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Pri.Sci.Nat # 400045/08

BOTANICAL ASSESSMENT OF PROPOSED NEW HARDENED WATER RESERVOIRS AND PIPELINE, KOEBERG NUCLEAR POWER STATION, CAPE TOWN.

Compiled for: Sharples Environmental Services, Milnerton

Client: Eskom (Koeberg Nuclear Power Station)

17 November 2023

DECLARATION OF INDEPENDENCE

In terms of Chapter 5 of the National Environmental Management Act of 1998 specialists involved in Impact Assessment processes must declare their independence and include an abbreviated Curriculum Vitae.

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

NA Helme

ABRIDGED CV:

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Since 1997 I have been based in Cape Town, and have been working as a specialist botanical consultant, specialising in the diverse flora of the south-western Cape. Since the end of 2001 I have been the Sole Proprietor of Nick Helme Botanical Surveys, and have undertaken over 1700 site assessments in this period.

A selection of relevant previous botanical work is as follows:

- Botanical assessment of Zeekoevlei weir upgrades (Infinity Environmental 2022)
- Botanical assessment of proposed development on Ptn 29 of Farm 410 Caledon (PHS Consulting 2022)
- Botanical assessment of proposed development on Ptn 10 of Broken Hill 88, Heidelberg (Isikhova 2021)
- Botanical assessment of Ptns 3 & 6 of Farm 563 Kleinmond (Lornay Environmental 2021)
- Botanical assessment of Ptn 9 of Farm 429 Gabrielskloof, Caledon (Infinity Environmental 2021)

- Baseline ecological assessment of Karwyderskraal 584, Caledon (Terramanzi 2021)
- Botanical impact assessment of proposed development of Ptn 29 of Farm 410, Caledon (PHS Consulting 2021)
- Botanical assessment of proposed new cultivation on Welbedacht farm, Tra Tra Mountains (Footprint Environmental 2020)
- Biodiversity Compliance Statement - Philippi erf 1/1460 (Infinity Environmental 2020)
- Botanical assessment of Kleinmond WWTW expansion (Aurecon 2020)
- Botanical assessment of Mooreesburg WWTW expansion (Aurecon 2020)
- Botanical assessment of Struisbaai cemetery sites (Infinity Environmental 2020)
- Botanical assessment of MoPama development site, Swellendam (Landscape Dynamics 2020)
- Botanical assessment of Ptn of Rem of Erf 1 Caledon (Theewaterskloof Municipality 2019)
- Botanical assessment of proposed new cultivation on Portion of Wittewater 148, Piketberg (Cornerstone Environmental 2019)
- Botanical assessment of Droogerivier farm Leipoldtville (Footprint Environmental 2018)
- Botanical assessment of Sebulon farm, Redelinghuys (Natura Libra Environmental Services 2018)
- Botanical assessment of proposed new cultivation on Ptn 2 of farm Groenevalley 155, Piketberg (Cederberg Environmental Assessment Practise 2017)
- Botanical assessment of proposed new cultivation on farm Rosendal, Koue Bokkeveld (Cederberg Environmental Assessment Practise 2016)
- Botanical assessment of proposed cultivation on farm Kransvlei, Clanwilliam (Cederberg Environmental Assessment Practise 2016)
- Botanical assessment of proposed cultivation on farm Erfdeel, Bo-Swaarmoed, Ceres (Cederberg Environmental Assessment Practise 2016)
- Botanical constraints in a northern corridor across Ptns 2 and 3 of Farm Frankendale 152, Vissershok (Urban Dynamics 2014).

CONDITIONS RELATING TO THIS REPORT:

The methodology, findings, results, conclusions and recommendations in this report are based on the author's best scientific and professional knowledge, and on referenced material and available knowledge. Nick Helme Botanical Surveys and its staff reserve the right to modify aspects of the report, including the recommendations and conclusions, if and when additional relevant information becomes available.

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1. INTRODUCTION

This botanical assessment was requested to inform the environmental planning and authorisation process being followed for the potential development of new hardened water system (two reservoirs and associate piping) at Koeberg Nuclear Power Station, Cape Town, Western Cape. A single layout alternative was presented for assessment (see Figure 1).

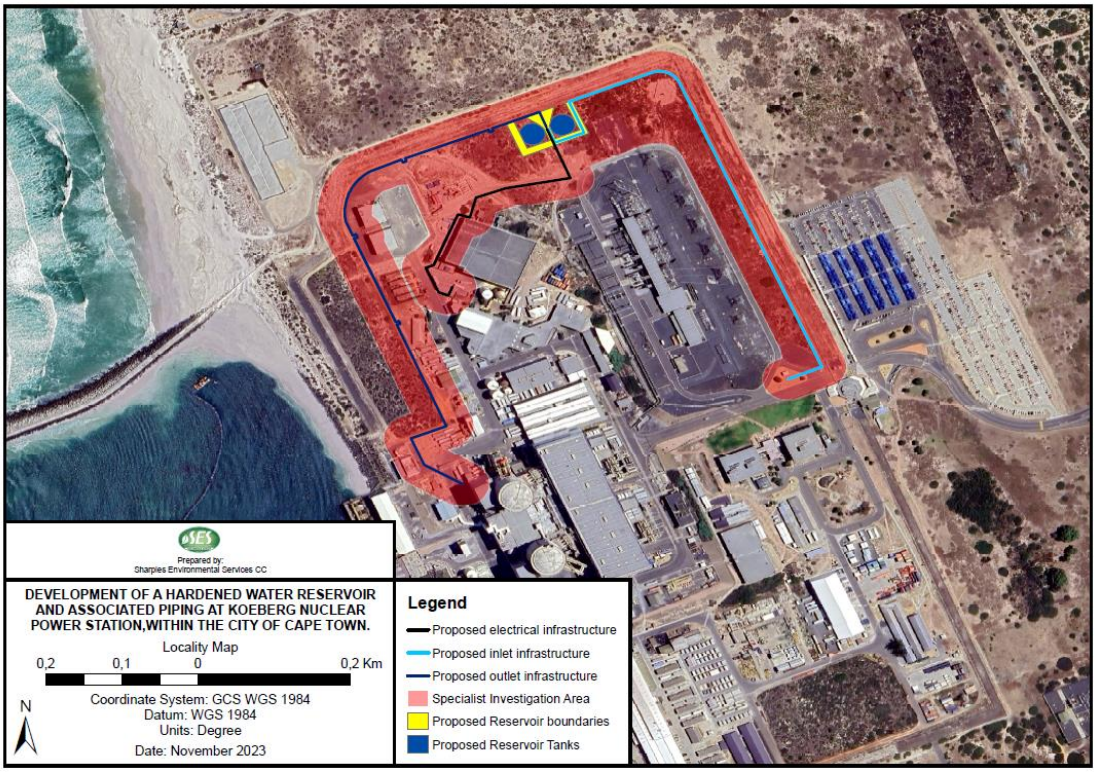

Figure 1: Map of the study area (provided), showing reservoir and pipeline positions.

2. TERMS OF REFERENCE

The terms of reference for this study were as follows:

- Undertake a site visit to assess the vegetation in the study area
- Identify and describe the vegetation in the study area and place it in a regional context, including its status in terms of the City of cape Town BioNet (CBA/ESA/ONA, etc)
- Identify and locate any (likely) plant Species of Conservation Concern in the study area, based on observation, literature and iNaturalist website review
- Provide an overview and map of the botanical conservation significance (sensitivity) of the site
- Identify and assess (according to standard IA methodology) the potential impacts of the project, using the current development layout provided

- Indicate the acceptability of the project proposal from an ecological perspective
- Identify and describe the potential cumulative impacts of the proposed development in relation to existing developments in the surrounding area
- Recommend mitigation measures to avoid and/or minimise impacts and/or optimise benefits associated with the proposed project, including layout change.

3. LIMITATIONS, ASSUMPTIONS AND METHODOLOGY

The site was visited on 14 November 2023. This was outside the optimal winter – spring flowering season in this winter rainfall area, but most of the annuals and geophytes present were still evident and identifiable, whilst all perennial plants were identifiable. There were thus some minor seasonal constraints on the accuracy of the botanical findings, but given the heavy dominance of perennials in this area – which in a Fynbos system can usually be used as indicators of habitat sensitivity - the confidence in the accuracy of the botanical findings is high. The author has undertaken extensive work within the region, which facilitates the making of local and regional comparisons and inferences of habitat quality and conservation value.

The study area was walked, and all plants on site were noted. No site photographs were allowed, but some were provided by Koeberg staff. Satellite imagery dated January 2023 (and earlier) was used to inform this assessment, and for mapping. It is assumed that development of any hard surfaces would result in the permanent loss of all natural or partly natural vegetation in that area.

The botanical sensitivity of a site is a product of plant species diversity, plant community composition, rarity of habitat, degree of habitat degradation, rarity of species, ecological viability and connectivity, restorability of habitat, vulnerability to impacts, and reversibility of threats.

The meaning of the No Go alternative in this case is assumed to mean no new development or additional habitat loss in the study area.

4. REGIONAL CONTEXT OF THE VEGETATION

The study area is part of the West Strandveld bioregion (Mucina & Rutherford 2006), and 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 West Strandveld bioregion is characterised by moderate winter rainfall, poor, sandy soils, low topographic diversity, and some 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 high (>40% of original extent lost within the region), and the bioregion has a fairly high number of threatened plant species (Raimondo *et al* 2009).

The study area has been excluded from the City of Cape Town Biodiversity Network, so no copy of this mapping is shown. The Eskom owned area surrounding the actual Koeberg power station has enormous conservation value, and incorporates large areas of largely pristine natural vegetation, most of which is mapped in the BioNet are "Core 1; Protected in Perpetuity".

5. THE VEGETATION AND ITS SENSITIVITY

According to the SA Vegetation Map the original natural vegetation in the study area is all **Cape Flats Dune Strandveld** (Mucina & Rutherford 2018). Based on my ground-truthing I agree with this, and no copy of the vegetation map is provided as it adds little value.

Cape Flats Dune Strandveld is now gazetted as **Endangered** on a national basis (Government of South Africa 2022), with less than 60% of its total original extent remaining intact, less than 5% conserved, and a national conservation target of 24% (Rouget *et al* 2004). The unit supports a moderate number of threatened and endemic plant species, and occurs on deep, nutrient poor, alkaline sands in the coastal area between Strand, Cape Point and Grotto Bay. The vegetation type does not need fire for optimal ecological functioning (Helme *et al* 2016).

Plate 1: View of edge of track on northeast side. The pipeline will run on the far side of the existing track (photo provided by Eskom). This area is of Low – Medium botanical sensitivity.

Plate 2: View of the Medium (to the left) and Low sensitivity (to the right) vegetation in the proposed tank area, looking south (photo provided by Eskom).

The site is flat, a result of earthmoving machinery activity during the construction of Koeberg Nuclear Power Station, as can be seen by the Google Earth time series analysis from 2003 onwards. All (or at least 90%) of vegetation on site today is thus probably secondary, and has re-established since Koeberg power station construction.

There is no woody alien invasive vegetation on site, but various alien herbs and annuals are likely, given the soil disturbance, including *Senecio burchellii* (indigenous, but invasive in disturbed areas), *Brassica tournefortii, Raphanus rapistrum* (wildemostert), *Lolium* sp. (ryegrass), *Avena* sp. (wild oats), *Bromus diandrus* (ripgut brome), *Lupinus* sp. (lupin), *Vicia* spp. (vetch), *Pennisetum clandestinum* (kikuyu), *Oenothera* sp. (evening primrose), (*Echium plantagineum* (Patterson's curse) and *Conyza bonariensis*.

Indigenous plant species diversity and abundance on site is fairly low, being about 30-40% of what would be expected in a pristine example of this habitat. This is a result of the previous and ongoing disturbance of the general area.

The primary indigenous species in the study area include *Carpobrotus edulis* (suurvy), *Metalasia muricata* (blombos), *Muraltia spinosa* (tortoise berry), *Morella cordifolia* (wasbessie)*, Osteospermum moniliferum* (bietou), *Tetragonia decumbens, Osteospermum incanum (*dune bietou*), Ruschia macowanii, Searsia laevigata* (dune taaibos)*, Chironia baccifera* (tortoise berry), *Trachyandra divaricata* (duinekool)*, Helichrysum niveum, Ficinia dunensis, Searsia glauca* (blue kunibush), *Hermannia pinnata, Searsia laevigata* (dune taaibos), *Gazania maritima, Didelta carnosa, Cotula turbinata* (gansogies), *Arctotheca calendula*

(Cape weed), *Otholobium bracteolatum, Leysera gnaphalodes, Pelargonium capitatum* (dune malva), and *Cynodon dactylon*.

The best quality vegetation lies in the area where part of the eastern tank will be located (Medium sensitivity; see Figure 2), whereas the western tank is in an area that has been previously disturbed (Low sensitivity; see Figure 2), with lots of dumped concrete and sand. Species found in the eastern tank area that were not seen elsewhere include *Phylica ericoides, Helichrysum cymosum, Senecio erosus* and *Thesium spicatum*.

No plant **Species of Conservation Concern** (SCC) are likely to occur on site, given the previous disturbance and the habitat concerned.

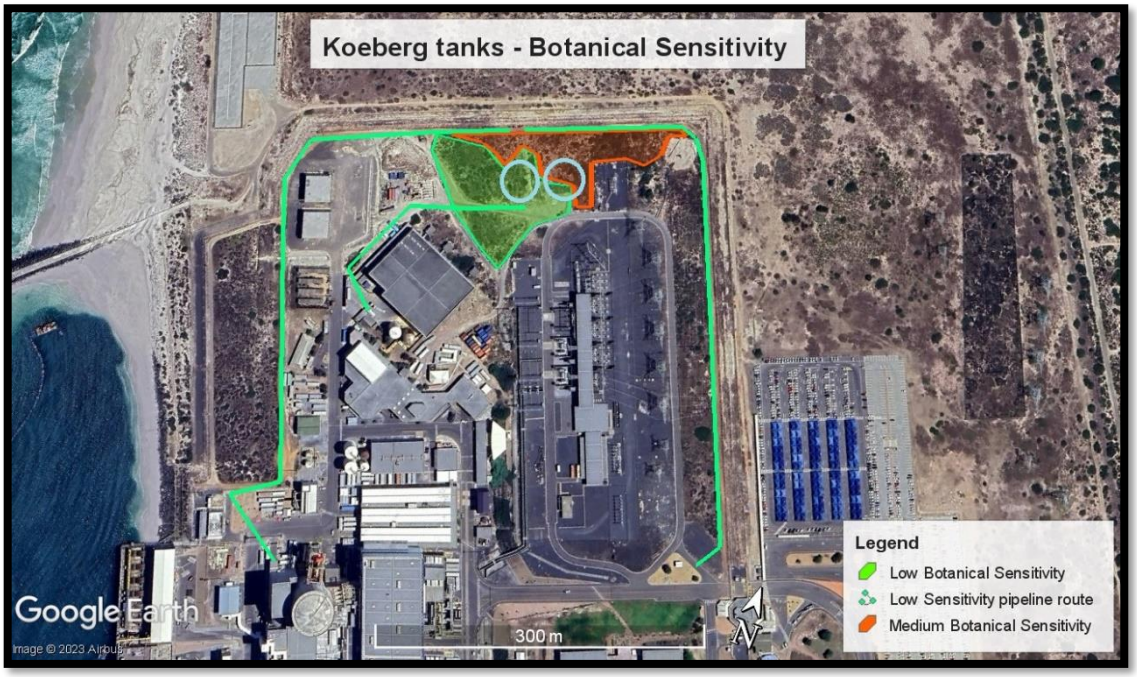

Figure 2: Botanical sensitivity map of the study area. The approximate position of the two proposed reservoirs is shown by the blue circles.

6. IMPACT ASSESSMENT

6.1 Construction Phase (Direct) Botanical Impacts

It can be assumed that the primary construction phase botanical impact of the new hard footprints and tanks would be permanent loss of all of the existing natural and partly natural vegetation in the development footprints (gazetted as an Endangered vegetation type).

The primary construction phase botanical impact of the new pipelines would be temporary to long term loss of all of the existing natural and partly natural vegetation in these footprints (gazetted as an Endangered vegetation type).

No plant Species of Conservation Concern were recorded within the likely hard footprints nor within the pipeline routes, and none are likely.

Vegetation that will be lost in the pipeline routes (<0.3ha) is nearly all of Low sensitivity. Vegetation loss in the eastern reservoir area will be about 70% in Medium sensitivity area, and the rest in Low sensitivity areas, whilst all the vegetation that will be lost in the western reservoir area is of Low sensitivity. Total vegetation loss will be less than 0.5ha.

Botanical significance of this vegetation loss is Low negative before and after mitigation.

The No Go alternative would clearly have a slightly lower direct (construction phase) botanical impact than the proposed development - presumably best rated as Neutral.

The extent of the impacts are deemed to be local and regional, but also national, in that the vegetation types are also assessed at a national level.

Development Alternative	Extent of impact	Duration of impact	Intensity	Probability of impact	Irreplaceable loss of biodiversity	Significance before mitigation	Significance after mitigation
Proposed Layout	Mainly local	Temporary to Permanent	Medium	Definite	Low	Low -ve	Low –ve
No Go	Local	Unknown and variable	Neutral to low negative	Not likely	Low	Neutral	Neutral

Table A: Summary table for construction phase botanical impacts associated with the proposed development. The primary construction phase impacts would be permanent and temporary loss of natural and partly natural vegetation (gazetted as an Endangered vegetation type), in the development footprint (<0.5ha)

6.2 Operational Phase Botanical Impacts

Operational phase impacts will take effect as soon as the natural vegetation on the site is lost or disturbed, and will persist in perpetuity, or as long as the area is not rehabilitated. Operational phase impacts include further loss of current rather low levels ecological connectivity across the site and associated habitat fragmentation.

Overall the operational phase botanical impacts of the pipeline are likely to be **Very Low negative** and **Low negative** for the reservoirs.

The No Go alternative would clearly have a slightly lower indirect (operational phase; Neutral) botanical impact than the proposed development.

Positive ecological impacts are not likely to be realised at this stage.

Development Alternative	Extent of impact	Duration of impact	Intensity	Probability of impact	Irreplaceable loss of biodiversity	Significance before mitigation	Significance after mitigation
Proposed Layout	Mainly local	Temporary to Permanent	Low	Definite	Very Low	Low -ve	Low –ve
No Go	Local	Unknown and variable	Neutral to low negative	Not likely	Low	Neutral	Neutral

Table B: Summary table for operational phase botanical impacts associated with the proposed development. The operational phase impacts would be minor loss of current ecological connectivity in the reservoir footprints and associated habitat fragmentation.

6.3 The No Go Alternative

The No Go alternative (continuation of the *status quo)* on this site would have clearly slightly lower construction and operational phase botanical impacts (Neutral) than the proposed development, and would thus technically probably be the preferred alternative from a botanical perspective.

6.4 Cumulative Impacts

The cumulative ecological impacts are in many ways equivalent to the regional ecological impacts, in that the vegetation type/s likely to be impacted by the proposed development have been, and will continue to be, impacted by numerous

developments and other factors (the cumulative impacts) within the region. The primary cumulative impacts in the region are loss of natural vegetation and threatened plant species to ongoing agriculture, urban development and alien plant invasion (Mucina & Rutherford 2012; Helme *et al* 2016).

The overall cumulative ecological impact of development of this site at the regional scale is likely to be Very Low negative.

6.5 Positive Impacts

No significant positive ecological impacts of the proposed development are likely during either the construction or the operational phase.

7. REQUIRED MITIGATION

The following mitigation for the proposed development is deemed feasible, reasonable and mandatory:

- The authorised hard surface (reservoir) footprints should be surveyed and pegged out on site prior to any site development.
- No areas of Medium sensitivity natural or partly natural vegetation (as per Figure 2) should be disturbed outside the pegged out and authorised development footprints.

8. CONCLUSIONS AND RECOMMENDATIONS

- Most of the vegetation in the study area has been heavily disturbed in the past, and is now secondary vegetation and is hence of Low botanical sensitivity, presenting no constraints to the proposed development. Loss of these areas would be of Very Low botanical significance at a regional scale.
- There is some Medium sensitivity vegetation in the vicinity of the eastern proposed tank. No plant Species of Conservation Concern occur here, and this area does not present a significant constraint to the proposed development. Loss of the vegetation in the proposed footprint in this area (<0.15ha) would be of Low negative botanical significance at a regional scale.
- The overall botanical significance of the proposed development would hence be of Low negative before and after mitigation.

- No special botanical mitigation would be necessary for the development, other than that outlined in Section 7. Provided that this is done the proposed development could be authorised without significant negative botanical impacts.

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