BOTANICAL IMPACT ASSESSMENT

FOR

PROPOSED ERICA DRIVE EXPANSION IN BELHAR AND KUILSRIVIER AREA

Prepared for: City of Cape Town Metropolitan Municipality
Contact: Wynand Buhr
Tel: 021 444 4683
Email: wynand.buhr@capetown.gov.za

Prepared by: Eco Impact Legal Consulting (Pty) Ltd
P.O. Box 45070
Claremont
South Africa
7735
Tel: 021 671 1660/9976
Email: admin@ecoimpact.co.za

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PROJECT DETAILS

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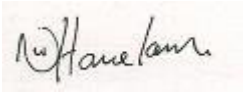
Carried Out By: Eco Impact Legal Consulting (Pty) Ltd P.O. Box 45070 Claremont 7735 Tel: 021 671 1660 Email: admin@ecoimpact.co.za	**Client:** City of Cape Town Metropolitan Municipality Contact: Wynand Buhr Tel: 021 444 4683 Email: wynand.buhr@capetown.gov.za	
Field Assistant: Johmandie Pienaar (Giliomee) Environmental Assessment Practitioner **Main Author and Specialist:** Nicolaas Hanekom Pri.Sci.Nat (Ecological Science) No 400274/11	**Client Contact Person:** City of Cape Town Metropolitan Municipality Contact: Wynand Buhr Tel: 021 444 4683 Email: wynand.buhr@capetown.gov.za	

Verification	Capacity	Name	Signature	Date
Field Assistant	Senior EAP & Biodiversity Specialist	Johmandie Pienaar (Giliomee)		24 November 2017
By Author and Reviewed	Director: Environmental Management; Principle EAP & Biodiversity Specialist	Nicolaas Hanekom		24 November 2017

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1. Introduction

The City of Cape Town Metropolitan Municipality, hereafter referred to as the Municipality, proposes to extend and expand the existing Erica Drive in Belhar to relieve current traffic congestions within the area.

The proposed Erica Drive / Belhar Main Road extension is approximately 3,24km in length. Erica Road will link to the R300 with an interchange which will give access to the north only. The first section of Erica Drive between Belhar Drive and New Nooiensfontein Road will be known as Erica Drive and the section between New Nooiensfontein Road and Highbury Road will be known as Belhar Main Road. The planned road is a dual carriageway with a median that varies in width between 2m and 5m. The planned cross-section comprises of two 3,4m lanes, a 2,4m surfaced shoulder and a 0,3m channel on both the shoulder side and the median side per direction of travel. This is a 9,8m kerb to kerb width per direction. On either side of the dual carriageway will be a 2m sidewalk. The 2,4m surfaced shoulders will be utilized as cycle ways (both sides of the road).

The dual carriageway will be constructed within a road reserve which varies between 32m and 40m. A section of the road reserve adjacent to Kuils River is 50m wide. On the western end of the proposed road it will tie into the existing Erica Drive at the Belhar Drive intersection. On the eastern end it will tie into the existing Highbury Road Intersection. The existing Highbury Road intersection and Belhar Main Road further to east are being designed by another consultant. The first section of the project between Belhar Drive and the R300 (western side) lies within an open field and are owned by council and zoned as road reserve. The section between the R300 road reserve and the Reuter Street intersection is an open field. As part of the neighbouring development most of the road reserve has been determined and zoned as road reserve. There is however areas which needs to be rezoned as road reserve (current zoning = agricultural). The existing Erica Drive / Belhar Road between the Reuter Street Intersection and Highbury Road crosses Kuils River and falls within an existing road reserve. Duo to site distance requirements splay sizes at intersections do require additional road reserve. The additional road reserve influences a number of residential stands as well as property of the Provincial Government of the Western Cape. The R300 off-ramp is 660m in length and will consist of a 4m lane and 2 x 2m pave shoulders which widens to 2 x 3,7m lanes at the Erica Drive Intersection (terminal). The R300 on-ramp is 890m in length and will consist of a single 4m lane and 2 x 2m paved shoulders. The larger part of the ramps falls within the existing R300 road reserve.

The new Erica Drive / Belhar Drive Intersection will be signalized. The Erica Drive / St Vincent Drive Intersection (T-junction) will have STOP-control on St Vincent Drive. Erica Drive will cross the R300 with a bridge passing over the R300. The R300 Bridge will be widened when Erica Drive becomes a dual carriageway Road. Both interchange terminals (T-junctions) will be signalized. The Erica Drive / Reuter Street Intersection will have STOP-control on Reuter Street. The Erica Drive / Isabel Street/Eland Street Intersection will have STOP-control on Isabel Street and Eland Street. The existing Kuils River Bridge will be widened when Erica Road becomes a dual carriageway road. Alterations to the existing Kuils River Bridge will be required for better pedestrian and

cycle accommodation. The Erica Drive / Nooiensfontein Road Intersection will be changed into a partial intersection (left-in / left-out) when Erica Drive becomes a dual carriageway road. The Erica Drive / Belhar Main Road / New Nooiensfontein Road Intersection will be changed into a double lane roundabout when Erica Drive / Belhar Main Road becomes a dual carriageway road. The existing school access in Belhar Main Road will be changed to a partial intersection (left-in / left-out) when Belhar Main Road becomes a dual carriageway road.

Construction phasing:

Construction of the road is planned in two phases. The **first phase** is to construct the eastbound carriageway of Erica Drive (9,8m kerb to kerb road width) with 2m sidewalks on either side between Belhar Drive and Reuter Street. This section of road is approximately 1,75km in length. This phase might include dual carriageway road sections but will be dependent on the budget and design requirements.

The **second phase** will be the construction of the full dual carriageway from Belhar Drive in the west to Highbury Road intersection on the eastern side.

Footprint:

The construction footprint for the full project is estimated to be 125 000 square metres (12.5Ha). The final development footprint is estimated to be 100 000 square metres (10.0Ha) for the full project.

The consulting engineers (ITS Engineers) provided Eco Impact with layout maps of the proposed road expansion and from these maps it was determined that an area of approximately 12.5ha had to be and was surveyed for this assessment on 8 September and 13 November 2017.

The botanical assessment was commissioned in order to help inform the possible development and environmental authorisation process for the proposed road expansion as described above. The assessment is intended to provide baseline botanical information that can be used to guide the potential development process.

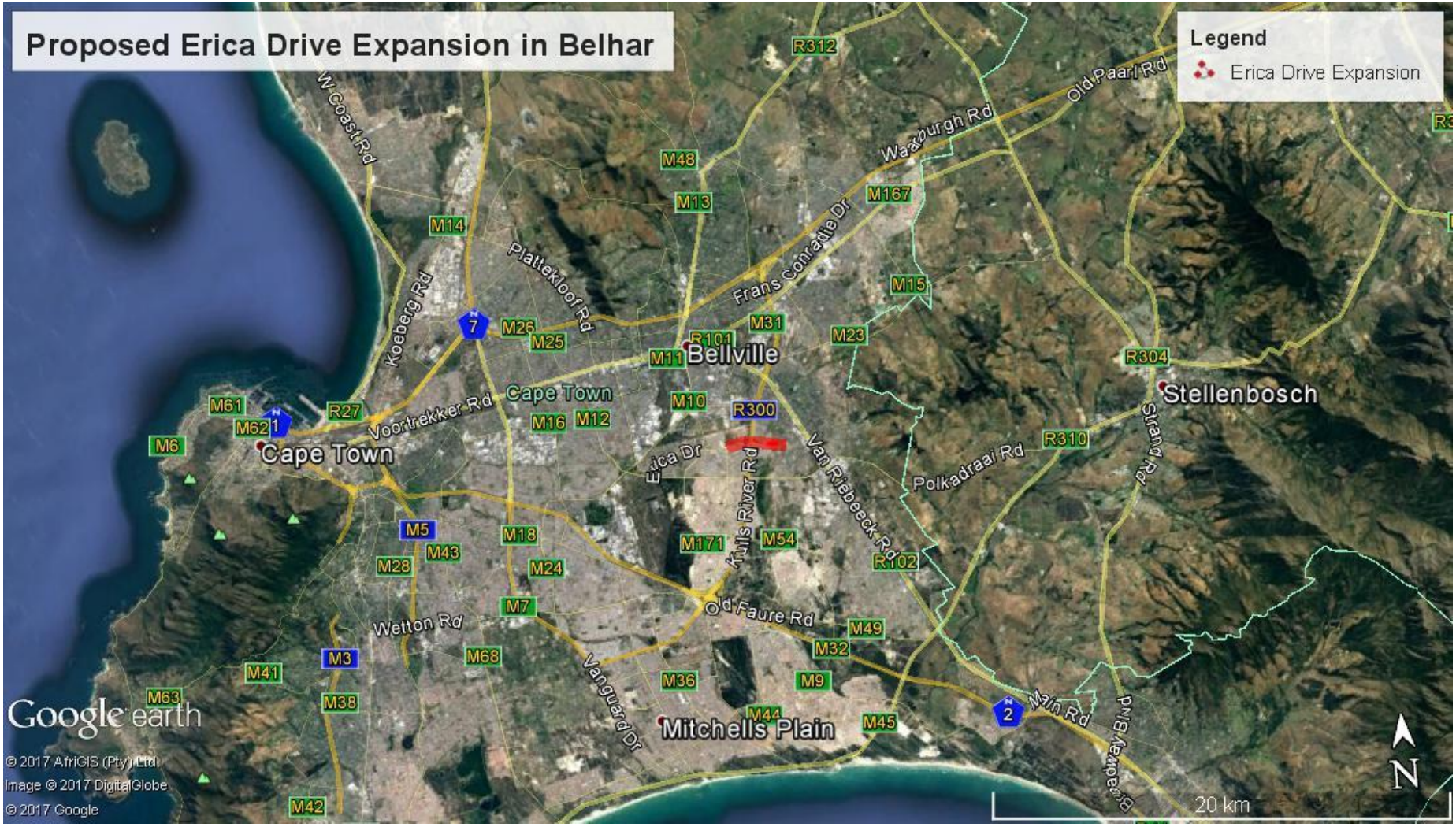

Figure 1.1 Proposed Erica Drive expansion locality map.

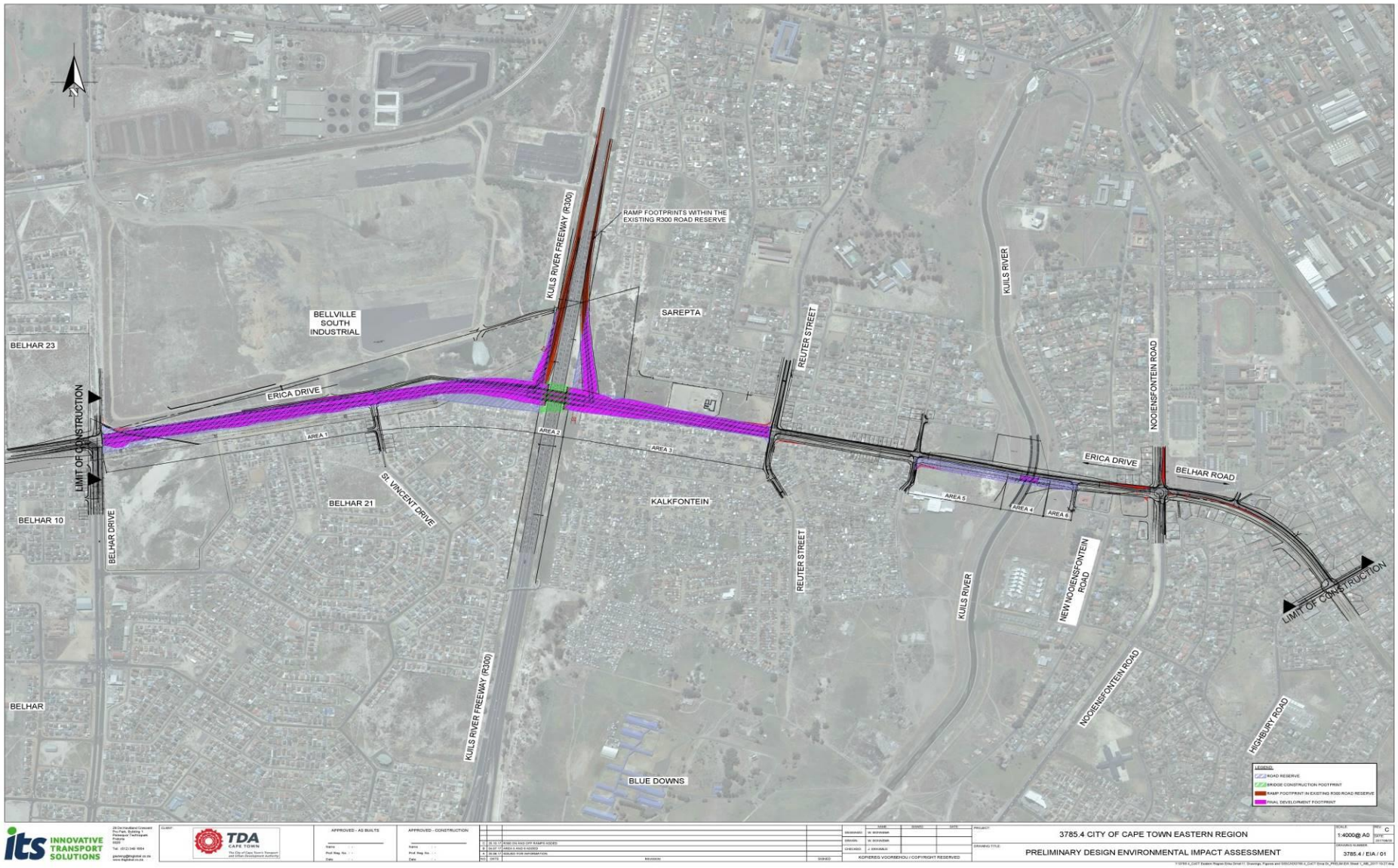

Figure 1.2 Proposed Erica Drive expansion development map.

2. Terms of Reference

The terms of Reference for this study were as follows:

- Undertake a site visit during the main flowering season to assess the vegetation in the study area.
- Provide a description of the vegetation in the study area and identify and locate any plant Species of Conservation Concern that are present, or likely to be present.
- Compile a botanical sensitivity map of the area, with accompanying explanation in the report. Refer to and take into account any CBA maps for the area.
- Identify likely botanical impacts of the proposed development alternatives, and the No Go alternative, and assess their significance, using standard IA methodology.
- Provide recommendations for mitigation of any identified impacts, and for the construction and operational phases of the proposed project.
- Provide a professional opinion on whether the proposed development should be authorised, from a botanical perspective.

3. Limitations, Assumptions and Methodology

The study area was visited on 8 September and 13 November 2017. The first site visit was undertaken within what is normally considered the optimal peak spring flowering period in this primarily winter rainfall region and it was possible to identify all terrestrial indigenous vegetation species remaining on site. The overall confidence level in the accuracy of the botanical findings is high. Probably because the study area has not been burnt for more than 20 years and has been significantly disturbed due to urban development, there were very few annuals and bulbs evident on site. The study area was walked and all indigenous plants were noted. Various photographs and plant specimens were taken.

Relevant references are noted in the text, and conclusions were drawn based on this documentation and professional experience in the area. Areas were measured using Google Earth Pro.

It is assumed that the study area is an accurate representation of the proposed road expansion area (Refer to Figures 1.1 and 1.2) as provided by the engineers. For purposes of this assessment the No Go alternative is assumed to be a continuation of the status quo, which in this case is vacant un-used land on the entire study area. This study does not address wetland or freshwater issues at all, as this was not part of the brief, and a separate freshwater ecosystem impact assessment will in fact be conducted to address these issues.

Conservation value and sensitivity of habitats are products of species diversity, plant community composition, rarity of habitat and vegetation type, degree and type of habitat degradation, rarity of species, ecological viability and connectivity, restorability, vulnerability to impacts, and reversibility of threats. Any areas with a good chance of supporting and maintaining viable populations of threatened or localised plant species are deemed to be of High sensitivity.

Medium sensitivity areas have been partly disturbed and typically support 10 - 30% of the original species diversity (prior to disturbance), may have limited numbers of a few plant Species of Conservation Concern, and have moderate rehabilitation potential.

Low sensitivity areas have been heavily disturbed, with changes to the soil structure and composition, and support less than 10% of the expected indigenous plant diversity, no plant Species of Conservation Concern, and rehabilitation potential is considered to be low, at least without substantial investments in time, materials and money.

Reference is made to the South African Vegetation Map (Mucina & Rutherford 2006 and 2012 updates), to the National Spatial Biodiversity Assessment (Rouget et al 2004), and to the National List of Threatened Ecosystems (DEA 2011). In addition, the City of Cape Town Biodiversity Network (2017) was also referenced as well.

4. Description of the Study Area

4.1 Physical Characteristics of the Site

The development area west and immediately east of the R300 is undulating with sand dunes. These dunes have however been heavily disturbed and are more likely man-made to the most extent due to land excavations and stock piling that occurred while establishing the surrounding urban developments and landfill site. Most of the development area east of the R300 is flat with gradual slopes. The highest elevation of the area west of the R300 is 64m and the lowest 54m, the highest elevation of the area east of the R300 is 54m (dune immediately west of R300) and lowest 40m (the Kuils River tributary).

The geology of the area is characterised by loose and gravelly grey sandy top soil highly erodible; and mottled, highly weathered subsoil with signs of wetness within lower lying depressions where wetlands occurs. The soils at Kuils River are underlain by the Kuils River-Helderberg Granite pluton (Theron *et al.,* 1992).

The site is located within dense urban residential areas. The area west of the R300 is also bordered by a landfill site. The channelled Kuils River tributary crosses the eastern half of the development site along Belhar Road and the R300 crosses the western half. As previously mentioned the site has been significantly disturbed and transformed due to urban development. Ongoing illegal waste dumping is taking place at various locations within the area west of the R300 adjacent to the landfill site. Several wetlands also occur throughout the proposed development site and assessment of the wetland areas will be conducted in a separate investigation. The brief for this botanical assessment only focussed on identifying potential impacts on significant terrestrial indigenous vegetation areas.

4.2 Vegetation at a Regional and National Context

The study area is part of the Fynbos biome, located within what is now known as the Core Region of the Greater Cape Floristic Region (GCFR; Manning & Goldblatt 2012).

The GCFR is one of only six Floristic Regions in the world, and is the only one largely confined to a single country (the Succulent Karoo component extends into southern Namibia). It is also by far the smallest floristic region, occupying only 0.2% of the world's land surface, and supporting about 11500 plant species, over half of all the plant species in South Africa (on 12% of the land area). 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). Many 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 habitat is reduced to extremely small fragments. Data from the nationwide plant Red Listing project indicate that 67% of the 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 lies within the area considered to be part of the West Strandveld bioregion and Southwest Fynbos bioregion (Mucina & Rutherford 2006). The West Strandveld bioregion is characterised by relatively high winter rainfall, low altitude and poor, sandy soils, with large urban areas and high levels of alien invasive vegetation. Due to this combination of factors the loss of natural vegetation in this bioregion has been severe (>60% of original extent lost within the region), and the bioregion has a fairly high number of threatened plant species (Raimondo et al 2009). The Southwest Fynbos bioregion has less fertile soils, but is even more species rich, and has almost as many threatened plan species.

The lowland regions of the Cape metropole (stretching from Atlantis southeast to near Somerset West), generally known as the Cape Flats, are under enormous pressure, and the area has been described as a "conservation megadisaster" (Rebelo et al 2011), in terms of the number of severely threatened plants (some already extinct) and habitats within the area.

The City of Cape Town ("CoCT") regularly updates and revises its Biodiversity Network as sites are lost and new information becomes available (Holmes et al 2008), and the latest map (dated 2017) indicates that no mapped terrestrial vegetation Critical Biodiversity Areas ("CBA") occurs on the proposed development site. However at least 5.7ha of the proposed development site is mapped as aquatic/wetland Critical Ecological Support Area.

See study area maps below and site photographs attached as Appendix D.

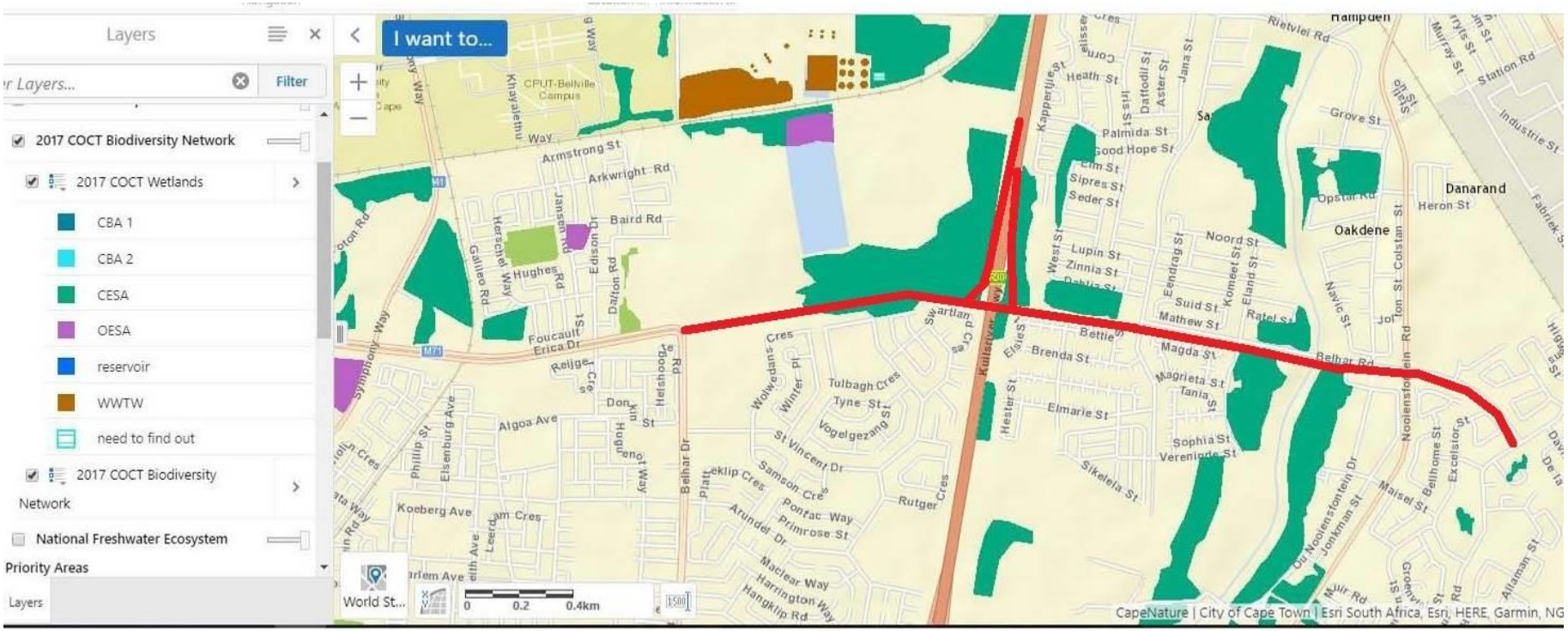

Figure 2: City of Cape Town Biodiversity Network (2017)

4.3 The Vegetation on Site

The vegetation map of South Africa (Mucina and Rutherford 2012) indicates that the western half of the study area would have originally been covered with Cape Flats Dune Strandveld (*Endangered*) and the eastern half with Cape Flats Sand Fynbos (*Critically Endangered*).

Cape Flats Sand Fynbos occurs on lowland acid sands, and is one of the most threatened habitat types in the country and is listed as Critically Endangered on a national basis (DEA 2011), with less than 20% of its original total extent remaining, less than 1% conserved, and an unachievable conservation target of 30% (Rouget *et al* 2004).

Cape Flats Dune Strandveld is generally found on alkaline sands of marine origin, and although fairly well conserved within the Table Mountain National Park (notably at Cape Point) it is rapidly disappearing from its former stronghold – the Cape Flats. The unit is listed as Endangered on a national basis (DEA 2011), with less than 58% of its original total extent remaining, about 5% conserved (mostly within the Table Mountain National Park), and a conservation target of 24% (Rouget *et al* 2004). It should be noted that the City of Cape Town regards the Cape Flats form of this vegetation type as Critically Endangered, and regards it as distinct from the (more intact) form on the west coast between Cape Town and Silwerstroomstrand (Holmes *et al* 2013).

Figure 3: Map of the SA Vegetation Types originally present on site (as per Mucina & Rutherford 2012)

The study site however has a long history (centuries) of disturbance, and consequently there is no remaining natural vegetation in good condition (with viable populations of threatened or localised plant species) remaining within the study area. All ecological processes on the site have been significantly impacted by soil disturbance (excavations, stock piling, site clearance etc.), inappropriate fire regimes, loss of pollinators and seed dispersers, alien-, weed- and garden plant invasion, habitat fragmentation due to urban development, canalisation of the Kuils River and artificial wetland creation due to above

mentioned impacts as well as required storm water management measures implemented on the site and surrounds. The heavily disturbed remnant habitats also present a very difficult conservation challenge. Essentially the whole study site can be considered transformed habitat. The transformed terrestrial (i.e. non wetland) areas support less than 20% of their likely original plant communities.

The whole study site is significantly invaded by alien invasive, weed and garden plants, notably *Eucalyptus sp., Acacia saligna, Bromus grass sp., Ramnus sp., Echium plantagineum, Pennisetum clandestinum, Lupinus sp, Raphanus rapistrum, Brassica tournefortii, Erodium moschatum* and *Conyza bonariensis.* The overall average alien, weed and garden plant cover within the development area is 70% to 100%. It appears that no attempt has been made by the landowner/s to eradicate any alien invasive or weed plant species nor has the area been burnt within the past couple of years.

Overall indigenous non-wetland plant species diversity on site is fairly low, being about 20% of what would be expected in a pristine example of this habitat. The areas west of and immediately adjacent to the R300 are where most of the remaining indigenous vegetation species occur. This is a result of previous and ongoing disturbance of the site, and the fact that only about 30 - 40% of the whole study site has any indigenous vegetation remaining which include recorded species such as *Oxalis pes caprae* (geel suuring), *Cynodon dactylon* (fynkweek), *Carpobrotus edulis*, *Metalasia densa*, *Thamnocortus sp*, *Muraltia spinosa*, *Arctotheca calendula*, *Ehrharta villosa*, *Trachyandra divaricata*, *Searsia glauca*, *Rhus* sp, *Searsia laevigata, Pelargonium capitatum, Lyperia lychnidea.*

No significant populations (or individual) plant Species of Conservation Concern (SCC) were recorded or are likely to occur on site, given the previous disturbance and the habitat concerned.

Photo 1: Area west of R300 where Erica Road extension will connect to current Erica Drive

Photo 2: Area west of R300 along Eskom powerline and adjacent to landfill site.

Photo 3: Area west of R300 along Eskom powerline and adjacent to landfill site.

Photo 4: Area west of R300 along Eskom powerline and adjacent to landfill site.

Photo 5: Area west of R300 along Eskom powerline and adjacent to landfill site. Note wetland reeds in background, directly adjacent to the R300 which is one of the mapped wetland CESA.

Photo 6: Western R300 off-ramp area, in-between R300 and landfill site.

Photo 7: Study area immediately east of the R300.
Note wetland left on the photo (facing away from the R300).

Photo 8: Eastern R300 off-ramp development area with wetland.

Photo 9: Eastern R300 off-ramp development area.

Photo 10: Study area east of the R300 (facing towards the R300).

Photo 11: Study area south of Belhar road and west of the Kuils River channel, currently mapped as a wetland CESA, but clearly no wetland characteristics remain.

Photo 12: Study area south of Belhar road; east and west of the Kuils River channel, currently mapped as a wetland CESA, but no wetland characteristics remain.

Photo 13: Study area south of Belhar road; east and west of the Kuils River channel at the bridge crossing, currently mapped as a wetland CESA, but no wetland characteristics remain on either side of the Kuils River tributary.

Photo 14: Study area south of Belhar road; east of the Kuils River channel at the bridge crossing, currently mapped as a wetland CESA, but no wetland characteristics remain.

4.4 Terrestrial Botanical Sensitivity

Most of the study area is considered to be of Low terrestrial botanical sensitivity and conservation value (see Figure 4), with mainly no to very low indigenous plant diversity remaining. The area west and immediately east of the R300 is considered to be of Medium terrestrial botanical sensitivity as this is where most of the remaining indigenous vegetation was recorded.

No plant Species of Conservation Concern (SCC) were recorded nor are likely to occur within the study area due to the previous and ongoing disturbance of the habitat concerned. These areas also have a low to moderate rehabilitation potential. Rehabilitation will be intensive and would have to involve reintroduction of specimens,

alien and weed clearance and maintenance and dune stabilisation with indigenous vegetation etc. and due to the location within the urban area, low ecological connectivity value and small size of the site this will not be a viable site for rehabilitation efforts.

This assessment is informed by:

- The fact that the study area is not mapped as a terrestrial CBA or ESA in the City of Cape Town Biodiversity Network.
- The low indigenous plant species diversity in the study area
- The high infestation of alien and weed plant species
- Existing infrastructure and developments on the site and surrounds
- No plant or animal Species of Conservation Concern recorded on site nor are they expected to breed/occur on the proposed development site
- A complete lack of any significant indigenous vegetation species diversity or presence in at least 60% of the study area, suggesting low rehabilitation potential
- The heavily disturbed soils, suggesting low rehabilitation potential
- The limited ecological connectivity of the site with ongoing disturbances such as urban development, waste and soil dumping, site clearance, storm water management, excavations etc.

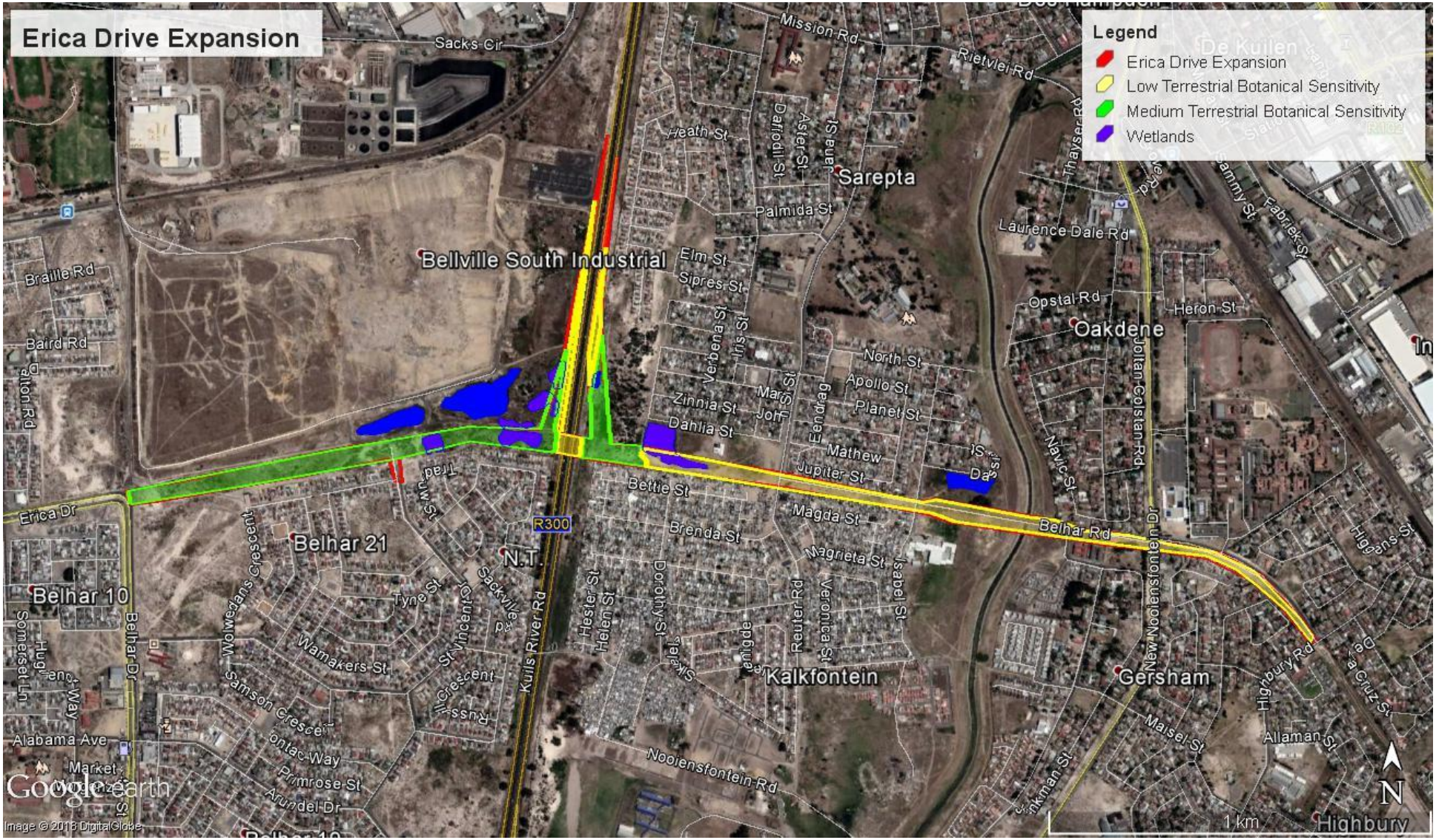

Figure 4: Terrestrial botanical sensitivity map of the proposed Erica Drive expansion study site

5. Identification and Assessment of Potential Botanical Impacts

The botanical impacts will be both direct and indirect, although the latter (habitat fragmentation, loss of ecological connectivity) will be less significant for this project than the direct impacts. Construction phase impacts will be both permanent and long term.

In the case of this project the primary construction phase impact is loss of indigenous terrestrial vegetation species in a significantly transformed habitat within the development footprint. All development located within the proposed development footprint area will result in the permanent loss of that vegetation. It is assumed that the disturbance will be restricted to the footprint areas shown in Figure 4, and that is what is assessed here.

(See Appendix B attached for Impact Assessment Methodology used)

Construction Phase Terrestrial Botanical Impacts:

Nature of potential impact:
Loss of and Impacts on Low to Medium Sensitivity terrestrial indigenous vegetation

Discussion:
The habitat loss is deemed to be permanent (>15 years).

The underlying vegetation types are Endangered Cape Flats Dune Strandveld, and Critically Endangered Cape Flats Sand Fynbos. This loss of habitat cannot be easily mitigated, except by improving the quality of the surrounding, remaining habitat.

No loss of high sensitivity habitat or plant Species of Conservation Concern will take place as a result of this proposed development, however habitat will be lost and therefore a medium impact on processes is expected to occur.

Cumulative impacts:
Habitat fragmentation and loss of ecological connectivity.

Mitigation:

- Clearly demarcate the boundary of the proposed development footprint area before construction commences and undertake construction activities (including construction camp) only in demarcated development footprint area. Demarcation method to be approved by an Environmental Control Officer (ECO).
- No construction related disturbance should be allowed outside of the proposed development areas. This includes no dumping of fill, no roads, and all forms of temporary disturbance.
- Implement site specific erosion and storm water runoff management measures to prevent (or if prevention is not possible limit) any erosion from occurring on the development footprint area and surrounds.

Criteria	**Without Mitigation**	**With Mitigation**
Extent	2	1
Duration	5	5
Magnitude	4	4

Probability	5	5
Significance	55 - Medium	50 - Medium
Status	Medium Negative Significance without Mitigation	Medium Negative Significance with Mitigation
Reversibility	100% Reversible	100% Reversible
Irreplaceable loss of resources	2-Partial loss of resource will occur	2-Partial loss of resource will occur
Degree to which impact can be mitigated	2 – Cannot be completely mitigated	

Operational Phase Terrestrial Botanical Impacts:

Nature of potential impact: Spread of alien invasive vegetation associated with the soil disturbance caused by construction
Discussion: The primary operational phase botanical impacts are likely to be the spread of alien invasive vegetation associated with the soil disturbance caused by construction.
Cumulative impacts: Reductions in the current levels of ecological connectivity across the site.
Mitigation: • The municipality as landowner/s must adhere to his/her legal obligations to actively eradicate and manage alien tree infestations present on the applicable and surrounding properties.

Criteria	**Without Mitigation**	**With Mitigation**
Extent	3	1
Duration	5	1
Magnitude	6	2
Probability	4	2
Significance	56 - Medium	8 - Low
Status	Medium Negative Significance without Mitigation	Low Negative Significance with Mitigation
Reversibility	100% Reversible	100% Reversible
Irreplaceable loss of resources	2-Partial loss of resources but can be rehabilitated	1 – Resource will not be lost
Degree to which impact can be mitigated	1 – Can be completely mitigated	

Decommissioning/Rehabilitation Phase:

Nature of potential impact: Potential erosion of the site and surrounds during rehabilitation phase
Discussion: Decommissioning (i.e. demolishing developed structures) could lead to soil erosion which can occur due to wind (wind erosion cause dust pollution); and due to overland storm water flow should heavy rains fall.
Cumulative impacts: Exposing soil may lead to erosion of site and surrounds if not mitigated.
Mitigation: • Decommissioned areas must be rehabilitated and planted with indigenous vegetation immediately after built structures have been removed. • Engineered contour structures reinstated and maintained. • Monitor rehabilitation of area on a 6 monthly basis until effective/successful rehabilitation has been obtained. • If erosion is detected implement erosion rectification and preventions measures as guided by an ECO

Criteria	**Without Mitigation**	**With Mitigation**
Extent	3	1
Duration	5	1
Magnitude	6	2
Probability	4	2
Significance	56 - Medium	8 - Low
Status	Medium Negative	Low Negative (Acceptable)
Reversibility	100%	100%
Irreplaceable loss of resources	2-Partial loss of resources but can be rehabilitated	1 – Resource will not be lost
Degree to which impact can be mitigated	1 – Can be completely mitigated	

No-Go Alternative

The status quo would appear to be ongoing active loss of habitat due to illegal waste and soil dumping, urban development, storm water management, alien and weed plants increase etc.

Given this variability it is thus difficult to generalise about the No Go impact, and to infer likely future impacts. On balance, assuming continuation of the status quo, it is likely that the No Go alternative will have a Neutral to Medium negative botanical impact.

6. Concluding Remarks and Recommendations

The vegetation and ecology within the study area has been heavily disturbed for a long time, and no significant patches of intact natural vegetation remain within the non-

wetland areas. Terrestrial botanical diversity is generally very low compared to what it was prior to human disturbance.

Two vegetation types would originally have been present in the area, all of which are now regarded as threatened on a national basis (one Critically Endangered and one Endangered).

Of the Critically Endangered Cape Flats Sand Fynbos vegetation mainly none to very little indigenous vegetation remains, therefore these areas have been indicated as **Low terrestrial botanical sensitivity**, presenting no constraints to the proposed development. Loss of this area would be of **negligible botanical significance at a regional scale**.

The remaining proposed development area represents significantly disturbed secondary Endangered Cape Flats Dune Strandveld vegetation. Limited indigenous vegetation diversity remains within the areas marked as Medium terrestrial botanical sensitivity areas, with no plant Species of Conservation Concern. The loss of the **Medium sensitivity vegetation** in the study area is likely to be of **Medium to Low negative significance** at a regional scale, before and after mitigation.

No specific botanical mitigation is required for this project, other than demarcating and restricting the proposed development area throughout the construction phase and ongoing alien invasive vegetation management and removal in the disturbed areas around the development footprints.

It is expected that the proposed development will lead to the clearance of less than 2ha of homogenous indigenous vegetation species and no species of conservation concern.

Although development of the Medium terrestrial botanical sensitivity area has been rated as having a potential Medium negative significance at a regional scale if other factors such as ongoing human disturbances and urban development, alien plant encroachment, low ecological connectivity etc. are taken into consideration it is believed that the entire proposed development will have a Low negative significance on the terrestrial habitat of the site and surrounds. If is therefore concluded that the proposed development could therefore be authorised without causing significant negative terrestrial botanical impacts.

Summary of recommendations as listed in the report and additional general impact mitigation measures to be implemented:

Planning considerations and constraints-

- The construction and final development footprints should be demarcated and all proposed activities should be restricted to the proposed development area.

Construction, Operational and Rehabilitation phases -

- The project implementation process should be subject to standard Environmental Management Programme (EMP) prescripts and conditions and only proceed under supervision of a competent and diligent Environmental Control Officer, both during the construction, operational and decommission/rehabilitation phases.
- Undertake development activities only in identified and specifically demarcated areas as proposed.
- Demarcate no-go areas before any land clearing occurs under the supervision of an ECO. Demarcation must be clearly visible and effective and no-go area must remain demarcated throughout construction phase.
- Personnel should be restricted to the construction camp site and immediate construction areas only.
- Remove and conserve topsoil layer and overburden material for rehabilitation after construction activities have ceased
- No construction related disturbance should be allowed within the remaining adjacent indigenous vegetation and wetland areas. This includes no dumping of fill, no roads, and all forms of temporary disturbance.
- Implement site specific erosion and storm water runoff management measures as according to EMP requirements to prevent (or if prevention is not possible limit) any erosion from occurring on the development footprint area and surrounds.
- Rehabilitate impacted indigenous vegetation areas outside of the development areas immediately if disturbed with indigenous vegetation species.
- Proper waste bins to be provided during construction and operation and all waste to be regularly (at least once a week) removed to municipal landfill site.
- If any fuel or hazardous materials is spilled on site it must be treated as according to EMP requirements.
- The cement mixing area must be at least 32m away from the edge of the wetlands and is only to take place within demarcated cement mixing area that is impermeable and has a berm so that no cement mix runoff water escapes from cement mixing area.
- The landowner/s must adhere to his/her legal obligations to actively eradicate and manage alien vegetation infestations present on the applicable and surrounding properties.
- Monitor soil erosion on a regular basis and rehabilitate impacted areas as soon as possible under supervision of appointed ECO.
- Storm water discharge flow must be managed and restricted in such a manner that it does not cause erosion.
- Only use topsoil as derived and conserved from the proposed development areas to be rehabilitated after development activities have ceased on the property.
- Only use vegetation indigenous to the area to rehabilitate impacted/decommissioned areas and implement ongoing monitoring of the rehabilitated areas until successful rehabilitation has taken place.
- After topsoil has been replaced ongoing monitoring and removal of alien vegetation regrowth must be conducted to ensure effective rehabilitation of indigenous vegetation.
- Decommissioned areas must be rehabilitated and planted with indigenous vegetation immediately after built structures have been removed.

- Engineered contour structures reinstated and maintained.
- Monitor rehabilitation of areas impacted outside of the proposed development areas or decommissioned areas on a 6 monthly basis until effective/successful rehabilitation has been obtained.
- If erosion is detected during or after rehabilitation implement erosion rectification and preventions measures as guided by an ECO

Eco Impact is of the opinion, and based on the survey and desk study done, that the proposed development activities; if designed and implemented according to the recommendations as provided in this report, will not have an unacceptable significantly negative impact on the environmental aspects of the site and surrounds as assessed in this report.

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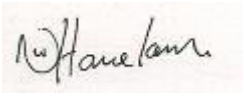
APPENDIX A: Declaration of Independence

THE INDEPENDENT PERSON WHO COMPILED OR REVIEWED A SPECIALIST REPORT OR UNDERTOOK A SPECIALIST PROCESS

I **Nicolaas Willem Hanekom**, as the appointed independent specialist hereby declare that I:

- act/ed as the independent specialist in this application;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and
- do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- have and will not have no vested interest in the proposed activity proceeding;
- have disclosed, to the applicant, EAP and competent authority, any material information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- am fully aware of and meet the responsibilities in terms of NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act, and that failure to comply with these requirements may constitute and result in disqualification;
- have ensured that information containing all relevant facts in respect of the specialist input/study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties was facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments on the specialist input/study;
- have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;
- have ensured that the names of all interested and affected parties that participated in terms of the specialist input/study were recorded in the register of interested and affected parties who participated in the public participation process;
- have provided the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not; and terms of regulation 71 of GN No. R. 543.

Eco Impact is independent and does not have an interest in the business nor receive any payment other than fair remuneration for services rendered as required in terms of regulations.



Pri.Sci.Nat (Ecological Science) 400274/11

Signature of the specialist:
Name of company: Eco Impact legal Consulting (Pty) Ltd
Date: 24 November 2017

Abbreviated CV:

Nicolaas Hanekom has 26 years' experience working as an ecologist for nature conservation organizations. He has extensive field experience and botanical knowledge, some knowledge of wetlands ecology, is knowledgeable of the region in which they are working and exercises sound and unbiased scientific and professional judgment. He is a qualified Environmental Assessment Practitioner and a registered Professional Natural Scientist (Ecologist) with the SACNASP who holds a M. Tech, Nature Conservation from the Cape Peninsula University of Technology. This master's thesis focussed on the impact of different land uses on the Phytodiversity ("Botany/ plants") of the West Coast Strandveld in and around Rocherpan Nature Reserve.

Hanekom further qualified in Environmental Management Systems ISO 14001:2004, at the Centre for Environmental Management, North-West University, as well as Environmental Management Systems ISO 14001:2004 Audit: Internal Auditors Course to ISO 19011:2011 level, from the Centre for Environmental Management, North-West University qualifying him to audit to ISO/SANS environmental compliance and EMS standards.

He has also completed the suite of Greener Governance courses with certificates in:

- An Overview of Environmental Management at the Local Government Level, Centre for Environmental Management, North-West University;
- Greener Governance for Local Authorities, Centre for Environmental Management, North-West University;
- Tools for Integrated Environmental Management and Governance, Centre for Environmental Management, North-West University.

Hanekom attended and obtained a certificate on Integrated Protected Area Planning at the Centre for Environmental Development, University of KwaZulu Natal and a certificate in Project Management (Theory and Practical), through CS Holdings. He has lectured in two subjects at the Cape Peninsula University of Technology. He has 14 years of environmental planning experience, working for Free State and Western Cape departments of environmental affairs, where he reviewed and commented on development (EIA) applications in the West Coast region.

Hanekom has been responsible for many environmental impact assessments and several EIA applications, waste license and atmospheric emission license applications as well as being involved in the implementation of several environmental management systems.

APPENDIX B: Impact Assessment Methodology

Below is the assessment methodology utilized in determining the significance of the potential mining impacts on the biophysical environment, and where applicable the possible alternatives. The methodology is broadly consistent with that described in the Department of Environmental Affairs' Guideline Document on the EIA Regulations (1998) and as provided by the Shangoni Management Services.

For each potential impact, the significance is determined by specified factors as in Table 1. Significance is described prior to mitigation as well as with the most effective mitigation measure(s) in place.

The mitigation described in the document represents the full range of plausible and pragmatic measures that must be implemented.

Despite the attempts at providing a completely objective and impartial assessment of the environmental implications of proposed activities, the specialist can never completely escape the subjectivity inherent in attempting to define significance.

Recognising this, potential subjectivity in the current process is addressed as follows:

- Be clear about the difficulty of being completely objective in the determination of significance;
- Develop an explicit methodology for assigning significance to impacts and outlining this methodology in detail. Having an explicit methodology not only forces the assessor to come to terms with the various facets contributing toward determination of significance, thereby avoiding arbitrary assignment, but also provides the reader of the report with a clear summary of how the assessor derived the assigned significance; and
- Wherever possible, differentiating between the likely significance of potential environmental impacts as experienced by the various affected parties.

Although these measures may not totally eliminate subjectivity, they do provide an explicit context within which to review the assessment of impacts.

Table 1: Assessment criteria for the evaluation of impacts

Criteria	**Description**		
Nature	a description of what causes the effect, what will be affected, and how it will be affected.		
	Type	**Score**	**Description**
Extent (E)	None (No)	1	Footprint
	Site (S)	2	On site or within 100 m of the site
	Local (L)	3	Within a 20 km radius of the centre of the site
	Regional (R)	4	Beyond a 20 km radius of the site
	National (Na)	5	Crossing provincial boundaries or on a national / land wide scale
Duration (D)	Short term (S)	1	0 – 1 years
	Short to medium (S-M)	2	2 – 5 years
	Medium term (M)	3	5 – 15 years
	Long term (L)	4	> 15 years
	Permanent(P)	5	Will not cease

Criteria	Description		
Magnitude (M)	Small (S)	0	will have no effect on the environment
	Minor (Mi)	2	will not result in an impact on processes
	Low (L)	4	will cause a slight impact on processes
	Moderate (Mo)	6	processes continuing but in a modified way
	High (H)	8	processes are altered to the extent that they temporarily cease
	Very high (VH)	10	results in complete destruction of patterns and permanent cessation of processes.
Probability (P) the likelihood of the impact actually occurring. Probability is estimated on a scale, and a score assigned	Very improbable (VP)	1	probably will not happen
	Improbable (I)	2	some possibility, but low likelihood
	Probable (P)	3	distinct possibility
	Highly probable (HP)	4	most likely
	Definite (D)	5	impact will occur regardless of any prevention measures
Significance (S)	Determined through a synthesis of the characteristics described above: **S = (E+D+M) x P** Significance can be assessed as low, medium or high		
Low: < 30 points:	The impact would not have a direct influence on the decision to develop in the area		
Medium: 30 – 60 points:	The impact could influence the decision to develop in the area unless it is effectively mitigated		
High: < 60 points:	The impact must have an influence on the decision process to develop in the area		
No significance	When no impact will occur or the impact will not affect the environment		
Status	Positive (+)		Negative (-)
The degree to which the impact can be reversed	Completely reversible (R)	90-100%	The impact can be mostly to completely reversed with the implementation of the correct mitigation and rehabilitation measures.
	Partly reversible (PR)	6-89%	The impact can be partly reversed providing that mitigation measures as stipulated in the EMP are implemented and rehabilitation measures are undertaken
	Irreversible (IR)	0-5%	The impact cannot be reversed, regardless of the mitigation or rehabilitation measures taking place
The degree to which the impact may cause irreplaceable loss of resources	Resource will not be lost (R)	1	The resource will not be lost or destroyed provided that mitigation and rehabilitation measures as stipulated in the EMP are implemented
	Resource may be partly destroyed (PR)	2	Partial loss or destruction of the resources will occur even though all management and mitigation measures as stipulated in the EMP are implemented
	Resource cannot be replaced (IR)	3	The resource cannot be replaced no matter which management or mitigation measures are implemented.
The degree to which the impact can be mitigated	Completely mitigatible (CM)	1	The impact can be completely mitigated providing that all management and mitigation measures as stipulated in the EMP are implemented
	Partly mitigatible (PM)	2	The impact cannot be completely mitigated even though all management and mitigation measures as stipulated in the EMP are implemented. Implementation of these measures will provide a measure of mitigatibility
	Un-mitigatible (UM)	3	The impact cannot be mitigated no matter which management or mitigation measures are implemented.