyr herbicide (e.g. Garlon, Timbrel, with colour dye) to prevent resprouting. If this is not done within five minutes of being cut some stems may resprout, wasting the original effort. All cut branches should be stacked into pyramids (cut ends up) and left to dry – where rodents will eat the available seed under the pile, reducing seed germination. Annual follow ups are required in all areas that have been previously cleared. Small seedlings may be hand pulled, and alien grasses and herbs should either be hand pulled or sprayed with suitable herbicide, but only if cover is greater than 60% per m^2 and indigenous plant cover is less than 10%. An independent botanist should monitor and audit this process two years after completion of project construction.

18) The applicant must engage with CapeNature (or another appropriate conservation body) and an experienced biodiversity offset advisor prior to the project being executed, in order to formalise the form and quantum of a biodiversity offset, as an important element of mitigation for degradation of Limestone Strandveld habitat in the Jacobsbaai area.

19) The applicant must ensure that there is sufficient budget to implement all management recommendations noted above.

Table 6: Monitoring operations required.

Impact	Mitigation/Management action	Monitoring		
		Method	***Frequency***	***Responsibility***
Construction Phase: Permanent loss of vegetation due to construction in natural vegetation	ECO to ensure that all proposed infrastructure footprints within natural vegetation are fenced/cordoned off prior to construction, using coloured rope or similar; ensure that no disturbance occurs outside of these designated corridors; ensure laydown areas are not in natural vegetation; ensure that Search and Rescue is undertaken prior to disturbance	Visual checking and supervising to ensure compliance	Daily during construction	ECO
Construction Phase: Animals trapped in open pipe trenches	ECO to monitor open sections of trench every morning and evening and remove any animals	Visual inspection	Twice daily	ECO or contractor
Construction & Operational Phases: Degradation of natural vegetation within development footprint	Search and Rescue - make sure that all movable plants within designated development footprints in areas of natural vegetation are removed before construction commences; make sure that they are replanted in areas requiring rehabilitation once construction ceases; prior to any development, and after S&R.	Appointed horticulturist to liaise with botanist	Once off	ECO and appointed horticulturist
Operational Phase: Alien vegetation invasion	Annual removal of all invasive alien vegetation from within project footprint, using DWA approved methods	DWA methodology; cut stems and paint immediately with suitable herbicide; no herbicide spraying in areas with >10% natural vegetation.	Annually, in October or November, for 5 yrs after construction.	Alien vegetation contractor to undertake work; independent botanist to audit two years after construction has been completed

9 CONCLUSIONS AND RECOMMENDATIONS

- All construction and operational phase mitigation and management requirements outlined in Section 8 of this report must be required as Conditions of Approval.
- Pump Stations A, B, C and D (and their proposed access roads) have negligible botanical or faunal impact and require no specific mitigation.
- Pump Station E is likely to have a Medium negative botanical impact, before and after mitigation, and a Low – Medium negative faunal impact, before and after mitigation.
- Both proposed pipeline routes would have some negative botanical and faunal impacts which cannot be avoided or mitigated. Without mitigation the **blue route** (Jacobsbaai Western Corridor) would have a High negative botanical impact (Medium negative faunal impact), which could be reduced to Medium negative with mitigation or Low – Medium negative with biodiversity offset) (Low negative for faunal impact). The required mitigation includes rerouting a portion of the route (from Pumpstation C to D), and a financial contribution to a biodiversity offset..
- The **purple route** (Jacobsbaai Eastern Corridor) would have a Medium negative botanical impact, both before and after mitigation. Faunal impact is likely to be Medium negative before mitigation, and Low negative after mitigation.
- Thus if rerouting of a portion of the blue route is undertaken, and all mitigation is put in place then there is **no strongly preferred routing alternative** from a botanical perspective.

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APPENDIX 1

Assessment methodology

The following methodology is to be applied in the specialist studies for the assessment of potential impacts.

The assessment of impact significance should be based on the following convention:

Nature of impact - this reviews the type of effect that a proposed activity will have on the environment and should include "what will be affected and how?".

Extent - this should indicate whether the impact will be local and limited to the immediate area of development (the site); limited to within 5km of the development; or whether the impact may be realised regionally, nationally or even internationally.

Duration - this should review the lifetime of the impact, as being very short term (0 - 1 years), short term (1 - 5 years), medium (5 - 15 years), long term (>15 years but where the impacts will cease after the operation of the site), or permanent.

Intensity - here it should be established whether the impact is destructive or innocuous and should be described as either low (where no environmental functions and processes are affected), medium (where the environment continues to function but in a modified manner) or high (where environmental functions and processes are altered such that they temporarily or permanently cease).

Probability - this considers the likelihood of the impact occurring and should be described as improbable (low likelihood), probable (distinct possibility), highly probable (most likely) or definite (impact will occur regardless of prevention measures).

Reversibility - this considers the degree to which the adverse environmental impacts are reversible or irreversible. For example, an impact will be described as low should the impact have little chance of being rectified to correct environmental impacts. On the other hand, an impact such as the nuisance factor caused by noise impacts from wind turbines can be considered to be highly reversible at the end of the project lifespan.

Irreplaceability - this reviews the extent to which an environmental resource is replaceable or irreplaceable. For example, if the proposed project will be undertaken on land that is already transformed and degraded, this will yield a low irreplaceability score; however, should a proposed development destroy unique wetland systems for example, these may be considered irreplaceable and thus be described as high.

The status of the impacts and degree of confidence with respect to the assessment of the significance must be stated as follows:

Status of the impact: A description as to whether the impact will be positive (a benefit), negative (a cost), or neutral.

Degree of confidence in predictions: The degree of confidence in the predictions, based on the availability of information and specialist knowledge. This should be assessed as high, medium or low.

Based on the above considerations, the specialist must provide an overall evaluation of the significance of the potential impact, which should be described as follows:

Low*:* Where the impact will not have an influence on the decision or require to be significantly accommodated in the project design

Medium: Where it could have an influence on the environment which will require modification of the project design or alternative mitigation;

High: Where it could have a 'no-go' implication for the project unless mitigation or re-design is practically achievable.

Significance Rating

Intensity: **HIGH**

		Duration				
		Permanent	Long term	Medium term	Short term	Very short term
Extent	National					
	Regional					
	Local					
	Site specific					

Intensity: **MEDIUM**

		Duration				
		Permanent	Long term	Medium term	Short term	Very short term
Extent	National					
	Regional					
	Local					
	Site specific					

Intensity: **LOW**

		Duration				
		Permanent	Long term	Medium term	Short term	Very short term
Extent	National					
	Regional					
	Local					
	Site specific					

	High significance
	Medium significance
	Low significance

The above assessment must be described in the text.

ABBREVIATED CURRICULUM VITAE - NICHOLAS ALEXANDER HELME

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Since 1997 I have been based in Cape Town, and have been working as a specialist botanical consultant, specialising in the diverse flora of the south-western Cape. Since the end of 2001 I have been working on my own and trade as Nick Helme Botanical Surveys, and have undertaken at least 900 site assessments during this period.

A selection of relevant work undertaken over the last few years is as follows:

- Constraints analysis for propose Solar City development between Saldanha and Vredenburg (Planning Partners 2013)
- Botanical Assessment for proposed Eskom Uiekraal substation and powerline, Saldanha (Landscape Dynamics 2013)
- Scoping and Impact Assessment of proposed Saldanha Desalination Facility and Pipeline (CSIR 2012)
- Botanical Impact Assessment of proposed Saldanha Tank Farm (WorleyParsons 2012)
- Ecology Impact Assessment of proposed Rare Earths Mineral Separation Plant, Saldanha (AGES Gauteng 2011)
- Botanical inputs into proposed Saldanha IDZ (MEGA 2011)
- Botanical Assessment of site on SAS Saldanha (Footprint Environmental 2011)
- Fatal Flaw Analysis of Ptn of Ptn 16 of Pienaarspoort 197, Saldanha (MOGS 2011)
- Scoping study of proposed Wind Energy Facility near Britannia Bay (Savannah Environmental 2010)
- Scoping and Impact Assessment study of proposed Wind Energy Facility at Rheboksfontein, Darling (Savannah Environmental 2010)
- Scoping and Impact Assessment study of proposed Wind Energy Facility near Vredenburg (Savannah Environmental 2010)
- Scoping and Impact Assessment of proposed Wind Energy Facility near Hopefield (Savannah Environmental 2008 & 2009)

- Botanical Scoping and Impact Assessment of proposed St Helena Hills development (DJ Environmental 2009)
- Botanical Impact Assessment of Portion 4 of Farm 560, Yzerfontein (EnviroLogic 2009)
- Botanical Impact Assessment of Portion 9 of Farm 957, Saldanha (EnviroLogic 2008)
- Botanical Sensitivity study of Portion 4 of Farm Yzerfontein 560 (De Villiers family 2008)
- Botanical Scoping and Impact Assessment of proposed overnight sites in the West Coast National Park (SANParks 2008 & 2010)
- Botanical Impact Assessment of proposed development on Portion 87 of the Farm Witteklip 123, Vredenburg (CCA Environmental 2008)
- Fine Scale Vegetation Mapping and Conservation Planning for Saldanha Municipality (CapeNature & SANBI, 2006 - 2007)
- Botanical Assessment of Rem. Erf 460 Ptn A, St Helena (Envirodinamik 2007)
- Baseline botanical assessment of Portion 5 of the Farm Duyker Eiland 6, St Helena (Johan Neethling Environmental Services 2006)
- Specialist Botanical input for the proposed expansion of the St Helena Urban Edge (CK Rumboll 2006)
- Botanical Assessment of Phases 4-9, Sandy Pt Heights, St Helena (EnviroLogic 2006)