A PROTECTED PLANT RESCUE AND PROTECTION PLAN FOR THE PROPOSED COMBINED CYCLE GAS TURBINE (CCGT) POWER PLANT AND ASSOCIATED INFRASTRUCTURE, SALDANHA BAY LOCAL MUNICIPALITY, WEST COAST DISTRICT MUNICIPALITY, WESTERN CAPE PROVINCE

An EOH Company

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February 2016

Conducted on behalf of:
Vortum Energy (Pty) Ltd

Compiled by:

Dr. BJ Henning (PhD plant Ecology; M.Sc Botany - Soil Science related Pr.Sci.Nat)

Reviewed by:

Ms. E. Grobler (EAP.)

REPORT DISTRIBUTION LIST

Name	Institution
Mr. D. Ventura	Vortum Energy (Pty) Ltd
Ms. E. Grobler	AGES Limpopo (Pty) Ltd

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Declaration

I, Barend Johannes Henning, declare that -

- I act as the independent specialist;
- I will perform the work relating to the project in an objective manner, even if this results in views and findings that are not favourable to the project proponent;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this project, including knowledge of the National Environmental Management Act, 1998 (Act No. 107 of 1998; the Act), regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I will take into account, to the extent possible, the matters listed in Regulation 8;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the project proponent and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the project; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority or project proponent;
- All the particulars furnished by me in this document are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of section 24F of the Act.

_____

Signature of specialist

Company: Exigo Sustainability (Pty) Ltd.

Date: February 2016

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1 ASSIGNMENT

Exigo Sustainability was appointed by Ages Limpopo to compile a plant rescue and protection plan for the proposed establishment of an energy generation facility (thermal power plant) with associated infrastructure and structures on a portion (±130 ha) of the Remainder of the Farm LANGEBERG 188, Malmesbury RD (861.6007 ha in extent), located within the Saldanha Bay Local Municipality, West Coast District Municipality, Western Cape Province. The development also includes the development of a new powerline corridor between the site and the Aurora Substation, as well as a natural gas or liquid fuel supply pipeline.

The assignment is interpreted as follows: Compile a management plan to be implemented as guidelines by the Environmental Control Officer (ECO) for the rescue and protection of rare and endemic plant species occurring on the proposed development site. The study will be done according to guidelines stipulated by the Department of Environmental Affairs and Tourism (DEAT) and legislation pertaining to the protection of plants in the Western Cape Province.

1.1 INFORMATION SOURCES

The following information sources were obtained:

1. National and provincial legislation was evaluated in order to provide lists of any plant or animal species that have protected status. The most important legislation is the following:
    a. National Environmental Management: Biodiversity Act (Act No 10 of 2004);
    b. National Forest Act;
    c. Western Cape Nature Conservation Laws Amendment act, 2000;
    d. CITES: Convention on the Trade in Endangered Species of Wild Fauna and Flora.
2. All relevant maps through Geographical Information Systems (GIS) mapping, and information (previous studies and environmental databases) on the rare and protected plants of the site concerned;
3. Requirements regarding the management plan as requested by DEAT;
4. Information on the micro-habitat level was obtained through obtaining a first-hand perspective from the ecological study compiled by Henning (2015) was also utilized for this study;

1.2 REGULATIONS GOVERNING THIS REPORT

1.2.1 National Environmental Management Act, 1998 (Act No. 107 of 1998) - Regulation No. R982

This report was prepared in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) Gazette No. 38282 Government Notice R. 982. Appendix 6 – Specialist reports includes a list of requirements to be included in a specialist report:

1. A specialist report or a report prepared in terms of these regulations must contain:
    a. Details of
        i. The specialist who prepared the report; and
        ii. The expertise of that specialist to compile a specialist report, including a curriculum vitae;
    b. A declaration that the specialist is independent in a form as may be specified by the competent authority;
    c. An indication of the scope of, and purpose for which, the report was prepared;
    d. The date and season of the site investigation and the relevance of the season to the outcome of the assessment;
    e. A description of the methodology adopted in preparing the report or carrying out the specialized process;
    f. The specific identified sensitivity of the site related to the activity and its associated structures and infrastructure;
    g. An identification of any areas to be avoided, including buffers;
    h. A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;
    i. A description of any assumptions made and any uncertainties or gaps in knowledge;
    j. A description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment;
    k. any mitigation measures for inclusion in the EMPr;

l. any conditions for inclusion in the environmental authorisation;

m. any monitoring requirements for inclusion in the EMPr or environmental authorisation

n. A reasoned opinion –

   i. As to whether the proposed activity or portions thereof should be authorised and

   ii. If the opinion is that the proposed activity or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr and where applicable, the closure plan;

o. A description of any consultation process that was undertaken during the course of preparing the specialist report;

p. A summary and copies of any comments received during any consultation process and where applicable all responses thereto; and

q. Any other information requested by the competent authority.

1.3 TERMS OF REFERENCE

1.3.1 Objectives

1. List the plant species of conservation concern in the study area.
2. Describe the management principles and specific methodology on the plant rescue and protection on the proposed development site. It includes plant rescue methods (relocation, seed collection or taking vegetative cuttings), but primarily focuses on plant relocation procedures (root preparation and excavation, lifting and backfill requirements), and the installation of marker stakes, tree guards, weed mats and mulch around relocated plants.

1.3.2 Limitations and assumptions

- In order to obtain a comprehensive understanding of the dynamics of protected plant rescue and protection plan, surveys and monitoring should ideally be replicated over several seasons and over a number of years. However, due to project time constraints such long-term studies are not feasible;
- The large study area did not allow for the finer level of assessment that can be

obtained in smaller study areas. Therefore, data collection in this study relied heavily on data from representative sections, as well as general observations, generic data and a desktop analysis;

2 INTRODUCTION

Plants are the backbone of life on Earth. Today, however, plant communities around the world are under threat. Scientists estimate that at least 100,000 plants are threatened with extinction--that's more than one-third the total known species of plants on the planet.

The main threats to plants today are habitat destruction, invasive species, and over collection. The loss of a plant species can have devastating effects on ecosystems as a whole, as other species lose their sources of food and shelter. Additionally, plants play a crucial role in stabilising soils and help prevent erosion.

While the situation is critical, efforts are underway around the globe to halt the loss of plant diversity. International treaties such as the Convention on Biological Diversity are setting goals and targets for conservation worldwide. More specifically, the Global Strategy for Plant Conservation (GSPC) has laid out 16 outcome-oriented targets to be achieved by 2010. The GSPC recognizes the important role that education can play in conservation programmes. Target 14 of the GSPC calls for the "importance of plant diversity and the need for its conservation incorporated into communication, educational and public-awareness programmes."

There are two main ways to conserve biodiversity. These are termed ex situ (i.e. out of the natural habitat) and in situ (within the natural habitat). Populations of plant species are much easier than animals to maintain artificially. They need less care and their requirements for particular habitat conditions can be provided more readily. It is also much easier to breed and propagate plant species in captivity. This management plan focus specifically on the rescue and protection of plant species on the site for the proposed development of a thermal plant.

3 STUDY AREA

3.1 LOCATION AND DESCRIPTION OF ACTIVITY

The project site consists of a portion (±130 ha) of the Remainder of the Farm LANGEBERG 188, Malmesbury RD (861.6007 ha in extent), located within the Saldanha Bay Local Municipality, West Coast District Municipality, Western Cape Province. The project site is located 9 km North-East of the Port of Saldanha Bay, West of the regional road R27, in an area excluded from the provisions of the Subdivision of Agricultural Land Act (Act 70 of 1970) and already earmarked for Industrial Uses.

The Eskom Blouwater Distribution Substation is located 3.2 km South-West of the project site; the Saldanha Steel Works is 5km West-South-West from the project site; the Langebaanweg Military Airport is 7.5 km east of the project site.

Access to the project site would be either:

- From the regional road R27, which runs adjacent to the eastern boundary of the project site; or
- From a secondary road (R79) linking the regional road R27 with the regional road R399, which runs adjacent to the southern boundary of the project site.

The developed area (footprint) will be up to 80 hectares. The energy generation facility will be a thermal power plant with a maximum generation capacity up to 1200 MW_{el} (electrical rated power). The aerial image of the site is indicated in figure 2.

The name of the facility will be VORTUM THERMAL POWER PLANT. The characteristics, the technology and the extent of the initiative are defined more in detail below.

The proposed thermal power plant will be a Combined Cycle Gas Turbine (CCGT) power plant, to be fuelled with natural gas imported by means of one or more gas import facilities (e.g. LNG Import Terminal(s) and/or new gas pipeline(s)). Indeed the Department of Energy is investigating the feasibility of new gas pipelines and LNG Import Terminals, in order to import natural gas from new offshore gas fields and/or from other countries (e.g. Mozambique). The securing of new energy sources, like natural gas, has become high priority for the Government, considering that the current energy production is not able to meet the increased energy demand of the Country. This leads to frequent electricity shortage and fluctuations in supply (“load shedding”), detrimental to the economic development of South Africa.

Should natural gas not be available at the time of the commissioning of the Vortum Thermal Power Plant, the proposed facility may be fuelled with liquid fuel (diesel or other types of liquid fuels) until natural gas is available. Gas turbines can be fuelled either with natural gas or

liquid fuel.

Due to the current electricity shortage and the urgent need for new power generation units in the Country, the Vortum Thermal Power Plant may operate as an Open Cycle Gas Turbine (OCGT) power plant as a first phase and in the second phase, with the “closure” of the open cycle (by means of steam turbine units added to the gas turbine unites), as a Combined Cycle Gas Turbine (CCGT) power plant. The construction timeframe of an OCGT plant is notably shorter than that of a CCGT plant.

In a CCGT power plant a Rankine cycle (steam cycle) is added to a Brayton cycle (gas cycle). The combination of the two thermodynamic cycles result in improved overall efficiency as less heat is wasted because heat is recovered - the "waste" heat from the gas cycle is utilised to produce steam to generate additional electricity via steam turbine units, enhancing the efficiency of overall electricity generation. The thermal efficiency of a CCGT power plant is up to 62%.

A Combined Cycle Gas Turbine (CCGT) power plant consists of gas turbine units coupled with steam turbine units: the "waste" heat from each gas turbine is sent to heat recovery steam generators (HRSG) to generate high pressure steam; the steam from the HRSG drives steam turbines coupled with generators, in order to generate electricity increasing the efficiency of the power plant.

Each gas turbine and steam turbine is coupled to the single generator in a tandem arrangement, on a single shaft (single-shaft configuration). The CCGT power plant will consist of the following components:

- Two or more gas turbine units with a capacity up to 400 MW_{el} (electrical rated power) each;
- Fuel storage facility (in case of liquid fuel);
- Heat recovery steam generators (HRSG) to generate steam;
- Two or more steam turbine units with a capacity up to 220 MW_{el} (electrical rated power) each;
- Electrical generators, which convert the mechanical energy of the gas and steam turbine units to electricity;
- Gas compressors and combustors, for the gas cycle;
- Water pumps and pressurisers, for the steam cycle;
- Cooling system, with condensers & cooling towers, in order to condensate the steam

to water;

- A dam, to collect the water necessary for the generation of steam;
- A control room with offices;
- Warehouses;
- A natural gas or liquid fuel supply pipeline;
- A water supply pipeline;
- On-site high voltage substation;
- High-voltage power lines, for the connection to the Eskom grid.

The number and size (capacity) of the gas and steam turbine units has not been finalised yet and will depend on the load (demand) curve required by the grid. This will be assessed during the scoping phase in consultation with Eskom.

The CCGT power plant may consist of - e.g.:

- 2 gas turbines units of 375 MW_{el} each + 2 steam turbines units of 200 MW_{el} each (overall installed capacity: 1150 MW_{el}); or (e.g.)
- Gas turbines units of 150 MW_{el} each + 5 steam turbines units of 80 MW_{el} each (overall installed capacity: 1150 MW_{el}); or;
- A combination of different sizes of gas and steam turbine units.

The overall installed capacity will nevertheless be up to 1200 MW_{el}. The Vortum Thermal Power Plant will deliver the energy to the Eskom AURORA main transmission substation via one or more 400 kV power lines approximately 27 km long. The number of new 400 kV power lines will be assessed during the scoping phase in consultation with Eskom. The proposed power line corridor runs parallel to existing Eskom high-voltage power lines and may cross through the following properties (please refer to Locality Map Figure 1)

- Portions 1 and 9 (Remaining Extent) of the Farm LANGEBERG 187;
- Portions 1 and Remainder of the Farm UYEKRAAL 189;
- Farm EVERTS HOPE 190;
- Farm WASCHKLIP 183;
- Farm ZOUTEKUYLEN 179;
- FARM 1162;
- Portions 3 and 8 of the Farm LANGVERWACHT 178;

- Farm ADJOINING SPRINGFONTEIN 174;
- Portions 3 and 4 of the Farm DRIEHOEKS FONTEIN 176

A natural gas / fuel supply pipeline is also planned as part of the development.

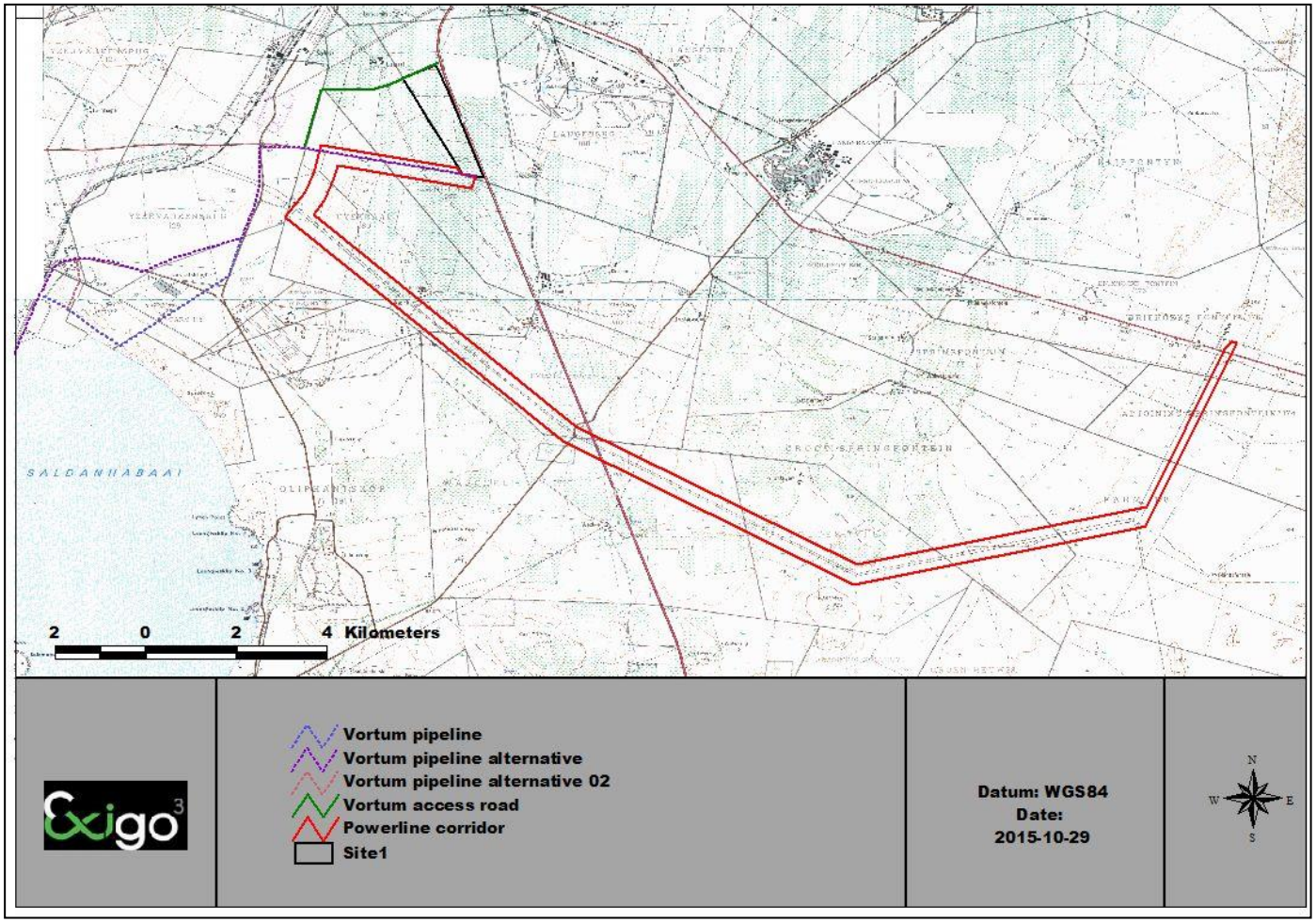

Figure 1. Regional Location Map

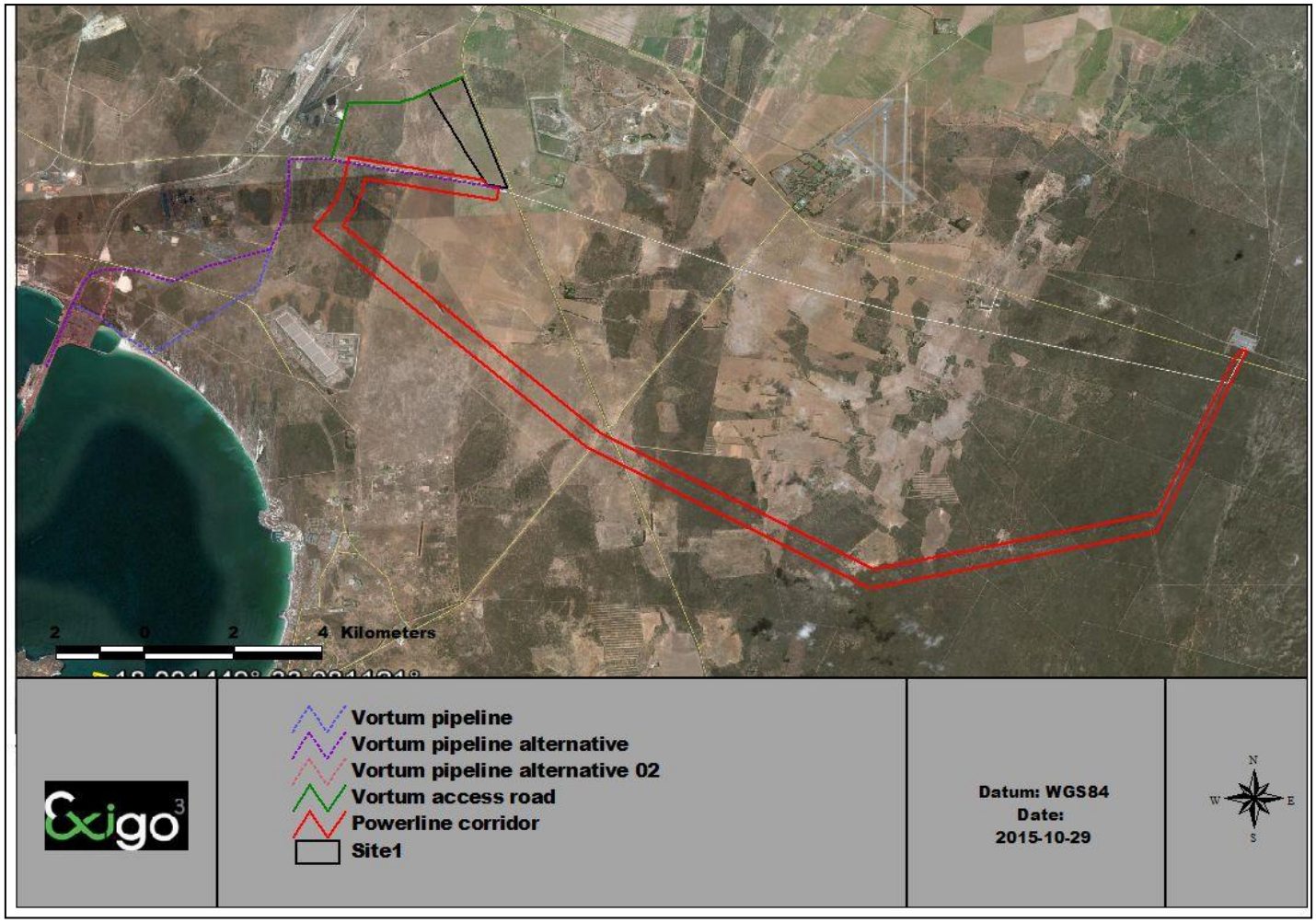

Figure 2. Satelite image showing the project area (Google Pro, 2010)

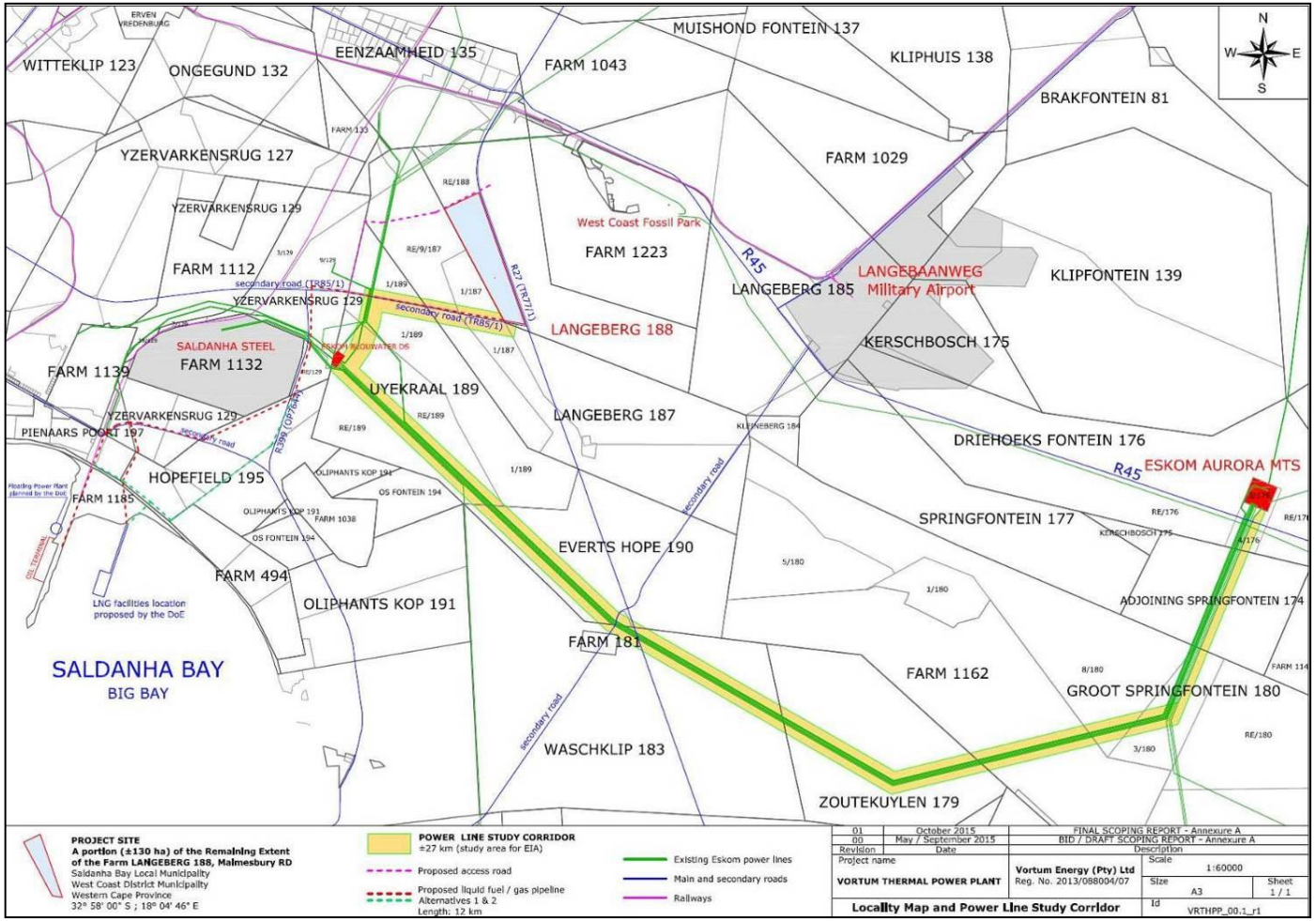

Figure 3. Layout Map of the proposed Vortum Thermal Power Plant and associated powerline and gas / fuel pipelines

4 PROTECTED AND THREATENED PLANT SPECIES OF THE STUDY AREA

The following lists and recommendation regarding threatened and protected plant species on the proposed development site has been adapted from the ecological report for the EIA conducted by Henning (2015). A plant species lists previously recorded for the study area according to the SIBIS database of SANBI are included in Appendix A.

4.1 Plant species of concern

There are two types of species of concern for the site under investigation, (i) those listed by conservation authorities as being on a Red List and are therefore considered to be at risk of extinction, and (ii) those listed as protected according to National and/or Provincial legislation.

4.1.1 Red List plant species

The latest data from the Threatened Species Program which compiles the Red List 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 conservation importance of the Saldanha Peninsula plant life, particularly the calcrete flats, has been recognised as extremely high and this was verified by Low and Pond (2001). The dwarf thicket on calcrete in the area is widely regarded as unique and threatened with 7.5% of species (12 out of 160) being on the Red Data List (SaSFlora, 1998 – 2007).

A list of red data plant species previously recorded in the study area in which the proposed development is planned was obtained from the Plants of Southern Africa (POSA) database of SANBI. There are various categories for Red Data Book species, such as ‘Endangered’, ‘Vulnerable’, ‘Rare’ and ‘Near threatened’ as listed in the Red Data List of Southern African Plants (Hilton-Taylor 1996).

The following species can potentially occur in the project area (Table 1):

Table 1. Potential red data species occurring in the area

Family	*Species*	Threat status
ASPHODELACEAE	*Aloe microstigma Salm-Dyck subsp. framesii (L.Bolus) Glen & D.S.Hardy*	Near threatened
ASTERACEAE	*Amellus capensis (Walp.) Hutch.*	Vulnerable
FABACEAE	*Amphithalea ericifolia (L.) Eckl. & Zeyh. subsp. erecta Granby*	Critically endangered
APIACEAE	*Arctopus dregei Sond.*	Near threatened
FABACEAE	*Argyrolobium velutinum Eckl. & Zeyh.*	Endangered
IRIDACEAE	*Babiana angustifolia Sweet*	Near threatened
IRIDACEAE	*Babiana hirsuta (Lam.) Goldblatt & J.C.Manning*	Near threatened
IRIDACEAE	*Babiana tubiflora (L.f.) Ker Gawl.*	Declining

Family	*Species*	Threat status
FABACEAE	*Calobota lotononoides (Schltr.) Boatwr. & B.-E.van Wyk*	Near threatened
APIACEAE	*Capnophyllum africanum (L.) Gaertn.*	Near threatened
APIACEAE	*Capnophyllum leiocarpon (Sond.) Manning & Goldblatt*	Declining
ASTERACEAE	*Cotula duckittiae (L.Bolus) K.Bremer & Humphries*	Vulnerable
ASTERACEAE	*Cotula eckloniana (DC.) Levyns*	Endangered
ASTERACEAE	*Cotula filifolia Thunb.*	Critically endangered
CRASSULACEAE	*Crassula decumbens Thunb. var. brachyphylla (Adamson) Toelken*	Near threatened
APIACEAE	*Cynorhiza meifolia (Eckl. & Zeyh.) Magee*	Data Deficient
HYACINTHACEAE	*Daubenya zeyheri (Kunth) J.C.Manning & A.M.van der Merwe*	Vulnerable
BORAGINACEAE	*Echiostachys spicatus (Burm.f.) Levyns*	Endangered
BORAGINACEAE	*Echiostachys spicatus (Burm.f.) Levyns*	Endangered
HYPOXIDACEAE	*Empodium veratrifolium (Willd.) M.F.Thomps.*	Endangered
ERICACEAE	*Erica trichostigma Salter*	Vulnerable
ASTERACEAE	*Felicia elongata (Thunb.) O.Hoffm.*	Vulnerable
ASTERACEAE	*Felicia elongata (Thunb.) O.Hoffm.*	Vulnerable
IRIDACEAE	*Ferraria densepunctulata M.P.de Vos*	Vulnerable
IRIDACEAE	*Ferraria foliosa G.J.Lewis*	Near threatened
IRIDACEAE	*Geissorhiza lewisiae R.C.Foster*	Vulnerable
IRIDACEAE	*Geissorhiza monanthos Eckl.*	Endangered
AMARYLLIDACEAE	*Gethyllis ciliaris (Thunb.) Thunb. subsp. ciliaris*	Near threatened
ASTERACEAE	*Helichrysum bachmannii Klatt*	Vulnerable
ASTERACEAE	*Helichrysum cochleariforme DC.*	Near threatened
ASTERACEAE	*Helichrysum tricostatum (Thunb.) Less.*	Near threatened
MALVACEAE	*Hermannia procumbens Cav. subsp. myrrhifolia (Thunb.) De Winter*	Endangered
IRIDACEAE	*Hesperantha erecta (Baker) Benth. ex Baker*	Near threatened
AMARYLLIDACEAE	*Hessea mathewsii W.F.Barker*	Critically endangered
FABACEAE	*Indigofera platypoda E.Mey.*	Endangered
HYACINTHACEAE	*Lachenalia mathewsii W.F.Barker*	Critically endangered
HYACINTHACEAE	*Lachenalia mediana Jacq. var. mediana*	Vulnerable
HYACINTHACEAE	*Lachenalia pustulata Jacq.*	Near threatened
HYACINTHACEAE	*Lachenalia viridiflora W.F.Barker*	Critically endangered
FABACEAE	*Lebeckia plukenetiana E.Mey.*	Endangered
FABACEAE	*Liparia splendens (Burm.f.) Bos & de Wit subsp. splendens*	Vulnerable
FABACEAE	*Otholobium bolusii (H.M.L.Forbes) C.H.Stirt.*	Near threatened
FABACEAE	*Otholobium venustum (Eckl. & Zeyh.) C.H.Stirt.*	Vulnerable
HYPOXIDACEAE	*Pauridia longituba M.F.Thomps.*	Endangered
GERANIACEAE	*Pelargonium chelidonium (Houtt.) DC.*	Endangered
FABACEAE	*Podalyria sericea (Andrews) R.Br. ex Aiton f.*	Vulnerable
FABACEAE	*Podalyria sericea (Andrews) R.Br. ex Aiton f.*	Vulnerable
IRIDACEAE	*Romulea barkerae M.P.de Vos*	Endangered
IRIDACEAE	*Romulea saldanhensis M.P.de Vos*	Endangered
CARYOPHYLLACEAE	*Silene ornata Aiton*	Data Deficient
ASTERACEAE	*Steirodiscus tagetes (L.) Schltr.*	Vulnerable

Family	*Species*	Threat status
AMARYLLIDACEAE	*Strumaria chaplinii (W.F.Barker) Snijman*	Endangered
ASTERACEAE	*Tripteris calcicola J.C.Manning & Goldblatt*	Vulnerable
FABACEAE	*Wiborgia fusca Thunb. subsp. macrocarpa R.Dahlgren*	Endangered
FABACEAE	*Xiphotheca reflexa (Thunb.) A.L.Schutte & B.-E.van Wyk*	Endangered
FABACEAE	*Xiphotheca reflexa (Thunb.) A.L.Schutte & B.-E.van Wyk*	Endangered

No red data species was documented during the surveys probably as a result of the degraded state of the vegetation on the footprint site of the thermal power plant and the corridors for the pipelines and powerlines. The potential however still exist that a species might have been missed and subsequently monitoring should be implemented during construction.

4.1.2 PROTECTED TREE SPECIES (NFA)

The National Forest Act (no.84 of 1998: National Forest Act, 1998) provides a list of tree species that are considered important in a South African perspective as a result of scarcity, high utilization, common value, etc. In terms of the National Forest Act of 1998, these tree species may not be cut, disturbed, damaged, destroyed and their products may not be possessed, collected, removed, transported, exported, donated, purchased or sold – except under license granted by DWAF (or a delegated authority). Obtaining relevant permits are therefore required prior to any impact on these individuals. Taking cognizance of the data obtained from the field surveys, no protected tree species occur in the area.

4.1.3 PROTECTED SPECIES

Plant species are also protected according to the (NEMBA: Act 10 0f 2004) and the Western Cape Nature Conservation Laws Amendment act, 2000. According to these Acts, no person may pick, import, export, transport, possess, cultivate or trade in a specimen of a specially protected or protected plant species. The Appendices to the Acts provide an extensive list of species that are protected, comprising a significant component of the flora expected to occur on site. Communication with Provincial authorities indicates that a permit is required for all these species, if they are expected to be affected by the proposed project.

After a detailed survey was conducted the following protected plants were found during the surveys as stipulated in the NCNCA, Act no. 9 of 2009. (Table 2). No other protected flora listed in NEMBA (2004) was documented during the surveys from the NEMBA (2004) lists.

Table 2. Protected plants documented during the survey

Species
Aloe perfoliata (Photograph 8)
Berkheya rigida
Boophane haemanthoides (Photograph 7)
Carpobrotus edulis

Vortum Thermal Power Plant Flora Rescue & Protection Plan

Species
Chrysanthemoides incana
Conicosia pugioniformis
Cotyledon orbiculata
Dimorphotheca sinuata
Drosanthemum spp.
Erica mammosa
Eriocephalus africanus
Felicia filifolia
Felicia heterophylla
Felicia tenella
Jordaaniella dubia
Mesembryanthemum crystallinum
Mesembryanthemum gueriachum
Ruschia macowani
Salaxis axillaris
Tylecodon wallichiii

Photograph 1. The protected geophyte *Boophane haemanthoides* was documented along the powerline corridor

Photograph 2. The succulent *Aloe perfoliata* on shallow soils in the project area

A permit should be obtained from the authorities before any of these plants could be eradicated. These plants should form part of a rescue and relocation programme should the development activities impact on populations.

5 PLANT RESCUE AND PROTECTION PLAN FOR THE THREATENED AND PROTECTED PLANTS OF THE SITE

Plant material that is to be “rescued” must be potted up into bags utilising local soil obtained from the topsoil obtained from the construction site or larger area. Adequate root systems per plant material type must be carefully excavated and retained in order for plant material to remain viable. Search and Rescue activities would include the removal of grass clumps, smaller transplantable shrubs and trees and endangered species such as geophytes and succulents should be placed into bags using local soil.

Should the ECO require that plants be cleared for the proposed construction of the facility, the following rescue and conservation strategy for the relevant plant species should apply:

- General principles:
    - Vegetation removal must be limited to the thermal power plant, liquid fuel pipeline and power line corridors construction site;
    - Vegetation to be removed as it becomes necessary rather than removal of all vegetation throughout the site in one step;
    - Materials should not be delivered to the site prematurely which could result in additional areas being cleared or affected;
    - No vegetation to be used for firewood;
    - Gathering of firewood, fruit, muti plants, or any other natural material onsite or in areas adjacent to the site is prohibited unless with prior approval of the ECO;
    - Only vegetation within the footprint area must be removed;
    - Vegetation removal must be phased in order to reduce impact of construction;
    - Construction site office and laydown areas must be clearly demarcated and no encroachment must occur beyond demarcated areas.
    - All natural areas impacted during construction must be rehabilitated with locally indigenous plant species.
    - A buffer zone should be established in areas where construction will not take place to ensure that construction activities do not extend into these areas. These areas include drainage channels and rocky outcrops in the study area;
    - Construction areas must be well demarcated and these areas strictly adhered to;

  - The use of pesticides and herbicides in the study area must be discouraged as these impacts on important pollinator species of indigenous vegetation;
  - Soils must be kept free of petrochemical solutions that may be kept on site during construction. Spillage can result in a loss of soil functionality thus limiting the re-establishment of flora;

- Harvesting of seeds from specimens to be used in the ex situ nursery and future rehabilitation. The ecologist shall determine when seed is mature and ready for collecting, and shall collect, extract, clean and label the seed. Seed shall be labelled to indicate the plant species name, date of collection, weight of seed and place of collection. The seed shall be stored in air-tight containers at a constant temperature, away from direct light. Seed shall be provided to the principal of the ex situ nursery;
- Prior to plants being cleared from the work site, the ecologist shall take vegetative cuttings from the individual plants that can reproduce vegetatively. The ecologist shall determine when to take the cuttings and the best type to take (e.g. young growth, mature material). Cuttings shall be labelled with plant species name, date and place of collection, and stored in moist paper in a cool place prior to planting. Vegetative cuttings shall be provided to the nursery;
- Intact removal of protected plant species under permit. Permits should be obtained from the Western Cape Environmental authorities where red data or protected flora is to be disturbed or relocated. Plant material that is to be “rescued” must be potted up into bags utilising local soil. Adequate root systems per plant material type must be carefully excavated and retained in order for plant material to remain viable. Search and Rescue activities would include the removal of grass clumps, smaller transplantable shrubs and trees and endangered species such as geophytes and succulents should be placed into bags using local soil. Options to be considered for the above-mentioned protected and red data specimens:
  - Suitable translocation areas: e.g. protected areas in the larger area;
  - Translocation to suitable areas earmarked for public open spaces, restoration and rehabilitation, both on and off-site;
  - Use of removed plants in an indigenous nursery for future restoration and rehabilitation programs;
  - Translocation to other areas suitable for survival of the removed specimens;
  - Proper habitat suitability assessments before reintroductions to reduce the risk of mortalities in both source and destination populations.
  - Plant relocation procedures are described in detail in Appendix B of this

report and involve the following:

- Timing of relocation;
- Weed control;
- Root preparation;
- Preparation of planting holes;
- Root excavation techniques;
- Lifting technique;
- Backfill;
- Soil additives;
- Watering basin;
- Initial watering;
- Initial fertiliser.

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APPENDIX A. PLANT SPECIES LISTS FOR QDS

Family	*Species*	Threat status	SA Endemic
AIZOACEAE	*Aizoon paniculatum L.*	LC	No
AIZOACEAE	*Galenia africana L.*	LC	No
AIZOACEAE	*Tetragonia fruticosa L.*	LC	No
AIZOACEAE	*Tetragonia rosea Schltr.*	LC	No
AMARYLLIDACEAE	*Amaryllis belladonna L.*	LC	No
AMARYLLIDACEAE	*Boophone haemanthoides F.M.Leight.*	LC	No
AMARYLLIDACEAE	*Brunsvigia orientalis (L.) Aiton ex Eckl.*	LC	No
AMARYLLIDACEAE	*Gethyllis afra L.*	LC	No
AMARYLLIDACEAE	*Gethyllis ciliaris (Thunb.) Thunb. subsp. ciliaris*	NT	No
AMARYLLIDACEAE	*Gethyllis lanuginosa Marloth*	LC	No
AMARYLLIDACEAE	*Haemanthus pubescens L.f. subsp. pubescens*	LC	No
AMARYLLIDACEAE	*Hessea mathewsii W.F.Barker*	CR	No
AMARYLLIDACEAE	*Strumaria chaplinii (W.F.Barker) Snijman*	EN	No
AMARYLLIDACEAE	*Strumaria tenella (L.f.) Snijman subsp. tenella*	LC	No
ANACARDIACEAE	*Searsia dissecta (Thunb.) Moffett*	LC	No
ANACARDIACEAE	*Searsia glauca (Thunb.) Moffett*	LC	No
ANACARDIACEAE	*Searsia laevigata (L.) F.A.Barkley var. laevigata forma laevigata*	Not Evaluated	No
ANACARDIACEAE	*Searsia pterota (C.Presl) Moffett*	LC	No
ANACARDIACEAE	*Searsia undulata (Jacq.) T.S.Yi, A.J.Mill. & J.Wen*	LC	No
ANTHERICACEAE	*Chlorophytum comosum (Thunb.) Jacques*	LC	No
ANTHERICACEAE	*Chlorophytum triflorum (Aiton) Kunth*	LC	No
APIACEAE	*Annesorhiza grandiflora (Thunb.) M.Hiroe*	LC	No
APIACEAE	*Annesorhiza macrocarpa Eckl. & Zeyh.*	LC	No
APIACEAE	*Arctopus dregei Sond.*	NT	No
APIACEAE	*Arctopus echinatus L.*	LC	No
APIACEAE	*Berula thunbergii (DC.) H.Wolff*	LC	No
APIACEAE	*Capnophyllum africanum (L.) Gaertn.*	NT	No
APIACEAE	*Capnophyllum leiocarpon (Sond.) Manning & Goldblatt*	Declining	No
APIACEAE	*Centella affinis (Eckl. & Zeyh.) Adamson var. affinis*	LC	No
APIACEAE	*Cynorhiza meifolia (Eckl. & Zeyh.) Magee*	DDD	No
APIACEAE	*Cynorhiza typica Eckl. & Zeyh.*	LC	No
APIACEAE	*Dasispermum hispidum (Thunb.) Magee & B.-E.van Wyk*	LC	No
APIACEAE	*Lichtensteinia obscura (Spreng.) Koso-Pol.*	LC	No
APIACEAE	*Torilis arvensis (Huds.) Link*	Not Evaluated	No
APOCYNACEAE	*Asclepias crispa P.J.Bergius var. crispa*	LC	No
APOCYNACEAE	*Cynanchum obtusifolium L.f.*	LC	No
APOCYNACEAE	*Microloma sagittatum (L.) R.Br.*	LC	No
APOCYNACEAE	*Orbea variegata (L.) Haw.*	LC	No

Family	*Species*	Threat status	SA Endemic
ASPARAGACEAE	*Asparagus aethiopicus L.*	LC	No
ASPARAGACEAE	*Asparagus capensis L. var. capensis*	LC	No
ASPARAGACEAE	*Asparagus declinatus L.*	LC	No
ASPARAGACEAE	*Asparagus exuvialis Burch. forma exuvialis*	Not Evaluated	No
ASPARAGACEAE	*Asparagus fasciculatus Thunb.*	LC	No
ASPARAGACEAE	*Asparagus kraussianus (Kunth) J.F.Macbr.*	LC	No
ASPARAGACEAE	*Asparagus lignosus Burm.f.*	LC	No
ASPARAGACEAE	*Asparagus retrofractus L.*	LC	No
ASPARAGACEAE	*Asparagus rubicundus P.J.Bergius*	LC	No
ASPARAGACEAE	*Asparagus undulatus (L.f.) Thunb.*	LC	No
ASPHODELACEAE	*Aloe microstigma Salm-Dyck subsp. framesii (L.Bolus) Glen & D.S.Hardy*	NT	No
ASPHODELACEAE	*Aloe perfoliata L.*	LC	No
ASPHODELACEAE	*Bulbine annua (L.) Willd.*	LC	No
ASPHODELACEAE	*Bulbine favosa (Thunb.) Schult. & Schult.f*	LC	No
ASPHODELACEAE	*Bulbine minima Baker*	LC	No
ASPHODELACEAE	*Bulbine praemorsa (Jacq.) Spreng.*	LC	No
ASPHODELACEAE	*Bulbine sedifolia Schltr. ex Poelln.*	LC	No
ASPHODELACEAE	*Bulbinella cauda-felis (L.f.) T.Durand & Schinz*	LC	No
ASPHODELACEAE	*Bulbinella nutans (Thunb.) T.Durand & Schinz subsp. nutans*	LC	No
ASPHODELACEAE	*Bulbinella triquetra (L.f.) Kunth*	LC	No
ASPHODELACEAE	*Kniphofia uvaria (L.) Oken*	LC	No
ASPHODELACEAE	*Trachyandra ciliata (L.f.) Kunth*	LC	No
ASPHODELACEAE	*Trachyandra divaricata (Jacq.) Kunth*	LC	No
ASPHODELACEAE	*Trachyandra hispida (L.) Kunth*	LC	No
ASPHODELACEAE	*Trachyandra revoluta (L.) Kunth*	LC	No
ASPHODELACEAE	*Trachyandra scabra (L.f.) Kunth*	LC	No
ASTERACEAE	*Amellus asteroides (L.) Druce subsp. asteroides*	LC	No
ASTERACEAE	*Amellus capensis (Walp.) Hutch.*	VU	No
ASTERACEAE	*Amellus tenuifolius Burm.*	LC	No
ASTERACEAE	*Anthemis cotula L.*	Not Evaluated	No
ASTERACEAE	*Arctotheca calendula (L.) Levyns*	LC	No
ASTERACEAE	*Arctotheca populifolia (P.J.Bergius) Norl.*	LC	No
ASTERACEAE	*Arctotis hirsuta (Harv.) Beauverd*	LC	No
ASTERACEAE	*Arctotis revoluta Jacq.*	LC	No
ASTERACEAE	*Berkheya rigida (Thunb.) Erwart, Jean White & B.Rees*	LC	No
ASTERACEAE	*Chrysanthemoides incana (Burm.f.) Norl.*	LC	No
ASTERACEAE	*Chrysocoma ciliata L.*	LC	No
ASTERACEAE	*Conyza canadensis (L.) Cronquist*	Not Evaluated	No
ASTERACEAE	*Cotula coronopifolia L.*	LC	No
ASTERACEAE	*Cotula duckittiae (L.Bolus) K.Bremer & Humphries*	VU	No

Family	*Species*	Threat status	SA Endemic
ASTERACEAE	*Cotula eckloniana (DC.) Levyns*	EN	No
ASTERACEAE	*Cotula filifolia Thunb.*	CR	No
ASTERACEAE	*Cotula turbinata L.*	LC	No
ASTERACEAE	*Didelta carnosa (L.f.) Aiton var. carnosa*	LC	No
ASTERACEAE	*Didelta carnosa (L.f.) Aiton var. tomentosa (Less.) Roessler*	LC	No
ASTERACEAE	*Dimorphotheca sinuata DC.*	LC	No
ASTERACEAE	*Dimorphotheca tragus (Aiton) B.Nord.*	LC	No
ASTERACEAE	*Eriocephalus africanus L. var. paniculatus (Cass.) M.A.N.Müll.,P.P.J.Herman & Kolberg*	LC	No
ASTERACEAE	*Eriocephalus racemosus L. var. affinis (DC.) Harv.*	LC	No
ASTERACEAE	*Eriocephalus racemosus L. var. racemosus*	LC	No
ASTERACEAE	*Euryops linifolius (L.) DC.*	LC	No
ASTERACEAE	*Euryops multifidus (Thunb.) DC.*	LC	No
ASTERACEAE	*Felicia bergeriana (Spreng.) O.Hoffm.*	LC	No
ASTERACEAE	*Felicia dregei DC.*	LC	No
ASTERACEAE	*Felicia elongata (Thunb.) O.Hoffm.*	VU	No
ASTERACEAE	*Felicia elongata (Thunb.) O.Hoffm.*	VU	No
ASTERACEAE	*Felicia filifolia (Vent.) Burtt Davy subsp. schlechteri (Compton) Grau*	LC	No
ASTERACEAE	*Felicia heterophylla (Cass.) Grau*	LC	No
ASTERACEAE	*Felicia hyssopifolia (P.J.Bergius) Nees subsp. glabra (DC.) Grau*	LC	No
ASTERACEAE	*Felicia merxmuelleri Grau*	LC	No
ASTERACEAE	*Felicia merxmuelleri Grau*	LC	No
ASTERACEAE	*Felicia tenella (L.) Nees subsp. pusilla (Harv.) Grau*	LC	No
ASTERACEAE	*Foveolina tenella (DC.) Källersjö*	LC	No
ASTERACEAE	*Gymnodiscus capillaris (L.f.) DC.*	LC	No
ASTERACEAE	*Helichrysum bachmannii Klatt*	VU	No
ASTERACEAE	*Helichrysum cochleariforme DC.*	NT	No
ASTERACEAE	*Helichrysum indicum (L.) Grierson*	LC	No
ASTERACEAE	*Helichrysum litorale Bolus*	LC	No
ASTERACEAE	*Helichrysum niveum (L.) Less.*	LC	No
ASTERACEAE	*Helichrysum patulum (L.) D.Don*	LC	No
ASTERACEAE	*Helichrysum revolutum (Thunb.) Less.*	LC	No
ASTERACEAE	*Helichrysum tricostatum (Thunb.) Less.*	NT	No
ASTERACEAE	*Ifloga ambigua (L.) Druce*	LC	No
ASTERACEAE	*Ifloga verticillata (L.f.) Fenzl*	LC	No
ASTERACEAE	*Leucanthemum vulgare Lam.*	Not Evaluated	No
ASTERACEAE	*Leysera gnaphalodes (L.) L.*	LC	No
ASTERACEAE	*Metalasia densa (Lam.) P.O.Karis*	LC	No
ASTERACEAE	*Metalasia muricata (L.) D.Don*	LC	No
ASTERACEAE	*Nidorella foetida (L.) DC.*	LC	No
ASTERACEAE	*Oedera imbricata Lam.*	LC	No
ASTERACEAE	*Oedera uniflora (L.f.) Anderb. & K.Bremer*	LC	No

Family	*Species*	Threat status	SA Endemic
ASTERACEAE	*Oncosiphon sabulosum (Wolley-Dod) Källersjö*	LC	No
ASTERACEAE	*Oncosiphon suffruticosum (L.) Källersjö*	LC	No
ASTERACEAE	*Osteospermum grandiflorum DC.*	LC	No
ASTERACEAE	*Osteospermum pinnatum (Thunb.) Norl. var. pinnatum*	LC	No
ASTERACEAE	*Othonna arborescens L.*	LC	No
ASTERACEAE	*Othonna coronopifolia L.*	LC	No
ASTERACEAE	*Othonna cylindrica (Lam.) DC.*	LC	No
ASTERACEAE	*Othonna frutescens L.*	LC	No
ASTERACEAE	*Othonna mucronata Harv.*	LC	No
ASTERACEAE	*Othonna perfoliata (L.f.) Jacq.*	LC	No
ASTERACEAE	*Othonna quercifolia DC.*	LC	No
ASTERACEAE	*Poecilolepis ficoidea (DC.) Grau*	LC	No
ASTERACEAE	*Pseudognaphalium luteo-album (L.) Hilliard & B.L.Burtt*		No
ASTERACEAE	*Pteronia divaricata (P.J.Bergius) Less.*	LC	No
ASTERACEAE	*Pteronia incana (Burm.) DC.*	LC	No
ASTERACEAE	*Pteronia onobromoides DC.*	LC	No
ASTERACEAE	*Pteronia onobromoides DC.*	LC	No
ASTERACEAE	*Pteronia uncinata DC.*	LC	No
ASTERACEAE	*Rhynchopsidium pumilum (L.f.) DC.*	LC	No
ASTERACEAE	*Senecio arenarius Thunb.*	LC	No
ASTERACEAE	*Senecio arniciflorus DC.*	LC	No
ASTERACEAE	*Senecio burchellii DC.*	LC	No
ASTERACEAE	*Senecio elegans L.*	LC	No
ASTERACEAE	*Senecio littoreus Thunb. var. hispidulus Harv.*	LC	No
ASTERACEAE	*Senecio littoreus Thunb. var. littoreus*	LC	No
ASTERACEAE	*Senecio maritimus L.*	LC	No
ASTERACEAE	*Senecio pterophorus DC.*	LC	No
ASTERACEAE	*Senecio sarcoides C.Jeffrey*	LC	No
ASTERACEAE	*Steirodiscus tagetes (L.) Schltr.*	VU	No
ASTERACEAE	*Tripteris calcicola J.C.Manning & Goldblatt*	VU	No
ASTERACEAE	*Tripteris sinuata DC. var. sinuata*	LC	No
ASTERACEAE	*Ursinia anethoides (DC.) N.E.Br.*	LC	No
ASTERACEAE	*Ursinia anthemoides (L.) Poir. subsp. anthemoides*	LC	No
BORAGINACEAE	*Amsinckia retrorsa Suksd.*	Not Evaluated	No
BORAGINACEAE	*Echiostachys spicatus (Burm.f.) Levyns*	EN	No
BORAGINACEAE	*Echiostachys spicatus (Burm.f.) Levyns*	EN	No
BORAGINACEAE	*Heliotropium supinum L.*	Not Evaluated	No
BORAGINACEAE	*Myosotis discolor Pers.*	Not Evaluated	No
BRASSICACEAE	*Barbarea verna (Mill.) Asch.*	Not Evaluated	No
BRASSICACEAE	*Heliophila acuminata (Eckl. & Zeyh.) Steud.*	LC	No

Family	*Species*	Threat status	SA Endemic
BRASSICACEAE	*Heliophila adpressa O.E.Schulz*	LC	No
BRASSICACEAE	*Heliophila africana (L.) Marais*	LC	No
BRASSICACEAE	*Heliophila elata Sond. var. elata*	Not Evaluated	No
BRASSICACEAE	*Heliophila linearis (Thunb.) DC. var. linearifolia (Burch. ex DC.) Marais*	LC	No
BRASSICACEAE	*Heliophila macowaniana Schltr.*	LC	No
BRASSICACEAE	*Raphanus raphanistrum L.*	Not Evaluated	No
BRYACEAE	*Bryum torquescens Bruch ex De Not.*		No
BUDDLEJACEAE	*Buddleja glomerata H.L.Wendl.*	LC	No
CAMPANULACEAE	*Microcodon glomeratum A.DC.*	LC	No
CAMPANULACEAE	*Prismatocarpus crispus L'Hér.*	LC	No
CAMPANULACEAE	*Roella prostrata E.Mey. ex A.DC.*	LC	No
CAMPANULACEAE	*Wahlenbergia adpressa (Thunb.) Sond.*	LC	No
CAMPANULACEAE	*Wahlenbergia androsacea A.DC.*	LC	No
CAMPANULACEAE	*Wahlenbergia capensis (L.) A.DC.*	LC	No
CAMPANULACEAE	*Wahlenbergia exilis A.DC.*	LC	No
CAMPANULACEAE	*Wahlenbergia hispidula (Thunb.) A.DC.*	LC	No
CAMPANULACEAE	*Wahlenbergia obovata Brehmer*	LC	No
CAMPANULACEAE	*Wahlenbergia paniculata (Thunb.) A.DC.*	LC	No
CAMPANULACEAE	*Wahlenbergia suffruticosa C.N.Cupido*		No
CARYOPHYLLACEAE	*Silene burchellii Otth var. angustifolia Sond.*	Not Evaluated	No
CARYOPHYLLACEAE	*Silene ornata Aiton*	DDT	No
CARYOPHYLLACEAE	*Silene undulata Aiton*	LC	No
CARYOPHYLLACEAE	*Spergularia media (L.) C.Presl*	Not Evaluated	No
CELASTRACEAE	*Cassine peragua L. subsp. barbara (L.) R.H.Archer*	LC	No
CELASTRACEAE	*Gymnosporia buxifolia (L.) Szyszyl.*	LC	No
CELASTRACEAE	*Maytenus lucida (L.) Loes.*	LC	No
CELASTRACEAE	*Pterocelastrus tricuspidatus (Lam.) Walp.*	LC	No
CELASTRACEAE	*Putterlickia pyracantha (L.) Szyszyl.*	LC	No
CELASTRACEAE	*Putterlickia pyracantha (L.) Szyszyl.*	LC	No
CHENOPODIACEAE	*Atriplex cinerea Poir. subsp. bolusii (C.H.Wright) Aellen var. adamsonii Aellen*	LC	No
CHENOPODIACEAE	*Atriplex lindleyi Moq. subsp. inflata (F.Muell.) Paul G.Wilson*	Not Evaluated	No
CHENOPODIACEAE	*Atriplex semibaccata R.Br. var. appendiculata Aellen*	LC	No
CHENOPODIACEAE	*Bassia diffusa (Thunb.) Kuntze*	LC	No
CHENOPODIACEAE	*Chenopodium ambrosioides L.*	Not Evaluated	No
CHENOPODIACEAE	*Salicornia meyeriana Moss*	LC	No
CHENOPODIACEAE	*Sarcocornia capensis (Moss) A.J.Scott*	LC	No
CHENOPODIACEAE	*Sarcocornia littorea (Moss) A.J.Scott*	LC	No
CHENOPODIACEAE	*Sarcocornia mossiana (Toelken) A.J.Scott*	LC	No
CHENOPODIACEAE	*Sarcocornia natalensis (Bunge ex Ung.-Sternb.) A.J.Scott var. natalensis*	LC	No

Family	*Species*	Threat status	SA Endemic
CHENOPODIACEAE	*Sarcocornia perennis (Mill.) A.J.Scott var. perennis*	LC	No
CHENOPODIACEAE	*Sarcocornia pillansii (Moss) A.J.Scott var. pillansii*	LC	No
COMMELINACEAE	*Tradescantia fluminensis Vell.*	Not Evaluated	No
CONVOLVULACEAE	*Cuscuta nitida Choisy*	LC	No
CRASSULACEAE	*Crassula decumbens Thunb. var. brachyphylla (Adamson) Toelken*	NT	No
CRASSULACEAE	*Crassula dejecta Jacq.*	LC	No
CRASSULACEAE	*Crassula dichotoma L.*	LC	No
CRASSULACEAE	*Crassula expansa Dryand. subsp. expansa*	LC	No
CRASSULACEAE	*Crassula glomerata P.J.Bergius*	LC	No
CRASSULACEAE	*Crassula nudicaulis L. var. nudicaulis*	LC	No
CRASSULACEAE	*Crassula thunbergiana Schult. subsp. thunbergiana*	LC	No
CRASSULACEAE	*Crassula tomentosa Thunb. var. tomentosa*	LC	No
CUCURBITACEAE	*Kedrostis psammophylla Bruyns*	LC	No
CYPERACEAE	*Bolboschoenus maritimus (L.) Palla*	LC	No
CYPERACEAE	*Ficinia bulbosa (L.) Nees*	LC	No
CYPERACEAE	*Ficinia secunda (Vahl) Kunth*	LC	No
CYPERACEAE	*Isolepis levynsiana Muasya & D.A.Simpson*	LC	No
CYPERACEAE	*Isolepis marginata (Thunb.) A.Dietr.*	LC	No
CYPERACEAE	*Isolepis rubicunda (Nees) Kunth*	LC	No
CYPERACEAE	*Schoenoplectus corymbosus (Roth ex Roem. & Schult.) J.Raynal*	LC	No
CYPERACEAE	*Schoenoplectus triqueter (L.) Palla*	Not Evaluated	No
EBENACEAE	*Diospyros austro-africana De Winter var. austro-africana*	LC	No
EBENACEAE	*Euclea natalensis A.DC. subsp. capensis F.White*	LC	No
EBENACEAE	*Euclea racemosa Murray subsp. racemosa*	LC	No
ERICACEAE	*Erica flacca E.Mey. ex Benth.*	LC	No
ERICACEAE	*Erica inaequalis (N.E.Br.) E.G.H.Oliv.*	LC	No
ERICACEAE	*Erica mammosa L.*	LC	No
ERICACEAE	*Erica plumosa Thunb.*	LC	No
ERICACEAE	*Erica subdivaricata P.J.Bergius*	LC	No
ERICACEAE	*Erica trichostigma Salter*	VU	No
ERICACEAE	*Erica tristis Bartl.*	LC	No
EUPHORBIACEAE	*Adenocline violifolia (Kuntze) Prain*	LC	No
EUPHORBIACEAE	*Clutia affinis Sond.*	LC	No
EUPHORBIACEAE	*Clutia alaternoides L. var. alaternoides*	LC	No
EUPHORBIACEAE	*Clutia daphnoides Lam.*	LC	No
EUPHORBIACEAE	*Clutia ericoides Thunb. var. ericoides*	LC	No
EUPHORBIACEAE	*Euphorbia burmannii E.Mey. ex Boiss.*	LC	No
EUPHORBIACEAE	*Euphorbia mauritanica L. var. mauritanica*	LC	No
EUPHORBIACEAE	*Euphorbia peplus L.*	Not Evaluated	No
FABACEAE	*Acacia mearnsii De Wild.*	Not Evaluated	No

Family	*Species*	Threat status	SA Endemic
FABACEAE	*Amphithalea ericifolia (L.) Eckl. & Zeyh. subsp. erecta Granby*	CR	No
FABACEAE	*Argyrolobium velutinum Eckl. & Zeyh.*	EN	No
FABACEAE	*Calobota angustifolia (E.Mey.) Boatwr. & B.-E.van Wyk*	LC	No
FABACEAE	*Calobota cytisoides (Berg.) Eckl. & Zeyh.*	LC	No
FABACEAE	*Calobota lotononoides (Schltr.) Boatwr. & B.-E.van Wyk*	NT	No
FABACEAE	*Calobota spinescens (Harv.) Boatwr. & B.-E.van Wyk*	LC	No
FABACEAE	*Crotalaria excisa (Thunb.) Baker f. subsp. excisa*	LC	No
FABACEAE	*Dipogon lignosus (L.) Verdc.*	LC	No
FABACEAE	*Indigofera heterophylla Thunb.*	LC	No
FABACEAE	*Indigofera incana Thunb.*	LC	No
FABACEAE	*Indigofera meyeriana Eckl. & Zeyh.*	LC	No
FABACEAE	*Indigofera platypoda E.Mey.*	EN	No
FABACEAE	*Indigofera procumbens L.*	LC	No
FABACEAE	*Indigofera venusta Eckl. & Zeyh.*	LC	No
FABACEAE	*Lebeckia ambigua E.Mey.*	LC	No
FABACEAE	*Lebeckia plukenetiana E.Mey.*	EN	No
FABACEAE	*Lessertia herbacea (L.) Druce*	LC	No
FABACEAE	*Lessertia rigida E.Mey.*	LC	No
FABACEAE	*Liparia splendens (Burm.f.) Bos & de Wit subsp. splendens*	VU	No
FABACEAE	*Lotononis involucrata (P.J.Bergius) Benth. subsp. involucrata*	LC	No
FABACEAE	*Lotononis sabulosa T.M.Salter*	LC	No
FABACEAE	*Medicago polymorpha L.*	Not Evaluated	No
FABACEAE	*Melilotus indicus (L.) All.*	Not Evaluated	No
FABACEAE	*Melolobium aethiopicum (L.) Druce*	LC	No
FABACEAE	*Melolobium candicans (E.Mey.) Eckl. & Zeyh.*	LC	No
FABACEAE	*Melolobium exudans Harv.*	LC	No
FABACEAE	*Otholobium bolusii (H.M.L.Forbes) C.H.Stirt.*	NT	No
FABACEAE	*Otholobium bracteolatum (Eckl. & Zeyh.) C.H.Stirt.*	LC	No
FABACEAE	*Otholobium venustum (Eckl. & Zeyh.) C.H.Stirt.*	VU	No
FABACEAE	*Podalyria sericea (Andrews) R.Br. ex Aiton f.*	VU	No
FABACEAE	*Podalyria sericea (Andrews) R.Br. ex Aiton f.*	VU	No
FABACEAE	*Rafnia angulata Thunb. subsp. angulata*	LC	No
FABACEAE	*Rafnia capensis (L.) Schinz subsp. capensis*	LC	No
FABACEAE	*Sutherlandia frutescens (L.) R.Br.*	LC	No
FABACEAE	*Vicia benghalensis L.*	Not Evaluated	No
FABACEAE	*Vicia sativa L. subsp. sativa*	Not Evaluated	No
FABACEAE	*Wiborgia fusca Thunb. subsp. fusca*	LC	No
FABACEAE	*Wiborgia fusca Thunb. subsp. macrocarpa R.Dahlgren*	EN	No
FABACEAE	*Wiborgia leptoptera R.Dahlgren subsp. leptoptera*	LC	No
FABACEAE	*Wiborgia obcordata (P.J.Bergius) Thunb.*	LC	No

Family	*Species*	Threat status	SA Endemic
FABACEAE	*Wiborgia obcordata (P.J.Bergius) Thunb.*	LC	No
FABACEAE	*Xiphotheca reflexa (Thunb.) A.L.Schutte & B.-E.van Wyk*	EN	No
FABACEAE	*Xiphotheca reflexa (Thunb.) A.L.Schutte & B.-E.van Wyk*	EN	No
FUMARIACEAE	*Cysticapnos vesicaria (L.) Fedde subsp. vesicaria*	LC	No
GENTIANACEAE	*Chironia baccifera L.*	LC	No
GENTIANACEAE	*Chironia decumbens Levyns*	LC	No
GENTIANACEAE	*Chironia linoides L. subsp. linoides*	LC	No
GENTIANACEAE	*Orphium frutescens (L.) E.Mey.*	LC	No
GENTIANACEAE	*Sebaea aurea (L.f.) Roem. & Schult.*	LC	No
GERANIACEAE	*Pelargonium carnosum (L.) L'Hér. subsp. carnosum*	LC	No
GERANIACEAE	*Pelargonium chelidonium (Houtt.) DC.*	EN	No
GERANIACEAE	*Pelargonium hirtum (Burm.f.) Jacq.*	LC	No
HAEMODORACEAE	*Wachendorfia multiflora (Klatt) J.C.Manning & Goldblatt*	LC	No
HYACINTHACEAE	*Daubenya zeyheri (Kunth) J.C.Manning & A.M.van der Merwe*	VU	No
HYACINTHACEAE	*Eucomis regia (L.) L'Hér.*	LC	No
HYACINTHACEAE	*Lachenalia mathewsii W.F.Barker*	CR	No
HYACINTHACEAE	*Lachenalia mediana Jacq. var. mediana*	VU	No
HYACINTHACEAE	*Lachenalia pustulata Jacq.*	NT	No
HYACINTHACEAE	*Lachenalia viridiflora W.F.Barker*	CR	No
HYACINTHACEAE	*Ornithogalum juncifolium Jacq. var. juncifolium*	LC	No
HYACINTHACEAE	*Ornithogalum maculatum Jacq.*	LC	No
HYPOXIDACEAE	*Empodium veratrifolium (Willd.) M.F.Thomps.*	EN	No
HYPOXIDACEAE	*Pauridia longituba M.F.Thomps.*	EN	No
HYPOXIDACEAE	*Spiloxene serrata (Thunb.) Garside var. serrata*	LC	No
IRIDACEAE	*Babiana ambigua (Roem. & Schult.) G.J.Lewis*	LC	No
IRIDACEAE	*Babiana angustifolia Sweet*	NT	No
IRIDACEAE	*Babiana hirsuta (Lam.) Goldblatt & J.C.Manning*	NT	No
IRIDACEAE	*Babiana mucronata (Jacq.) Ker Gawl. subsp. mucronata*	LC	No
IRIDACEAE	*Babiana ringens (L.) Ker Gawl. subsp. ringens*	LC	No
IRIDACEAE	*Babiana tubiflora (L.f.) Ker Gawl.*	Declining	No
IRIDACEAE	*Ferraria densepunctulata M.P.de Vos*	VU	No
IRIDACEAE	*Ferraria foliosa G.J.Lewis*	NT	No
IRIDACEAE	*Geissorhiza lewisiae R.C.Foster*	VU	No
IRIDACEAE	*Geissorhiza monanthos Eckl.*	EN	No
IRIDACEAE	*Gladiolus alatus L.*	LC	No
IRIDACEAE	*Gladiolus floribundus Jacq.*	LC	No
IRIDACEAE	*Gladiolus gracilis Jacq.*	LC	No
IRIDACEAE	*Gladiolus orchidiflorus Andrews*	LC	No
IRIDACEAE	*Hesperantha erecta (Baker) Benth. ex Baker*	NT	No
IRIDACEAE	*Hesperantha radiata (Jacq.) Ker Gawl.*	LC	No
IRIDACEAE	*Lapeirousia anceps (L.f.) Ker Gawl.*	LC	No

Family	*Species*	Threat status	SA Endemic
IRIDACEAE	*Lapeirousia jacquinii N.E.Br.*	LC	No
IRIDACEAE	*Melasphaerula ramosa (L.) N.E.Br.*	LC	No
IRIDACEAE	*Moraea albiflora (G.J.Lewis) Goldblatt*	LC	No
IRIDACEAE	*Moraea caeca Barnard ex Goldblatt*	LC	No
IRIDACEAE	*Moraea macrocarpa Goldblatt*	LC	No
IRIDACEAE	*Romulea barkerae M.P.de Vos*	EN	No
IRIDACEAE	*Romulea saldanhensis M.P.de Vos*	EN	No
IRIDACEAE	*Romulea tabularis Eckl. ex Bég.*	LC	No
JUNCACEAE	*Juncus effusus L.*	LC	No
JUNCACEAE	*Juncus tenuis Willd.*	Not Evaluated	No
JUNCAGINACEAE	*Triglochin bulbosa L.*	LC	No
JUNCAGINACEAE	*Triglochin striata Ruíz & Pav.*	LC	No
LAMIACEAE	*Salvia africana-caerulea L.*	LC	No
LAMIACEAE	*Salvia lanceolata Lam.*	LC	No
LAMIACEAE	*Stachys arvensis L.*	Not Evaluated	No
LOBELIACEAE	*Cyphia crenata (Thunb.) C.Presl var. crenata*	LC	No
MALVACEAE	*Anisodontea biflora (Desr.) Bates*	LC	No
MALVACEAE	*Hermannia heterophylla (Cav.) Thunb.*	LC	No
MALVACEAE	*Hermannia pinnata L.*	LC	No
MALVACEAE	*Hermannia prismatocarpa E.Mey. ex Harv.*	LC	No
MALVACEAE	*Hermannia procumbens Cav. subsp. myrrhifolia (Thunb.) De Winter*	EN	No
MALVACEAE	*Hermannia scordifolia Jacq.*	LC	No
MALVACEAE	*Hermannia trifurca L.*	LC	No
MELIANTHACEAE	*Melianthus elongatus Wijnands*	LC	No
MESEMBRYANTHEMACEAE	*Amphibolia laevis (Aiton) H.E.K.Hartmann*	LC	No
MESEMBRYANTHEMACEAE	*Apatesia helianthoides (Aiton) N.E.Br.*	LC	No
MESEMBRYANTHEMACEAE	*Conicosia pugioniformis (L.) N.E.Br. subsp. pugioniformis*	LC	No

APPENDIX B. PLANT RELOCATION PROCEDURES

1. **Timing**

    - If practicable plants shall be moved in autumn or winter when their growth rate is slowest and the soil is moist.

2. **Weed Control**

    - Refer to the Alien Invasive Management Plan compiled for the weed control requirements.
    - The areas where plants are to be relocated shall be eradicated of weeds before replanting commences. Any existing vegetative growth shall be slashed to a height of 1m;

3. **Root Preparation**

    - If nominated, the ECO shall undertake root pruning in advance of relocating. The ECO shall cut the roots at the margins of the root ball, and shall allow the plant to 'adjust' whilst still in situ. For large plants (trees and shrubs) root cutting shall occur progressively commencing at least 4-8 weeks prior to the plant being dug from the ground. A section of the margin of the root ball shall be cut each week during the period leading up to the plant being relocated.

4. **Preparation of Planting Holes**

    - Planting holes shall be prepared before the plant to be relocated is dug up. As far as practicable, topsoil and subsoil shall be kept separate when preparing planting holes. The ECO shall remove from site any unsuitable material brought to the surface during excavation.
    - The hole shall be at least twice the diameter of the root ball and no deeper than the height of the proposed root ball. If the depth of the hole exceeds the root ball height, compacted soil shall be added to the hole to prevent settling after transplanting. Sides of the hole shall be sloped and roughened to create an irregular surface that will facilitate root penetration.

5. **Root Excavation Technique**

    - Before any excavation is carried out, the ECO shall thoroughly water the plants to be relocated and shall mark the proposed root ball size on the ground. In general, the root ball diameter for larger plants (trees and shrubs) should be 10 mm for every 1 mm of trunk diameter, measured at 300 mm above the ground.
    - For tussock grasses and other strap leaf plants the root ball shall generally be twice the

diameter of the base of the tussock.

- Spade Dug
    - Plants shall be dug from the ground using a spade. Beyond the edge of the root ball, a sharp spade shall be driven into the ground, cutting all the way around the plant. Soil taken with the plants shall extend a minimum of 100mm beyond the root ball to minimise disturbance and/or root damage. Any exposed roots shall be pruned flush with the face of the root ball using sharp secateurs or loppers, ensuring the rootball is not loosened.
    - If necessary, the root ball shall be wrapped in natural fibre (e.g. hessian) to prevent soil being lost during relocation. Once the ball is securely wrapped and tied, the plant shall be undercut. (Small plants may not need to be wrapped, especially if the soil is moist and holds together).
    - A spade shall be used to excavate roots in situations where the use of other machinery would cause undue damage to the remaining vegetation.
    - This method is most suitable for relocating individual small plants or clumps of bulbous, grass or sedge species.
- Mini Excavator/Backhoe/Skid Steer Loader Excavated
    - Plants shall be dug from the ground using a mini excavator, backhoe or skid steer loader. Soil taken with the plants shall extend a minimum of 150 mm beyond the root ball to minimise disturbance and/or root damage. Any exposed roots shall be pruned flush with the face of the root ball using sharp secateurs or loppers, ensuring the root ball is not loosened.
    - If necessary, the root ball shall be wrapped in natural fibre (e.g. hessian) to prevent soil being lost during relocation. Once the ball is securely wrapped and tied, the plant shall be undercut. (Small plants may not need to be wrapped especially if the soil is moist and holds together).
    - This root excavation method shall only be used for sites that are sparsely vegetated and where the machinery will not cause undue damage to the remaining vegetation.

6. Lifting Technique

- Plants shall be lifted from their existing location and immediately placed in the pre-prepared planting holes;
- For small plants, the root ball shall be lifted from the hole by hand or by using a sling attached to a small machine;
- Lifting of plants shall be carried out or supervised by a qualified and/or suitably

experienced horticulturist and crane/machine operator;

- Appropriate lifting equipment shall be used;
- Suitable slings shall be attached around a balance point of the plant and shall provide a support system around the root ball. When a sling is attached to the plant, padding and protection is required to reduce possible damage. Plants shall not be lifted by the trunk alone. A qualified crane/machine operator shall determine the support system to be used.

7. Backfill

- Once the plant has been placed in the hole it shall be backfilled with site topsoil and lightly consolidated. The plant shall be set at a height such that the surface of root ball is at the same level as the surrounding soil surface.
- Only topsoil free from perennial weeds, stones, debris, clods of subsoil or other deleterious material may be used as backfill for planting. Topsoil stockpiled from the removal site also may be used as backfill.
- Where in the opinion of the Superintendent excavated material is unsuitable for backfill, imported soil shall be used. Imported soil shall be matched as closely as practicable to the existing site soil. Organic matter shall not be added to the backfill material.

8. Soil Additives

- Water Retention Agents
    - Water retention agents (i.e. AquaBoost AG, Alcosorb Water Crystals) shall be applied in accordance with the manufacturer's instructions and recommended rates. The watering regime during the maintenance period shall be closely monitored to ensure over watering does not occur.

9. Initial Watering

- Immediately following planting, each plant shall be watered with a volume of clean potable water.

10. Initial Fertiliser

- Aquasol, Thrive or Maxicrop shall be applied at the manufacturer's recommended rates once per month, for 6 months.