Botanical Assessment: Proposed Kleinvlei Dam, Farm Kleinvlei 209/1, Ceres, Witzenberg Municipality, Western Cape Province

Botanical Surveys & Tours

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Report prepared for EnviroAfrica CC

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National Legislation and Regulations governing this report

This is a 'specialist report' and is compiled in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended, and the Environmental Impact Assessment Regulations, 2014, as amended.

Appointment of Specialist

David J. McDonald of Bergwind Botanical Surveys & Tours CC was appointed by EnviroAfrica CC, to undertake a botanical assessment of the area proposed for the Kleinvlei Dam at Farm De Hoek, Koue Bokkeveld, Witsenberg Municipality, Western Cape Province.

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Expertise

Dr David J. McDonald:

- Qualifications: BSc. Hons. (Botany), MSc (Botany) and PhD (Botany)
- Botanical ecologist with over 40 years' experience in the field of Vegetation Science.
- Founded Bergwind Botanical Surveys & Tours CC in 2006
- Has conducted over 400 specialist botanical / ecological studies.
- Has published numerous scientific papers and attended numerous conferences both nationally and internationally (details available on request)

Curriculum Vitae – Appendix 3

Independence

The views expressed in the document are the objective, independent views of Dr McDonald and the study was carried out under the aegis of, Bergwind Botanical Surveys and Tours CC. Neither Dr McDonald nor Bergwind Botanical Surveys and Tours CC have any business, personal, commercial or other interest in the proposed development apart from fair remuneration for the work performed.

Conditions relating to this report

The content of this report is based on the author's best scientific and professional knowledge as well as available information. Bergwind Botanical Surveys & Tours CC, its staff and appointed associates, reserve the right to modify the report in any way deemed fit should new, relevant or previously unavailable or undisclosed information become known to the author from on-going research or further work in this field, or pertaining to this investigation.

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Declaration of independence:

I David Jury McDonald, as the appointed Specialist hereby declare/affirm the correctness of the information provided or to be provided as part of the application, and that I:

- in terms of the general requirement to be independent:
  - other than fair remuneration for work performed in terms of this application, have no business, financial, personal or other interest in the development proposal or application and that there are no circumstances that may compromise my objectivity; or
- in terms of the remainder of the general requirements for a specialist, have throughout this EIA process met all of the requirements;
- have disclosed to the applicant, the EAP, the Review EAP (if applicable), the Department and I&APs all material information that has or may have the potential to influence the decision of the Department or the objectivity of any report, plan or document prepared or to be prepared as part of the application; and
- am aware that a false declaration is an offence in terms of Regulation 48 of the EIA Regulations, 2014 (as amended).

Signature of the specialist:

Bergwind Botanical Surveys & Tours CC

Name of company:

Date: 29 March 2021

CONTENTS

1. Introduction

The current landowner of Portion 1 of Kleinvlei 209 known as Farm De Hoek, Ceres, in the Kouebokkeveld (Figure 1) proposes to build an instream dam that would impound the flow of water from winter rainfall. Bergwind Botanical Surveys & Tours CC was commissioned to conduct a botanical assessment to determine the site condition and sensitivity of the area proposed for the Kleinvlei Dam.

This report places the vegetation in a regional context from a conservation perspective and the investigation follows published guidelines for evaluating potential impacts on the natural vegetation as they pertain to the study area (Brownlie 2005; Cadman *et al.,* 2016). The requirements and recommendations of Cape Nature and the Botanical Society of South Africa for assessment of biodiversity of proposed development sites have been considered and the '*Best Practice Guidelines for the implementation of the Flora (3c) & Terrestrial Fauna (3d) Species Protocols as well as the Aquatic Biodiversity Protocol (3b) for environmental impact assessments in South Africa*' [Draft] (Enviro Insight, 2020) have also been taken into consideration.

2. Terms of Reference

- Provide a broad, baseline description of the vegetation of the study area, placing it in a regional context. Reference should also be made to any bioregional maps of the area.

- Describe the vegetation communities and associated conservation value/sensitivity of the study area and identify any areas of specific concern (e.g. high sensitivity and/or conservation status).

- Provide specific information relating to the vegetation in the study area, with reference to any species of special concern and their conservation status, which can be used as baseline information for the assessment of potential impacts of the proposed project.

- Identify, describe and assess the impacts of the proposed activities on the vegetation.

- Recommend appropriate mitigation measures that would reduce all major (significant) impacts or enhance potential benefits, if any.

3. Study Area

3.1 Location

The farm Kleinvlei 209/1 is located immediately adjacent to the R303 road, the main road through the Kouebokkeveld running in a north-south direction. Kleinvlei 209/1 lies approximately 5 km southeast of the small town, Op-die-Berg and 33 km northeast of Ceres. The area where the Kleinvlei Dam is proposed is situated in the southwest corner of the farm in the catchment of the Houdenbeksrivier (Figures 1 & 2).

The proposed dam with alternative locations for the wall, given as Dam 1, Dam 2 and Dam 3 is shown in Figure 3.

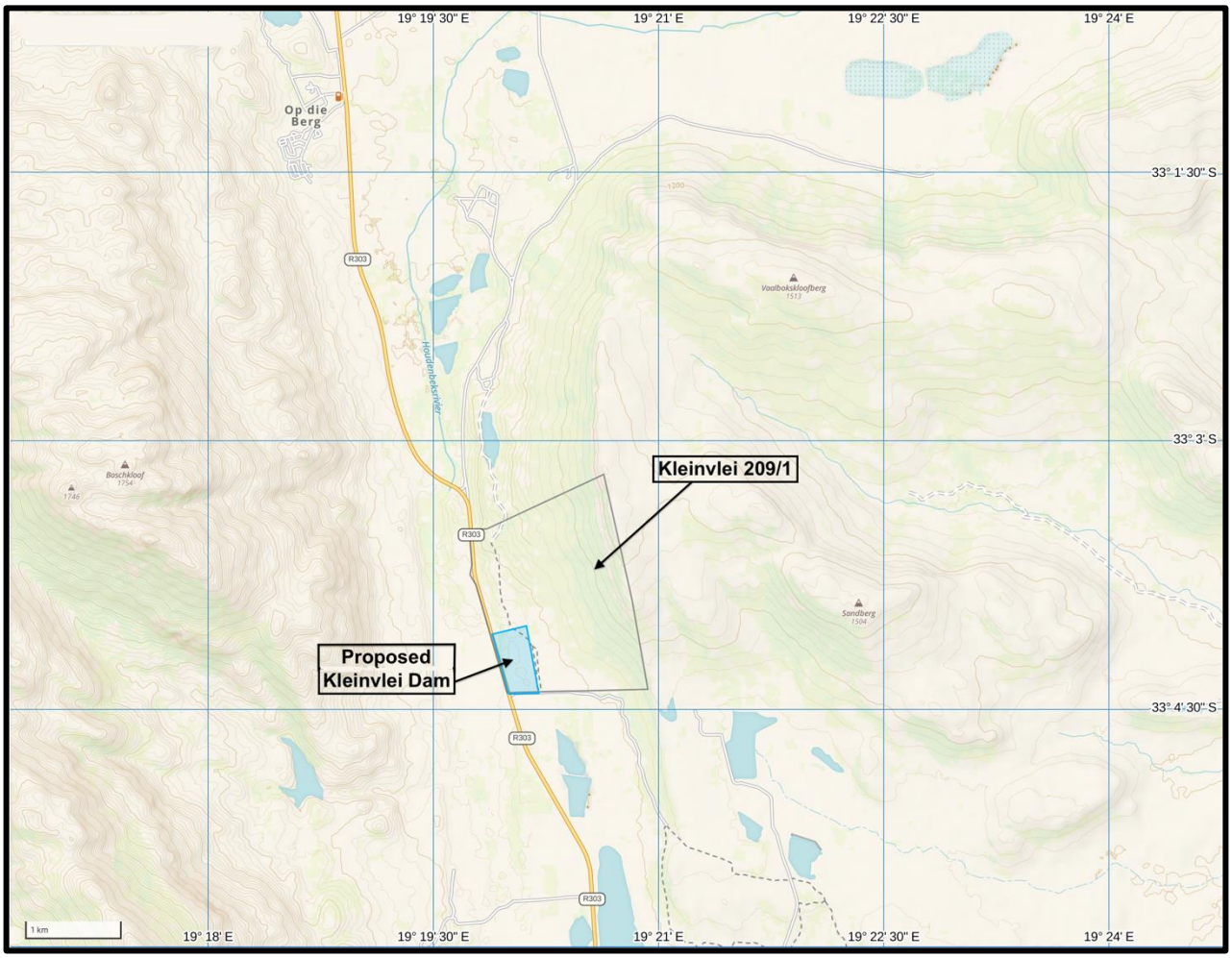


Figure 1. The location and topography of the proposed Kleinvlei Dam site, approximately 5 km from Op-die-Berg.

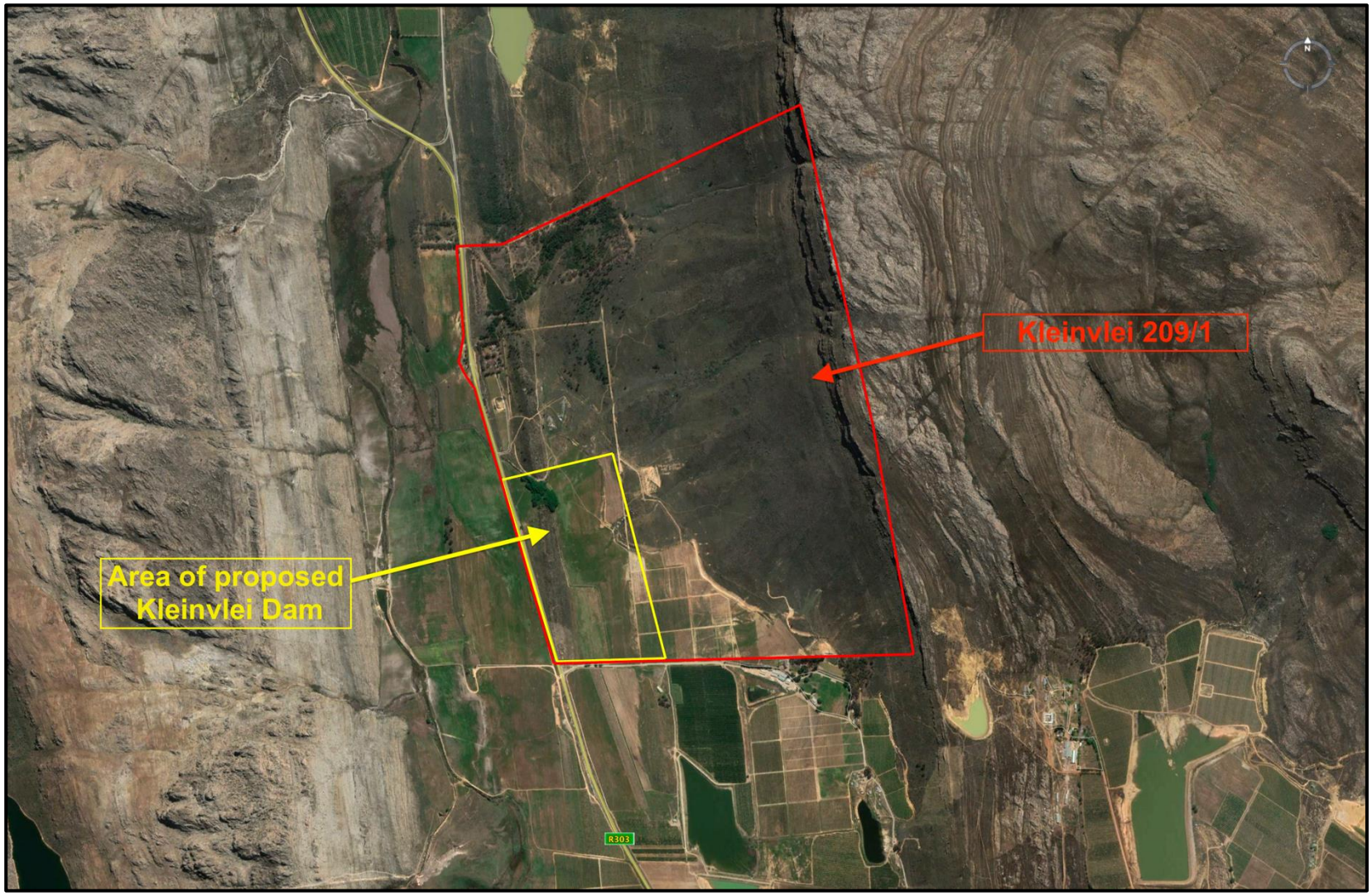


Figure 2. Satellite image from Google Earth ™annotated to show the area in which the proposed Kleinvlei Dam would be built, in the southwestern corner of Kleinvlei 209/1.

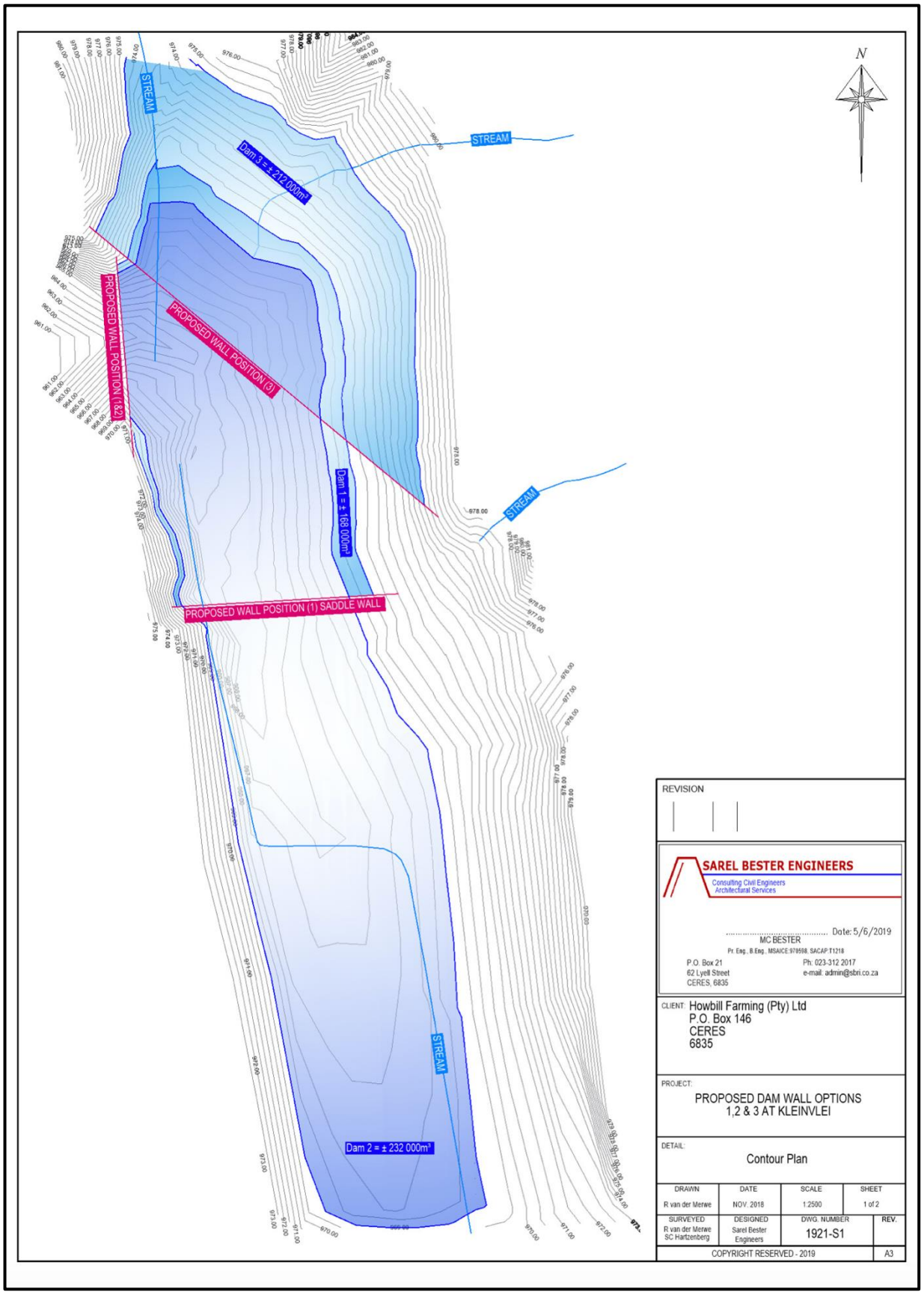


Figure 3. Engineers' drawing of the alternatives for the proposed Kleinvlei Dam.

3.2 Geology, Topography and Soils

The farm Kleinvlei 209/1 is located mainly on sediments of the Biedouw Subgroup Group and Ceres Subgroup of the Bokkeveld Group, with a small area in the northwest, impinging on the Nardouw Subgroup of the Table Mountain Group. The proposed Kleinvlei Dam is located almost entirely on Ceres Subgroup sediments consisting of three sandstone and three shale units and from observations in the field it appears that shale sediments dominate in the area of the basin of the dam. The walls would impact sandstone rock.

Figure 4. Geological map from 1: 1 000 000 shapefiles from Geological Survey, superimposed on a Google Earth ™ image. The Kleinvlei Dam would be located on shales of the Ceres Subgroup and marginally on sandstone of the Nardouw Subgroup.

The soils derived from the parent material at the proposed dam site display a plinthic catena and fall within the BA land type (Figure 5). They are predominantly shale-derived with fine texture in comparison with soils derived from sandstone that has a coarse texture.

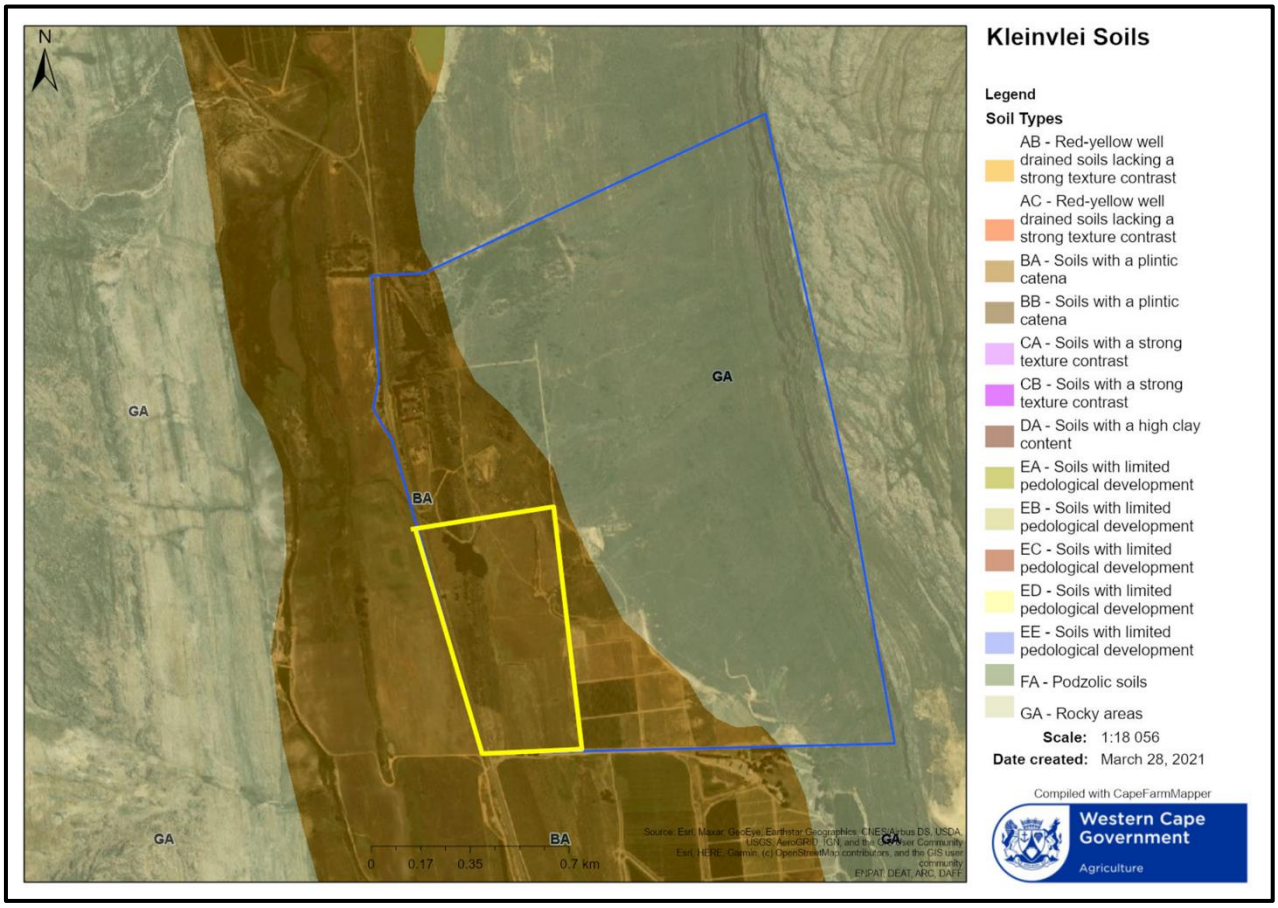


Figure 5. Soil map of the site proposed for Kleinvlei Dam from Cape Farm Mapper ™. The soils have a plinthic catena.

3.3 Climate

Mean daily maximum and minimum temperatures 27.1°C and 3.1°C for February and July, respectively. Frost incidence 10–30 days per year. See also climate diagram for FFh 1 Kouebokkeveld Shale Fynbos (Figure 4.68).

Mean Annual Precipitation (MAP) for Kouebokkeveld Shale Fynbos is 567 mm (Figure 6) (Rebelo *et al.* 2006 in Mucina & Rutherford, 2006) and it is outstripped almost four-fold by Mean Annual Evaporation. This means that the environment is relatively dry. Most of the rain falls in the winter with May to August being the wettest months. Since rain falls mainly in the winter and the summers are relatively dry, the climate is classified as a Mediterranean-type climate. South-east winds prevail in summer and have a drying effect; most precipitation occurs when the northwesterly winds blow in winter.

The mean daily maximum temperature is highest in February (27.1 ºC) and lowest in July (3.1 ºC). Frost occurs from 10—30 days per year and the low winters temperatures give the area the eponymous name of ***Koue***bokkeveld (Cold Bokkeveld).

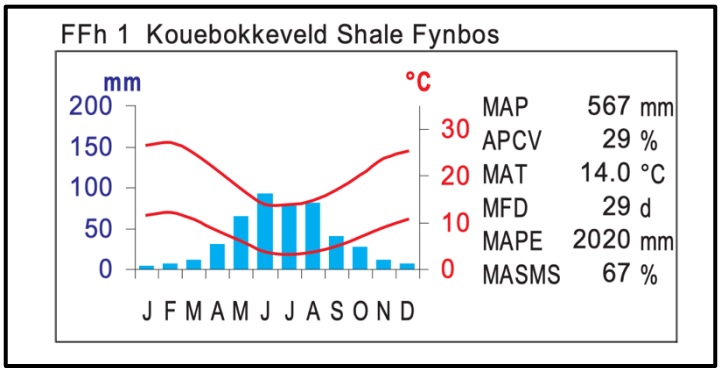


Figure 6. Climate diagram for Kouebokkeveld Shale Fynbos (from Rebelo *et al.* 2006 in Rutherford & Mucina, 2006) showing MAP – Mean Annual Precipitation; ACPV = Annual Precipitation Coefficient of Variance; MAT = Mean Annual Temperature; MFD = Mean Frost Days; MAPE = Mean Annual Potential Evaporation; MASMA = Mean Annual Soil Moisture Stress.

4. Evaluation Method

The study area was visited on 3 March 2020 (late summer) on a clear day with moderate temperature.

The survey route and waypoints were recorded on GAIA GPS on an Apple iPhone XR as well as on a Garmin GPSmap 66s handheld device. During the survey, notes together with a photographic record (with photos geo-tagged) were compiled on the proposed dam site and surrounds. A total of six sample waypoints were recorded (see Figure 7). The site visit took approximately 4 hours.

The locations of the alternative dam walls were investigated and are discussed below as linked to the respective waypoints. The diagrams provided by the dam engineers were overlayed on Google Earth ™ satellite imagery (Figure 7) and were used to guide the survey.

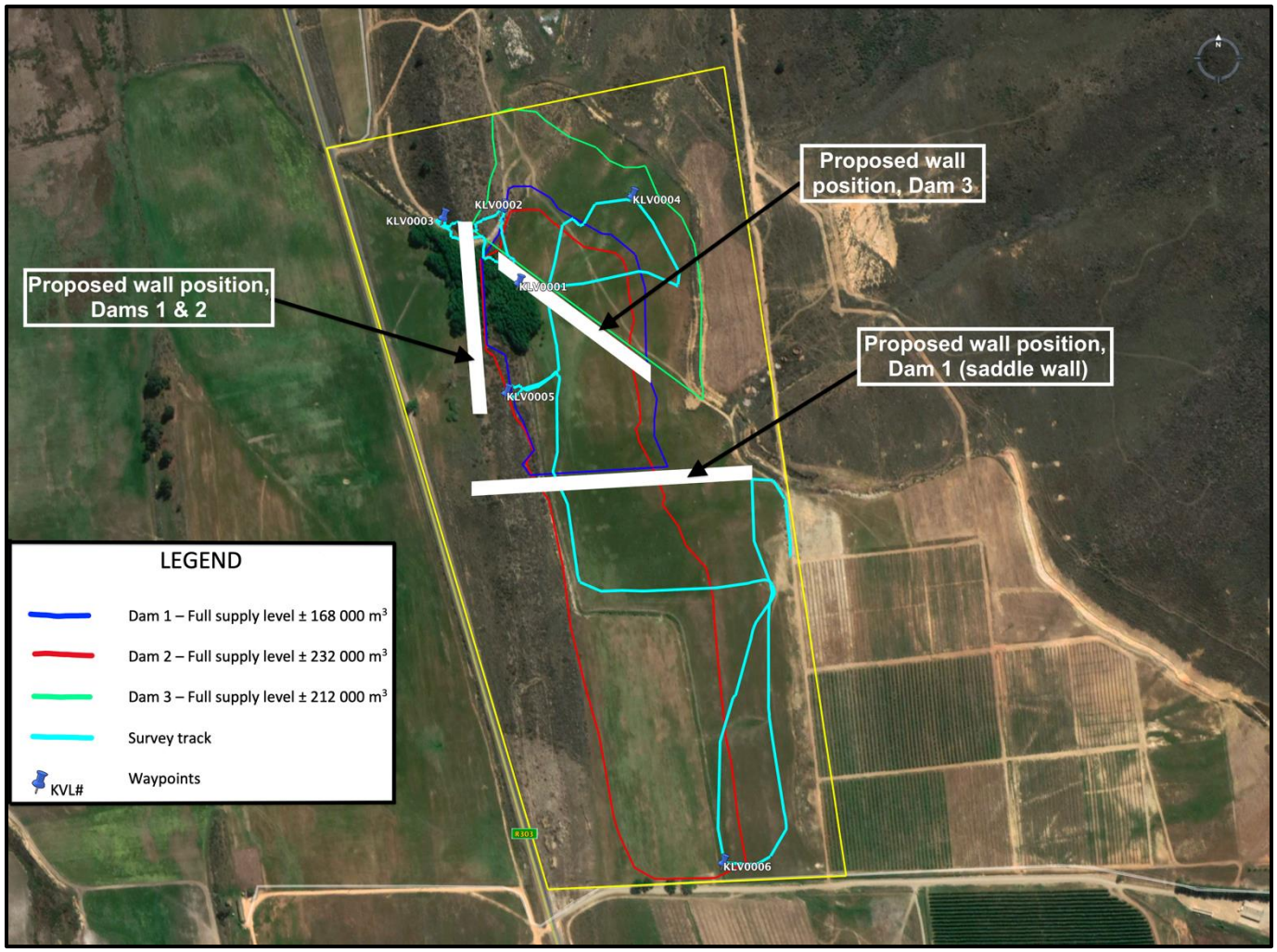


Figure 7. The proposed dam alternatives superimposed on a Google Earth ™ image together with the survey track and waypoints.

5. Limitations and Assumptions

Season was low-level limitation since most of the area investigated has been transformed or except for where the dam walls would be located. The remaining vegetation at these locations was very dry and not in an ideal state for plant species identification. However, given this limitation, a list of species was made at or near each of the dam wall locations and a moderate to high level of confidence is placed on the data collected.

6. Disturbance regime

The entire area of the basin of the proposed dam (whichever alternative is selected) has been transformed by agriculture. The original vegetation was removed, and the area was used for cultivation of pumpkins and other cash crops. It was then more recently converted to a crop of oats for grazing. pasture for sheep. At the time of the survey, the vegetation in the low-lying valley basin was pasture where sheep were grazing.

The locations of the proposed dam walls also fall partly in the transformed area and partly in areas where remnants of fynbos vegetation persist. The latter locations are specifically at sample waypoints KVL0002, KVL0003 and KVL0005. At waypoint KVL0004 is a vigorous stand of exotic poplar trees (*Populus* x *canescens*) the covers ± 1.2 ha. No indigenous vegetation is found under these trees.

7. The Vegetation

7.1 General description

The vegetation of the Fynbos Biome was described by Rebelo *et al.* (2006) and included in the Vegetation of South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2006). The vegetation, including that of the Fynbos Biome, was mapped by Mucina, Rutherford and Powrie (2005) (VEGMAP) and subsequently by SANBI (2012, 2018). According to this classification and mapping, the proposed Kleinvlei Dam (all alternatives) is located in an area that was originally Kouebokkeveld Shale Fynbos (Figure 8).

Kouebokkeveld Shale Fynbos is a moderately tall and dense proteoid shrubland on shale slopes, with asteraceous shrubs prominent. Waboomveld i.e., where *Protea nitida* is common

occurs on colluvial soils. Restiolands occur in bottomlands and this is what would have been present in the 'dam basin' before it was cleared.

A few isolated patches of shrubby Winterhoek Sandstone Fynbos dominated by *Cliffortia ruscifolia*, occur in the area, specifically at the location of the dam wall for Alternatives 1 & 3 and at the western side of the saddle wall for Dam 1. These patches of fynbos vegetation on sandstone are very old and not sensitive; they have not been burnt for a very long time and are somewhat moribund. The patches of sandstone fynbos are also too small to include in the VEGMAP (Figure 8).

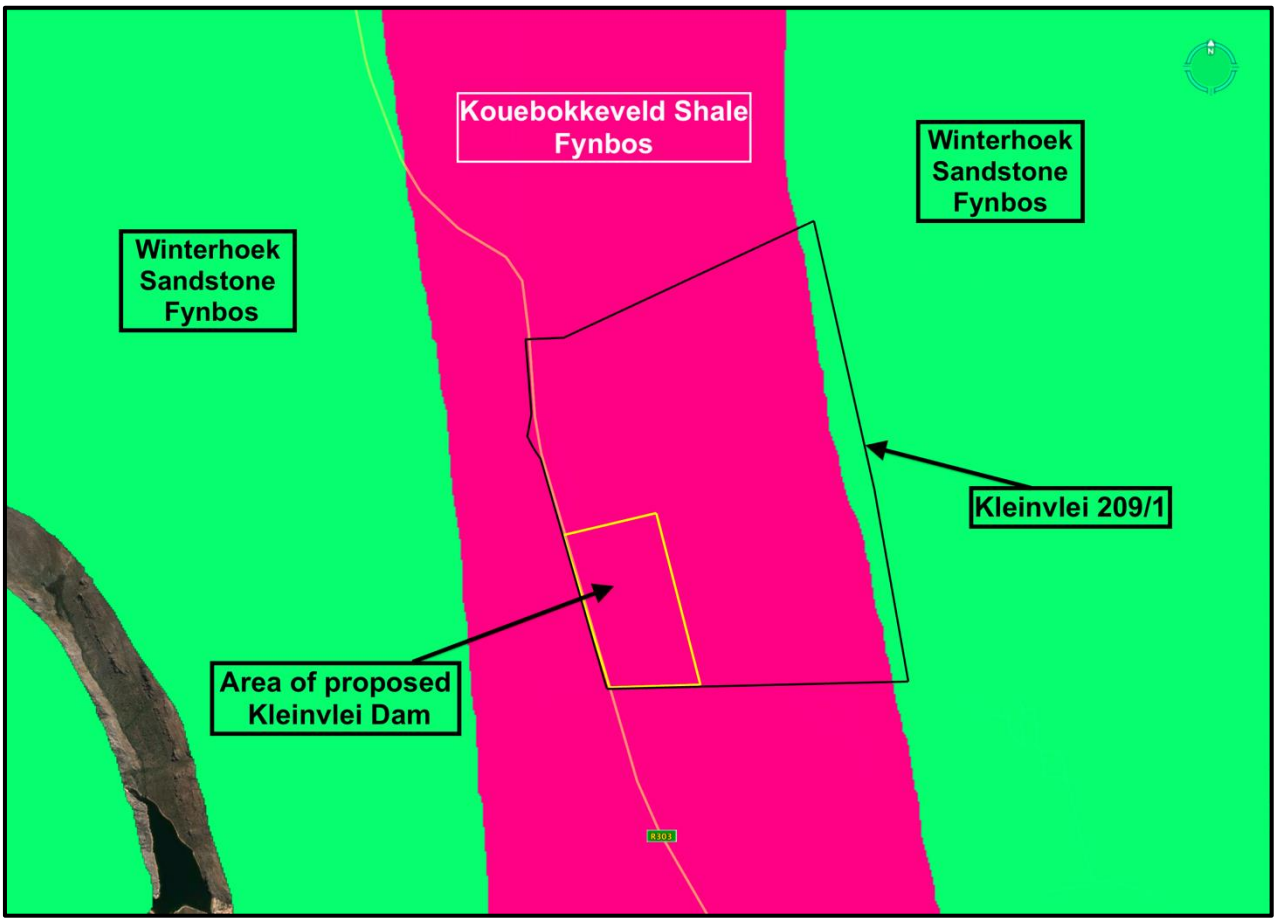


Figure 8. Portion of the *Vegetation Map of South Africa, Lesotho, and Swaziland* (Mucina, Rutherford & Powrie 2005; SANBI, 2018) with the proposed Kleinvlei Dam area (yellow boundary) located in Kouebokkeveld Shale Fynbos.

7.2 Vegetation at the proposed Kleinvlei Dam site

The following description is of the vegetation recorded at the six sample waypoints in the survey of the proposed Kleinvlei Dam site (Figure 7).

KVL0001: S 32° 04’ 01.95” E 19° 19’ 59.27”

Waypoint KVL0001 was recorded at the dense stand of poplar trees where the vehicle was parked, at the start of the survey. No indigenous vegetation was found at this location, neither under the trees (Figure 9), nor outside in the area used for grazing (Figure 10).

Figure 9. An old, mature stand of Populus x canescens is found where the dam wall for the Dam 1 and Dam 2 alternatives would be built.

Figure 10. The ‘dam basin’ would be on a low, open plain with no natural vegetation remaining.

KVL0002: S 32° 03' 59.1" E 19° 19' 58.6"

This waypoint was at an excavated channel that would be the main water feed into the dam (Figures 11 & 12). The channel was somewhat overgrown with grasses and shrubs. *Stoebe plumosa* (slangbos) and *Elytropappus gnaphaloides* had vigorously colonized disturbed ground in this vicinity. The location was characterized by a low species richness and the species including those above are indicative of disturbance. The other species recorded include, *Anthospermum aethiopicum*, *Athanasia trifurcata*, *Berkheya rigida*, *Cliffortia ruscifolia*, *Cymbopogon marginatus*, *Psoralea* sp. and *Tenaxia stricta.*

Figure 11. A wide channel, now overgrown, was made to convey water to an agricultural furrow. View looking northeast.

Figure 12. The channel ends near the poplar stand at the position where the dam wall for Dam 1 and Dam 2 would be built.

KVL0003: S 32° 03’ 59.5” E 19° 19’ 55.9”

This waypoint was recorded on a sandstone ridge where the dam wall (preferred option: Alternatives 1 & 2) would be constructed. A panorama of photos of the low-lying area that would be the dam basin were taken from waypoint KLV0003 looking east and southeast. The five images were stitched together to illustrate the sandstone ridge in the foreground, the stand of poplars on the right and the basin (cultivated with oats) underlain by shale in the centre (Figure 13).

Figure 13. A panoramic view looking southeast from waypoint KVL0003, over the bottomland plain that would be inundated by Dam 1 and Dam 2 and partially by Dam 3.

A track has been cleared between the poplar stand and the rocky sandstone ridge (Figures 14 & 15). This has resulted in a fair amount of disturbance that has encouraged the growth of *Stoebe plumosa* and *Athanasia trifurcata*, amongst other early colonizing species.

Figure 14. A track has been excavated on the sandstone ridge next to the poplar stand.

Figure 15. The excavated track, looking northwest, on the side of the sandstone ridge.

The area around waypoint KLV0003 is grassy with *Tenaxia stricta* dominant and with an open to mid-dense shrub stratum dominated by *Cliffortia ruscifolia* (Figures 16—18). Other plant species recorded on the sandstone outcrop include, *Achyranthemum* sp., *Athanasia trifurcata*, *Chrysocoma ciliata*, *Corymbium glabrum*, *Diospyros glabra*, *Ehrharta* sp., *Elytropappus gnaphaloides*, *Elytropappus rhinocerotis*, *Manulea* sp. – orange flowers, *Pentaschistis* sp., *Protea repens*, *Searsia angustifolia*, *Syncarpha* sp. The vegetation on the rocky sandstone ridge is an isolated patch of Winterhoek Sandstone Fynbos but it is too small to map as a separate unit in the VEGMAP (Figure 8).

Mole-rat activity was also noted in this area.

Figure 16. The vegetation on the sandstone ridge where the Dam1 and Dam 2 wall would be built is grassy with mid-high shrubs of *Cliffortia ruscifolia*.

Figure 17. The broken terrain of the sandstone ridge north of the poplar stand.

Figure 18. *Protea repens* was found on the sandstone ridge amongst very old, dense *Stoebe plumosa* (slangbos).

KVL0004: S 32° 03’ 58.68” E 19° 20’ 04.37”

This waypoint was located in the area of the Dam 3 option. The terrain is an old land that is now dominated by exotic grasses (all dry at the time of the survey) and scattered patches of *Stoebe plumosa* (Figures 19 & 20) This area has very low sensitivity and additional plant species recorded were *Bromus* sp., *Avena fatua* and *Elytropappus rhinocerotis*.

Figure 19. The area that would be inundated by Dam 3. It consists mainly of exotic annual grasses and scattered plants of *Stoebe plumosa*.

Figure 20. The basin of Dam 3 looking westwards. The dark coloured vegetation is Winterhoek Sandstone Fynbos on a sandstone ridge.

KVL0005: S 32° 04’ 06.09” E 19° 19’ 58.71”

The intention was to sample the vegetation at the position of the east extremity of the proposed Dam 1 saddle wall. The location of waypoint KVL0005 was off the exact location of the proposed saddle wall but the vegetation is the same along the ridge of sandstone. An excavated channel runs along the toe of the sandstone ridge.

Again, the vegetation is an isolated patch of Winterhoek Sandstone Fynbos that is dominated by dense *Cliffortia ruscifolia*. This fynbos has also not been burnt for a long time.

Apart from *C. ruscifolia*, additional plant species recorded on the ridge include, *Athanasia trifurcata*, *Berkheya rigida, Chrysocoma ciliata*, *Conyza bonariensis*, *Diospyros glabra*, *Ehrharta* sp., *Pelargonium englerianum*, *Protea laurifolia* (one plant), *Syncarpha* sp. and *Tenaxia stricta.* Apart from Tenaxia stricta, other grass species were present but dry and not identified.

Along the channel that functions as an agricultural drain, *Gomphocarpus fruticosus* and *Pennisetum macrourum* (riverbed grass) were dominant.

Figure 21. A dense, old, moribund stand of Cliffortia ruscifolia-dominated fynbos occurs on the sandstone ridge around waypoint KVL0005.

Figure 22. The drainage channel at the toe of the sandstone ridge. The dominant plant species are *Gomphocarpus fruticosus* (black arrow) and *Pennisetum macrourum* (red arrow)

KVL0006: S 32° 04' 23.75" E 19° 20' 08.43"

This waypoint was recorded at the south end of the extent of the proposed Dam 2 (at full supply level). The 'upstream' channel that would feed into the dam goes through a culvert under the farm access road near this point (Figure 23). The entire area is transformed, having been previously cultivated (Figure 24). The only plants of note were *Juncus scirpoides* and *Pennisetum macrourum*, both indicating wetness along the agricultural furrow (Figure 25). Exotic Kikuyu grass (*Pennisetum clandestinum*) also occurs in the furrow.

Figure 23. The culvert under the access road to the farm. Note the *Pennisetum macrourum* grass, typically found in wet situations.

Figure 24. The bottomland where the inundation of Dam 2 would occur. It is completely transformed habitat.

Figure 25. *Juncus scirpoides, Pennisetum macrourum* and exotic Pennisetum clandestinum (Kikuyu grass) dominate in the agricultural furrow.

8. Conservation Status

8.1 Western Cape Biodiversity Spatial Plan (2017)

Winterhoek Sandstone Fynbos is classified as Least Threatened, whereas Kouebokkeveld Shale Fynbos is classified as Vulnerable D1 in the National List of Threatened Ecosystems (Government Gazette, 2011; see also Pence, 2014). The D1 criterion in this instance denotes threatened plant species associations and where there are greater than or equal to 40 species of conservation concern (Red List species). The Western Cape Biodiversity Spatial Plan [WCBSP] (CapeNature, 2017; Pence, 2017; Pool-Stanvliet, 2017) overlaid as a layer on a Google Earth ™ aerial image shows that the proposed Kleinvlei Dam would be constructed in an area with low sensitivity.

The map in Figure 26 shows that the proposed wall for the Dam 1 and Dam 2 alternatives is located in an ESA2 area. However, this is not so because the mapping has assigned ESA2 to the stand of poplar trees and it most certainly is not an ESA2 area.

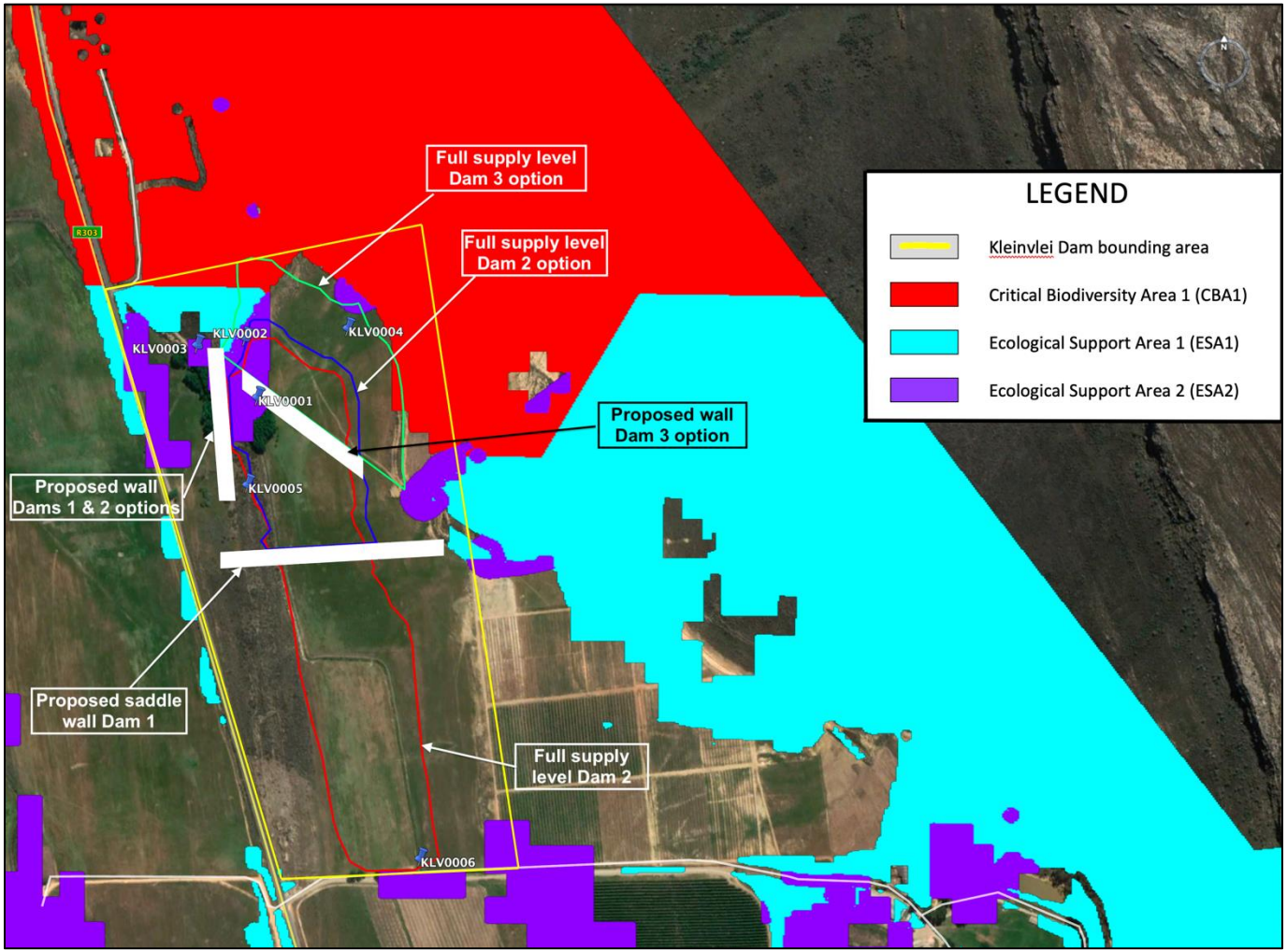
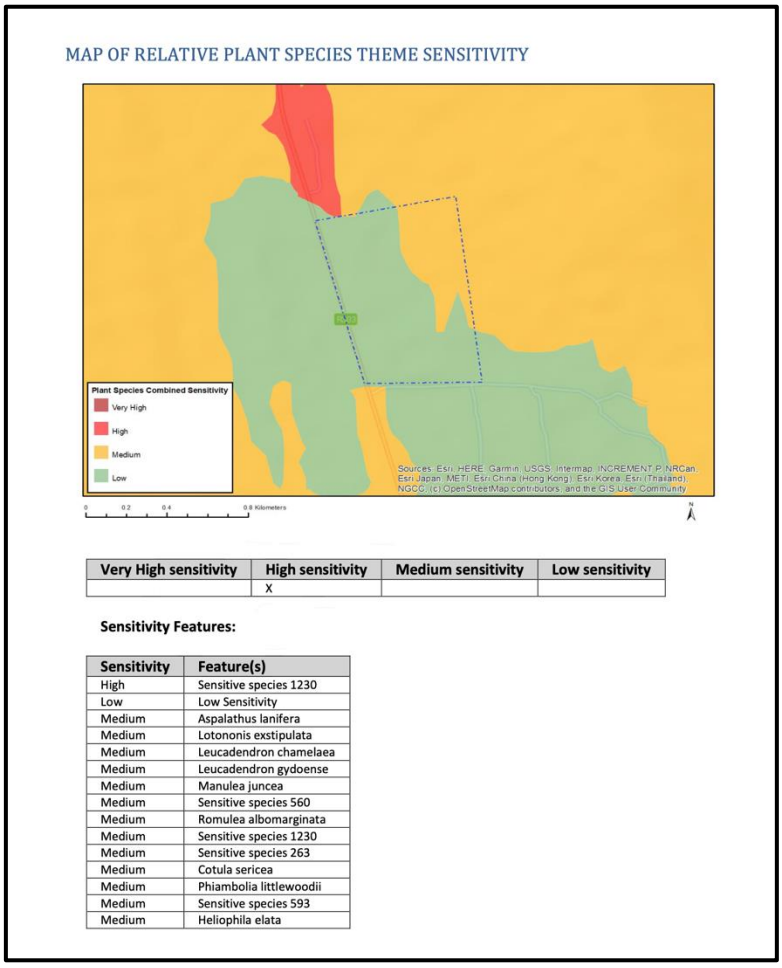


Figure 26. Google Earth ™ aerial image with Western Cape Biodiversity Spatial Plan map superimposed for the proposed Kleinvlei Dam, showing that it mostly falls outside any critical biodiversity areas or ecological support areas except two of the dam wall options that apparently affect an ESA2 area. However, this is misleading since the ESA2 area is located on the stand of exotic poplar trees.

8.2 National Web-based Environmental Screening Tool

The National Web-based Environmental Screening Tool was applied to the proposed Kleinvlei Dam area and for the Relative Plant Species Theme Sensitivity, it shows that the site is mostly **Low Sensitivity** with some mapped as **Medium Sensitivity**. The ground-truthing undertaken clearly indicates that the site has **Low** to **Very Low Sensitivity** with respect to flora and vegetation (Figure 27). Note that the small table in Figure 27 indicates **High Sensitivity**. This is obviously erroneous.

The map for Relative Terrestrial Biodiversity Theme Sensitivity indicates that the entire area of the dam and its surrounds has **Very High Sensitivity**. With respect to the footprint of any of the dam alternatives, not one would be located in an area of **Very High Sensitivity** for Terrestrial Biodiversity (Figure 28). The rationale for this classification in the National Web-based Environmental Screening Tool is not known but it is not supported at all by observations on the site. At best the site has **Low Sensitivity** for terrestrial biodiversity.



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
	X		

Sensitivity Features:

Sensitivity	Feature(s)
High	Sensitive species 1230
Low	Low Sensitivity
Medium	Aspalathus lanifera
Medium	Lotononis exstipulata
Medium	Leucadendron chamelaea
Medium	Leucadendron gydoense
Medium	Manulea juncea
Medium	Sensitive species 560
Medium	Romulea albomarginata
Medium	Sensitive species 1230
Medium	Sensitive species 263
Medium	Cotula sericea
Medium	Phiambolia littlewoodii
Medium	Sensitive species 593
Medium	Heliophila elata

Figure 27. The output for the Relative Plant Species Theme Sensitivity for the Kleinvlei Dam site.

MAP OF RELATIVE TERRESTRIAL BIODIVERSITY THEME SENSITIVITY

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Very High	Ecological Support Area 2
Very High	Ecological Support Area 1
Very High	Critical Biodiversity Area 1
Very High	Vulnerable ecosystem

Figure 28. The output for the Relative Terrestrial Biodiversity Theme Sensitivity for the Kleinvlei Dam site.

9. Impact Assessment

The impacts considered are the 'No Go' Scenario and three alternative sites for the dams, named Dam 1, Dam2 and Dam 3. Dam 1 and Dam 3. Dam 2 is the preferred alternative; it is the dam with the highest volume and would cover the largest footprint.

9.1 The 'No Go' scenario

In the case of the 'No Go' scenario, the proposed dam would not be constructed. The medium- to long-term outcome would be that there would be little change to the local environment since the area would continue to be used for grazing sheep. The result would be **Very Low Negative** (Table 1).

9.2 Direct Impacts

Direct impacts are those impacts that would be caused specifically by the construction of a dam and inundation due to the filling of the dam. As far as this study is concerned, the direct impact would be the effect on areas that have historically been cleared, ploughed and grazed by sheep. There would be a limited amount of negative impact on Winterhoek Sandstone Fynbos from the construction of the wall that would be required for Dam 1 and Dam 2. Dam 1 would have the extra 'saddle wall' and that would result in a small loss of Winterhoek Sandstone Fynbos in the vicinity of waypoint KV0005. Its direct impact is thus rated as **Low Negative** prior to mitigation and **Very Low Negative** after mitigation. There would also be a **Low Negative** impact of the Dam 3 wall on Winterhoek Sandstone Fynbos.

The construction and operation of the dam, whichever alternative is pursued, will have no effect on vulnerable Kouebokkeveld Shale Fynbos since this vegetation type is no longer present on the dam footprint of all alternatives. It will also have minimal effect (negative or positive) on any riparian vegetation even though there are some patches of wetness that have resulted from the excavation of agricultural drains. The wall of the dam as well as the inundation caused by filling total would have a **Low Negative** impact on indigenous vegetation (Table 1).

Table 1. Impact and Significance – Loss of Kouebokkeveld Shale Fynbos and Winterhoek Sandstone Fynbos

CRITERIA	'NO GO' ALTERNATIVE	Construction and operation of Dam 1		Construction and operation of Dam 2 (Preferred alternative)		Construction and operation of Dam 3	
Nature of direct impact (local scale)	**Loss of fynbos vegetation and / or riparian vegetation**						
		WITHOUT MITIGATION	WITH MITIGATION	WITHOUT MITIGATION	WITH MITIGATION	WITHOUT MITIGATION	WITH MITIGATION
Extent	Local	Local	Local	Local	Local	Local	Local
Duration	Long-term	Long-term	Long-term	Long-term	Long-term	Long-term	Long-term
Intensity	Low	Medium	Low	Low	Very Low	Low	Very Low
Probability of occurrence	High	High	High	High	High	High	High
Confidence	High	High	High	High	High	High	High
Significance	Low Negative	Medium Negative	Low Negative	Low negative	Very Low Negative	Low Negative	Very Low Negative
Nature of Cumulative impact	**Loss of fynbos vegetation and / or riparian vegetation**						
Cumulative impact prior to mitigation	Very Low Negative						
Degree to which impact can be reversed	Very Low						
Degree to which impact may cause irreplaceable loss of resources	Low to Very low						
Degree to which impact can be mitigated	Low						
Proposed mitigation	The requirement for mitigation would not be great but it is recommended that once the dam wall of any of the alternatives is complete, the wall should be vegetated with local fynbos plants to stabilize it. No exotic species should be used for this purpose. In addition, the building of the dam would present the opportunity to completely remove the >1 ha stand of poplar trees, to ensure that this species is no longer present downstream of the dam spillway, since it is undesirable and water-hungry!						

Cumulative impact post mitigation	Very Low Negative
Significance of cumulative impact (broad scale) after mitigation	Very Low Negative

9.3 Indirect Impacts

No obvious indirect impacts were noted with respect to indigenous vegetation.

9.4 Mitigation

- The dam wall should be vegetated with local fynbos plants and not exotic species or plant species not locally found. The best method would be to brush-cut local fynbos and lay the cut material on the soil surface of the wall of the dam. This would allow seeds in the cut material the opportunity to grow and they would be protected by the cut branches.
- A second mitigation would be to ensure that the exotic poplar trees are properly and completely removed so that they do not resprout from roots left in the soil.

9.5 Cumulative Impacts

As far as cumulative impacts on terrestrial ecosystems are concerned there would be negligible negative effect.

10. Conclusions and Recommendations

The construction of the Kleinvlei Dam would not result in the loss of much natural terrestrial vegetation. The basin of the dam of all alternatives would be on areas that have been historically disturbed and where there is no longer any Kouebokkeveld Shale Fynbos. The dam walls of all three alternatives would have a limited (small) effect on isolated patches of old Winterhoek Sandstone Fynbos that has low sensitivity. The impact would consequently be **Very Low Negative** after mitigation.

From a terrestrial botanical viewpoint, the construction of any of the dam alternatives would be within acceptable ‘Low Negative’ limits and all alternatives are supported. However, since it would be optimal from a water storage point of view that the Dam 2 (preferred alternative) would be built, there is no reason to indicate it would not be desirable. It is therefore supported without reservation.

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Report submitted: 29 March 2021

Appendix 1: Impact Assessment Methodology

Method of Assessing Impact Significance

The identification and assessment of environmental impacts is a multi-faceted process, using a combination of quantitative and qualitative descriptions and evaluations. It involves applying scientific measurements and professional judgement to determine the significance of environmental impacts associated with the proposed project. The process involves consideration of, *inter alia*: the purpose and need for the project; views and concerns of interested and affected parties (I&APs); social and political norms, and general public interest.

Identification and Description of Impacts

Identified impacts are described in terms of the nature of the impact, compliance with legislation and accepted standards, receptor sensitivity and the significance of the predicted environmental change (before and after mitigation). Mitigation measures may be existing measures or additional measures that were identified through the impact assessment and associated specialist input. The impact rating system considers the confidence level that can be placed on the successful implementation of mitigation.

Evaluation of Impacts and Mitigation Measures

Introduction

Impacts are assessed using SLR's standard convention for assessing the significance of impacts, a summary of which is provided below.
In assigning significance ratings to potential impacts before and after mitigation the approach presented below is to be followed.

1. **Determine the impact consequence rating:** This is a function of the "intensity", "duration" and "extent" of the impact (see Section 0). The consequence ratings for combinations of these three criteria are given in Section 0.

2. **Determine impact significance rating:** The significance of an impact is a function of the consequence of the impact occurring and the probability of occurrence (see Section 0). Significance is determined using the table in Section 0.

3. **Modify significance rating (if necessary):** Significance ratings are based on largely professional judgement and transparent defined criteria. In some instances, therefore, whilst the significance rating of potential impacts might be "low", the importance of these impacts to local communities or individuals might be extremely high. The importance/value which interested and affected parties attach to impacts will be highlighted, and recommendations should be made as to ways of avoiding or minimising these perceived negative impacts through project design, selection of appropriate alternatives and / or management.

4. **Determine degree of confidence of the significance assessment:** Once the significance of the impact has been determined, the degree of confidence in the assessment will be qualified (see Section 0). Confidence in the prediction is associated with any uncertainties, for example, where information is insufficient to assess the impact.

Criteria for Impact Assessment

The criteria for impact assessment are provided below.

Criteria	Rating	Description
Criteria for ranking of the INTENSITY (SEVERITY) of environmental impacts	**ZERO TO VERY LOW**	Negligible change, disturbance or nuisance. The impact affects the environment in such a way that natural functions and processes are not affected. People / communities are able to adapt with relative ease and maintain pre-impact livelihoods.
	LOW	Minor (Slight) change, disturbance or nuisance. The impact on the environment is not detectable or there is no perceptible change to people's livelihood.
	MEDIUM	Moderate change, disturbance or discomfort. Where the affected environment is altered, but natural functions and processes continue, albeit in a modified way. People/communities are able to adapt with some difficulty and maintain pre-impact livelihoods but only with a degree of support.
	HIGH	Prominent change, disturbance or degradation. Where natural functions or processes are altered to the extent that they will temporarily or permanently cease. Affected people/communities will not be able to adapt to changes or continue to maintain-pre impact livelihoods.
Criteria for ranking the DURATION of impacts	**SHORT TERM**	< 5 years.
	MEDIUM TERM	5 to < 15 years.
	LONG TERM	> 15 years, but where the impact will eventually cease either because of natural processes or by human intervention.
	PERMANENT	Where mitigation either by natural processes or by human intervention will not occur in such a way or in such time span that the impact can be considered transient.
Criteria for ranking the EXTENT / SPATIAL SCALE of impacts	**LOCAL**	Impact is confined to project or study area or part thereof, e.g. limited to the area of interest and its immediate surroundings.
	REGIONAL	Impact is confined to the region, e.g. coast, basin, catchment, municipal region, etc.
	NATIONAL	Impact is confined to the country as a whole, e.g. South Africa, etc.
	INTERNATIONAL	Impact extends beyond the national scale.
Criteria for determining the PROBABILITY of impacts	**IMPROBABLE**	Where the possibility of the impact to materialise is very low either because of design or historic experience, i.e. ≤ 30% chance of occurring.
	POSSIBLE	Where there is a distinct possibility that the impact would occur, i.e. > 30 to ≤ 60% chance of occurring.
	PROBABLE	Where it is most likely that the impact would occur, i.e. > 60 to ≤ 80% chance of occurring.
	DEFINITE	Where the impact would occur regardless of any prevention measures, i.e. > 80% chance of occurring.

Criteria	Rating	Description
Criteria for determining the DEGREE OF CONFIDENCE of the assessment	**LOW**	≤ 35% sure of impact prediction.
	MEDIUM	> 35% and ≤ 70% sure of impact prediction.
	HIGH	> 70% sure of impact prediction.
Criteria for the DEGREE TO WHICH IMPACT CAN BE MITIGATED - the degree to which an impact can be reduced / enhanced	**NONE**	No change in impact after mitigation.
	VERY LOW	Where the significance rating stays the same, but where mitigation will reduce the intensity of the impact.
	LOW	Where the significance rating drops by one level, after mitigation.
	MEDIUM	Where the significance rating drops by two to three levels, after mitigation.
	HIGH	Where the significance rating drops by more than three levels, after mitigation.
Criteria for LOSS OF RESOURCES - the degree to which a resource is permanently affected by the activity, i.e. the degree to which a resource is irreplaceable	**LOW**	Where the activity results in a loss of a particular resource but where the natural, cultural and social functions and processes are not affected.
	MEDIUM	Where the loss of a resource occurs, but natural, cultural and social functions and processes continue, albeit in a modified way.
	HIGH	Where the activity results in an irreplaceable loss of a resource.

Determining Consequence

Consequence attempts to evaluate the importance of a particular impact, and in doing so incorporates extent, duration and intensity. The ratings and description for determining consequence are provided below.

Rating	Description
VERY HIGH	Impacts could be EITHER: of ***high intensity*** at a ***regional level*** and endure in the ***long term***; OR of ***high intensity*** at a ***national level*** in the ***medium term***; OR of ***medium intensity*** at a ***national level*** in the ***long term.***
HIGH	Impacts could be EITHER: of ***high intensity*** at a ***regional level*** and endure in the ***medium term***; OR of ***high intensity*** at a ***national level*** in the ***short term***; OR of ***medium intensity*** at a ***national level*** in the ***medium term;*** OR of ***low intensity*** at a ***national level*** in the ***long term***; OR of ***high intensity*** at a ***local level*** in the ***long term***; OR of ***medium intensity*** at a ***regional level*** in the ***long term.***
MEDIUM	Impacts could be EITHER: of ***high intensity*** at a ***local level*** and endure in the ***medium term***; OR of ***medium intensity*** at a ***regional level*** in the ***medium term***; OR of ***high intensity*** at a ***regional level*** in the ***short term***; OR of ***medium intensity*** at a ***national level*** in the ***short term***; OR of ***medium intensity*** at a ***local level*** in the ***long term***; OR of ***low intensity*** at a ***national level*** in the ***medium term;*** OR of ***low intensity*** at a ***regional level*** in the ***long term.***
LOW	Impacts could be EITHER of ***low intensity*** at a ***regional level*** and endure in the ***medium term***; OR of ***low intensity*** at a ***national level*** in the ***short term***;

Rating	Description
	OR of ***high intensity*** at a ***local level*** and endure in the ***short term***; OR of ***medium intensity*** at a ***regional level*** in the ***short term***; OR of ***low intensity*** at a ***local level*** in the ***long term***; OR of ***medium intensity*** at a ***local level*** and endure in the ***medium term.***
VERY LOW	Impacts could be EITHER of ***low intensity*** at a ***local level*** and endure in the ***medium term***; OR of ***low intensity*** at a ***regional level*** and endure in the ***short term***; OR of ***low to medium intensity*** at a ***local level*** and endure in the ***short term.*** OR **Zero to very low intensity** with any combination of extent and duration.

Determining Significance

The consequence rating is considered together with the probability of occurrence in order to determine the overall significance using the table below.

		PROBABILITY			
		IMPROBABLE	**POSSIBLE**	**PROBABLE**	**DEFINITE**
CONSEQUENCE	**VERY LOW**	**INSIGNIFICANT**	**INSIGNIFICANT**	**VERY LOW**	**VERY LOW**
	LOW	**VERY LOW**	**VERY LOW**	**LOW**	**LOW**
	MEDIUM	**LOW**	**LOW**	**MEDIUM**	**MEDIUM**
	HIGH	**MEDIUM**	**MEDIUM**	**HIGH**	**HIGH**
	VERY HIGH	**HIGH**	**HIGH**	**VERY HIGH**	**VERY HIGH**

In certain cases it may not be possible to determine the significance of an impact. In these instances the significance is **UNKNOWN**.

Appendix 2: Minimum Content Requirements for Terrestrial Biodiversity Specialist Reports as per Protocol for the Specialist Assessment of Environmental Impacts on Terrestrial Biodiversity (GN 320 of 20 March 2020)

Protocol ref	**Terrestrial Biodiversity Specialist Assessment Report Content**	**Section / Page**
3.1.1.	contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae;	Page 2 & Appendix 3
3.1.2.	a signed statement of independence by the specialist;	Page 4
3.1.3.	a statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;	Page 12 & 14
3.1.4.	a description of the methodology used to undertake the site verification and impact assessment and site inspection, including equipment and modelling used, where relevant;	Page 12
3.1.5.	a description of the assumptions made and any uncertainties or gaps in knowledge or data as well as a statement of the timing and intensity of site inspection observations;	Page 14
3.1.6.	a location of the areas not suitable for development, which are to be avoided during construction and operation (where relevant);	N/A
3.1.7.	additional environmental impacts expected from the proposed development;	N/A
3.1.8.	any direct, indirect and cumulative impacts of the proposed development;	Page 29
3.1.9.	the degree to which impacts and risks can be mitigated;	Page 31
3.1.10.	the degree to which the impacts and risks can be reversed;	Page 29
3.1.11.	the degree to which the impacts and risks can cause loss of irreplaceable resources;	Page 29
3.1.12.	proposed impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr);	N/A
3.1.13.	a motivation must be provided if there were development footprints identified as per paragraph 2.3.6 above that were identified as having a "low" terrestrial biodiversity sensitivity and that were not considered appropriate;	N/A
3.1.14.	a substantiated statement, based on the findings of the specialist assessment, regarding the acceptability, or not, of the proposed development, if it should receive approval or not; and	Page 31
3.1.15.	any conditions to which this statement is subjected.	N/A

Appendix 3: Curriculum Vitae

Dr David Jury McDonald Pr. Sci. Nat.

Name of Company: Bergwind Botanical Surveys & Tours CC. (Independent consultant)

Work and Home Address: 14 A Thomson Road, Claremont, 7708

Tel: (021) 671-4056 **Mobile:** 082-876-4051 **Fax:** 086-517-3806

E-mail: dave@bergwind.co.za

Website: www.bergwind.co.za

Profession: Botanist / Vegetation Ecologist / Consultant / Tour Guide

Date of Birth: 7 August 1956

Employment history:

- 19 years with National Botanical Institute (now SA National Biodiversity Institute) as researcher in vegetation ecology.
- Five years as Deputy Director / Director Botanical & Communication Programmes of the Botanical Society of South Africa
- Fifteen years as private independent Botanical Specialist consultant (Bergwind Botanical Surveys & Tours CC)

Nationality: South African (ID No. 560807 5018 080)

Languages: English (home language) – speak, read and write
Afrikaans – speak, read and write

Membership in Professional Societies:

- International Association for Impact Assessment (SA)
- South African Council for Natural Scientific Professions (**Ecological Science, Registration No. 400094/06**)
- Field Guides Association of Southern Africa

Key Qualifications:

- Qualified with a M. Sc. (1983) in Botany and a PhD in Botany (Vegetation Ecology) (1995) at the University of Cape Town.
- Research in Cape fynbos ecosystems and more specifically mountain ecosystems.
- From 1995 to 2000 managed the Vegetation Map of South Africa Project (National Botanical Institute).
- Conducted botanical survey work for AfriDev Consultants for the Mohale and Katse Dam projects in Lesotho from 1995 to 2002. A large component of this work was the analysis of data collected by teams of botanists.
- **Director: Botanical & Communication Programmes** of the Botanical Society of South Africa (2000—2005), responsible for communications and publications; involved with conservation advocacy particularly with respect to impacts of development on centres of plant endemism.
- Further tasks involved the day-to-day management of a large non-profit environmental organisation.

- **Independent botanical consultant** (2005 – to present) over 400 projects have been completed related to environmental impact assessments in the Western, Southern, Eastern and Northern Cape, Karoo and Lesotho. A list of reports (or selected reports for scrutiny) is available on request.

Higher Education

Degrees obtained
and major subjects passed:

B.Sc. (1977), University of Natal, Pietermaritzburg
Botany III
Entomology II (Third year course)

B.Sc. Hons. (1978) University of Natal, Pietermaritzburg
Botany (Ecology /Physiology)

M.Sc. - (Botany), University of Cape Town, 1983.
Thesis title: 'The vegetation of Swartboschkloof, Jonkershoek, Cape Province'.

PhD (Botany), University of Cape Town, 1995.
Thesis title: 'Phytogeography endemism and diversity of the fynbos of the southern Langeberg'.

Certificate of Tourism: Guiding (Culture: Local)
Level: 4 Code: TGC7 (Registered Tour Guide: WC 2969).

Employment Record:

January 2006 – present: Independent specialist botanical consultant and tour guide in own company:
Bergwind Botanical Surveys & Tours CC

August 2000 - 2005 : Deputy Director, later Director Botanical & Communication Programmes, Botanical Society of South Africa

January 1981 – July 2000 : Research Scientist (Vegetation Ecology) at National Botanical Institute

January 1979—Dec 1980 : National Military Service

Further information is available on my company website: www.bergwind.co.za