

**Botanical Assessment
for the proposed Harmony Dam and
agricultural areas at Farms Houdenbek 415
and Winkel Haak RE/224, near Op-die-Berg,
Witzenberg Municipality,
Western Cape Province**



***Dr David J. McDonald
Bergwind Botanical Surveys & Tours CC.
14A Thomson Road, Claremont, 7708
Mobile: 082-876-4051***

Prepared for EnviroAfrica

February 2026

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 first in June 2017 and subsequently in early 2024, to provide specialist botanical consulting services for the assessment of the areas of the proposed Harmony Dam (First Phase) and an area for cultivation (Second Phase) on the farms Houdenbek 415 and Winkel Haak RE/224, near Op-die-Berg, Ceres District, Witzenberg Municipality, Western Cape Province.

Details of Specialist

Dr David J. McDonald Pr. Sci. Nat.

Bergwind Botanical Surveys & Tours CC

14A Thomson Road

Claremont

7708

Mobile: 082-876-4051

e-mail: dave@bergwind.co.za

Professional registration: South African Council for Natural Scientific Professions No. 400094/06

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 1000 specialist botanical / ecological studies.
- Has published numerous scientific papers and attended numerous conferences both nationally and internationally (details available on request).

Curriculum Vitae – Appendix 2

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.

This report must not be altered or added to without the prior written consent of the author. This also refers to electronic copies of the report which are supplied for the purposes of inclusion as part of other reports, including main reports. Similarly, any recommendations, statements or conclusions drawn from or based on this report must reference it. If these form part of a main report relating to this investigation or report, the report must be included in its entirety as an appendix or separate section to the main report.

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 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).



12 February 2026

Signature of the specialist:
Bergwind Botanical Surveys & Tours CC

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1. Introduction

EnviroAfrica CC was appointed by the Applicant, Môrester Estates, to conduct the environmental assessment process for the construction of the proposed Harmony Dam on the farms Houdenbek 415 and Winkel Haak RE/224, near Op-die-Berg, Ceres District, Witzenberg Municipality in the Western Cape Province. Bergwind Botanical Surveys & Tours CC ('Bergwind') was appointed to carry out the botanical assessment in 2019 in what is now called the 'First Phase'. A second appointment was made in early 2024 for the study to be revisited with additional fieldwork and reporting to accommodate more recent developments in the proposal.

The study is conducted in terms of the National Environmental Management Act (NEMA) (No.7 of 1998) as amended and the 2014 Environmental Impact Assessment Regulations. Bergwind Botanical Surveys & Tours CC was in turn appointed by EnviroAfrica, on behalf of the Applicant, to carry out a botanical assessment of the areas on the designated property to inform the environmental impact assessment process.

The principles, guidelines and recommendations of CapeNature and the Botanical Society of South Africa for proactive assessment of the biodiversity of proposed development sites have been followed (Brownlie 2005, Cadman *et al.* 2016). Procedures for the assessment and minimum criteria for reporting on identified environmental themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for environmental authorisation (Government Gazette, 2020) have been observed in this investigation.

2. Terms of Reference

The Terms of Reference are:

Undertake a site visit to the study area and compile a specialist report that addresses the following:

- Take cognizance of, and comply with, the substantive content requirements outlined within Appendix 6 of GN R982, as amended, which outlines the legal minimum content requirements for specialist studies in terms of the 2014 NEMA EIA Regulations;
- The local and regional context of the vegetation communities and plant species within the affected areas, taking cognizance of the relevant biodiversity plans, bioregional planning documents, Environmental Management Frameworks etc.
- The ecosystem status and conservation value of the vegetation communities, including whether the potentially affected areas comprise critically endangered or endangered ecosystem(s) listed in terms of section 52 of the NEMBA;
- Any rare or endangered species encountered or likely to be or have been present;
- The presence of and proximity of the proposed site to protected area(s) identified in terms of NEMPAA and proximity to a Biosphere Reserve (where relevant).
- Confirm the approximate area (m²) of indigenous vegetation (as defined in the NEMA EIA Regulations) that would be cleared for the proposed project.

- A description of the direct, indirect, residual and cumulative botanical impacts (both before and after mitigation) and an assessment of the significance of the impacts (on a nominal scale of Neutral/ Negligible, Very Low, Low, Medium, High) by evaluating: (a) nature of the impacts (positive/ negative), (b) extent of the impacts (zero/ site specific/local/ regional/ national/ international), (c) magnitude of the impacts (zero/ Very Low/Low/ Medium/ High), (d) duration of the impacts (none/ short/ medium/ long term) and (e) probability of occurrence of the impacts (none/ unlikely/ possible/ definite). In addition, (f) the level of confidence in findings relating to potential impacts, (g) reversibility of potential impacts (i.e. the degree to which the impact can be reversed); and (h) the degree to which the impact may cause irreplaceable loss of resources.
- An indication of the degree (very low/ low/ medium/ high) to which the impacts can be avoided, managed and mitigated, a description of the measures to mitigate any impacts, and an indication of whether or not the measures (if implemented) would change the significance of the impact, for the construction and operational phases of the project.
- Take cognizance of the Department of Environmental Affairs (DEA) and Department of Environmental Affairs and Development Planning (DEA&DP) Guideline for Involving Biodiversity Specialists in the EIA Process and the requirements of the Botanical Society of South Africa (BotSoc) in developing an approach to the botanical investigation.

3. Study Area

3.1 Locality

3.1.1 Harmony Dam

Initially two alternative dam sites were considered. The first was on the stream Tuinskloof on the neighbouring Vaalboskloof 221/RE. Use of this site would have required consent from and compensation to the landowner, so this alternative was abandoned prior to the commissioning of this study. The second alternative is on the stream flowing northwards from Vaalboskloof 221 onto Houdenbek 415. This second alternative (occasionally referred to as the Harmony #2 Dam) has been pursued (location indicated in Figures 1--3), for which four dam wall options were proposed (see below).

The site proposed for the Harmony Dam is in the southeast corner of Houdenbek 415 at the lower end of a small catchment that lies mainly on the adjacent property Vaalboskloof 221. The dam site is in a narrow kloof vegetated with fynbos shrubland on either side of a perennial stream. The substrate is sandstone, and a prominent ridge of bedrock sandstone is found on the east side of the stream. The northern section of the dam site has old fields on sandstone alluvium.

Owing to the probable flooding of rock paintings by the proposed Harmony #2 Dam, resulting from the concurrent Heritage Assessment (J. Kaplan pers. comm.), the proposed dam wall is now (as of 2024) at a lower position in the catchment, such that the high-water-level of the dam would not directly affect the rock paintings.

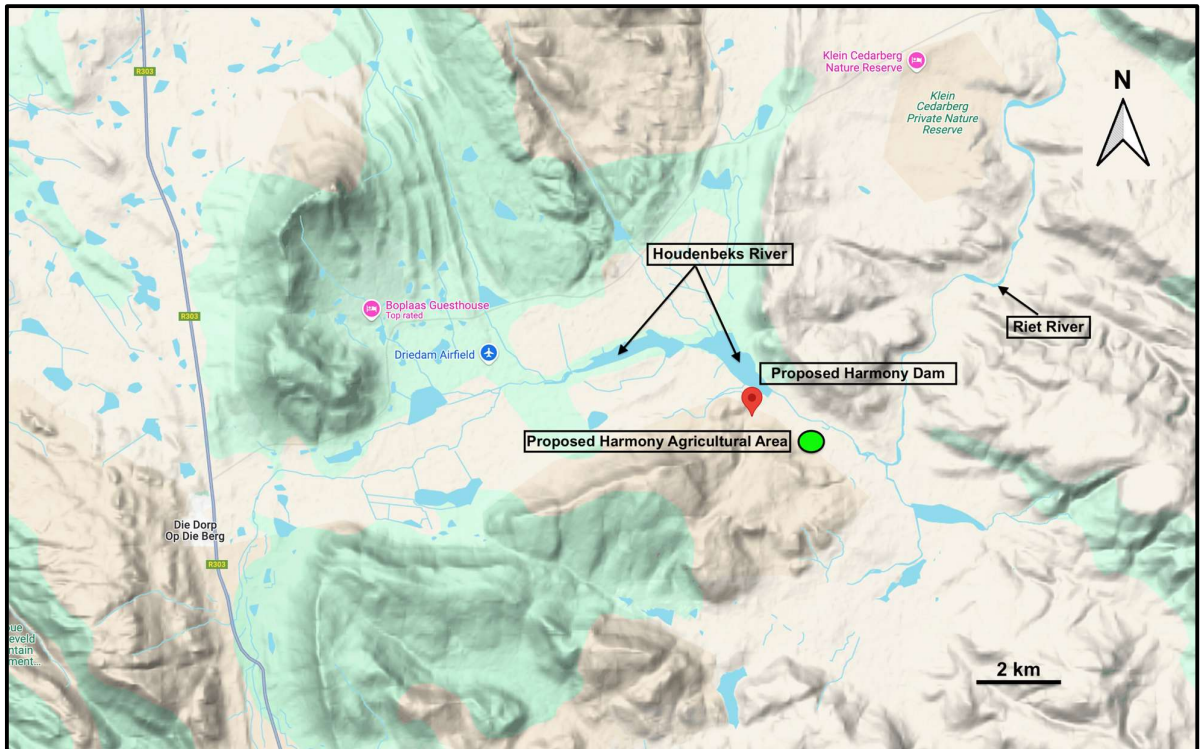


Figure 1. Location of the proposed Harmony Dam (red icon) at farm Houdenbek 415 and the Harmony Agricultural Areas at RE Winkel Haak 224, Ceres (green icon).

3.1.3 Harmony Agricultural Area

The proposed Harmony Agricultural Areas are located southeast of the Harmony Dam site; the Alternative 1 area (not preferred) is mostly on the property Remainder Winkel Haak 224, and the Alternative 2 area (preferred) is fully on Winkel Haak 224 (Figure 1, green dot showing the general locality of the agriculture sites).

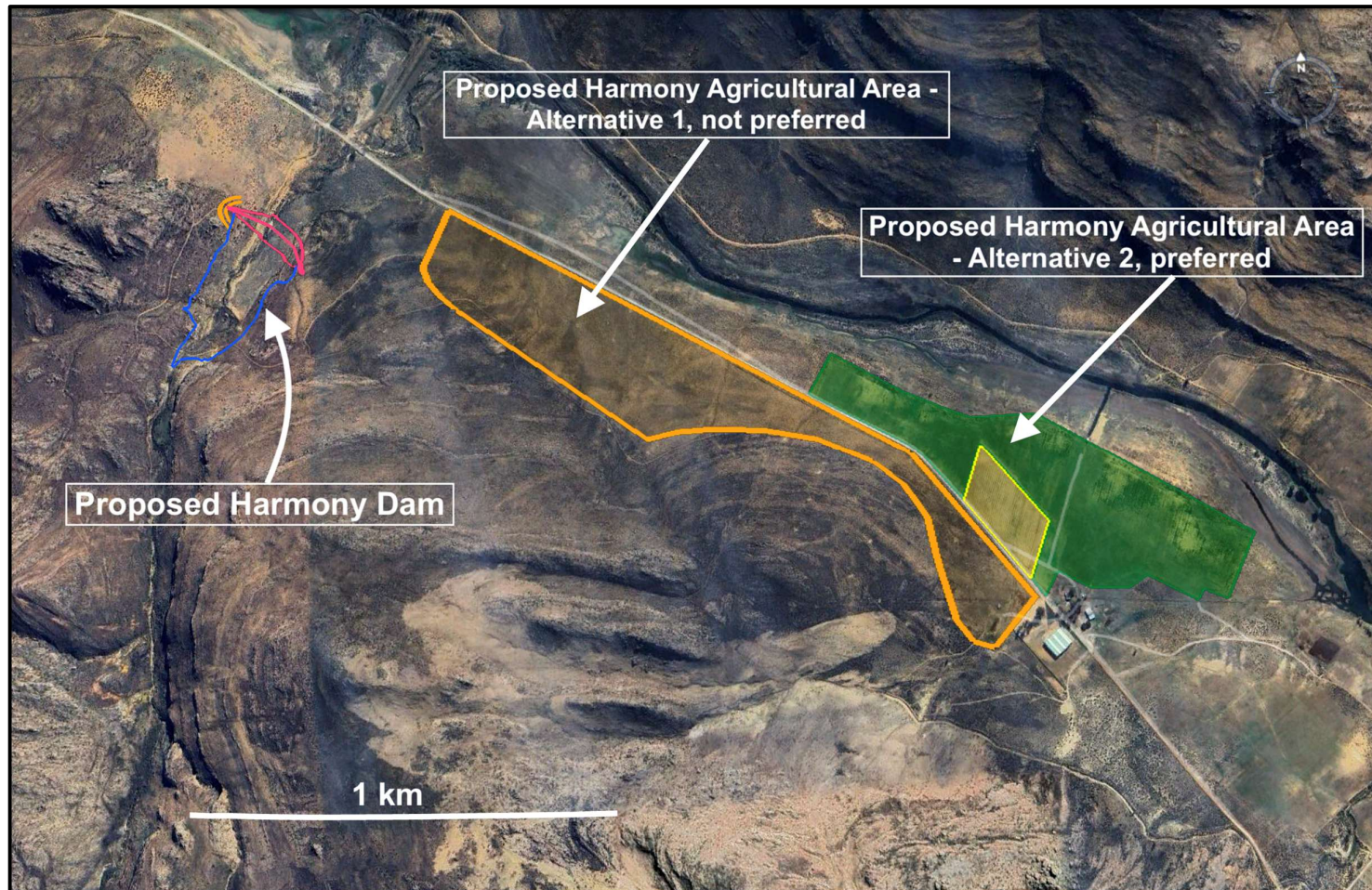


Figure 2. Aerial image (Google Earth TM) showing the detailed location of the proposed Harmony Dam and the proposed Harmony Agricultural Area Alternative 1 (orange) and Alternative 2 [preferred] (green and yellow) in relation to the Houdenbeks River.

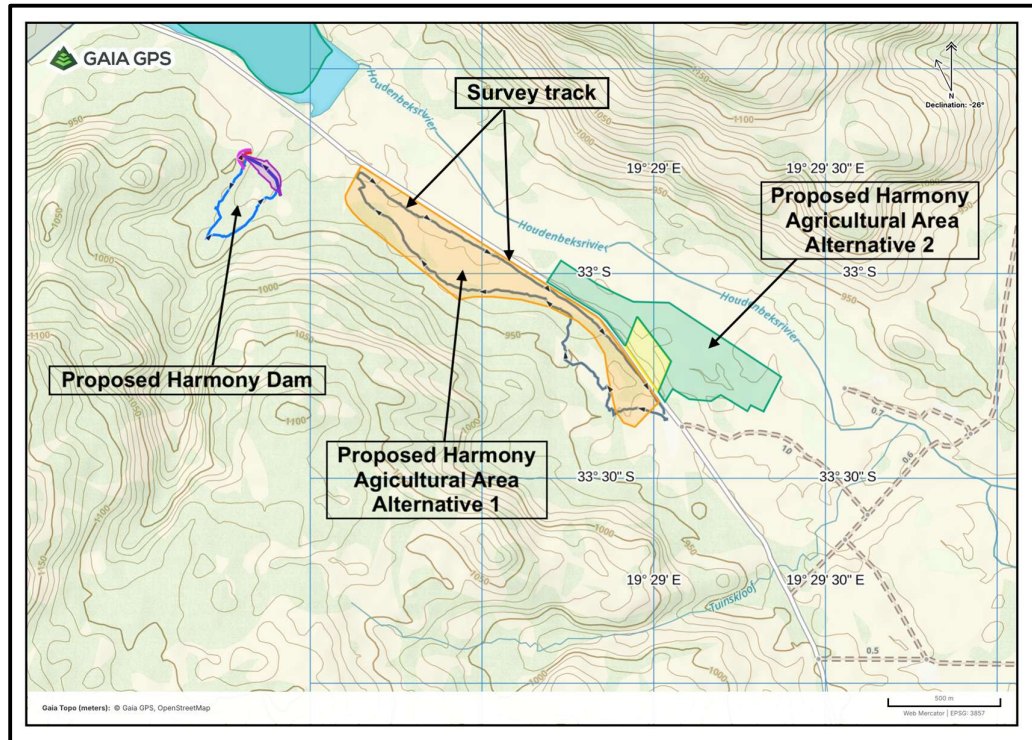


Figure 3. Topographical Map showing the location of the proposed Harmony Dam and Agricultural Area Alternative 1 (not preferred - orange polygon) and Agricultural Area Alternative 2 (preferred – green and yellow polygon) northeast of Houdenbeksberg, Kouebokkeveld.

3.2 Topography and Geology

3.2.1 Harmony Dam

The Option 1 site (preferred) as well as the Option 3 site of the Harmony Dam are located on sandy shale and siltstone with sandstone bands, becoming mainly quartzitic sandstone, of the Bidouw Subgroup, Witteberg Group, Cape Supergroup (Figure 4). The preferred site is in an incised valley whereas the Option 3 site is located on more open, even terrain.

Soils at the Harmony Dam preferred site (Option 3) are classified as rocky, being mainly of the Glenrosa and Mispah soil forms. In contrast, the soils of the Option 3 site are soils labeled ED, with limited pedological development.

The topography of the Harmony Dam site is on slopes with shallow gradient with aspect west-facing and east-facing (Figure 6).

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The topography of the Harmony Dam site is on slopes with shallow gradient with aspect west-facing and east-facing (Figure 6)

3.2.2 Harmony Agricultural Area

The proposed Harmony Agricultural Area (Alternative 1) is a greenfield site with undisturbed vegetation that is underlain by rocks of the Witpoort Formation of the Weltevrede Subgroup, Witteberg Group, Cape Supergroup (Figure 4). The topography is gently undulating and the aspect mostly northeast-facing (Figure 6).

The soils of the proposed Harmony Agricultural Area (Alternative 1) are a mix of alluvial soils (grey regic sands) in the south-eastern part and rocky soils of the Glenrosa and Mispah soil forms as found at the Harmony Dam site (Figure 5).

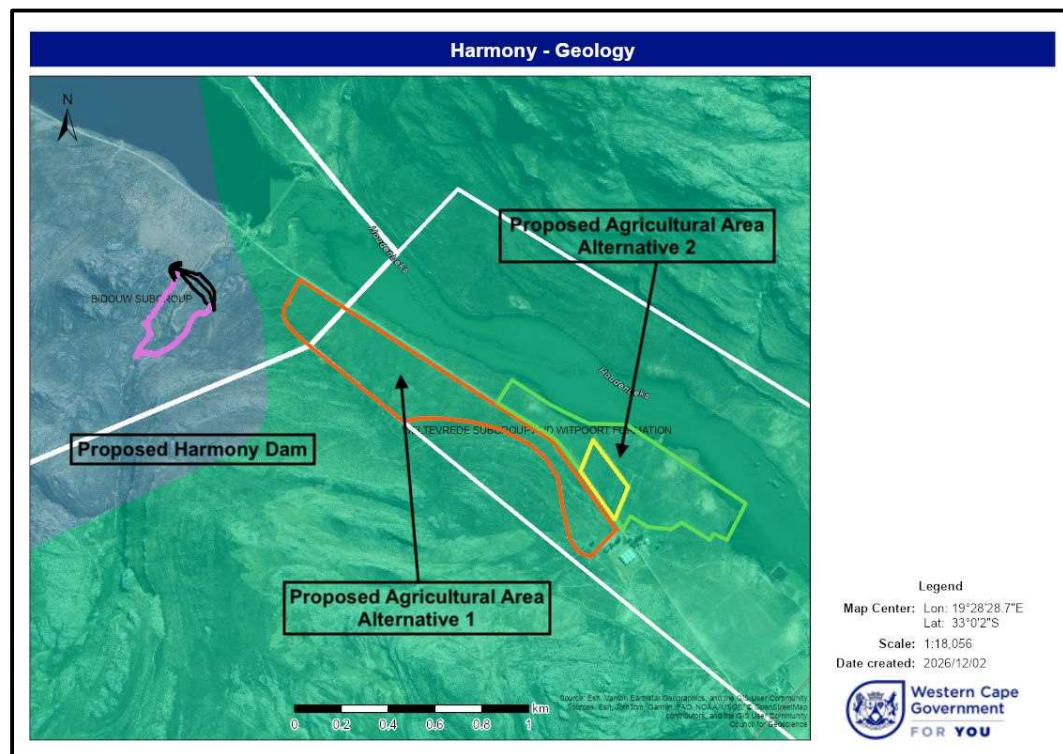


Figure 4. Geological map with the proposed Harmony Dam located in the Bidouw Subgroup, Witteberg Group. The Harmony Agricultural Areas (both alternatives) are on the Witpoort Formation, Weltevrede Subgroup, Witteberg Group.

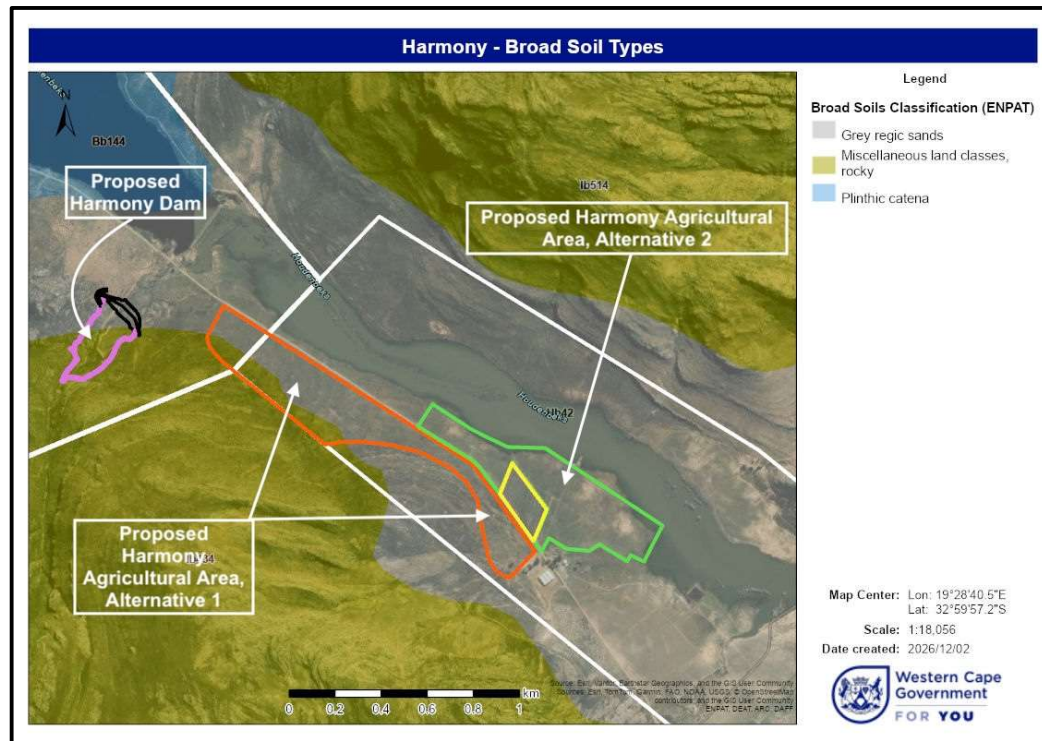


Figure 5. Broad soil types with the proposed Harmony Dam at a site with rocky soils. The Harmony Agricultural Area, both alternatives are mapped as having grey regic sands.

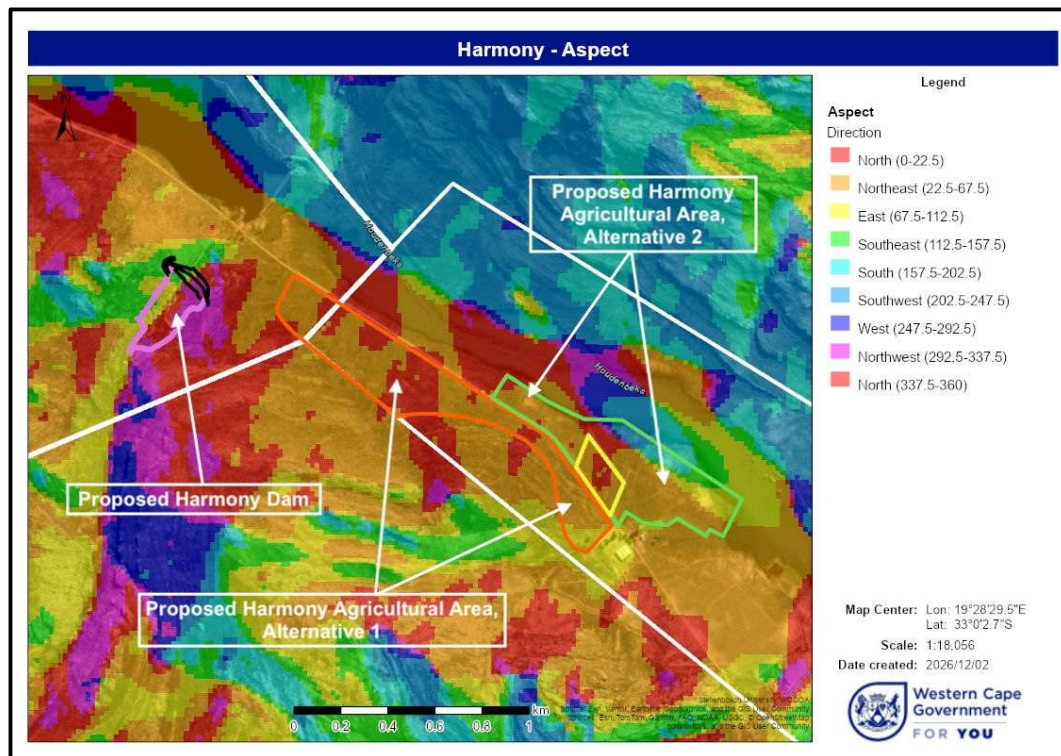


Figure 6. The aspects of the terrain of the Toeka and Harmony Dams and the Harmony Agricultural Area.

3.3 Climate

The study area falls within the Winter Rainfall Region of the Western Cape Province. It experiences a Mediterranean-type climate with cool to cold, wet winters and hot, dry summers. The climate diagram for Winterhoek Sandstone Fynbos (Figure 7) most closely approximates the climate of the Houdenbek study area.

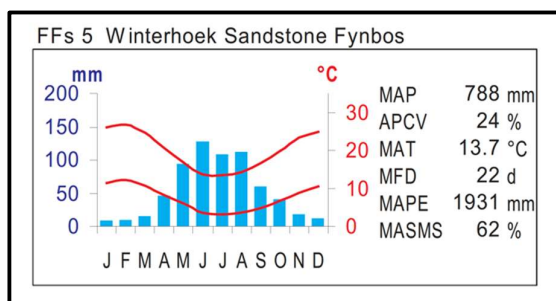


Figure 7. Climate diagram for Winterhoek Sandstone Fynbos, the principal vegetation type in the study area (Rebello *et al.* in Mucina & Rutherford, 2006) showing MAP – Mean Annual Precipitation; APCV = Annual Precipitation Coefficient of Variance; MAT = Mean Annual Temperature; MFD = Mean Frost Days; MAPE = Mean Annual Potential Evaporation; MASMA = Mean Annual Soil Moisture Stress.

4. Methods

4.1 Field Sampling

The fieldwork for the assessment of the Harmony Dam site was conducted on 30 June 2017 and took approximately 5 hours and then the site was visited again on 17 December 2018, 4 March 2019 and lastly on 6 August 2024, when the proposed Harmony Agricultural Area, Alternative 1 (Figure 2) was also surveyed. The Harmony sites were accessed from the gravel road between Houdenbek 415 and RE Winkel Haak 224, Ceres.

The Harmony Agricultural Area, Alternative 2 was not surveyed directly. It has been proposed after it was ascertained that development of the Alternative 1 area would result in a HIGH NEGATIVE impact in terms of loss of Kouebokkeveld Alluvium Fynbos and Winterhoek Sandstone Fynbos. The Alternative 2 areas has been previously cultivated when onions and kiwi fruit were grown.

4.2 Desk-top analysis and reporting

The photographs obtained in the field as well as available literature and Google Earth Pro TM were used for the description of the vegetation presented in this report. The National Vegetation Map (SANBI, 2024) (referred to as VEGMAP) was used as the 'base-map' to determine the principal original vegetation types.

5. Limitations and Assumptions

Since the first survey took place in June i.e. winter, it was expected that the vegetation would be in good condition. However, with the significantly dry winter during a long drought prior to the site visit in

2017, the vegetation was not in optimal condition. However, a meaningful survey was still possible since the fynbos shrubland is not as dependent on winter rainfall for it to be successfully surveyed because the vegetation is perennial, and most of the plant species could be seen.

A second site visit was conducted on 17 December 2018 and then a third site visit on 4 March 2019 to augment the data collected in June 2017.

A final site visit was conducted on 6 August 2024 but provided not much more data for the Harmony Dam site but new information for the proposed Harmony Agricultural Area.

Only the Option 1 location for the proposed Harmony Dam was investigated in 2017, since the Options 2, 3 and 4 had not been proposed by the time of the field survey. The Options 2, 3 and 4 were only proposed after the Heritage Assessment (Heritage CTS, 2018) had taken place.

The Option 3 dam site, now elected as the preferred site, for the Harmony Dam was surveyed on 6 August 2024 but a GPS track was not recorded. This is not considered to be a limitation since only the dam wall area was surveyed, the remainder of the area that would be inundated by a future Harmony Dam has been adequately covered by the first three site visits and surveys. There has been very little change, with the vegetation being in much the same condition.

6. Development Options

6.1 Harmony Dam

Once it had been determined that the only feasible location of the Harmony Dam would be at the so-called Harmony No. 3 site, four development options were considered (together with the 'No Go' alternative) (Figure 8). They are as follows:

- (i) Option 1 (the main area surveyed in this study) was the preferred option for reasons pertaining to construction and potential water storage capacity.
- (ii) Option 2 would be with the wall moved further north than Option 1; this option has not been pursued since the capacity of the dam would be too small for it to be viable.
- (iii) Option 3 would be with the wall moved further north but with the wall curved to increase storage capacity.
- (iv) Option 4 would be as for Option 1 but with an additional wall to the south to protect the identified heritage resources. The cost of the additional wall renders this option unviable.

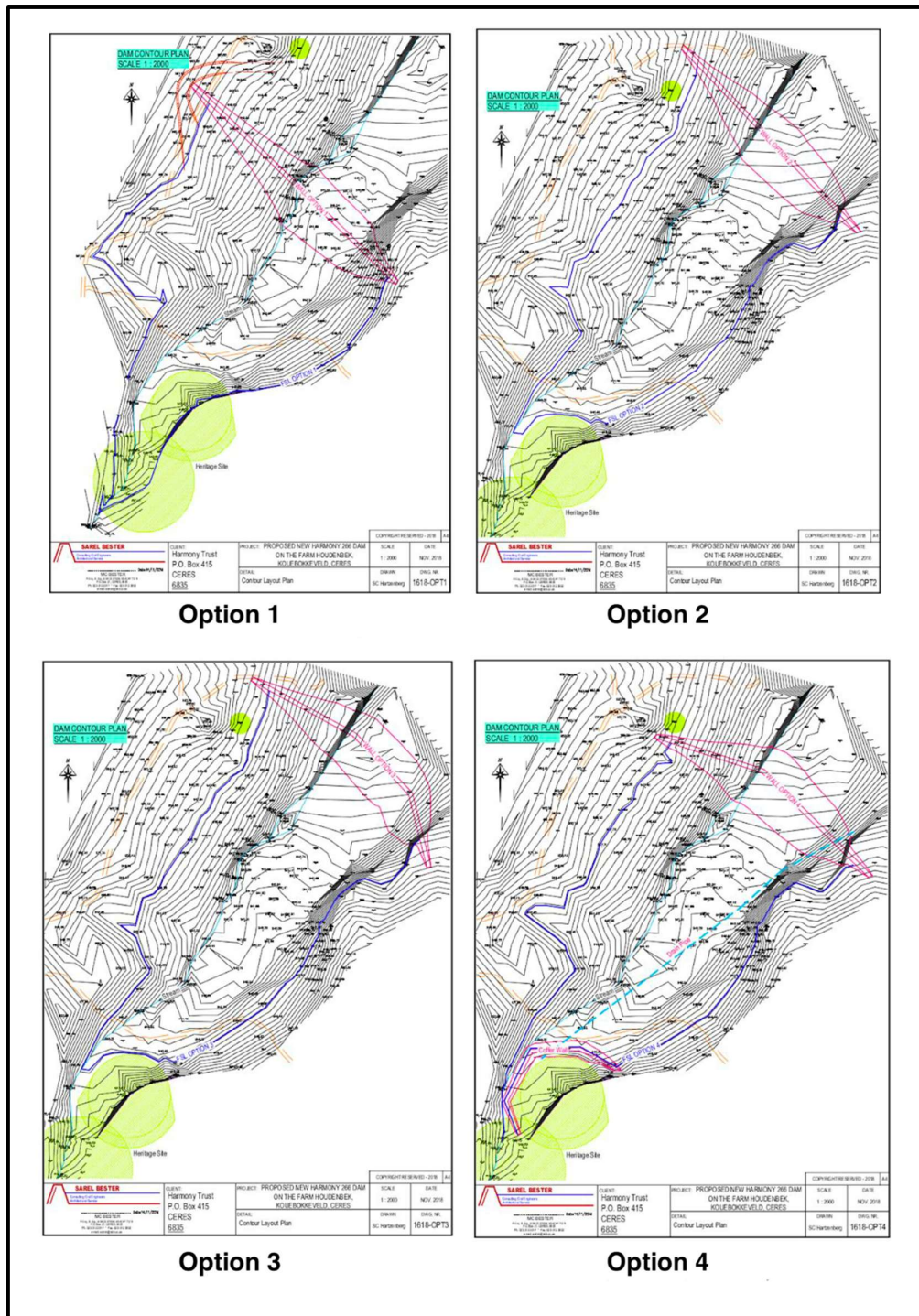


Figure 8. Four proposed alternatives for the Harmony Dam. Option 3 is the preferred site (Diagram supplied by Sarel Bester Engineers).

7. Disturbance regime

7.1 Harmony Dam

The Option 1 dam proposal – now **not preferred**, for the Harmony Dam is hardly disturbed. The only disturbance is a two-spoor farm track. Selection of this option would result in flooding of pristine fynbos in the dam inundation area (Figure 9), and as was determined, sensitive heritage sites with rock paintings.



Figure 9. A view of the typical proteoid-restioid shrubland on sandstone substrate in the valley where the proposed Harmony Dam would be constructed.



Figure 10. The lower part of the catchment where the Harmony Dam wall would be located.

The Option 3 site, which is now the preferred, however, is much more disturbed. From historical images obtained from Google Earth Pro™ that there has been some agricultural activity in the area where the dam wall would be constructed (Figure 10). Given that Option 3 (preferred as of 2024) is being pursued, the dam water would flood an area that has partly been disturbed (Figure 14) and is partly undisturbed fynbos (Figures 15—17).



Figure 11. Marker for the dam wall (white arrow) on the west side at the overflow location.



Figure 12. Lower edge of the proposed Harmony Dam wall would reach (arrow).

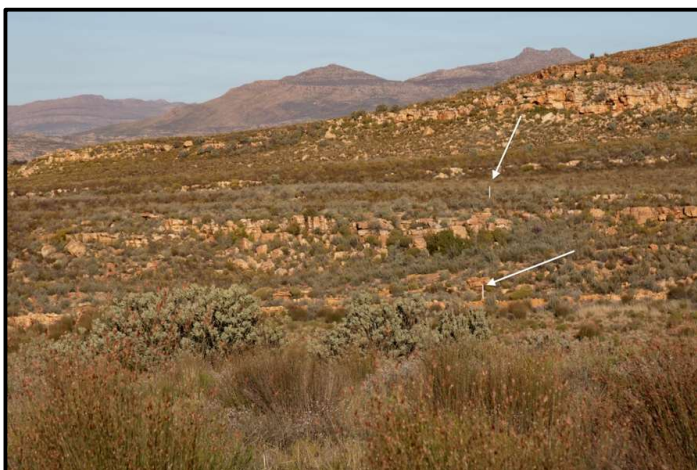


Figure 13. White arrows indicate markers for the Harmony Dam wall on the east side.



Figure 14. The disturbed area at the lower end of the catchment that would be impacted by the wall of the Harmony Dam.



Figure 15. Aerial image (Google Earth™ of 3 March 2004 with the Option 3 dam wall superimposed.



Figure 16. Aerial image (Google Earth™) of 17 June 2010 with the Option 3 dam wall superimposed.



Figure 17. Aerial image (Google Earth™) of 5 July 2017 with the Option 3 dam wall superimposed.

8.1 The vegetation in context

According to the Vegetation map of South Africa, Lesotho, and Swaziland (eSwatini) (Mucina, Rutherford & Powrie, 2005), the vegetation that occurs at the proposed Harmony Dam site (all options) is Winterhoek Sandstone Fynbos (Figure 18). It is a vegetation type that is widespread on the sandstone substrates of the Kouebokkeveld plateau and mountains, including Houdenbek Mountain, the Agter-Witzenberg and parts of the Groot Winterhoek Mountains. Rebelo *et al.* (2006) describe the Winterhoek Sandstone Fynbos as follows:

“Vegetation is mainly closed restioland in deeper, moister sands, with low, sparse shrubs that become denser and restios less dominant in the drier habitats. Proteoid and ericaceous fynbos are found on higher slopes while asteraceous fynbos is more common on lower slopes. Cape thicket is prominent on the lowest slopes.”

A concern has been raised by Dr Brian du Preez (botanist) that the proposed Harmony agricultural development would potentially affect the newly described *Aspalathus jardinii* Du Preez & C.H.Stirt.

that occurs on 'dune sands' of the Rietrivier and possibly surrounding areas. This possibility was considered but the species in question was not found during this investigation. However, the proximity of the Harmony Agricultural area to the Riet Rivier which is the type locality of *A. jordinii* suggests that this locally endemic species could be affected as speculated by Dr du Preez (see also below under Section 11.1).

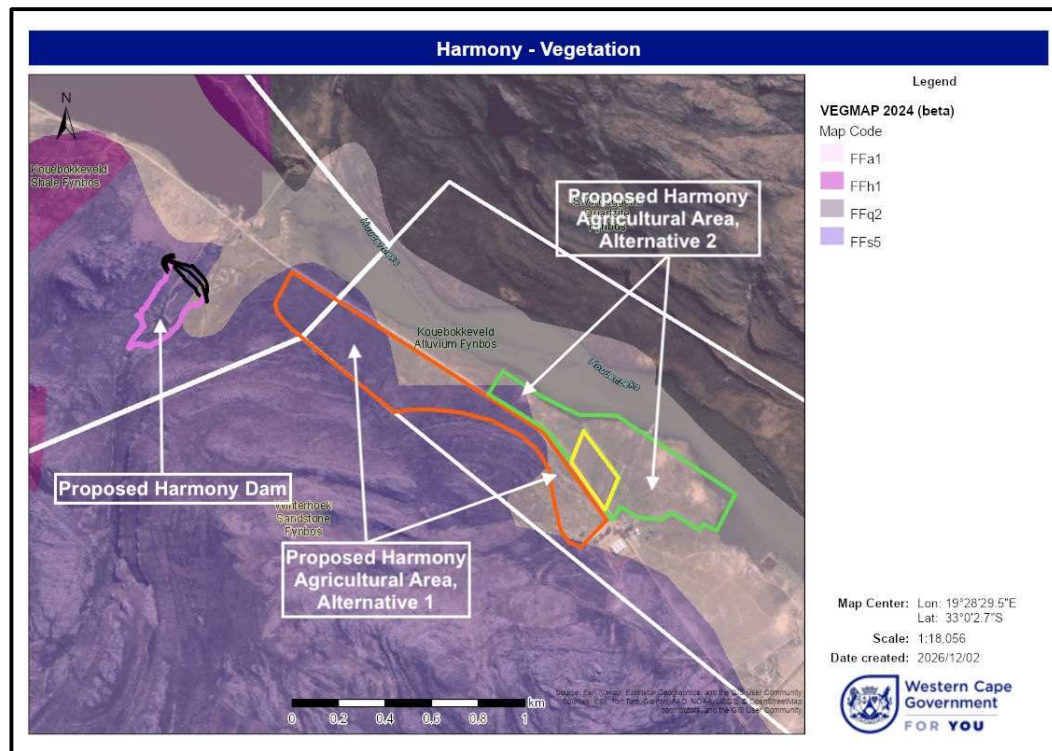


Figure 18. Portion of the *Vegetation map of South Africa, Lesotho, and Swaziland* (Mucina, Rutherford & Powrie, 2005) showing the two vegetation types originally or still occurring at the proposed Harmony Dam and agricultural development sites.

8.2 The vegetation of the Harmony Dam area

The following notes were compiled at the respective sample waypoints at the Option 1 location of the proposed Harmony Dam. The Option 3 location was subsequently investigated in August 2024.

Waypoint HD1: S 32° 59' 50.5" E 19° 27' 39.1"

At the two-spoor track on the west side of the valley. The vegetation is uniform in the dam footprint (Figure 19). It consists of an open to mid-dense, tall proteoid stratum, dominated by *Protea laurifolia*, with a low closed (dense) restioland understorey. Species recorded include: *Centella* sp., *Cymbopogon marginatus*, *Ehrharta ramosa*, *Myrovernix gnaphaloides*, *Hypodiscus argenteus*, *Ischyrolepis* sp., *Leucadendron* sp., *Leucospermum calligerum*, *Metalasia densa*, *Muraltia spinosa*, *Passerina obtusifolia*, *Phyllis* sp., *Protea* sp., *Restio* sp., *Stoebe capitata*, *Tetraria capillacea*, *Thamnochortus* sp.



Figure 19. View up the valley where the proposed Harmony Dam would be located in Winterhoek Sandstone Fynbos.

Waypoint HD2: S 32° 59' 52.9" E 19° 27' 39.3"

Area with localized large sandstone boulders (Figure 20). The same vegetation community is found as at waypoint HD1 but with some additional species namely, *Anaxeton* sp., *Asparagus capensis*, *Cliffortia ruscifolia*, *Diospyros glabra*, *Felicia filifolia*, *Lobostemon* sp. and *Stoebe plumosa*.



Figure 20. Large sandstone boulders are found in part of the study area.

Waypoint HD3: S 32° 59' 54.1" E 19° 27' 38.6"

This area has a mid-dense stand of *Protea laurifolia* in the upper stratum, 1—2.5 m tall. The lower stratum is strongly restioid and the plant community is the same as at waypoint HD1 and HD2 but with the additional presence of *Phyllica sp.* and *Protea laevis* (Figure 21).



Figure 21. The area around waypoint HD3.

Waypoint HD4: S 32° 59' 57.0" E 19° 27' 38.8"

This waypoint is located on a two-spoor track at the upper end of the Option 1 and Option 2 dam footprint (inundation area) (Figure 22). The vegetation is the same proteoid fynbos as found at waypoints HD1—HD3. In addition, *Leucadendron salignum* and the ground protea, *Protea laevis* (Figure 23) were found here.



Figure 22. A two-spoor track leads up the valley through the site proposed for the Harmony Dam.



Figure 23. *Protea laevis*.

Waypoint HD5: S 32° 59' 59.0" E 19° 27' 40.0"

This waypoint was recorded at the dry stream channel (Figure 24). Species include *Asparagus aethiopicus*, *Cannomois* sp. – dominant, *Cliffortia juniperifolia*, *Cliffortia strobilifera*, *Cymbopogon marginatus*, *Dicerotheramnus rhinocerotis*, *Eragrostis curvula*, *Erica* sp. – very small flowers, *Imperata cylindrica*, *Muraltia spinosa*, *Myrovernix gnaphaloides*, *Rhodocoma gigantea*, *Searsia undulata* and *Willdenowia* cf. *incurvata*.



Figure 24. The seasonal stream channel with dominant Restionaceae.

Waypoint HD6: S 32° 59' 56.3" E 19° 27' 42.3"

Open grassy area on alluvium. Vegetation is almost exclusively *Eragrostis curvula* (Figure 25). Near the sandstone cliffs is a third community dominated by *Searsia undulata* with *Asparagus retrofractus* (entwined in the shrubs) (Figure 26).



Figure 25. Open grassy area on alluvium with a shrubby thicket community next to the sandstone cliffs.



Figure 26. *Asparagus retrofractus*



Waypoint HD7: S 32° 59' 53.2" E 19° 27' 45.4"

This waypoint was recorded at a soil pit where the Option 1 dam wall would be (Figure 27). The Option 3 (preferred) would result in most of the area seen here being inundated. The vegetation on the sandy alluvium is dominated by restios, mainly *Willdenowia incurvata*. No *Protea laurifolia* occurs at this location. *Leucadendron brunioides* var. *brunioides* was recorded here (Figure 30); this subspecies is not threatened.



Figure 27. Area of the proposed Harmony Dam Option 1 site. Most of this area would be inundated by Option 3 as well.

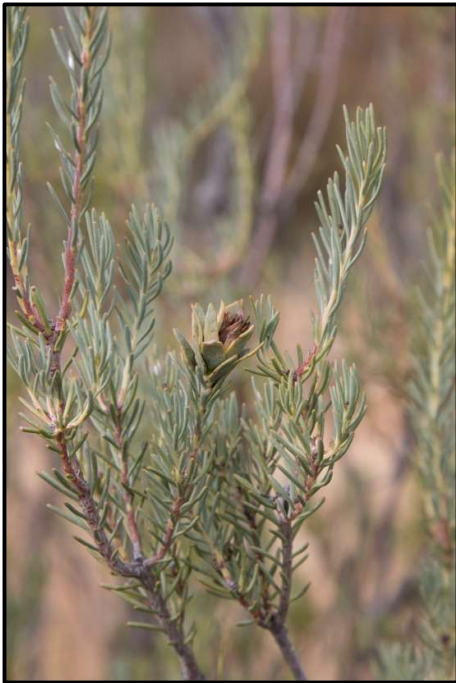


Figure 28. *Leucadendron brunioides* var. *brunioides*

9. The Harmony Agricultural Area, Alternative 1

The proposed Harmony Agricultural Area, Alternative 1 lies parallel to the Houdenbek to the Winkel Haak gravel road, a short distance east of the site of the proposed Harmony Dam. It may be described as an elongate obtuse-ended strip of varying width, determined by rocky outcrops, and would be 29 ha in extent.

The survey of the vegetation in the proposed agricultural area was conducted on 6 August 2024, when the area had had good winter rain. Consequently, the vegetation was in good condition. The site was sampled at ten waypoints, HA1—HA10 (Figure 29).

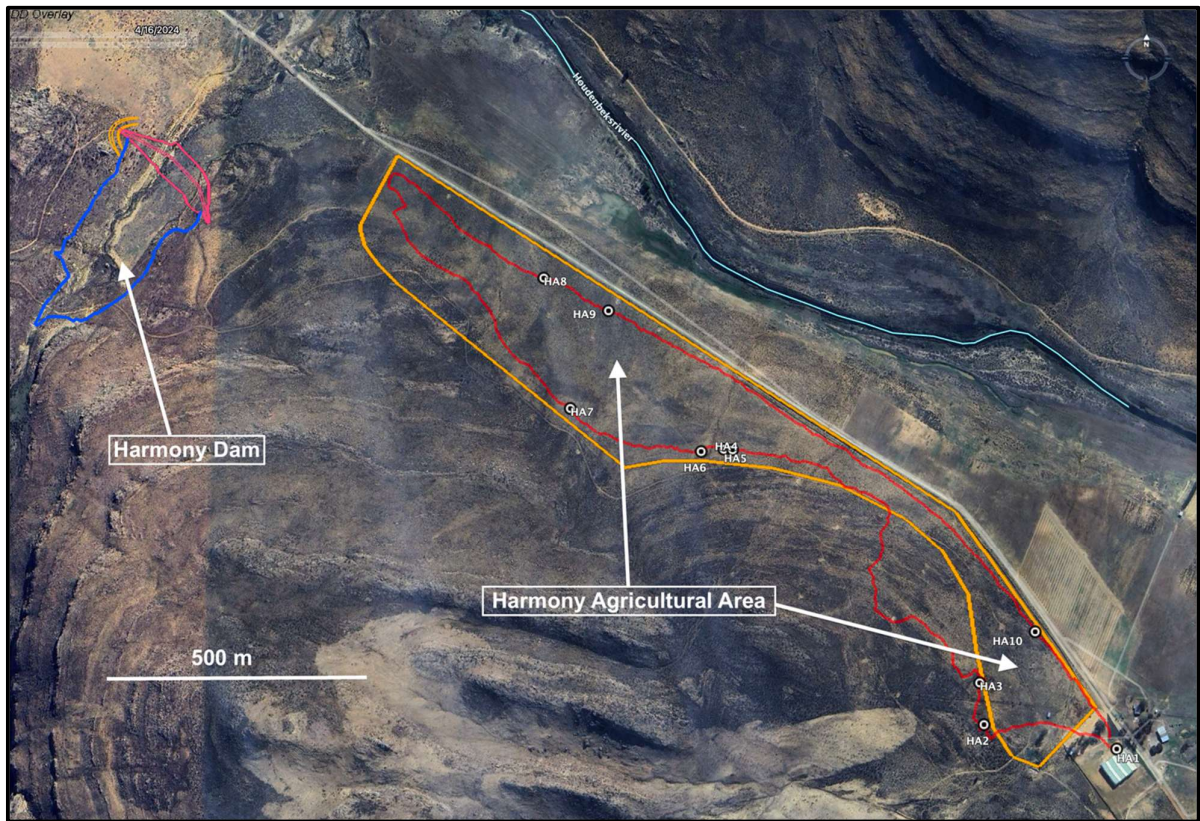


Figure 29. Annotated satellite aerial photo (Google Earth TM) showing the proposed Harmony Dam in relation to the proposed Harmony Agricultural Area, Alternative 1. The red line within the agricultural area is the survey track with waypoints.

Table 1. The coordinates of the waypoints in the Harmony Agricultural Area, Alternative 1.

Waypoint	Latitude	Longitude
HA1	S 33° 0' 21.31"	E 19° 29' 2.58"
HA2	S 33° 0' 19.79"	E 19° 28' 52.68"
HA3	S 33° 0' 17.20"	E 19° 28' 52.36"
HA4	S 33° 0' 2.63"	E 19° 28' 33.92"
HA5	S 33° 0' 2.59"	E 19° 28' 33.27"
HA6	S 33° 0' 2.73"	E 19° 28' 31.58"
HA7	S 33° 0' 0.04"	E 19° 28' 21.83"
HA8	S 33° 59' 51.86"	E 19° 28' 19.53"
HA9	S 33° 59' 53.91"	E 19° 28' 24.67"
HA10	S 33° 0' 14.04"	E 19° 28' 56.49"

Notes were compiled and plant species recorded at the sample waypoints with the proposed Harmony Agricultural Area, Alternative 1, investigated in August 2024.

The vegetation of the proposed Harmony Agricultural Area, Alternative 1, is a mix of Winterhoek Sandstone Fynbos and Kouebokkeveld Alluvium Fynbos (see Figure 18). The Winterhoek Sandstone Fynbos is the same as that described for the Harmony Dam site. This fynbos is characterized by the presence of *Protea laurifolia* (Figures 30 & 31) stands on the slightly elevated 'upper' rocky areas whereas this species is absent from the 'lower' areas on more alluvial soil that is fine-grained alluvial sand and silt with many pebbles and boulders on the soil surface (Figure 34).



Figure 30. *Protea laurifolia*.



Figure 31. The strong distinction between the Kouebokkeveld Alluvium Fynbos in the foreground with the Winterhoek Sandstone Fynbos with *Protea laurifolia* the dominant tall shrub.

The Kouebokkeveld Alluvium Fynbos has two strata, the low stratum in the eastern part of the site is dominated by Restionaceae, particularly *Thamnochortus* sp., *Restio capensis* and *Hypodiscus albo-*

aristatus (Figure 32), sedges in the genus *Tetraria* were also present but a more detailed search would be necessary to record the species. The shrub stratum is dominated by *Leucadendron glaberrimum* subsp. *glaberrimum* (Figure 35).



Figure 32. The eastern part of the proposed Harmony Agricultural Area, Alternative 1 is dominated by restios.



Figure 33. *Leucadendron glaberrimum* subsp. *glaberrimum*. Female cone left and male plant right.

In the western part of the site, the vegetation is much grassier than in the eastern part with *Pentameris* cf. *macrocalycina* (Figure 35) being the co-dominant with the restios mentioned above, and more visible grass species (Figure 36). This may be attributed to rockier terrain in the west. *Muraltia spinosa* is a prominent shrub in the western part of the site (Figure 37).



Figure 35. *Pentameris macrocalycina*.



Figure 36. The white grasses seen here are plants of *P. macrocalycina* that are much more prevalent in the western part of the proposed Harmony Agricultural Area, Alternative 1.



Figure 37. *Murraltia spinosa* is a mid-high shrub prominent in the western part of the proposed Harmony Agricultural Area, Alternative 1.

Plant species not mentioned above that were encountered in the proposed Harmony Agricultural Area, Alternative 1, include the following:

Adromischus sp., *Aspalathus* sp. (1) (very spiny), *Aspalathus* sp. (2), *Aspalathus* sp. (3) (bushy low shrub), *Aspalathus* sp. (prostrate forb), *Asparagus capensis*, *Babiana* sp., *Brunsvigia* sp., *Clutia* sp., *Cotula bipinnata*, *Ehrharta ramosa*, *Erica nudiflora*, *Eriocephalus africanus*, *Eriospermum* sp., *Euphorbia tuberosa*, *Ficinia* sp., *Gazania krebsiana*, *Haplocarpha lanata*, *Helichrysum* sp., *Hypodiscus argenteus*, *Lachenalia* sp., *Lampranthus* sp., *Leucadendron brunioides* var. *brunioides*, *Lobostemon* sp., *Lotononis pungens*, *Myrovernix gnaphaloides*, *Othonna ramulosa*, *Oxalis obtusa*, *Passerina obtusifolia*, *Pauridia serrata*, *Pelargonium triste*, *Phylica* sp. (1) – upright shrub, *Phylica* sp. (2) - low, many branched shrublet, *Polygala microlopha*, *Romulea tortuosa*, *Senecio* sp. (1), *Senecio* sp. (2), *Seriphium* cf. *capitatum*, *Tenaxia stricta*.

10. The Harmony Agricultural Area, Alternative 2 (preferred)

The Harmony Agricultural Area, Alternative 2, has been identified as the preferred alternative. It consists of 21.9 ha that was formerly cultivated for onions and a 3.1 ha area that was used for the cultivation of kiwi fruit (Figure 38). The original vegetation that would have occurred is Koue Bokkeveld Alluvium Fynbos that is now a critically endangered vegetation type. Use of this area would not require any further clearing of any natural vegetation.



Figure 38. Aerial photo of the Harmony Agricultural Area, Alternative 2 (preferred) showing the already cleared area formerly used for onion cultivation and the 3.1 ha area under shade-netting formerly used for kiwi fruit cultivation.

11. Ecosystem Sensitivity

11.1 National Web-based Environmental Screening Tool

The National Web-based Environmental Screening Tool was applied to a polygon that covers the areas of interest in this study i.e. the Harmony Dam site and Harmony Agricultural Area, Alternative 1. The outcome for this 'combined site' is that the 'PLANT SPECIES THEME' is **MEDIUM SENSITIVITY** (Figure 39)

Many plant species are listed by the screening tool, being those species regarded as sensitive that may occur (see list in Figure 39). Most of the species listed were not recorded in this study and which is ascribed to the fact that the surveys have been 'snapshots' and not sustained plant surveys in all seasons over more than one year. An example of this is that there may be autumn-flowering geophytes that were not recorded at all. Despite the numerous species listed in Figure 39, the result of the screening tool for plant sensitivity is only **MEDIUM**, whereas from the field surveys there is strong indication that the sensitivity should be HIGH, particularly for the undisturbed areas of Koue Bokkeveld Alluvium Fynbos.

The result of the screening tool for the 'TERRESTRIAL BIODIVERSITY THEME' is **VERY HIGH SENSITIVITY**. This is based on several 'features' listed in Figure 40. The most important of the 'features' is undoubtedly the **Critically Endangered** status of both Kouebokkeveld Alluvium Fynbos.

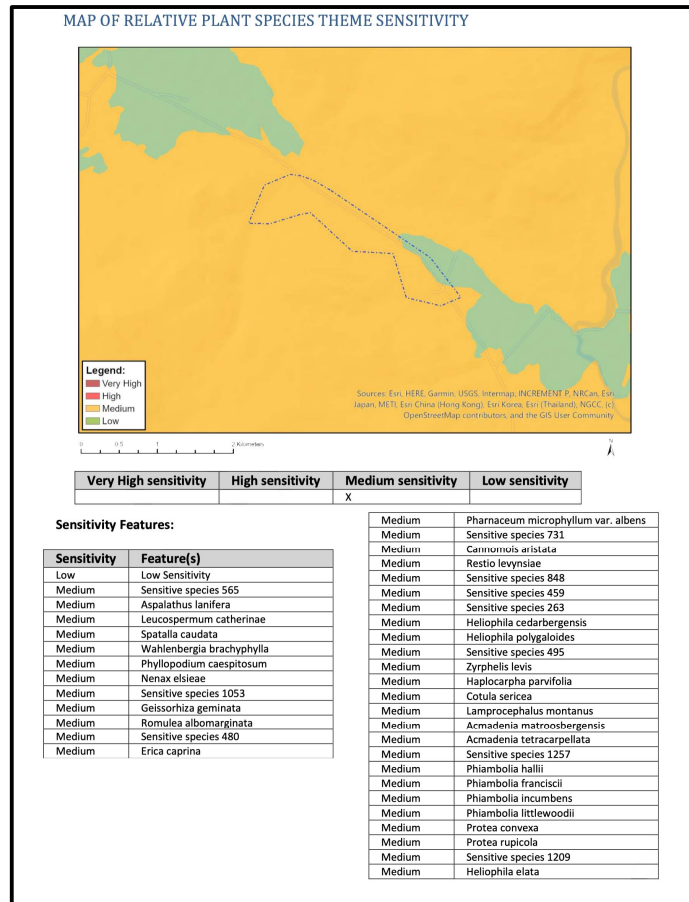


Figure 39. The map of Relative Plant Species Sensitivity with sensitive species list for the Harmony area.

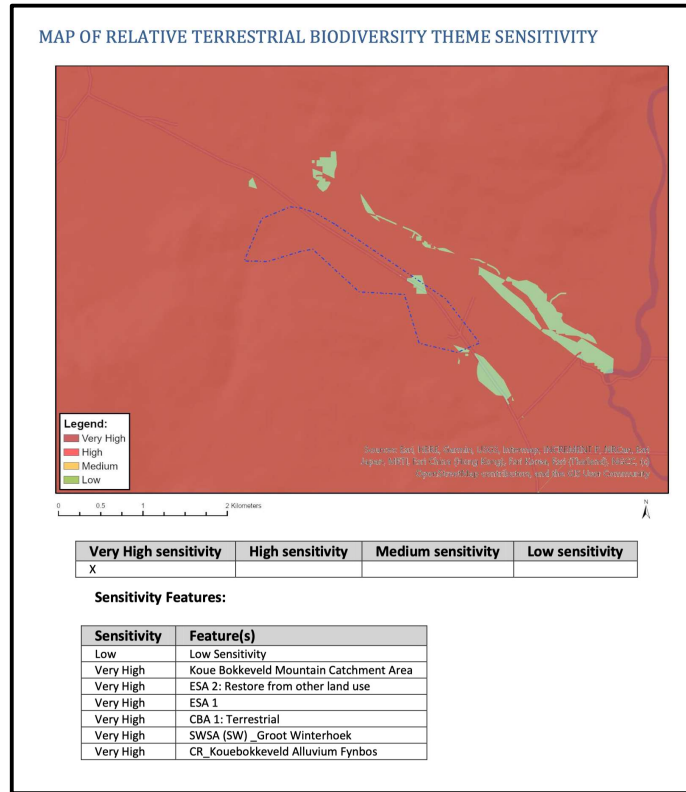


Figure 40. The map of Relative Terrestrial Biodiversity Sensitivity, indicating very high sensitivity.

11.2 Red Listed Ecosystems

In 2021 the National Biodiversity Assessment was updated and emanating from that was the mapping of threatened ecosystems, for practical purposes called the **Red List of Ecosystems** (RLE) for the terrestrial realm of South Africa (SANBI, 2021; Skowno & Monyeke, 2021). This database reflects the current remaining natural extent (remnants) of 458 ecosystems and is mapped for the Houdenberg-Winkelhaak area investigated here (Figure 41). Examination of the map shows that for the Harmony Dam most of the affected habitat falls in habitat of least concern with only a small area in critically endangered habitat. Most of the Harmony Agricultural Area, Alternative 1, is classified and mapped as having mostly habitat of least concern, with small areas in the northeast and southeast being classified and mapped as having critically endangered habitat. This is disputed since there is much more critically endangered habitat within the Harmony Agricultural Area, Alternative 1, than is indicated on this map, as determined in this study.

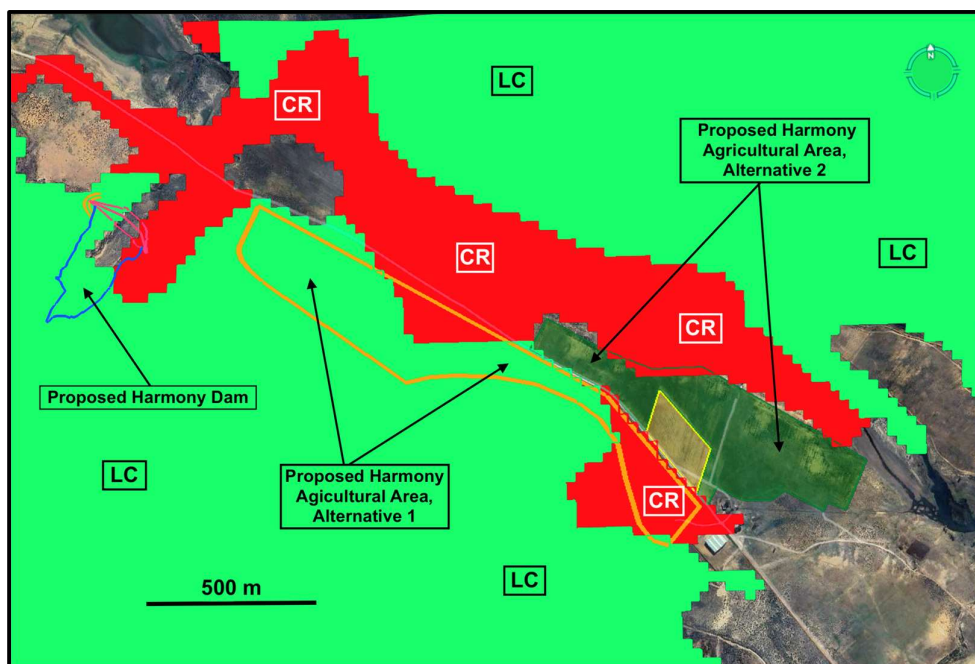


Figure 41. A map of the Red Listed Ecosystems in Houdenbek-Winkel Haak area of the Kouebokkeveld.

12. Conservation Status

12.1 Plant Species of Conservation Concern (SCC)

No Red List species (i.e. species of conservation concern, or SCC), were encountered at the proposed Harmony Dam site, however at the Harmony Agricultural Area Alternative 1 (not preferred), it is possible that the recently described 'new' *Aspalathus jadinii*, (Endangered) could occur. Several species of *Aspalathus* were recorded in this study but they were all without flowers so not identifiable in the field. It would be necessary to sample those plants when they are flowering to obtain accurate identifications. The precautionary principle is therefore invoked with the recommendation that a focused search for *A. jadinii* should be undertaken to confirm if the species occurs in the Harmony Agricultural Area, Alternative 1 or not.

12.2 Endangered Habitat

The list of Threatened Terrestrial Ecosystems (Government Gazette, 2022) was checked for the vegetation types occurring in the study area. Kouebokkeveld Alluvium Fynbos which is **CRITICALLY ENDANGERED B1(i)** may be marginally affected by the Harmony Dam. However, the Harmony Agricultural Area, Alternative 1, principally supports Kouebokkeveld Alluvium Fynbos of extremely high conservation value. An extract from the abovementioned Government Gazette reads as follows:

Kouebokkeveld Alluvium Fynbos	Fynbos	Critically Endangered	B1(i)	Kouebokkeveld Alluvium Fynbos is narrowly distributed with high rates of habitat loss in the past 28 years (1990-2018), placing the ecosystem type at risk of collapse.
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It is thus incontrovertible that development of the proposed Harmony Agricultural Area would trigger the requirement for a Conservation Offset.

12.3 Western Cape Biodiversity Spatial Plan

The most recent version of the Western Cape Biodiversity Spatial Plan (Cape Nature, 2024) depicted in Figure 42 shows that for the proposed Harmony Agricultural Area, the entire area is classified as CBA1. This follows from the critically endangered status of Kouebokkeveld Alluvium Fynbos.

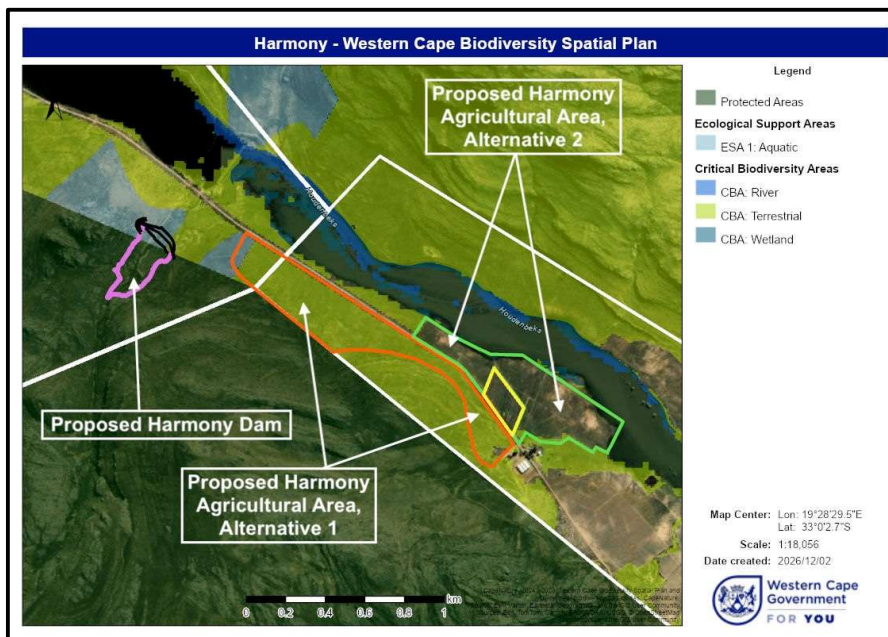


Figure 42. Critical Biodiversity Areas map from CapeNature 2024. The Harmony Dam would lie well within the Koue Bokkeveld Mountains Catchment Area [protected] (green). The Harmony Agricultural Area Alternative 1 is classified as CBA1 & CBA2, whereas the Alternative 2 area is not classified since it has already been cleared of vegetation.

13. Impact Assessment

Impacts on the vegetation are assessed for the construction and operation of the proposed dams. For the Harmony Dam, four options (alternatives) and the No Go are assessed. In addition, the 'No-Go' alternative and two agricultural development alternatives are assessed. Alternative 1 would involve clearing of vegetation on a previously undisturbed area and Alternative 2 would involve development on an existing cleared and ploughed area.

13.1 ‘No-Go’ Alternative

In the case of the **“No Go” alternative**, both the Harmony Dam would not be built and there would be no change to the *status quo*. The natural veld would persist in the catchment where the Harmony Dam would be built and agriculture would be pursued, probably mainly grazing by cattle. The ‘no development’ alternative or ‘No Go’ alternative would thus have a **Negligible** impact on the natural vegetation with no significant further loss in the short- to long-term.

The **“No-Go” alternative** for the Harmony Agricultural Areas would mean that the habitat would remain intact for the foreseeable future in the Alternative 1 area, and no change would occur in the Alternative 2 area.

The ‘No Go’ alternative is included in Tables 2 & 3.

13.2 Direct Impacts

Direct impacts are those that would occur directly on the vegetation of the proposed Harmony Dam and one of two sites where agricultural development would be practiced. The rating system used is given in Appendix 1. In addition to determining the individual impacts using various criteria, mitigation is also brought into the assessment.

The impacts of the proposed dam and agricultural area(s) on the vegetation and habitat are considered with respect to loss of vegetation type and habitat including plant species due to construction and operational activities. Ecological processes are intrinsic to the habitat and are not separated here for assessment but rather the assessment incorporates the effect on ecological processes as part of the affected habitat.

The assessment is not made with respect to the desirability or undesirability of an ‘in-stream dam’. That assessment resides in the realm of the freshwater specialist since cumulative effects of the dams on downstream flows must be assessed. This assessment is restricted to the ‘terrestrial’ vegetation.

13.2.1 Direct Impacts of the proposed Harmony Dam

12.2.1.1 Loss of vegetation type and habitat including plant species (including ecological processes) due to construction and operation of the proposed Harmony Dam (Table 2).

Option 1.

The Option 1 construction of the Harmony Dam would have the greatest negative impact on undisturbed natural vegetation (Winterhoek Sandstone Fynbos) since the largest area of intact fynbos

would be affected by the wall construction and inundation by the dam. The impact is rated as **High Negative**.

Option 2.

From a botanical perspective, the Option 2 construction of the Harmony Dam would have a marginally lower negative impact than Option 1 due to a smaller dam wall, but it would still be **High Negative**.

Option 3.

Option 3 is the preferred option. The wall would be constructed lower in the catchment in an area that is more disturbed than higher in the catchment. Marginally less proteoid fynbos (and intact undisturbed fynbos) would be inundated by the dam and hence the impact would be less negative. However, since the dam would still fall within a protected area the negative impact cannot be rated as less than **Medium Negative**.

Option 4.

The Option 4 dam would result in the loss of the most undisturbed vegetation and habitat and is not desirable. The impact would be **High Negative**.

12.1.1.2 Mitigation

Proposed mitigation would be rehabilitation (restoration of vegetation) of the dam wall. No mitigation would be possible on the footprint of the dam wall and in the inundation area.

Table 2. Impact and Significance – Loss of natural vegetation and habitat during construction and operational phases for the Harmony Dam.

CRITERIA	‘NO GO’ ALTERNATIVE		Option 1		Option 2		Option 3 (Preferred alternative)		Option 4	
Nature of direct impact (local scale)	Loss of Winterhoek Sandstone Fynbos									
	WITHOUT MITIGATION	WITH MITIGATION	WITHOUT MITIGATION	WITH MITIGATION	WITHOUT MITIGATION	WITH MITIGATION	WITHOUT MITIGATION	WITH MITIGATION	WITHOUT MITIGATION	WITH MITIGATION
Extent	Local	Local	Local	Local	Local	Local	Local	Local	Local	Local
Duration	Long-term	Long-term	Long-term	Long-term	Long-term	Long-term	Long-term	Long-term	Long-term	Long-term
Intensity	Low	Low	High	High	High	High	Medium	Medium	High	High
Probability of occurrence	Probable	Probable	Probable	Probable	Probable	Probable	Probable	Probable	Probable	Probable
Confidence	High	High	High	High	High	High	High	High	High	High
Significance	Negligible	Negligible	High negative	High negative	High negative	High negative	Medium negative	Medium negative	High negative	High negative
Nature of Cumulative impact	Loss of Winterhoek Sandstone Fynbos									
Cumulative impact prior to mitigation	Low negative									
Degree to which impact can be reversed	Not reversible									
Degree to which impact may cause irreplaceable loss of resources	Low									
Degree to which impact can be mitigated	Low									

Proposed mitigation	Mitigation not possible in the dam inundation area. The only mitigation would be to revegetate the dam wall.
Cumulative impact post mitigation	Low negative
Significance of cumulative impact (broad scale) after mitigation	Low negative

13.2.2 Direct Impacts of the proposed Harmony Agricultural Areas – Two alternatives

13.3.1.1 Loss of vegetation type and habitat including plant species (including ecological processes) due to construction (clearing) and operation of the proposed Harmony Agricultural Area, Alternatives 1 & 2 (Table 3).

The proposed development of the Harmony Agricultural Area, Alternative 1, would result in the complete loss of a tract of critically endangered Kouebokkeveld Alluvium Fynbos and some Winterhoek Sandstone Fynbos. The result is that the impact of clearing this 29 ha for crop production (analogous to the construction phase) would be **Very High Negative**. No further loss of this vegetation type would occur during the operational phase (Table 3).

The proposed development of the Harmony Agricultural Area, Alternative 2, would result in no further loss of critically endangered Kouebokkeveld Alluvium Fynbos. This is thus the PREFERRED alternative.

In the case of the "No-Go" scenario for the Harmony Agricultural Areas, the 29 ha of undisturbed fynbos in the Alternative 1 area (including critically endangered habitat) would remain intact. No further development of the Alternative 2 area (25 ha) would happen either, which would have a neutral impact since it is already significantly disturbed.

Table 3. Impact and Significance – Loss of natural vegetation and habitat during construction (clearing) and operation of the Harmony Agricultural Area.

CRITERIA	‘NO GO’ ALTERNATIVE	ALTERNATIVE 1		ALTERNATIVE 2	
Nature of direct impact (local scale)	Loss of critically endangered Kouebokkeveld Alluvium Fynbos.				
		WITH MITIGATION	WITHOUT MITIGATION	WITH MITIGATION	WITHOUT MITIGATION
Extent	Local	Local	Local	Local	Local
Duration	Long-term	Long-term	Long-term	Long-term	Long-term
Intensity	Low	Very High	Very High	Very Low	Very Low
Probability of occurrence	Probable	Probable	Probable	Probable	Probable
Confidence	High	High	High	High	High
Significance	Negligible	Very High Negative	Very High Negative	Very Low Negative	Very Low Negative
Nature of Cumulative impact	Loss of critically endangered Kouebokkeveld Alluvium Fynbos.			No further loss of critically endangered Kouebokkeveld Alluvium Fynbos.	
Cumulative impact prior to mitigation	Very High Negative			Very Low negative	
Degree to which impact can be reversed	Not reversible			Not reversible	
Degree to which impact may cause irreplaceable loss of resources	Very High			Very low	
Degree to which impact can be mitigated	Very Low			Not required	
Proposed mitigation	Only a Conservation Offset would provide mitigation			Not required	
Cumulative impact post mitigation	Medium negative			None	
Significance of cumulative impact (broad scale) after mitigation	High			Neutral	

13.3.1.2 Mitigation

No effective local mitigation measures would be possible to compensate for the loss of natural vegetation and habitat. Consequently, a Conservation Offset would be the only (and required!) mitigation.

13.4 Indirect impacts

Indirect impacts occur away from the 'action source' i.e. away from the development site. The impacts assessed here are specifically how the proposed dam and agricultural cultivation area(s) would have an indirect impact on vegetation and flora away from the development site. No indirect impacts for terrestrial vegetation and flora were identified. The indirect impacts pertain mainly to downstream effects of the dams (not part of this study). If implemented, the Harmony Agricultural Area, Alternative 1, could have negative impacts on the remaining habitat of Kouebokkeveld Alluvium Fynbos since ecological processes such as pollination and consequent gene flow could be affected.

13.5 Cumulative impacts

The receiving environment into which the proposed Harmony Dam would be imposed is only minimally disturbed. Good fynbos habitat would be lost but at a local scale. The Winterhoek Sandstone Fynbos would in no way be threatened by the construction of the dam and the contribution of the loss of vegetation and habitat due to the construction of the Harmony Dam would have a low to very low cumulative effect. The Winterhoek Sandstone Fynbos is widespread and well protected in the Kouebokkeveld Mountain Catchment Area and is not generally under threat.

In the case of the Harmony Agricultural Area, Alternative 1 (not preferred), the loss of 29 ha of critically endangered habitat would have a **large negative cumulative** impact since so little of this habitat type remains in the Kouebokkeveld. In contrast, the redevelopment of the Alternative 2 agricultural area would result in no further negative cumulative impacts.

14. General Assessment and Recommendations

- Good condition Winterhoek Sandstone Fynbos occurs at the Harmony Dam site.
- The impact of a dam at the Harmony Dam site (preferred option – Option 3) would result in a **Medium Negative** impact at a local scale. Scale is important in this case because the vegetation type is not threatened and in a cumulative sense the loss of vegetation and habitat would be relatively small. The construction of the Harmony Dam (Option 3) is supported, but not Options 1, 2 & 4.
- The loss of Kouebokkeveld Alluvium Fynbos in the Harmony Agricultural Area, Alternative 1 would result in **High to Very High Negative** impacts. The precautionary principle should be invoked.

The precautionary principle is a framework for risk management that suggests taking preventive measures when there's potential for harm, even if the scientific understanding of the risk is not fully established. It's essentially an approach of "better safe than sorry," emphasizing caution and the need for proactive measures when there's a threat of serious or irreversible damage.

- There is a strong possibility that the loss of Kouebokkeveld Alluvium Fynbos in the Harmony Agricultural Area, Alternative 1 (not preferred) would trigger the requirement of a Conservation Offset, hence the proposal of redevelopment of the Alternative 2 agricultural area (preferred) that would not incur the need for a Conservation Offset.
- Since the Harmony Agricultural Area, Alternative 1, is unlikely to be implemented, the need for a focused search for *Aspalathus jardinii* (as well as other sensitive plant species) would not be required.

15. Conclusions

For the Harmony Dam site, due to the relatively low level of disturbance, the important question is whether the dam is desirable or acceptable in a protected mountain catchment area? This question is not addressed here since the impacts are only based on the merits of the site in the local and immediate context of the vegetation found.

Construction of a dam at the Harmony Dam Option 3 site is supported when looked at purely from the terrestrial vegetation perspective.

The proposed Harmony Agricultural Area, Alternative 1 (not preferred) has natural habitat that although allied to the other fynbos in the general study area, is a separate vegetation type to that found at the dam site and should be carefully considered due to its ecological and conservation sensitivity. The requirement of a Conservation Offset for the use of the 29 ha Harmony Agricultural Area would be unavoidable if the Agricultural Area Alternative 1 is pursued. Therefore, the redevelopment of the Alternative 2 area (preferred) where there will be no further negative impacts, is fully supported.

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Appendix 1: Impact Assessment Methodology

The assessment of impacts needs to include the determination of the following:

- The nature of the impact – see Table 1.1
- The magnitude (or severity) of the impact – see Table 1.2
- The likelihood of the impact occurring - see Table 1.2

The degree of confidence in the assessment must also be reflected.

Table 1.1 *Impact assessment terminology*

Term	Definition
<i>Impact nature</i>	
Positive	An impact that is considered to represent an improvement on the baseline or introduces a positive change.
Negative	An impact that is considered to represent an adverse change from the baseline, or introduces a new undesirable factor.
Direct impact	Impacts that result from a direct interaction between a planned project activity and the receiving environment/receptors (e.g. between occupation of a site and the pre-existing habitats or between an effluent discharge and receiving water quality).
Indirect impact	Impacts that result from other activities that are encouraged to happen as a consequence of the Project (e.g. in-migration for employment placing a demand on resources).
Cumulative impact	Impacts that act together with other impacts (including those from concurrent or planned future third party activities) to affect the same resources and/or receptors as the Project.

Assessing significance

There is no statutory definition of ‘*significance*’ and its determination is, therefore, somewhat subjective. However, it is generally accepted that significance is a function of the magnitude of the impact and the likelihood of the impact occurring. The criteria used to determine significance are summarized in *Table 1.2*

Table 1.2 *Significance criteria*

<i>Impact magnitude</i>	
Extent	<i>On-site</i> – impacts that are limited to the boundaries of the rail reserve, yard or substation site. <i>Local</i> – impacts that affect an area in a radius of 20km around the development site. <i>Regional</i> – impacts that affect regionally important environmental resources or are experienced at a regional scale as determined by administrative boundaries, habitat type/ecosystem. <i>National</i> – impacts that affect nationally important environmental resources or affect an area that is nationally important/ or have macro-economic consequences.
Duration	<i>Temporary</i> – impacts are predicted to be of short duration and intermittent/occasional. <i>Short-term</i> – impacts that are predicted to last only for the duration of the construction period. <i>Long-term</i> – impacts that will continue for the life of the Project, but ceases when the Project stops operating. <i>Permanent</i> – impacts that cause a permanent change in the affected receptor or resource (e.g. removal or destruction of ecological habitat) that endures substantially beyond the Project lifetime.

Intensity	BIOPHYSICAL ENVIRONMENT: <i>Intensity can be considered in terms of the sensitivity of the biodiversity receptor (ie. habitats, species or communities).</i> Negligible – the impact on the environment is not detectable. Low – the impact affects the environment in such a way that natural functions and processes are not affected. Medium – where the affected environment is altered but natural functions and processes continue, albeit in a modified way. High – where natural functions or processes are altered to the extent that it will temporarily or permanently cease. Where appropriate, national and/or international standards are to be used as a measure of the impact. Specialist studies should attempt to quantify the magnitude of impacts and outline the rationale used.
	SOCIO-ECONOMIC ENVIRONMENT: <i>Intensity can be considered in terms of the ability of project affected people/communities to adapt to changes brought about by the Project.</i> Negligible – there is no perceptible change to people's livelihood Low - People/communities are able to adapt with relative ease and maintain pre-impact livelihoods. Medium - Able to adapt with some difficulty and maintain pre-impact livelihoods but only with a degree of support. High - Those affected will not be able to adapt to changes and continue to maintain-pre impact livelihoods.
Impact likelihood (Probability)	
Negligible	The impact does not occur.
Low	The impact may possibly occur.
Medium	Impact is likely to occur under most conditions.
High	Impact will definitely occur.

Once a rating is determined for magnitude and likelihood, the following matrix can be used to determine the impact significance.

Table 7.5 Example of significance rating matrix

SIGNIFICANCE RATING					
	LIKELIHOOD	Negligible	Low	Medium	High
MAGNITUDE	Negligible	Negligible	Negligible	Low	Low
	Low	Negligible	Negligible	Low	Low
	Medium	Negligible	Low	Medium	Medium
	High	Low	Medium	High	High

In Table 7.6, the various definitions for significance of an impact is given.

Table 7.6 Significance definitions

Significance definitions	
Negligible significance	An impact of negligible significance (or an insignificant impact) is where a resource or receptor (including people) will not be affected in any way by a particular activity, or the predicted effect is deemed to be 'negligible' or 'imperceptible' or is indistinguishable from natural background variations.

Minor significance	An impact of minor significance is one where an effect will be experienced, but the impact magnitude is sufficiently small (with and without mitigation) and well within accepted standards, and/or the receptor is of low sensitivity/value.
Moderate significance	An impact of moderate significance is one within accepted limits and standards. The emphasis for moderate impacts is on demonstrating that the impact has been reduced to a level that is as low as reasonably practicable (ALARP). This does not necessarily mean that 'moderate' impacts have to be reduced to 'minor' impacts, but that moderate impacts are being managed effectively and efficiently.
Major significance	An impact of major significance is one where an accepted limit or standard may be exceeded, or large magnitude impacts occur to highly valued/sensitive resource/receptors. A goal of the EIA process is to get to a position where the Project does not have any major residual impacts, certainly not ones that would endure into the long term or extend over a large area. However, for some aspects there may be major residual impacts after all practicable mitigation options have been exhausted (i.e. ALARP has been applied). An example might be the visual impact of a development. It is then the function of regulators and stakeholders to weigh such negative factors against the positive factors such as employment, in coming to a decision on the Project.

Once the significance of the impact has been determined, it is important to qualify the **degree of confidence** in the assessment. Confidence in the prediction is associated with any uncertainties, for example, where information is insufficient to assess the impact. Degree of confidence can be expressed as low, medium or high.

Appendix 2: 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

Mobile: 082-876-4051

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:

- Nineteen 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
- Twenty 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 1000 projects have been completed related to environmental impact assessments in the Western, Southern 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